SPECIAL PROVISIONS
FOR

MC 85 & 91ST AVENUE
(MC85: 95TH AVENUE TO 87TH AVENUE)

MCDOT

PROJECT NUMBER: TT0651

June 2022

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SPECIAL PROVISIONS
FOR
MC85 & 91st Avenue
(MC 85: 95th Avenue to 87th Avenue)
PROJECT NUMBER: TT0651

LOCATION OF THE WORK: This project is located in Sections 9, 10, 15 and 16 within Range 1 East and Township 1 North. The project includes portions of Buckeye Road (Maricopa County 85) and 91st Avenue within Maricopa County, Arizona. This project falls within the City of Tolleson and City of Phoenix jurisdictions.

PROPOSED WORK: The work consists of removal and replacement of asphalt pavement, roadway widening, curb and gutter installation, traffic signal installation, utility valve and manhole adjustments, sidewalk placement, lime/cement subrade stabilization, microsurfacing, pipe removal and installation, scupper installation, signing and marking and SRP Irrigation and lighting adjustments.

CONTRACT TIME: The Contractor shall complete all project work within 365 calendar days beginning with the start date specified in the Notice to Proceed.

AVAILABLE INFORMATIONAL MATERIAL: The following information is made available as an attachment to the solicitation for bids:

Geotechnical Report*
Roadway Cross Sections
Pothole Data
SRP Distribution Power Plans
SRP Irrigation Plans

*Note: Soils information contained in the geotechnical report was obtained and used for design purposes. It is the responsibility of the Contractor to establish soils information for their bid and construction purposes.

SECTION 104 SCOPE OF WORK

104.1.1 General: add the following

For all areas of the project south of the City of Tolleson city limits line shown in the plans, the order of precedence shall be modified as follows:

Change Orders
Addenda
Special Provisions
Project Plans

"2015 City of Phoenix supplements to the MAG Uniform Standard Specifications and Details"
Contracting Agency's supplements to the MAG Uniform Standard Specifications and Details
MAG Uniform Standard Specifications
MAG Standard Details

In no case shall the City of Phoenix supplements to the MAG override a more conservative specification provided in the Contracting Agency's supplements to MAG or the current MAG Uniform Standard Specifications and Details. Prior to construction of all work items, the Contractor shall confirm the proper specification to be utilized with the Engineer.

The 2015 City of Phoenix supplements to the MAG are provided in **Appendix H**.

The 2015 MAG Uniform Standard Specifications are provided in **Appendix I** for information only and shall not be used to construct this project.

104.4 PARTNERING:

The County's Partnering Program is designed to build the foundation of a cohesive partnership with MCDOT, the Contractor, MCDOT's Consultant Construction Manager, Subcontractors and Suppliers through identifying outcomes, setting goals and resolving disputes. This is accomplished through all project team members being committed to: building relationships upon mutual trust and teamwork; establishing and keeping open lines of communication; performing their best on the job; being open minded to new best practices; empowering employees to solve issues at the lowest level; and maintaining cooperative working relationships to meet project goals.

To implement this, the Contractor's management personnel, the County's Resident Engineer, the Consultant Construction Manager, and the Partnering Representative will initiate a conference call to determine a Partnering Facilitator to lead the Construction Kickoff Workshop and other subsequent partnering meetings during the project. They will also determine workshop attendees, agenda specifics, duration, frequency of partnering meetings and locations. Persons required to be in attendance will be agreed upon in this conference call in accordance with MCDOT's Partnering Program.

Since the Partnering Program provides benefits to both the County and the Contractor, the County will reimburse the Contractor for one half of the cost of the partnering charges, equally divided, based upon approved invoices and documented expenses to the Contractor in connection with the Item PARTNERING, in an amount not to exceed the ALLOWANCE shown in the Bidding Schedule. Expenses eligible for reimbursement are direct expenses incurred in providing facilities, facilitators, supplies, and materials for the Construction Kickoff workshop and other partnering meetings during the project. No labor costs or additional mark-up for profit and/or fee for Contractor will be eligible for reimbursement.

The establishment of a partnering charter on the project will not change the legal relationship of the parties to the contract, nor relieve either party from any terms of the contract.

SECTION 105 CONTROL OF WORK

105.5 COOPERATION OF CONTRACTOR, add the following:

The Contractor shall file with the Engineer and maintain a list of the names, telephone numbers, and email addresses (if applicable), of property owners for each property within the project limits.

105.6 COOPERATION WITH UTILITIES, add the following:

The following utilities are expected to be located within the limits of this project. These utilities, along with the contact information, are listed below:

The Contractor shall be responsible for coordinating any special inspection required by the utilities while digging close to existing facilities and all utility coordination efforts. A complete list of utility potholes completed during the design phase of the project is provided in **Appendix A** for reference only.

These utilities, along with the contact information, are listed below:

Utility Name	Contact Name	Phone Number	Type of Facility
Arizona Public Service	Ron Gandara	602-371-7546	Abandoned manhole
AT&T	Eric Nowicki	480-510-8107	Cable & Fiber
Lumen (Public)	Jason Jensen	801-735-2464	Cable & Fiber
Lumen (Private)	Mike Puruleski	602-578-5367	Cable & Fiber
City of Phoenix (Water)	Jami Erickson	602-261-8229	Water
City of Tolleson	Dale Crandell	623-640-5023	Water & Sewer
Cox Communications	Jose Aguirre	623-328-2184	Fiber
Level 3 Communication	Carlos Muniz	602-322-2162 623-215-5129	12” SteelAbandoned
MCDOT ITS	LeShawn Charlton	602-506-9025	ITS
MCDOT Signals	Efren Guevara	602-722-1907	Signals
MCI	Jesus Arrieta	480-349-1350	Fiber
Verizon	Waide Stockhill	480-510-0273	Fiber
Southwest Gas	Yvonne Aguirre	602-484-5338 602-763-5105	Gas
Salt River Project (Distribution)	Anthony Lawrence	602-748-6687 602-236-4921	Power
Salt River Project (Irrigation)	Ron Dobbin	602-236-2589 602-809-1587	Irrigation

Utility Name	Contact Name	Phone Number	Type of Facility
Salt River Project (Transmission)	Norman Reber	602-809-2812	Power
Salt River Project (Distribution Inspector)	Brad Hawn	602-236-8654 602-332-2240	Power
City of Phoenix (Electrician)	Marcelino Nava	602-540-3943	Power
City of Tolleson (Water)	Bryce Bragelman	623-478-8729 480-263-2800	Water
City of Tolleson (Sewer)	David Tyler	623-478-8722 602-803-2422	Sewer

Arizona Public Service

Arizona Public Service (APS) has an abandoned manhole located at the NWC of the MC85 & 91st Ave intersection. The manhole lid is labeled Arizona Public Service and it is located in the existing pavement. The manhole is filled with silt and slurry. Contractor is responsible for potholing alongside the manhole neck to locate the top of vault. Contractor is responsible for removing slurry and manhole neck to the extent needed to pave the intersection or as directed by the Engineer.

Lumen (previously CenturyLink)

Lumen pullboxes along the south side of MC85 in front of the Logic Park property frontage were intentionally installed above grade to be at the correct elevation for the ultimate roadway grading. If additional adjustment is needed during construction to place the pullboxes at finished grade, the Contractor is responsible for coordinating this adjustment with Lumen and Lumen's Contractor.

City of Phoenix Water/Sewer

Contractor to be advised that the City of Phoenix will be doing a sewer assessment for the siphon at 95th Ave. The assessment is expected to be complete by July 2022. Rehab efforts are anticipated to start in FY 24/25. No extensions will be granted for accommodating City of Phoenix rehabiliatation, no delay claims will be paid for accommodating City of Phoenix rehabilitation. For more information regarding the assessment or potential rehabilitation work, please contact Cindy Smith (cindy.smith@phoenix.gov) (602-261-8237).

Maintain 3' clearance between water meters/taps and other utilities.

6' horizontal separation from OD of pipe (water and/or sewer) to OD of proposed features shall be met in all areas throughout construction.

A one (1) foot minimum vertical separation from any dry underground utility crossing shall be provided for sewer mains, sewer services, water main, or water service to outside underground utility except for crossings of large mains indicated on next page.
All fire Hydrants shall maintain a 6-foot clearance from any utility and above ground structures.

North of Pima St along the Logic Park frontage is a waterline that was not installed to COP standards. COP is responsible for removing the coupling and installing a straight pipe from the water main to the meter. Contractor is responsible for coordinating grading schedule in this area with the Engineer. Engineer is responsible for coordinating with COP for repair work.

Southwest Gas

The high pressure gas valves at the SEC of the MC85 and 91st Ave intersection shall be adjusted to grade by SWG. The valves contain grease zurc fittings, the fittings are rigid and must be replaced, not adjusted.

Contractor to be advised that SWG will adjust the valves to finished grade which could potentially be above the pavement elevation being used during construction if the final lift of asphalt is saved until the end. If this occurs an interim wedge of asphalt shall be constructed to bring the interim grade up to the elevation of the gas valve. The wedge of pavement must extend 25' beyond the valve in every direction. The wedge and removal of the wedge will be considered incidental to the project.

The Contractor shall provide a minimum of 36 inches of cover over the top of each gas pipe unless otherwise reviewed and approved by the Engineer. New facilities shall maintain at least three feet horizontal clearance and two feet vertical clearance to existing gas line facilities. The Contractor shall verify locations marked out in the field with those shown on the plans before starting any excavation work. The Contractor shall hand dig at the marked locations until the gas pipe has been found and exposed. Use care to avoid damaging or breaking the small electrical tracer wire that may be buried with the pipe.

Once mechanical trenching is in progress, do not dig within two feet of a gas pipe. This trenching shall be done by hand in order to prevent any damage to the gas pipe. In the event your contractor should "hook" or otherwise strain a gas pipe while excavating, a call should be placed to (602) 271-GASS (4277).

Even though there may not be any apparent damage, strain may have damaged the wrap or a portion of the buried pipe or fittings causing a leak in the surrounding area.If a steel facility is exposed and the pipe coating is found to be in need of repair, please contact 602-271-GASS (271-4277) so a crew can be dispatched to rewrap the pipe. This service is at no cost to the Contractor so Southwest Gas can monitor the steel facilities and minimize the possibility of corrosion.

When the excavations are complete, all exposed gas pipes should be protected. If the trench is more than three feet wide, the pipe must be supported in a manner where the supporting material does not damage the pipe or its protective wrapping.
Guidelines for supporting exposed gas pipe:

- The pipe shall be protected from construction damage (avoid rocks/debris or tool/machine impacts).
- The pipe shall be supported to prevent excessive movement or strain (long lengths

of exposed pipe shall be supported at a minimum every 8' to prevent excessive sagging; rigid I-beams across the trench with support straps can be used to hold the pipe in place). Final Support Plan approval from Southwest Gas is required prior to construction. The Contractor shall call the construction coordinator Yvonne Aguirre at least 24 hours prior to set up inspection of trench.

- Any trench with exposed gas pipe must have plating when work is not being done to prevent debris from hitting the pipe (Arizona Corporation Commission requirement).
- When work is complete, the pipe must be re-buried and re-compacted to meet Southwest Gas backfill requirements.
- Southwest Gas Inspectors will regularly visit the site to ensure safe practices are maintained.
- For parallel utility installations, it is recommended that shoring be used to prevent the existing gas trench from flowing/collapsing into the newly excavated trench.

When backfilling, Southwest Gas requires both six inches of bedding and six inches of shading with sand or material free of rocks and able to pass through a 3/8-inch screen. This will provide a firm support under the facility and prevent damage to the pipe or pipe coating from the backfilling operation. Do not drop backfill directly over the gas pipe. During the compaction process, use extra care when directly over the gas pipe in order to avoid any damage.

The Contractor shall be aware that there may be abandoned steel gas lines within the project limits that may be coated with asbestos containing materials. Southwest Gas will remove and dispose of any abandoned steel gas lines that are exposed and in conflict with construction. The Contractor shall contact Southwest Gas at 602-271-GASS (271-4277) to coordinate the removal of the steel gas lines once excavation has begun.

The Southwest Gas system has Regulator Stations, rectifier stations, pipeline valves, line locating stations, test points and underground vaults each with protective valve box lids and vault manhole covers. According to the U.S. Department of Transportation's Pipeline Safety Regulations and Southwest Gas operating procedures, these facilities shall be accessible at all times.

Southwest Gas will paint yellow all protective valve box lids and vault manhole covers. It will be the responsibility of the public agency's contractor to make sure these are protected during construction. The public agency's contractor will be responsible for adjustments to all valve box lids and vault manhole covers due to grading and paving per MAG Details 391.1 and 391.2 whether called out in the plans or required in the field. Contact Southwest Gas Construction at 43rd Operations (602) 484-5350 for coordinating work and inspections. For emergencies, please call (602) 271-GASS (4277). This does not include the high pressure valves in the SEC of 91st Avenue and MC 85 the intersection, those must be adjusted by Southwest Gas.
Contact Yvonne Aguirre 602-484-5338, for coordinating work and inspections. For emergencies, please call 602-271-GASS (4277).

No additional measurement or payment will be made for pipe supports as part of this project. Backfilling and bedding required to rebury exposed Southwest Gas pipelines in conjunction with crossing pipelines including storm drain and SRP Irrigation pipes shall be considered included in the cost of the installation of the pipeline.

Salt River Project (Irrigation)

Salt River Project Irrigation (SRPI) owns irrigation facilities throughout the project limits which include existing pipe, concrete ditches, earthen ditches, headwalls, manholes, and turnout structures. Removal work for these facilities as shown in the project plans will be done by the Contractor and will be inspected by SRPI forces. SRP will provide construction staking for Contractor. MCDOT will run a QC and record locations for Record Drawings.

The Contractor shall coordinate with the SRPI Inspector noted on the plan set for: Any needed dry-ups; SRPI survey request, or other work that may require outages of SRPI facilities; SRPI access to the site for work that will be done by the Contractor and for required SRPI inspections; Attendance to the SRPI preconstruction meeting; And adherence to all SRPI requirements as indicated in these specifications, included in the project plans, and standards and specifications as referenced in plans and specifications.

The SRPI 2023 dry-up is currently scheduled from Jan 8, 2023 through Feb 7, 2023.. SRPI's annual dry-up is generally scheduled by the SRP Operations Division through the month of January, however, the Contractor will need to coordinate closely with the SRPI inspector for all work requiring a dry-up. Additional smaller dry-ups, if required within the SRPI system, must be granted by SRPI Operations, and will need to be coordinated with the SRPI inspector. Advance notice of 4 weeks shall be provided to SRPI and the Engineer for additional dry-ups unless otherwise approved by the Engineer.

The contractor shall coordinate the SRPI removal work to avoid disruption to farming activities. If temporary ditches are necessary to maintain deliveries from SRP or private irrigation ditches, they shall be designed, installed and maintained by the Contractor at no additional cost to the County. If construction of a temporary ditch is not possible to maintain the delivery, a pump around may be installed with the approval of the Engineer per Section 635.

If it is determined that an irrigation manhole adjustment is required, this work will need to be done during dry up.

SRP irrigation may be constructing a tailwater pickup at the west end of the project just west of the sewer siphon during the 2023 dry up (1/8/23-2/7/23). Contractor shall coordinate and schedule the installation with SRP. No extensions will be granted for accommodating SRP irrigation, no delay claims will be paid for accommodating SRP irrigation.

Contractor to exercise caution when removing the abandoned SRPI facilities at the connection points to the live system. SRPI has installed hard plugs at the connection at

91st Ave manhole station 314+00 and 91st Ave tee station 319+00. Contractor is to remove pipe up until the stick of pipe that connects to the live system. Contractor to slurry backfill pipe and trench up to the hard plug. SRP inspector to be present for excavation and abandonment activities for inspection. SRP construction crews to be notified of removal work and on-call incase an emergency repair is needed. Contractor is required to coordinate with SRPI inspector Jerry Crawford (602-236-5096) for this operation. SRPI inspector is required to coordinate with SRP construction crew on-call for emergency repairs.

Salt River Project Power (Transmission)

Prior to construction, the Contractor shall contact the Salt River Project Safety Services to arrange for a safety meeting regarding work under transmission power lines. The contact number for SRP Safety Services is 602-236-8117.

Pole setup areas are shown on the project plans. The storage of construction equipment and materials at SRP pole setup areas or under transmission power lines is not allowed.

During construction, the Contractor shall communicate all construction activities within the vicinity of SRP Transmission facilities as they are scheduled including duration and scope of work. If no work is being performed in the vicinity of SRP transmission facilities the contractor shall not store equipment or materials in a way that would preclude access. SRP requires 24-hour/7 days-a-week access to the transmission power line facilities for routine equipment setup and maintenance. The contractor shall allow access accordingly.

At all times during construction the contractor shall abide by SRP requirements and specifications for excavation near existing power poles. All excavation and construction activities withing 10-feet of any power pole or other SRP equipment within the project limits shall be reviewed and approved by the Engineer and SRP 2-weeks prior to the start of work.

Salt River Project (Distribution)

The Contractor will be responsible for construction of SRP distribution conduit to serve lighting and traffic signals as detailed on the plans and the SRP distribution design plans provided in back the project plan set. SRP will be responsible for splicing the wire in the lighting pullboxes.

At all times during construction the contractor shall abide by SRP requirements and specifications for excavation near existing power poles. All excavation and construction activities withing 10-feet of any power pole or other SRP equipment within the project limits shall be reviewed and approved by the Engineer and SRP 2-weeks prior to the start of work.

The Contractor will be responsible for ensuring that the following light energization processes are followed and completed. Early coordination is required to ensure successful completion.

- ***Light Engergization Process***

    - Below is a description of the light energizing process for the City of Phoenix, City of Tolleson, and how SRP is involved in each.

    - Contractor to be advised that the process to energize the lights could take longer than one month to complete, time extension will not be granted.

    - Contractor to be advised that SRP will require two lanes to be closed to provide sufficient space for staging and pulling wire.

    - ***City of Tolleson***
        - Contractor installs conduit, pullboxes, and lights
        - Contractor to provide all light pole information to City of Tolleson. City of Tolleson to write letter of authorization to SRP to de-energize the lights
        - Contractor is responsible for coordinating City issued letter to SRP giving authorization to energize new lights
        - Contractor coordinates with SRP to energize the lights
        - SRP pulls wire and energizes lightsSRP puts stickers on all the poles
        - Contractor coordinates with City of Tolleson to inspect the work

    - ***City of Phoenix***
        - Contractor installs conduit, pullboxes, and lights
        - Contractor submits a letter to the City of Phoenix requesting the City to inspect the work
        - City of Phoenix inspects the work and places stickers
        - City of Phoenix writes a letter of authorization to SRP that contains all of the pole numbers
            - Contractor to be advised that SRP will not pull wire until they receive a letter of authorization from the City of Phoenix

105.7 COOPERATION BETWEEN CONTRACTORS, add the following:

The City of Phoenix has a resurfacing project planned for FY 2023. Contact Rick Evans 602-262-4051 to discuss schedule impacts.

105.17 Measurement and Payment:

City of Phoenix will complete the signing and marking work within the City of Phoenix jurisdiction. This includes MC85 and 91st Ave south of MC85. City of Phoenix will not complete the signing and marking work on 91st Ave north of MC85 or any of the Signing and Marking work outside MCDOT and COP right of way. Contractor to coordinate with Gretchen Naehrbass for work to be perfomed by the City of Phoenix.

Principal Engineering Technician
gretchen.naehrbass@phoenix.gov
602-262-4610

No additional measurement or payment will be provided for cooperation with and accommodating the City of Phoenix striping and signing schedule.

No additional measurement or payment will be provided for removing slurry in the APS manhole to pave the roadway. This is considered incidental to the manhole removal item. Potholing the neck of the manhole will be paid using the pothole bid item.

No additional measurement or payment will be provided for coordination with Utilities.

The signing and marking of MC85 and south 91st Ave (inside the ROW) is expected to be completed by the City of Phoenix. If any of the work is not completed by the City of Phoenix, the following bid items will be used to pay for the work in accordance with Section 109.5 Actual Cost Work:
City of Phoenix Striping (Contingent) – Allowance
City of Phoenix Signing (Contingent) – Allowance

SECTION 106 CONTROL OF MATERIALS

106.2 SAMPLES AND TESTS OF MATERIALS, replace the third paragraph with the following:

The procedures and methods used to sample and test materials for acceptance will be determined by the Engineer. Unless otherwise specified by the Engineer, samples and tests for acceptance will be made in accordance with the “MCDOT Construction Materials Sampling and Testing Guidelines” and the applicable standard methods of AASHTO or ASTM, which were in effect and published at the time of bid advertisement.

At the discretion of the Engineer, the frequency may vary for individual projects or phases of projects in accordance with job conditions such as the uniformity of materials at the source, the methods and equipment used, and weather conditions. The number of samples and the distribution of the locations from which they are taken should be sufficient to adequately assure or verify that materials and construction are in accordance with the plans and specifications. The Engineer may direct that less acceptance sampling be done in particular cases of limited quantities of materials on a project, or for small projects. Conversely, the Engineer may direct that a greater amount of acceptance testing than that shown as "minimum sampling frequency" be done when the Engineer deems it necessary for adequate acceptance information.

SECTION 107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

107.1 COMPLIANCE WITH LAWS, add the following:

107.1.1 Environmental Mitigation Measures:

The Contractor shall adhere to all terms, conditions, and requirements contained in the Environmental Mitigations listed herein. All related permits, reports and notifications are located in **Appendix B** to these Special Provisions.

During project construction, MCDOT Environmental Program Branch shall be notified at (602) 506-8068 of any proposed changes in scope of work and/or work to be added outside the defined project limits, for evaluation of potential environmental impacts.

To prevent the introduction of invasive species seeds, all construction equipment shall be washed at the contractor's storage facility prior to entering the construction site.

To prevent invasive species seeds from leaving the site, the contractor shall inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris prior to leaving the construction site.

All disturbed soils that will not be landscaped or otherwise permanently stabilized by construction shall be stabilized by an approved method.

If any burrowing owls are found during the pre-construction survey (conducted by MCDOT), the contractor shall avoid construction activities within one hundred (100) feet of active burrows until the MCDOT Natural Resources Biologist (602.506.0001) authorizes the contractor to proceed.

If any burrowing owls are located during work activities, the contractor shall cease work within one hundred (100) feet of any area occupied by burrowing owls and contact the Engineer.

Avoidance or proper regulatory closure of unreported or undiscovered wells located within the project limits that may be impacted by construction is required.

Payment for Environmental Mitigation Compliance is an allowance determined by MCDOT and is intended to cover all activities associated with fulfilling environmental mitigation measures that are not directly included within other pay items. Payment will be based upon approved invoices, in accordance with Section 109.5.

107.1.2 Compliance with Migratory Bird Treaty Act:

If vegetation removal activities will occur between February 1st and August 31st, the contractor shall arrange for a qualified biologist to conduct a bird nest survey of the

grasses, shrubs, trees and/or limbs to determine the presence/absence of active bird nests. The survey shall be conducted within ten (10) calendar days of vegetation removal.

If active bird nests are found during the bird nest survey, the contractor shall notify the Engineer and avoid vegetation removal or pruning until the MCDOT Environmental Program Branch authorizes the work to resume. MCDOT Environmental Program Branch will arrange for a licensed wildlife rehabilitator to remove any eggs or nestlings from active nests within five (5) working days.

The Contractor shall provide documentation of the biologist qualifications at the preconstruction meeting or prior to any survey work being performed. The biologist shall have completed a full four-year course of study in an accredited college or university leading to a bachelor's or higher degree, which included a major field (24 semester hours) of study in biological sciences, natural resources management, or related disciplines appropriate to the services provided or a combination of education and equivalent experience totaling a minimum of five years.

Between September 1st and January 31st, grubbing, shrub clearing, and tree/limb removal activities are not subject to this restriction.

Payment for Migratory Bird Treaty Act Compliance will be based upon approved invoices, in accordance with Section 109.5.

107.2 PERMITS, add the following:

These subsections require the Contractor to obtain permits for different activities listed therein. Copies of each permit shall be submitted to the Engineer for project record.

The Contractor shall comply with all City of Phoenix and Tolleson permitting requirements.

City of Tolleson and the City of Phoenix will issue a no cost permit per IGA with MCDOT for Contractor to work within the City of Tolleson right of way. Contractor to request the no cost permit from Cities.

107.2.1 AZPDES (NPDES) Construction General Permit Requirements, add the following:

This project construction activities will disturb one or more acres of land; therefore, the project is subject to the Arizona Pollutant Discharge Elimination System (AZPDES) program and requires coverage under the Construction General Permit (CGP). The Contractor is responsible for obtaining CGP coverage and complying with permit requirements.

The Contractor shall acquire an authorization to discharge letter from the Arizona Department of Environmental Quality and submit it to the City of Phoenix. As a regulated

Municipal Separate Storm Sewer System (MS4) operator, the Contractor is required tocomply with its requirements.

107.2.2 Dust Control Permit, add the following:

The Contractor shall obtain a Dust Control Permit from the Maricopa County Air Quality Department and comply with Rule 310: Fugitive Dust from Dust-Generating Operations. No construction activity disturbance of the site is allowed until the Dust Control Permit has been issued.

107.2.2.1 Compliance with Maricopa County Stormwater Regulation:

This project activities are subject to the Maricopa County Stormwater Quality Management and Discharge Control Regulation (County Stormwater Regulation) and require a County Stormwater Permit from the Maricopa County Planning and Development Department (P&D). The Contractor shall be responsible for all activities associated with obtaining pre-construction Stormwater Permit approvals, Stormwater Permit compliance during construction, and payment of fees relating to and established by the regulation. No construction activity disturbance of the site is allowed until the Stormwater Permit has been issued. Permit requirements and related information are available from the following website:

https://www.maricopa.gov/1631/Commercial-Construction

Obtaining post-construction permit coverage and post-construction permit compliance are not Contractor responsibilities.

Fines and penalties imposed by Maricopa County Environmental Services Department for Contractor's failure to comply with the County Stormwater Permit shall be paid by the Contractor.

Payment for County Stormwater Permit is an allowance determined by the permitting agency and is intended to cover administrative cost only associated with applying for and receiving the approved permit. Payment will be based upon approved invoices, in accordance with Section 109.5.

107.2.3 City of Phoenix TRACS Permit
Renewal is required every 6 months or as traffic control changes, whichever comes first. One TRACS permit is required for each roadway (MC85 & 91st Ave).

107.5 SAFETY, HEALTH AND SANITATION PROVISIONS:
107.5.3 HAZARDOUS MATERIAL HANDLING
107.5.3.3 Identify Potentially Hazardous Materials, add the following:

The presence of lead has been identified within the proposed project limits associated with the roadway striping and curb paint. **See Appendix B**.

The Contractor shall comply with the Occupational Safety and Health Administration (OSHA) Lead in Construction Standard (29 CFR 1926.62) to include notification of employees of the presence of lead in the construction area.

The Contractor Safety Plan required by Section 107.5.5 shall address project construction requirements related to the listed items noted as containing lead.

107.15 COMMUNITY RELATIONS SUPPORT

107.15.4 Existing Conditions Documentation: add the following

The contractor shall prepare an as-built of the existing condition of all water valves and fire hydrants within the project limits. As-built documentation shall include at a minimum the condition of the debris cap, the functionality of the hydrant or valve and the condition of the pipe if exposed. The as-built information shall be provided to the Engineer as a PDF report showing the station/offset and condition of each features inventoried. As-built documentation is incidental and is included with the cost of adjusting the water meter.

The contractor shall confirm all City of Phoenix as-built requirements prior to the start of construction and provide a list of these requirements as a submittal to the Engineer within 5 working days of notice to proceed.

There will be no measurement or payment for the existing conditions documentation.

SECTION 108 COMMENCEMENT, PROSECUTION AND PROGRESS

108.3 CORRESPONDENCE TO THE CONTRACTOR

108.3.1 Escrow of Bid Documentation:

The Contractor shall submit the Bid Documentation to MCDOT in a sealed container within three days of the Pre-Construction Meeting. The documentation shall contain all assumptions and calculations used to determine each of the unit prices and will be placed in escrow with a banking institution or other bonded document storage facility and preserved by that institution or facility as specified in the following subsections.

(A) Submittal of Bid Documentation:

The Contractor shall submit the Bid Documentation in a sealed container to MCDOT. The container shall be clearly marked "Bid Documentation" and show on the face of the container the Contractor's name and address, the date of submittal, the project number, and the contract number.

(B) Affidavit:

In addition to the Bid Documentation, the Contractor shall submit an affidavit, signed under oath by a representative of the Contractor authorized to execute Bid Proposals, listing each bid document submitted by author, date, nature, and subject matter. The affidavit shall attest:

1) that the affiant has personally examined the Bid Documentation,
2) that the affidavit lists all of the documents relied upon by the bidder in preparing the bid for the project, and
3) that all Bid Documentation is included in the sealed container submitted in escrow.

(C) Duration and Use:

Within three (3) days of Pre-Construction meeting, MCDOT and the Contractor will jointly deliver the sealed container and affidavit to a banking institution or other bonded document storage facility that is agreed upon by MCDOT and the Contractor for placement in a safety deposit box, vault or other secure accommodation.

The document depository agreement shall state clearly that the Bid Documentation and Affidavit shall remain in escrow during the life of the contract or until the Contractor requests that MCDOT verify an approved change or variation order request for additional compensation or an extension of time based on the original bid or unless a court order provides MCDOT permission to obtain the Bid Documentation. In the absence of such action and provided the contractor signs the final Standard Release Form, MCDOT will instruct the document depository to release the sealed container to the Contractor.

In accordance with the Contractor's representation that the sealed container placed in escrow contains all of the materials relied upon in preparing its bid, the Contractor agrees to waive the right to use any Bid Documentation other than that placed in escrow in disputes arising out of the contract.
(D) Format and Contents:

The Contractor may submit Bid Documents for escrow in the usual cost estimating format. It is not the intention of this specification to cause any bidder extra work during the preparation of the proposal, but to ensure that the Escrow Bid Documents will be adequate to enable complete understanding and proper interpretation for their intended use. The Bid Documents shall be written in the English language.

It is required that the Bid Documents clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule. Bid items are to be separated into sub-items as required to present a completed and detailed cost estimate and allow a detailed cost review. The Bid Documents shall include all quantity take-offs, crew, equipment, calculations of rates of production and progress, copies of quotations from subcontractors and suppliers, and memoranda, narratives, consultant’s reports, add/deduct sheets, and all other information included by the bidder to arrive at the prices

contained in the bid proposal. Estimated costs shall be broken down into the bidder's usual estimate categories such as direct labor, repair labor, equipment operation, equipment ownership, expendable materials, permanent materials, and subcontract cost as appropriate. Plant and equipment and indirect costs are to be detailed in the bidder's usual format. The contractor's allocation of plant and equipment, indirect costs, contingencies, markup and other items to each bid item shall be included.

All costs shall be identified. For bid items amounting to less than $10,000, estimated unit costs are acceptable without a detailed costs estimate, providing that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markups, as applicable, are allocated.

If the Bid Documents were developed using computer generated software, the contractor shall provide the documents in hard copy and shall identify the name and version of the computer software used.

Bid documents provided by MCDOT need not be included in the Bid Documents for escrow unless needed to comply with the requirements of this subsection.

(E) Confidentiality of Bid Documentation:

The Bid Documentation and affidavit in escrow are, and shall remain, the property of the Contractor. MCDOT has no interest in, or right to, the Bid Documentation unless the contractor requests that MCDOT verify its request for additional compensation or an extension of time based on its bid or unless a court order gives MCDOT permission to obtain the Bid Documentation. In the event of such requests or court orders, the Bid Documentation and affidavit will become the property of MCDOT until complete resolution of the reason for the request or court order is achieved. These materials, and all copies made by MCDOT, will be returned to the Contractor at the conclusion of litigation, or final resolution of all outstanding claims, upon execution of a final release. MCDOT will make every reasonable effort to ensure that the Bid Documentation remains confidential within MCDOT except that said documents may be used in court, arbitration or other dispute resolution proceedings. Otherwise, said documents will not be made available to anyone outside MCDOT.

(F) Cost and Escrow Instructions:

The cost of the escrow documentation depository storage facility will be borne by MCDOT. MCDOT will provide escrow instructions to the document depository consistent with this subsection.

(G) Payment:

Payment for the cost of escrow facility will be through Allowance Item 108.03000 BID DOCUMENT ESCROW.

There will be no separate payment for compilation of the data, providing the container or the cost of verification of the Bid Documentation. All costs shall be included in the overall contract bid price.

SECTION 109 MEASUREMENT OF QUANTITIES

109.4.7 Minor Alterations and Additional Work (Contingent): This work consists of minor alterations to planned work, or necessary additional work not covered by an existing item and is limited in scope consistent with the scope of the project. The Engineer and the Contractor shall agree upon the scope of the work and cost of the work to be performed or agree to document cost in accordance with MAG Section 109.5, Actual Cost Work. The change, inclusive of cost shall be documented in a letter from the Engineer to the Contractor, which when executed by both parties and concurred by MCDOT shall have the same force and effect as a supplemental agreement.

Payment for work under this item will be made under Item 109.04007 Minor Alterations and Additional Work (Contingent), and shall be limited to $7,500.00 per authorization, and to a cumulative $50,000.00 for the Project.

Contract time cannot be adjusted utilizing Item 109.04007 Minor Alterations and Additional Work (Contingent), as any changes to contract time will require full execution of a written supplemental agreement by all parties concerned.

SECTION 201 CLEARING AND GRUBBING

201.6 MEASUREMENT, REMOVAL AND DISPOSAL OF TREES, add the following:

Tree root balls along the west side of 91st Ave are in conflict with the roadway widening excavation and stabilization activities. Tree root balls will be measured as each stump and root ball as a contract bid unit and will include the complete removal of the tree roots using cautious construction practices around existing utilities.

201.7 PAYMENT, REMOVAL AND DISPOSAL OF TREES, add the following:

No separate measurement or payment will be made for any additional effort that is required to remove the tree roots from around existing utilities.

SECTION 205 ROADWAY EXCAVATION

205.2 UNSUITABLE MATERIAL, add the following:

Existing asphalt pavement that needs to be removed within the roadway excavation areas shall be considered included within the Roadway Excavation item provided in the bid schedule.

205.7 MEASUREMENT, add the following:

Roadway excavation shall be measured from the top of existing pavement down to the top of the lime treatment.

No measurement will be made for asphalt pavement removal within roadway excavation areas. Asphalt removal in areas outside of the roadway excavation areas will be paid for separately under bid item 350.02254 REMOVE EXIST AC PAVEMENT unless otherwise noted within these special provisions or on the plans.

205.8 PAYMENT, add the following:

No payment will be made for asphalt pavement removal within the roadway excavation areas as defined in 205.7.

SECTION 220 RIPRAP CONSTRUCTION

220.2 MATERIALS, add the following:

The type and color of riprap shall match the existing riprap used within the project area. The Contractor shall provide samples for review and approval prior.

Existing riprap can be used as long as the material meets the requirements in Section 703 of the 2021 MAG Uniform Standard Specifications.

SECTION 230 DUST PALLIATIVE APPLICATION

230.2 MATERIALS, add the following:

The product type shall be Acrylic Copolymer with a dilution rate of 15:1.

230.6 APPLICATION, add the following:

The application Rate shall be within the range of 0.12 to 0.16 gallons of undiluted concentrate per square yard of surface area.

230.11 MEASUREMENT, add the following:

Topical Dust Palliative measurements will be the SY of undiluted concentrate used. No measurement or separate payment will be made for the surface area covered with Topical Dust Palliative. The square yardage of undiluted Topical Dust Palliative will be rounded to the nearest one-hundredth of a SY.

SECTION 301 SUBGRADE PREPARATION

301.7 PREPARATION OF SUBGRADE, revise the first paragraph and add the following:

The area to be measured will be the total accepted area of new asphalt concrete pavement and new fibermesh concrete that is not within the lime/cement treated subbase area defined on the plans. See Details for Structural Section 1a for slurry stabilization limits for detached and attached sidewalk.

Water used for subgrade preparation, embankment construction, and dust control in the project limits will be considered incidental.

SECTION 309 LIME STABILZATION OR MODIFICATION OF SUBGRADE

Section 309 is deleted in its entirety from all standard specifications and replaced with the following:

309.1 DESCRIPTION:

This section shall consist of constructing a mixture of soil, lime, cement and water for the lime-cement stabilization of subgrade soils. The work shall be performed in conformity with the lines, grades thickness, and typical cross sections shown on the plans. This section generally follows MAG Section 309, but the construction process is modified by applying and mixing cement into the lime-subgrade soil mixture after mellowing, before final compaction. The purpose of cement addition is to reduce overall curing time of the stabilized subgrade.

According to the National Lime Association, “Stabilization: When adequate quantities of lime and water are added, the pH of the soil quickly increases to above 10.5, which enables the clay particles to break down. Determining the amount of lime necessary is part of the design process and is approximated by tests such as the Eades and Grim test (ASTM D3276). Silica and alumina are released to react with calcium from the lime to form calcium-silicate-hydrates (CSH) and calcium-aluminate-hydrates (CAH). CSH and CAH are cementitious products similar to those formed in Portland cement. They form the matrix that contributes to strength of lime-stabilized soil layers. As this matrix forms, the soil is transformed from a sandy, granular material to a hard, relatively impermeable layer with significant load bearing capacity. The process begins within hours and can continue for years in a properly designed system. The matrix formed is permanent, durable, and significantly impermeable, producing a structural layer that is both strong and flexible.”

309.2 MATERIALS:

309.2.1 Soil or Subgrade: For lime-cement stabilization applications, the soil or subgrade material used for this work shall consist of materials on the site or imported, and shall be free of roots, sod, weeds and stones larger than 3 inches and have a

plasticity index (PI) greater than 10, when tested in accordance with AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90.

309.2.2 Quicklime and Hydrated Lime: Lime used shall be either quicklime or hydrated lime and shall conform to the requirements of ASTM C977. If quick lime will be the lime source, hydration processed should be carried out in an enclosed reaction tank, and the resultant lime slurry shall meet the requirements of subsection 309.2.3. All lime shall come from a single source. If a source change is requested, a new mix design shall be submitted using lime from the proposed new source. The new design must be approved by the Engineer prior to use.

309.2.3 Lime Slurry: The solids portion of the mixture, when considered on the basis of solids content, shall consist principally of hydrated lime of a quality and fineness sufficient to meet Section 309.2.2 requirements. A certificate of compliance shall be provided to the Engineer for each load of lime applied at the project. A Certificate of Compliance shall be provided to the Engineer for each load of lime applied at the project. The Specific Weight shall be included in the Certificate of Compliance.

309.2.4 Water: Water used for quicklime hydration, mixing or curing shall be of potable quality and shall be considered incidental to the items of work

309.2.5 Portland Cement: Portland cement shall comply with the Type II cement in MAG Section 725.

309.3 COMPOSITION:

309.3.1 Lime-Cement Stabilization Mix Design: Before commencing lime-cement treatment work, the Contractor shall submit for approval by the Engineer, a proposed mix design. The proposed mix design shall be prepared by a testing laboratory under the direction and control of a registered professional engineer. The mix design shall be determined using the soils or subgrade material to be stabilized and lime and cement from the proposed supplier, and shall report and comply with the following requirements:

Untreated Soil:

(a) Sulfates: Tested per ARIZ 733, AASHTO T-290, or ASTM C1580.

(b) Moisture-Density Relationship (Proctor): Tested per ASTM D698 Method A.

(c) Plasticity Index: Test method AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90.

(d) Sieve Analysis and Minus No. 200 Wash: Test methods ASTM C136 and ASTM D1140.

Lime-cement Treated Soil:

(a) pH: Lime saturation content per ASTM C977 APPENDIX or ASTM D6276.

(b) Plasticity Index: Less than 3, per AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90.

(c) Swell Potential: Maximum expansive potential of 1.0 percent ARIZ 249 using passing No. 4 sieve material. The maximum expansive potential shall be determined on a sample compacted to approximately 95 percent of the ASTM D698 Method A maximum dry density at approximately 2% below optimum moisture content. The sample should be confined under a 100 psf surcharge and inundated.

(d) Unconfined Compressive Strength: Minimum 160 psi per ASTM D5102 Procedure A, after five days curing at 100°F, sealed in air-tight condition.

(e) Mellowing time and mellowing moisture content for treated soil sections (b) and (c) to be determined by design engineer. Mellowing time and mellowing moisture content for treated soil section d determined by ASTM D5102.

(f) Hydrated Lime Content: The design engineer shall designate the minimum percentage of lime by dry weight of the dry soil to satisfy the criteria for Section 309.3.2 requirements. The percentage of lime specified shall be sufficient to allow for expected variations during the mixing process. A minimum of 3.0% hydrated lime and 2.0% of cement by dry weight of the dry soil is required for all mix designs. Increase lime content in trial design if the minimum content does not meet the requirements in sections (b) and (c).

309.4 CONSTRUCTION:

309.4.1 General:

It is the primary requirement of this specification to secure a completed course of treated material containing a uniform blend of lime and cement, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses.

The contractor shall submit a full Lime-Cement Stabilization plan to the Engineer for review and approval. This plan shall include estimated quantities of lime and cement to be applied in each phase of application. The plan shall include a list of all materials and equipment to be used, and a detailed schedule for application, mixing, and compacting. The plan shall also detail contingency measures to be initiated if material is not delivered as planned and/or equipment breaks down during the process. The schedule for application, mixing, and compaction shall consider weather conditions during the entire duration of lime-cement stabilization process. Construction of the lime-cement stabilization shall not commence until the Lime-Cement Stabilization plan is reviewed and approved by the Engineer. Within the plan the Contractor will show areas where CLSM will be placed over shallow utilities in lieu of lime and cement.

All existing asphalt pavement within or below the lime-cement stabilization zone shall be removed. Prior to beginning any lime-cement stabilization, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines and grades as shown on the plans. All potholing is to be completed and all bluestaknig shall be refreshed before starting this operation.

Lime and cement shall be applied in the proper sequence at the mix design rate for the depth of subgrade stabilization shown on the plans or requested by the Engineer.

When the design requires treatment to a depth less than 12 inches, the subgrade soil shall be treated in place and allowed to cure in place. After final mixing, the layer shall be compacted in one lift.

When the design requires treatment to a depth greater than 12 inches, the subgrade soil shall be treated in equal layers. The top layer(s) of soil shall be removed and stockpiled. The lower layer of soil to be treated shall then be treated and allowed to cure in place. After final mixing, the lower layer shall be compacted in maximum 12 inch thick compacted lifts. The stockpiled soil shall then be placed, treated, mixed and compacted in successive maximum 12 inch thick compacted lifts.

If the lime-cement stabilization is found to be in conflict with an existing or proposed utility line, the lime-cement stabilization shall be omitted and replaced with a half sack slurry, or approved equal. The half slack slurry shall be installed from the bottom of the aggregate base course layer to a depth of 8 inches below the aggregate base course layer or to the spring line of the utility, whichever comes first. The width of the half sack slurry application shall be 2 feet wider than the width of utility (one foot on each side) found to be in conflict.

If the Contractor encounters a shallow utility that has an elevation above the lime slurry stabilization mixing zone, the Contractor is to notify the Engineer immediately. The Contractor and Engineer shall work with the utility company to remove or relocate the existing utility.

309.4.2 Weather Limitation: Lime-cement treated subgrade shall not be constructed if the ambient temperature is below 40° F or when conditions indicate that temperatures may fall below 40° F within the first 24 hours of starting the treatment process.

309.4.3 Equipment: Contractor shall provide all equipment necessary to complete the work including grading and scarifying equipment, a spreader of the lime, slurry distribution trucks, mixing and pulverizing equipment (such as Bomag RS600C, equivalent or heavier, shall be used for mixing lime and cement with subgrade soil), sheepsfoot and pneumatic rollers, sprinkling equipment and trucks. Gravity feed or tailgate spreading, defined as not having automatic controls, will not be permitted. All equipment used for this work is subject to approval by the Engineer.

Cement spreader shall be a specially constructed device to distribute bulk cement at the specified rate. The spreader shall have the ability to maintain a consistent spread rate over variable travel speeds.

Slurry distribution trucks must be equipped with an agitator to keep the additive (Hydrated Lime, as appropriate) and water in a homogeneous suspension. Mixture shall be uniform in consistency from beginning to end of the distribution operation.

Equipment used shall be of a type sufficient to ensure that the soil subgrade is cut uniformly to the proper depth and shall have cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such a design that a visible indication is given at all times the machine is cutting to the proper depth.

309.4.4 Application of Lime: Lime shall be spread in the form of lime slurry and only on that area where the mixing operation can be completed during the same working day. The lime application rate shall be at the design content to +0.5%, based on weight of dry soil. The Engineer reserves the right to vary the rate of application of lime from the mix design during the progress of construction as necessary to maintain a pH of the lime/soil mixture above 12.0 and the desired characteristics of the treated subgrade.

For all lime applications, the Contractor shall provide the Engineer with daily application quantities.

309.4.4.1 Quicklime Application: If quicklime is the lime source, hydration process should be carried out in an enclosed reaction tank, and the resultant lime slurry shall meet the requirements of subsection 309.2.3. Contractor shall exercise safety measures when mixing quicklime with water. The resultant lime slurry shall be applied in accordance with Section 309.4.4.3.

309.4.4.2 Dry Hydrated Lime Application: Water should be mixed to the dry hydrated lime to form lime slurry that meets the requirement of Section 309.2.3 before application.

309.4.4.3 Lime Slurry Application: Lime slurry shall be mixed in a portable mixing unit and spread with trucks equipped with an approved distribution system. Lime slurry shall be applied at a rate that will yield the required lime percentage determined by the mix design.

309.4.5 Mixing of Lime Slurry with Subgrade Soil: Immediately following lime slurry application, thoroughly mix the slurry into the subgrade to the full designed depth of stabilization with the pulverizing equipment.

The use of disc plows or blades are strictly prohibited except in areas specified by the Engineer. To ensure a complete chemical reaction of the lime and soil or subgrade, water shall be used as required to maintain moisture content at optimum to +4% above the optimum of the lime-cement treated mix design Proctor, prior to beginning compaction. During the interval of time between application and mixing, lime that has been applied, unmixed and exposed to the open air for 10 hours or more will not be accepted. No traffic

other than the mixing equipment will be allowed to pass over the spread of lime until after completion of mixing. After mixing and prior to the initial compaction, clay lumps shall meet the following criteria:

	Percent
Minimum Passing 1-1/2 inch sieve	100
Minimum Passing No. 4 sieve	60

309.4.5.1 Temporary Compaction of Lime-Soil Mixture: After thorough mixing of lime and subgrade soil, the treated course should be lightly rolled to seal the lift, and left to cure for a minimum of 12 hours, or mellowing time, or the time as directed by Engineer. During this period, the treated lift shall maintain moisture content at optimum to +2% above the optimum.

309.4.5.2 Application of Cement: Prior to beginning any cement application, the previously lime-treated subgrade shall be re-scarified to full depth and width of the treatment. The quantity of cement shall be by weight as a percentage of the dry weight of the soil as determined by the lime-cement stabilization mix design or as directed by the Engineer, and shall be applied uniformly on the soil in a manner satisfactory to the Engineer. The allowable deviation in uniformity shall not exceed 10 percent. The entire operation of spreading and mixing shall be conducted in such a manner as will result in a uniform soil, lime-cement and water mixture for the full design width and depth.

The percentage of moisture in the soil, at the time of cement application, shall not exceed the quantity that will permit a uniform and intimate mixture of the soil, lime and cement during mixing operations, and it shall not exceed the specified optimum moisture content for the lime-cement stabilization mix design.

309.4.5.3 Final Mixing: After application of cement, the previously lime treated subgrade soil shall be thoroughly mixed with the pulverizing equipment to full depth and width of the treatment as shown on the plans. Mixing and moisture conditioning shall be continued until the mixture is uniform in color and at a moisture content of optimum to +4% of optimum as determined in the lime-cement treated mix design Proctor. Any mixture of soil, lime and cement which has not been compacted and finished shall not remain undisturbed for more than 30 minutes but shall be agitated by remixing.

309.4.6 Final Compaction: Compaction of the lime-cement treated subgrade shall begin immediately after final mixing and after final gradation has been met. Final compaction of the treated subgrade shall be complete within two (2) hours of initial cement placement. The course shall be sprinkled, if necessary, and compacted to provide the density specified below as determined by the use of the Standard Proctor (ASTM D 698) Moisture / Density Relationship. Testing shall occur after the subgrade is brought to the required lines and grades shown on the Typical Sections and Plans.

Description	Density, Percent	Moisture, Percent
Lime-cement stabilized subgrade that will receive subsequent courses.	Not less than 95, except when shown otherwise on the Plans.	Optimum to plus 4% unless otherwise shown on the Plans.

The in-place compacted field density shall be determined in accordance with ASTM D1556, sand cone, or ASTM D6938, nuclear gauge. In the event of disputed results, the nuclear gauge density shall be correlated to the referee sand cone density while the nuclear water content shall be correlated to the referee ASTM D2216 water content. The adjustment for rock larger than the no. 4 sieve shall be performed in accordance with ASTM D4718. In-place density tests for quality assurance purpose shall be performed by the Engineer at the rate of one per 2000 linear feet of a paving lane. Contractor is responsible for the quality control tests. If the material fails to meet these density requirements it shall be reworked as necessary to meet said requirements. Reapplication of cement (dry spreading) will be required by the Engineer to aid in recovering lost strength from reworking. Throughout this entire operation, the shape of the course shall be smooth and in conformity with the Typical Sections shown on the Plans and to the established lines and grades. Should the material due to any reason or cause lose the required stability, density and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at the sole expense of the Contractor.

Finishing of the completed section shall be accomplished by rolling as directed with a pneumatic tire or other suitable roller sufficiently light to prevent hair cracking.

If the final mixing and compaction does not occur with two (2) hours of the initial cement placement, remediation will be necessary. The Contractor shall coordinate with MCDOT and MCDOT's geotechnical engineer to assess the necessary remediation which will include at a minimum re-scarification and re-application of cement. All costs for remediation including but not limited to MCDOT's costs for coordination, engineering and testing and the Contractors expenses for all labor, materials and equipment to remediate the soil are the responsibility of the contractor. No additional measurement or payment will be made for any costs associated with remediation of the soil.

309.4.7 Thickness: The thickness of the lime-cement treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than 1000 square yards per layer. If more than one layer, the method used to remove material to determine the depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime as the means of visual inspection. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the County, the material where depth tests are taken.

All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required,

and reshaping and recompacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereupon or the work is accepted. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges or loose materials.

Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion, shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades.

309.4.8 Finishing and Curing: Immediately after completing compaction of the final course, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades. Complete finishing operations within 2 hours. after final compaction.

Finished grade tolerances for subgrade and base will be in accordance with Section 301.4 per the MAG Specifications.

Cure by maintaining a thorough and continuously moist condition by sprinkling. When permitted, cure with an asphalt material applied at a rate of 0.05 to 0.20 gallon. per square yard as approved. Do not allow equipment on the finished course during curing except as required for sprinkling, unless otherwise approved.

Cure the finished section for 2 days before adding another course or opening to traffic unless otherwise directed. Apply subsequent courses within 14 calendar days of completion of final compaction of the underlying treated course unless otherwise approved.

309.4.9 Maintenance: The Contractor shall maintain, at his/her own expense, the entire lime-cement treated subgrade in good condition from the start of work until all the work has been completed, cured for a minimum of two (2) days and accepted by the Engineer.

The Contractor shall make provisions for maintaining the compacted subgrade in a moist condition during the curing time. The requirement is to maintain the in situ moisture at least two (2) percentage points above optimum conditions throughout the treated section. This is to be accomplished by frequent light sprinkling of the surface. During this curing time, all construction vehicles shall be prohibited from the subgrade for a minimum of the two (2) day curing period as defined in subsection 309.4.8. Aggregate base may be placed after two (2) days.

The Contractor shall maintain the completed subgrade within the limits of his contract in good condition, satisfactory to the Engineer as to grade, crown and cross section until

such time as the surface course is constructed. All irregularities or other defects that may occur shall be repaired by the Contractor as his expense.

309.5 MEASUREMENT:

Measurement of the lime-cement stabilized subgrade shall be by the square yard (SY) of the stabilized area completed and accepted. Lime and cement used in the stabilization subgrade shall be measured by the ton actually used under bid items 309.02000 and 725.20000 respectively. Bid item 309.02000 is based off of the weight of dry hydrated lime. If quicklime is used as a lime source, the equivalent weight of hydrated lime shall be calculated by multiplying the dry weight of quicklime by a factor of 1.3. i.e. for each ton of dry quicklime that is used, payment will be made in the amount of 1.3 tons of hydrated lime.

No additional measurement shall be made for installing half sack slurry for utilities encroaching into the lime-cement stabilized subgrade. The surface area treated with half sack slurry shall be measured per square yard as lime-cement stabilized subgrade. Lime and cement shall not be measured within slurry areas.

Stripping, scarifying, grading, excavating, hauling, filling, compacting, disposing of excess or unsuitable materials or pavement shall be measured and paid for under “ROADWAY EXCAVATION” for the stabilizaed areas.

No direct measurement or payment will be made for removal of existing asphalt within or below the lime-cement stabilization zone.

309.6 PAYMENT:

The lime treated soils measured as provided above, will be paid for at the contract price per square yard, which price shall be full compensation for the item complete, as herein described and specified.

Lime and cement will be paid for separately as measured above.

No additional payment for curing seal will be made, the cost being considered incidental to the square yard of lime treated subgrade installed.

No allowance shall be made for any materials used or work done outside the limits shown on the plans and typical sections. The work performed and material furnished as prescribed by this item and measured as provide in this item shall be paid for at the unit price bid for lime-cement stabilized soil, which price shall be full compensation for scarifying the soil materials; for handling; hauling and spreading the lime slurry; for mixing the lime slurry into the subgrade through pulverization; for roll sealing and curing the subgrade; for re-scarifying the lime modified subgrade; for handling; hauling and spreading the cement; for mixing the cement into the lime modified subgrade through pulverization; for establishing final gradation; for spreading and shaping the mixture;

compacting the mixture, including all rolling required for this compaction; surface finishing; and for all manipulation, labor, equipment, appliances, tools and incidentals necessary to complete the work and carry out the maintenance provisions in this specification.

No additional payment shall be made for installing half sack slurry for utilities encroaching into the lime-cement stabilized subgrade. Areas where half sack slurry is used will be included in the area measured and paid for under the unit price for “LIME SLURRY STABILIZATION, 8” DEPTH”. No additional payment for lime or cement will be made in these areas.

Oversize rock (3” to 6”) may be encountered in the treatment layer. If this is encountered, the Contractor shall excavate the oversize rock and bring in borrow material per MAG 211. Payment for excavation will be made using the “Roadway Excavation” bid item. Payment for the borrow material will be made using the “Roadway Excavation” bid item.

Geo-grid may be encounterd in the treatment layer. If this is encountered, the Contractor shall excavate the geo-grid and bring in borrow material per MAG 211. Payment to remove the Geo-grid will be made in accordance with Section 109 of the MAG specs. Payment for the borrow material will be made using the “Roadway Excavation” bid item.

SECTION 321 PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

321.1 DESCRIPTION, add the following:

If the Contractor has installed new pavement to final grade and the pavement needs to be sawcut and removed for any reason. The Contractor shall follow the City of Phoenix pavement cut policy included in **Appendix G**."

321.8.2 Joints, the second paragraph is modified to add:

Longitudinal joints shall be located within 1-foot of the center of a lane or within 1-foot of the centerline between two adjacent lanes.

Section 321.8.9 Safety Edge, add the following:

Safety Edge preparation shall include all incidental work required to excavate and backfill the shoulder and prepare existing pavement edges in accordance with MAG Detail 201 SAFETY EDGE. Existing pavement edges unsuitable for a safety edge preparation shall be repaired in accordance with 321.8.6 (a) Asphalt Concrete Overlay, prior to placing the safety edge.

321.10 ACCEPTANCE, add the following:

As specified in Section 106.2, the procedures and methods used to sample and test materials for acceptance will be determined by the Engineer. Unless otherwise specified

by the Engineer, samples and tests for acceptance will be made in accordance with the "MCDOT Construction Materials Sampling and Testing Guidelines" and the applicable standard methods of AASHTO or ASTM, which were in effect and published at the time of bid advertisement.

Should results of testing of the original acceptance samples indicate non-compliance with the applicable acceptance requirements, the Engineer may perform additional sampling and testing as outlined within this Section or as otherwise determined by the Engineer to determine final acceptance.

Whenever more than one original acceptance sample of any type is collected per sublot, the Engineer shall evaluate each sample separately for the purposes of acceptance and payment; each sample shall represent its proportionate share of the sublot.

321.10.7 Pavement Smoothness (Rideability): Pavement smoothness payment adjustments shall only apply to roadways with new asphalt pavement surfacing length greater than 0.5 miles, a functional classification of collector or higher, and a posted speed limit of 40 mph or greater. When the new asphalt pavement has a minimum of two courses of hot mix asphalt, each layer being 1.0 inch or greater or when the pavement has a new overlay of at least 1.5 inches, the final pavement surface shall be evaluated for smoothness by the Engineer.

Prior to the placement of the final course of a new pavement, the Engineer will furnish the Contractor with a preliminary International Roughness Index (IRI) value that results from the Engineer's evaluation of the material placed to date. The actual time of this "preliminary" evaluation will be coordinated between the Engineer, the Contractor, and the MCDOT Road Management Section (RMS) Supervisor. This evaluation will be limited to one (1) test run in a single lane in each direction of travel. The IRI value will serve as a guide to the Contractor in evaluating his current level of conformance with the smoothness specification. Preliminary IRI evaluations shall **NOT** be performed on road segments with profile milling, due to the extreme rough texture created by the profiler. The IRI value obtained after placement of the final course of pavement will be the basis for determining payment adjustments for smoothness. The smoothness adjustment will be in accordance with the New Construction Rideability Adjustment Schedule (Table 1) or the Overlay Rideability Adjustment Schedule (Figure 1).

321.10.7.1 Evaluation Method: The MCDOT Road Management Section shall evaluate the final pavement surface for smoothness, using the MCDOT IRI vehicle equipped with an International Cybernetics Corp. Laser Road Profiler. The IRI value is the calculated measurement of the deviation of a pavement surface from a true planar surface. The IRI data is typically collected at the posted speed limit, however speeds may range from 20-60mph. A zero IRI value would indicate a perfectly smooth pavement surface, while increasing IRI values would correspond to an increasingly rough pavement surface. IRI values will be calculated in inches of vertical displacement for every 0.10 mile lane segment and normalized to inches/mile. [Example: a 0.10-mile section yielding an actual

vertical displacement of ten (10) inches would be normalized to an IRI value of 100 inches/mile.]

The final pavement surface being evaluated will be divided into 0.10-mile road segments and individual lanes. The final road segment will include any remaining portion of a segment not equaling 0.10 miles. [Example: 1.52 miles of pavement divides into 15 segments with the last one measuring 0.12 miles.] The IRI is calculated for each 0.10-mile segment and shall be averaged (three runs per lane) to determine the IRI value for that segment. All values obtained from the RMS IRI vehicle shall be final.

The following shall be subject to smoothness testing:

1. Roadway lanes that are 0.5 miles or greater in length.

2. Smoothness data will not be computed for the following project sections;

- Lanes less than 0.5 miles in length.
- Shoulders.
- Pavement on horizontal curves that require the test vehicle to travel at speeds less than 20 mph.
- Test segments with an irregularity such as bridge joints, cattle guards, drainage swales, railroad tracks, valley gutters, or other irregularity item as identified by the Engineer shall have a reduction in length of the test section by a minimum of 0.01 mile (53'), to exclude the irregularity from the data set.
- 91st Avenue/MC 85 Intersection from the farthest curb return in all directions
- Deceleration lane pavement tapers where the roadway pavement is less than 10-feet in width
- Edge of pavement tapers where the full width of pavement is less than 10-feet in width

3. Bridge decks shall be included only if paved as part of the project. If bridge decks are not included as part of the construction project, profile testing will be suspended before the first joint between the asphalt surfacing and the bridge/approach slab and restarted after the last joint between the bridge/approach slab and the asphalt surfacing.

4. Smoothness measurement testing will start and stop at the transverse joints of the project limits.

When requested by the Engineer, the Contractor shall provide traffic control for smoothness testing to allow the test vehicle to safely travel through signalized intersections and/or stop controls oriented in the test direction of travel.

The Contractor shall notify the Engineer within ten (10) working days after completion of all pavement repairs that the pavement is ready for smoothness testing. The Engineer will have the testing conducted within twenty (20) working days after notification by the

Contractor. All Asphalt concrete pavements shall conform to Section 321 and 325 prior to smoothness testing.

When the smoothness measurements indicate corrective work is required, the Engineer shall notify the Contractor in writing within ten (10) working days after the completion of the smoothness testing. The Contractor shall have twenty (20) working days following such notification to make repairs to the pavement.

The Contractor shall notify the Engineer within ten (10) working days after completion of all pavement repairs that the pavement is ready for smoothness re-testing. The Engineer will conduct the testing within twenty (20) working days after notification by the Contractor.

No testing shall be conducted during rain or under other conditions deemed inclement by the Engineer. During testing the roadway must be free of moisture and other materials that might affect the evaluation. Any work associated with preparing the roadway for the evaluation, such as but not limited to sweeping, will not be measured for payment.

321.10.7.2 Payment Adjustment for Rideability: Only asphalt concrete conforming to Section 321 or Section 325 shall be eligible for a positive payment adjustment for rideability. Positive adjustments for rideability **shall not be made** for those areas subsequently reviewed and determined by the Engineer to be otherwise defective. The Area shall be considered defective if it does not conform to requirements for Air Voids, Binder Content, Gradation, Density, and/or Pavement Thickness.

Payment adjustments shall be made under the contract item Rideability. Payment to the Contractor shall be based on the final IRI values adjusted according to Table 1 or Figure 1. Table 1 (New Construction Rideability Adjustment Schedule) shall be used for new construction and pavements constructed on reconditioned base or subgrade. Figure 1 (Overlay Rideability Adjustment Schedule) shall be used for single course overlays of 1.5” or greater. The adjustment will be applied to each one tenth mile (0.10 mi.) segment of each lane subject to smoothness testing. The rideability payment will be the indicated percent adjustment multiplied times the adjusted contract price for the surface course quantities of the hot mixed asphalt, asphalt overlay, or rubber asphalt overlay incorporated into the final construction.

Payment for Rideability will be distributed based on segment areas; the area of each lane segment will be the segment length times the segment width. The segment width shall be the striped traffic lane width or modified lane width. The width for exterior lanes will be the striped traffic lane width modified to include the asphalt area of adjacent bicycle lanes, paved shoulders, and short auxiliary lanes. The width of the innermost traffic lanes will be the striped traffic lane width modified to include the asphalt area of adjacent asphalt paved medians and left turn bays.

Table 1 – NEW CONSTRUCTION
RIDEABILITY ADJUSTMENT SCHEDULE

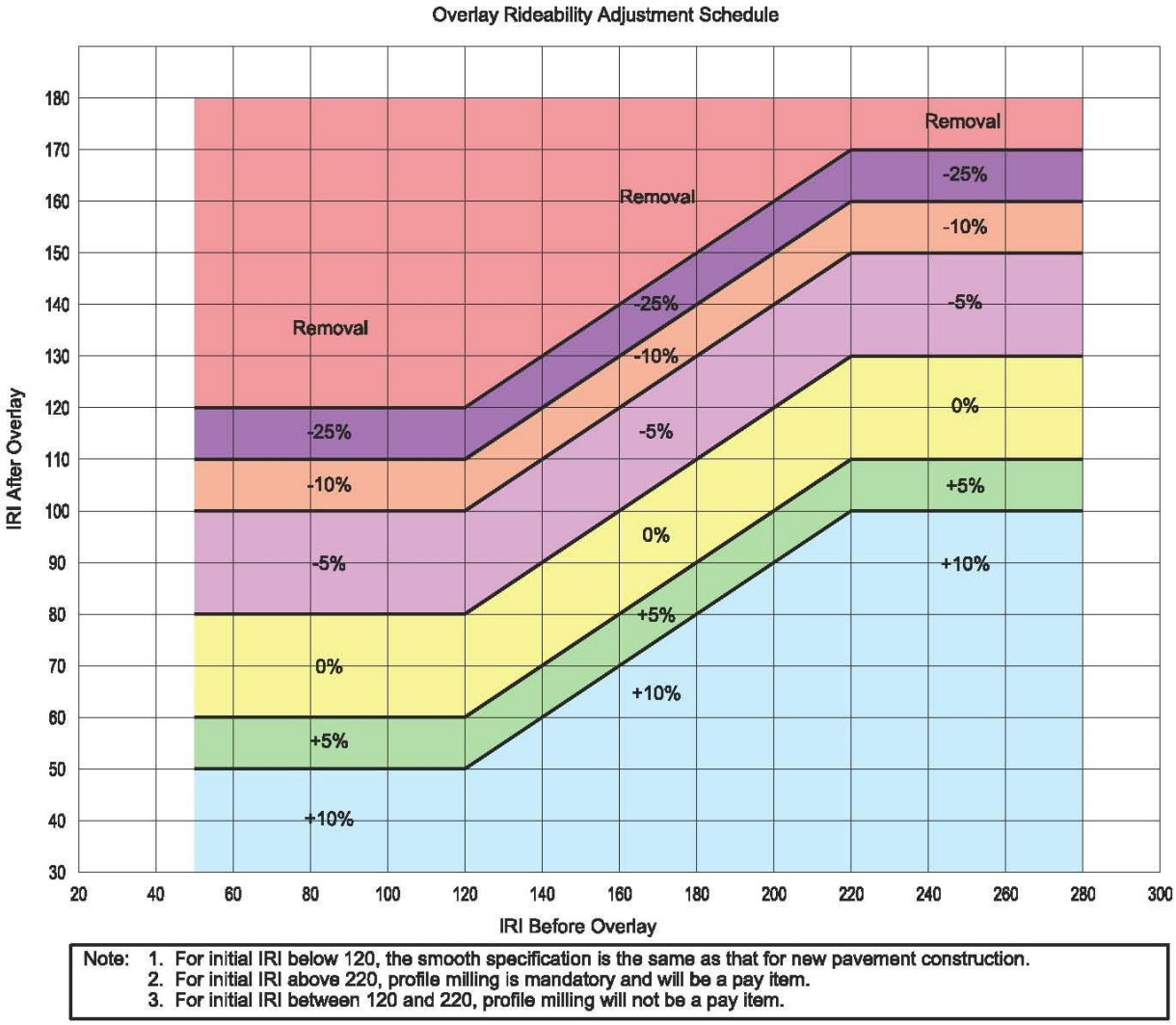
IRI (inches per mile)	PERCENT ADJUSTMENT
≤ 50	+10
51 - 60	+05
61 - 80	0
81 - 100	-05
101 - 110	-10
111 - 120	-25
>120	RxR Required

NOTES:

All IRI values will be rounded to the nearest whole number. (Example: 75.5 shall be rounded to 76.)

“RxR Required” is the Removal and Replacement of the defective area.

FIGURE1

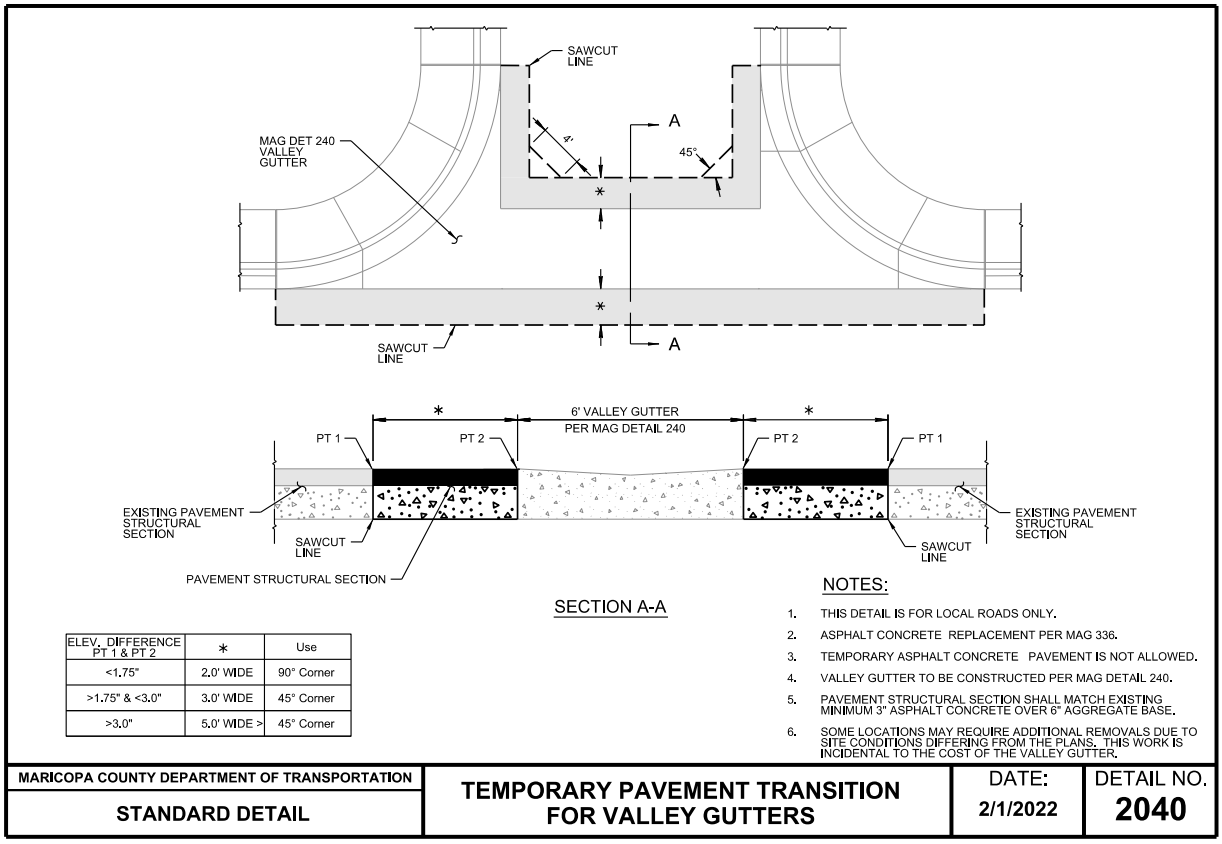


Note:
1. For initial IRI below 120, the smooth specification is the same as that for new pavement construction.
2. For initial IRI above 220, profile milling is mandatory and will be a pay item.
3. For initial IRI between 120 and 220, profile milling will not be a pay item.

SECTION 336 PAVEMENT MATCHING AND SURFACING REPLACEMENT

336.2 MATERIALS AND CONSTRUCTION METHODS

336.2.3 Temporary Pavement Replacement, add the following:



ELEV. DIFFERENCE PT 1 & PT 2	*	Use
<1.75"	2.0' WIDE	90° Corner
>1.75" & <3.0"	3.0' WIDE	45° Corner
>3.0"	5.0' WIDE >	45° Corner

NOTES:

1. THIS DETAIL IS FOR LOCAL ROADS ONLY.
2. ASPHALT CONCRETE REPLACEMENT PER MAG 336.
3. TEMPORARY ASPHALT CONCRETE PAVEMENT IS NOT ALLOWED.
4. VALLEY GUTTER TO BE CONSTRUCTED PER MAG DETAIL 240.
5. PAVEMENT STRUCTURAL SECTION SHALL MATCH EXISTING MINIMUM 3" ASPHALT CONCRETE OVER 6" AGGREGATE BASE.
6. SOME LOCATIONS MAY REQUIRE ADDITIONAL REMOVALS DUE TO SITE CONDITIONS DIFFERING FROM THE PLANS. THIS WORK IS INCIDENTAL TO THE COST OF THE VALLEY GUTTER.

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION STANDARD DETAIL	TEMPORARY PAVEMENT TRANSITION FOR VALLEY GUTTERS	DATE: 2/1/2022	DETAIL NO. 2040

Section 336.2.4.1 Permanent Asphalt Pavement Reolacement; add the following:

(H) For ADA Curb Ramp replacement work, the pavement removed for the sidewalk ramp construction will be replaced with hot mix asphalt concrete in accordance with the requirements of this section.

336.2.4.2 Adjustments, add the following:

The Contractor shall be responsible for adjusting to grade all new and existing manholes, valves, survey monuments, clean outs, etc., as directed by the Engineer. The Contractor shall remove all asphalt material and aggregate from this or prior work from all metal lids and covers encountered using a method approved by the Engineer. Debris will not be allowed to enter sanitary or storm sewers. All loose material shall be removed from the excavation site and the interiors of structures prior to resetting the frames.

The Contractor shall coordinate with the various utility companies regarding the adjustment and inspection of their facilities. Each utility company's specifications shall be adhered to during the adjustment. The Contractor shall be responsible for meeting any additional requirements of the utility companies with no additional measurement or payment.

Manhole frames shall be adjusted according to the MAG Standard Detail 422, except that the concrete collar shall extend up to the finished grade. Water valve, survey monument, and sewer clean out frames shall be adjusted in accordance with the City of Phoenix Supplement Standard Details P1270 and P1391. Gas valves shall be adjusted per Southwest Gas details in **Appendix D**.

336.4 MEASUREMENT, add the following:

There will be no separate measurement for backfill for adjustments or any other activities that require pavement matching and surface replacement.

Pavement replacement or repair in addition to what is shown on the project plans identified in the field by the Engineer shall be measured by the square yard.

The backfill shall be considered incidental to the other work items for which backfill is necessary.

336.5 PAYMENT, add the following:

There will be no separate payment for backfill for adjustments or any other activities that require pavement matching and surface replacement.

Pavement replacement or repair will be paid for under items "ASPHALT PAVEMENT REPLACEMENT" and "ASHPALT PAVEMENT REPAIR"

SECTION 338 PRICE ADJUSTMENT FOR BITUMINOUS MATERIALS

338.1 DESCRIPTION:

Price adjustment shall be calculated based on price changes of bituminous material occurring between the date of bid opening and the date that the material is delivered or used. Price adjustment shall be bi-directional, potentially increasing or decreasing contract payments.

The term "bituminous material" as used herein shall include asphalt cement, liquid asphalt and emulsified asphalt and shall apply only to the following specific pay items requiring these materials: Asphalt Concrete Pavement, Bituminous Tack Coat, Microsurfacing Aggregate, Type III.

The contract unit price for each item of bituminous material shall include all costs for furnishing, hauling, handling, spreading, and mixing of the material required, including the "initial cost" of bituminous material and all applicable taxes, bonds, and insurance premiums; but excluding any difference in the cost of bituminous material that occurs between the date of bid opening and the date that the material is delivered or used and the cost of taxes, bonds and insurance directly attributed to the price adjustment amount for bituminous materials.

338.2 MEASUREMENT:

Asphaltic Concrete

The approved mix design designates a range of bituminous material allowable for construction. If the amount of bituminous material exceeds the allowable range, the Contractor will not be compensated for the excess bituminous material. If the bituminous material is less than the allowable range and the asphalt concrete is found to be acceptable by the engineer, the bituminous material shall be subject to the price adjustment.

The tons of bituminous materials, which are present in asphalt concrete, shall be determined by tests using nuclear asphalt content gauge, extraction, ignition furnace, or other approved method. Tests shall be taken at least twice daily on a random basis. When only two tests are planned, they shall occur at placement of approximately 33% and 67% of the day's planned quantity. The arithmetic average of each day's bituminous testing that is found to be within or below the allowable range will be used to determine the amount of bituminous material present in the mix. If only one test is taken, the amount of bituminous material present in that sample will be used. The monthly production shall be the sum of the daily production.

Tack Coat

The tons of emulsified products to which the adjustment will be applicable will be the tons of the emulsified bituminous asphalt prior to dilution. The Contractor shall weigh the truck prior to and after placing the emulsion, the bituminous material subject to the price adjustment will be calculated based on the difference in the weight.

338.3 PAYMENT:

The "initial cost" of bituminous material will be the monthly cost posted by the Arizona Department of Transportation (ADOT) based on prices of bituminous material published in the Asphalt Weekly Monitor, a publication by Poten & Partners, Inc. The bituminous material "initial cost" price is shown for each month. This price will be deemed to be the "initial cost" for bituminous material of all types, grades, etc., on projects on which bids are opened during the month. This data may be obtained from the ADOT website:

https://apps.azdot.gov/files/cns/pdf/historical_data.pdf

For each item with bituminous material for which there is a specific pay item, an adjustment in compensation will be made for either an increase or decrease in the price of bituminous material as shown on the ADOT website, current for the date of use of the material, as compared to the "initial cost".

Adjustments in compensation for emulsified asphalt will be made for the bituminous material prior to dilution.

The tons of bituminous material in asphalt-rubber binder to which the adjustment will be applied will be 0.80 multiplied times the total quantity of the item used. The adjustment will not apply to twenty (20) percent of the material assumed to constitute the rubber additive.

The tons of bituminous materials which are paid for on an invoice basis to which the adjustment will be applicable are the tons which have been delivered to the project and subsequently incorporated into the work. The adjustment will be applicable on the date of use of the bituminous material.

Price Adjustment for Bituminous Materials shall include an adjustment for the actual change in cost of premiums on required payment and performance bonds, the actual change in cost of premiums for property damage and/or public liability insurance, and the change in sales tax (identified in Section 109.2) liability incurred as a result of the price adjustment for bituminous materials. The Contractor shall provide documentation to determine the adjustment for the actual change in cost of premiums on required payment and performance bonds, property damage and/or public liability insurance, and sales tax.

No additional compensation will be made for any additional or increased charges, costs, expenses, etc., which the Contractor may have incurred since the time of bidding and which may be the result of any increase in the "initial cost" of bituminous material.

The Price Adjustment for Bituminous Materials will be made in the next regular monthly progress payment following actual use or application of the bituminous material and may cause an increase or decrease in payments.

SECTION 340 CONCRETE CURB, GUTTER, SIDEWALK, SIDEWALK RAMPS, DRIVEWAY AND ALLEY ENTRANCES

340.2 MATERIALS, add the following:

Fibrous reinforcing meeting the requirements specified below shall be used in the concrete for driveways

- Specific Gravity: 0.91
- Tensile Strength: 55ksi
- Fiber Length: Graded ¼” to ¾”

340.3 CONSTRUCTION METHODS, add the following:

The fiber mesh reinforcement shall be installed in accordance with the manufacturer's specifications.

Expansion joints, unless otherwise specified in the project plans, shall be constructed in accordance with the City of Phoenix Detail P1230 and/or applicable MAG details. They shall be in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in case of a curved alignment when they will be constructed along the radial lines of the curve. The expansion joints shall be constructed to the full depth and width of the concrete and shall match the joints in the adjacent pavement, sidewalk or curb and gutter. The expansion joint material shall extend fully through the concrete from the surface to one inch into the subgrade. Joints shall be constructed at all radius points, driveways, alley entrances and at adjoining structures with a maximum interval of 50 feet between joints.

Contraction joints, unless otherwise specified in the project plans, shall be constructed in accordance with City of Phoenix Detail P1230 and/or applicable MAG details and in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in case of a curved alignment when they will be constructed along the radial lines of the curb. They shall be constructed to a depth of 1-1/2" at 10' intervals on all sidewalks regardless of the width. Unless an expansion joint is required, a contraction joint will coincide with each form joint. Sidewalk score marks, at least 1/2 inch deep are required at the midpoint of the contraction joint.
Contractor to submit a jointing plan and product material sheets for jointing to the Engineer for review and approval.

340.6 PAYMENT, add the following:

No additional measurement or payment for the fibrous reinforcement shall be made as it shall be considered included in the installation of the driveway and curbs.

SECTION 345 ADJUSTING FRAMES, COVERS AND VALVE BOXES

345.1 DESCRIPTION, add the following:

The Contractor shall coordinate a field walk with the owner's inspector for frames, covers, valve boxes, meter boxes, and pull boxes prior to commencing the work. Contractor to contact Carl Edwards (carl.edwards@phoenix.gov 602-309-1619).

Manholes: The Contractor shall inspect the existing condition of the top of manhole cone. The Contractor shall remove the existing concrete collar and adjustment rings to inspect the condition of the existing top of manhole cone. The condition of the existing manhole top will be recorded by the Contractor in the presence of the Owner's Inspector. If the top of the existing manhole cone is deemed by the Owner's Inspector to be failing and in need of replacement, the Contractor shall replace the top cone of the manhole in accordance to MAG Standard Detail 420. If the top of the manhole cone is deemed by the Owner's

Inspector to be in good condition, the Contractor shall replace the existing adjustment rings and adjust to the finished grade per plan and in accordance to MAG Standard Detail 422.

Water Valve Boxes, Frames, Covers, and Debris Caps: The Contractor shall inspect the existing condition of the water valve boxes, frames, covers, and debris caps. The condition of the existing the water valve boxes, frames, and covers shall be recorded by the Contractor in the presence of the City Inspector. If the existing water valve boxes, frames, covers, and debris caps are deemed by the City Inspector to be failing the Contractor shall replace the water valve boxes, frames, covers, and debris caps in accordance to the MAG Standard Detail 391-1 and 392. If the water valve boxes, frames, covers, and debris caps are deemed by the City Inspector to be in good condition, the Contractor shall adjust the water valve boxes, frames, and covers to the fished grade per plan and in accordance to the MAG Standard Detail 391-1. The Contractor is responsible for acquiring the debris caps form the City of Phoenix at no additional cost to the County. To acquire the debris caps a field directive needs to be issued by the City of Phoenix. Matthew Bryan will issue the field directive. His contact information can be seen below:

Matthew Bryan
City of Phoenix Water Services Department
Water Engineering Design & Construction Management
200 W Washington St, 8th Floor
Phoenix, AZ 85003
602-261-8363
matthew.bryan@phoenix.gov

Water Meter Boxes: The Contractor shall adjust existing water meter boxes to finish grade after completion of final grading behind the curb or sidewalk. The conditions of existing water meter boxes will be recorded by the Contractor in the presence of the City Inspector prior to beginning construction. Replacement boxes will be provided by the City, at no cost to the Contractor, for any previously damaged. Should any boxes become damaged during construction, the Contractor shall replace them with new boxes at no additional cost to the City.

345.3 ADJUSTING FRAMES, add the following:

The Contractor shall replace all existing manhole adjustment rings, frames and covers during the adjustment of manholes shown in the project plans.

Contractor shall submit shop drawings and a Certificate of Compliance for each frame adjustment.

345.6 MEASUREMENT, add the followingf:

No additional measurement for new adjustment rings, frames and covers will be made as these items are included within the adjustment of the manhole.

345.7 PAYMENT, add the following:

No additional payment for new adjustment rings, frames and covers will be made as these items are included within the adjustment of adjusting the manhole.

No additional payment will be made for coordinating with utility companies or performing field walks with utility company inspectors.

No additional payment shall be made for debris caps, the cost of these are included with the cost of adjusting the valve.

SECTION 350 REMOVAL OF EXISTING IMPROVEMENTS

350.2 CONSTRUCTION METHODS:

350.2.1 Utilities: add the following:

Southwest Gas will remove their abandoned asbestos steel gas lines. Coordinate with Yvonne Aguirre for removal (602-484-5338). Southwest gas is responsible for excavating a trench to remove the gas line, removing the asbestos covered gas line, hauling it away from the site, and slurry backfilling the trench to the top of the lime stabilization. Contractor is responsible for coordinating with and scheduling the SWG removal.

350.2.2 Others, add the following:

Existing light poles noted for removal and salvage in the project plans shall be delivered to the respective agency that owns the existing light pole. No additional measurement or payment will be made for transporting poles to different agencies based on the ownership of the existing light poles being salvaged.

If portions of the existing PCCP Slab are left in place, the Contractor shall as-built the location of the slab and provide electronic PDF as-builts to the Engineer. The as-built information will include station, offset to each corner of the accessible slab or the begin and end station if the slab is not accessible.

If existing box culverts or pipe culverts are encountered during PCCP slab removal, the existing culvert shall be removed or slurry backfilled at the direction of the Engineer.

Existing conduit shown on the project plans shall be removed up until a depth of 6'. Existing conduit deeper than 6' or existing conduit that is not shown on the project plans may be required to be removed at the discretion of the Engineer.

350.3 MISCELLANEOUS REMOVAL AND OTHER WORK, add the following:

(I) Any and all items not specifically set forth as a separate pay item, including, but not limited to gates, grates, pull boxes, irrigation junction structures and bollards.

(J) The Contractor shall remove and relocate all specified mailboxes in accordance with Maricopa County Standard Details 2065, 2067, and 2069.
Contractor to coordinate mailbox relocations and access with Tolleson Postmaster Dori Brogan (602) 568-1097 for relocation of mailbox along the west side of 91st Ave.

(K) All swing gates shall be constructed in reference to the detail provided on in the plans. The bid price shall include all necessary items to construct the gate and no additional payment shall be made for additional materials necessary to construction.

(L) Any removal called for on the drainage plans. Drainage removals include existing catch basins, pipe, scuppers and spillways. The contractor shall decommission drywells called out on the plans in accordance with the ADEQ Drywell Decommissioning Guidelines (Revised June 2005).

(M) Additional removals of existing improvements and construction of new improvements for new developments within the project limits.

(N) The Contractor shall remove pull boxes at locations called out in the Plans. ITS pull boxes shall only be removed after the existing fiber optic cabling has been removed. Traffic signal pull boxes shall only be removed after the existing conductors and cabling have been removed.

(O) The Contractor shall remove conduit at locations called out in the Plans. ITS conduit shall be removed after the existing fiber optic cabling has been removed from the conduit.

(P) The contractor shall repair all conduits damaged as a result of removing the ITS cables and conductors at no cost to the County.

(Q) The contractor shall dispose of the removed pull boxes, conduit, and fiber optic cabling and traffic signal conductors at an approved off-site location at no cost to the County.

At the discretion of the Engineer, if portions of the concrete slab are allowed to be left in place, Contractor is responsible for documenting the limits of the slab that are left in place. Contractor is responsible for coordinating backfill dates/times with Engineer so that Engineer's surveyor has ample time to survey the removal limits for asbuilts. No small fragments or slivers of concrete slab are to be left in place.

At the discretion of the City of Phoniex or the Engineer, if portions of the existing sidewalk that are not being replaced with the TT0651 project do not meet the ADA requirements

the City of Phoenix or the Engineer may require the removal and replacement of sidewalk panels or landscape reconstruction around the existing sidewalk.

350.4 PAYMENT, add the following:

Additional removals of existing improvements listed in the plans beyond the specified quantity shall be measured based on their corresponding bid items provided in the bid schedule and paid for out of an allowance provided under bid item "MISCELLANEOUS REMOVALS AND OTHER WORK".

Any work that may affect the project shall be coordinated with the appropriate Agency contact at least fourteen (14) days in advance.

Any other miscellaneous removal not listed or not shown on the plans will be measured and paid for out of an allowance provided under bid item "MISCELLANEOUS REMOVALS AND OTHER WORK".

Payment for existing box culvert or culvert removal or slurry backfill abandonment will be measured and paid for out of Section 109.5.

Payment for existing conduit removal shall include every conduit associated with an abandoned utility alignment shown on the project plans. Number of conduits per utility alignment vary. Additional information about existing abandoned conduit can be found in pothole reports in the appendices to these specifications.

No additional measurement or payment will be made for documenting the slab removal limits or coordinating with the Engineer.

Existing debris found in the concrete lined ditches shall be removed and disposed of. No additional measurement or payment will be made for the removal of debris or anything else found in or connected to the concrete lined ditches including port valves, port valve piping, and walls. The cost shall be considered incidental to and included within the Remove Concrete Ditch Lining bid item.

Work required to remove and replace additional existing sidewalk or reconstruct landscaping not noted within the project plans will be paid using the annexation reconstruction item.

SECTION 355 UTILITY POTHOLES-KEYHOLE METHOD

355.1 DESCRIPTION, add the following:

The work covered by this specification consists of furnishing all labor, equipment, appliances, materials, and performing all operations in connection with the excavation, backfilling and compaction of potholes. Pothole Excavation for appurtenances and their foundations, such as manholes, light poles, scuppers, spillways, vaults, valve boxes,

catch basins, or investigative potholes deemed necessary by the Engineer shall be quantified and paid for under the bid item POTHOLES.

See section 474.4 for light poles.

See section 105.6 for abandoned APS manhole.

SECTION 401 TRAFFIC CONTROL

401.2 Traffic Control Devices:

401.2.4 Pavement Markings, add the following:

Painted temporary striping used for traffic control shall not be placed on the finished surface course of the roadway pavement. All temporary striping shall be done to MCDOT standards.

Pre-marking the roadway on the finished surface course prior to final striping shall be installed in compliance with section 462.3.2(A). If pre-marking is necessary for City of Phoenix sections of the project, the Contractor shall coordinate all pre-marking activities with the City of Phoenix prior to any installation. The Engineer shall notify the City of Phoenix Traffic Field Investigator unit (602) 262-4684 a minimum of fifteen (15) business days prior to having traffic pavement marking work commence.

401.2.5 Removal of Permanent Traffic Control Devices, add the following:

The Engineer shall notify Gretchen Naehrbass (602-262-4610) a minimum of fifteen (15) business days prior to having traffic signing work commence. The Contractor shall schedule the work for the removal of existing signs to be completed within 12 hours of the installation of new signs.

401.2.6 Temporary Traffic Signal:

401.2.6.1 Description:

Installation of temporary traffic signal shall consist of a combination of MCDOT furnished signal equipment as detailed in Section 470 and Contractor furnished equipment to install a complete temporary traffic signal at the intersection of 91st Avenue and MC 85 for the duration of the project.

The temporary traffic signal shall conform to all aspects of this specification the MCDOT Supplement to the MAG Specifications, MCDOT Traffic Signal and Intersection Lighting Specifications, MCDOT Standard Details, MCDOT Traffic Signal Design Manual, the MUTCD and the MAG Uniform Standard Specifications for Public Works.

401.2.6.2 Materials:

All materials used for the temporary signal must be determined by the Engineer to be serviceable and in good working order prior to installation. All materials used must be inspected by the MCDOT Inspector prior to installation. This would include any replacement materials required throughout the course of the project.

401.2.6.2.1 Poles: Poles will be steel poles furnished by MCDOT and placed in the permanent locations as shown in the plans.

401.2.6.2.2 Span wire, tether wire, and line hardware:

Span wire assemblies shall include messenger wire, tether wire, all bolts, nuts, washers, clamps, cable straps, and other appurtenances as shown on the plans or necessary for proper installation.

401.2.6.2.3 Luminaries and Luminaire Mast Arms: Luminaire light fixtures and mast arms will be furnished by MCDOT.

401.2.6.2.4 Signal Head Assemblies: The Contractor shall furnish and install minimum two signal head assemblies per approach. Signal heads and material shall conform to the current MCDOT Supplement to the MAG and approved by the Engineer.

401.2.6.3 Construction Requirements:

The temporary signal shall be installed prior to the removal of any of the existing signal equipment currently in use. The existing traffic signal shall be maintained and in operation during the installation of the new signal equipment and span wire assemblies. Contractor shall be responsible for the coordination of the installation and activation of the temporary signal as it relates to any other work being done as part of this project. Any traffic signal equipment which is the responsibility of the Contractor, will not be grounds for time extensions or additional costs to MCDOT.

Maintenance of the temporary signal will be the responsibility of the Contactor. The signal shall be maintained in a proper operating condition at all times. Any damage caused by the motoring public or severe weather conditions or any other acts of nature shall be repaired by the Contractor. Any damage to the signal as a result of construction activities, personnel or equipment associated with the project shall be repaired by the Contractor at no cost to MCDOT.

Repositioning of the temporary signal to accommodate construction activities shall be considered as part of the cost of the temporary signal. Prior to any modifications to the signal, a modification plan shall be prepared and submitted to the MCDOT Engineer or MCDOT representative for review and approval.

MCDOT shall be notified a minimum of ten (10) working days prior to any signal construction at the intersection. The Contractor shall coordinate with MCDOT Inspector and MCDOT Signal Operation personnel to install new signal equipment and materials and the temporary signal equipment installation and receive prior approval for all modifications. The Contractor shall coordinate with MCDOT Signal Operation personnel and the power company for assistance to energize the temporary signal equipment. The temporary signal shall be in working condition, prior to any removal of the existing traffic signal.

401.4 TRAFFIC CONTROL MEASURES:

401.4.2 Traffic Control Technician, add the following:

The Traffic Control Technician shall be part of the prime contractor staff and shall not be a staff member of a subcontractor.

401.5 GENERAL TRAFFIC REGULATIONS:

401.5.1 Road Closure and Road Restrictions, add the following:

Full Closures:

Full closure of MC 85 shall not be allowed.

The Contractor shall provide written notification to the Engineer no less than three weeks in advance of full closures of any roadway. Full closures shall only be allowed on weeknights from 9:00 pm to 5:00 am Sunday to Thursday and on weekends from 10:00 pm Friday to 5:00 am Monday. No full closure will be allowed during special events or holidays or weekends which adjoin a holiday. This written notification shall include the days, times, duration, direction and limits of the closure. The contractor shall coordinate with the Engineer on the allowable times for the weekend full closure.

Two consecutive intersections shall not be closed at the same time.

The Contractor shall coordinate with the City of Phoenix to determine if any coordination is required due to conflicts in detouring traffic onto local streets.

Portable message boards shall be installed two weeks prior to all full closures on all roadways affected by the full closure.

The Contractor shall contact the Logic Park property owner (southwest quadrant of 91st Aveneue and MC 85 intersection) two weeks prior any work that is planned to be completed on or adjacent to the property:

Bo Larson
bo@marwest.net
602-388-2472

401.5.3 Temporary Lane Diversions, add the following:

Traffic shall be kept on paved surfaces. All temporary lane diversions shall be paved.

401.5.5 Access to Adjacent Property, add the following:

In the event that a driveway cannot be closed for the required cure time of the lime slurry or the fibermesh concrete, the full depth of lime slurry can be replaced with aggregate base as approved by the Engineer. See table 702-1 of the MAG Uniform Standard Specifications for the Aggregate Base requirements.

401.5.9 Traffic Control and Construction Phasing:

The general construction sequence will involve constructing the west side of 91st Avenue and the south side of MC 85 first since these areas are offline from the existing pavement and lane configuration. The contractor is to review existing drainage patterns and develop a construction sequence that eliminates any potential drainage issues during construction. As part of each traffic control submittal for shifts and lane closures the contractor shall submit a temporary drainage plan to the Engineer that accounts for drainage during the construction of the project features. One lane in each direction shall be maintained at all times on MC85 and 91st Ave. Prior to any new phase of construction or traffic control shift the Contractor shall provide his construction phasing and traffic control plans to the engineer for review and approval at least fourteen (14) days prior to commencement of work on the new phase. The Contractor shall energize lights prior to shifting traffic onto newly constructed pavement to meet or exceed existing lighting levels.

The construction along MC 85 (Buckeye Road), and 91st Avenue may be divided into multiple phases to minimize the impact to traffic. Access to businesses and residents shall be maintained throughout the entire construction period.

Contractor shall accommodate all utility companies working in their traffic control and Contractor shall facilitate utility companies providing certificates of insurance. No additional measurement or payment will be made for utility coordination.

Local Access Requirements - The Contractor shall maintain local access to all side streets, access roads driveways, alleys, and parking lots at all times and shall notify residents 72 hours in advance of any restrictions which will affect their access. The Contractor shall restore the access as soon as possible. If the primary access cannot be

restored in a timely manner, the Contractor shall provide an alternative which shall be pre-determined with the residents prior to imposing any restrictions. Where property has more than one point of access, no more than one access may be restricted or closed at a time. Any local street restrictions imposed shall be such that local area traffic circulation is maintained.

Business Access Requirements - Access shall be maintained to adjacent businesses at all times during their hours of operation. Access may be maintained by such measures as constructing driveways in half sections, or by providing bridging over new concrete. Properties with multiple driveway access shall not have more than one driveway access restricted at any given time. While the one driveway is restricted, access to the other adjacent driveways shall be maintained and unrestricted. Each individual driveway access restriction shall be no more than fourteen (14) calendar days. Any business restrictions shall be coordinated with the affected business in writing at least fourteen (14) days prior to imposing restrictions. Notification shall include the scope of the construction activities, duration of construction activities, and the possible interference with the day to day activities of the property. The contractor shall provide a reminder to each property and business operated affected by the pending restrictions at least 72 hours in advance of the closure. The contractor shall include “Business Access” signs where required as part of the traffic control plans or as directed by the Engineer.

94th Ave shall be considered an access point for both 101-06-434 & 101-06-427A.

The Pima St and 91st Ave driveway will not be able to be built in halves because there will not be sufficient room for trucks to make turning movements. There are a few options for how this driveway could be built and it is the Contractor’s sole responsibility to weight the pros and cons and decide the best possible construction method and coordinate with the City of Tolleson and the adjacent property owners to finalize the construction phasing.

Option 1 Logic Park Detour: It may be possible to route traffic with a short term detour (1 week or less) through the Logic Park Development. Since it is only wastewater treatment plant traffic the number of people traveling through their development will be minimal. This has been done in the past before the Development was operational. Street sweeping their property after the fact along the detour route may be required by the Engineer. This option has not been negotiated by MCDOT and is the Contractor’s responsibility to coordinate.

Option 2 Weekend Construction: It may be possible to phase the Pima St construction over the course of two weekends. Weekend one would consist of removing and slurry backfilling the underground pipes, removing the concrete, and backfilling with AB. Weekend two would consist of cutting the AB down to roadway subgrade, stabilizing the subgrade and paving. Even with the Pima St closure, emergency access will still need to remain open at all times to the wastewater treatment plant. Street sweeping around the AB driveway may be required by the Engineer.

Parcel 101-06-430 and 101-06-434 Requirements - Grantor and Grantee acknowledge and agree that the proposed construction shall, in part, affect access to two (2) buildings owned by Grantor (and/or its affiliate) located at 9310 West Buckeye Road ("9310") First Industrial, LP- D22668 and 9180 West Buckeye Road ("9180") FR AZ/TX, LLC - D22667, which are served by three (3) access drives abutting West Buckeye Road, designated for the purposes of this Section E from west to east along West Buckeye Road as (i) "Access Drive 1", which primarily serves 9310 (First Industrial, LP - D22668), (ii) "Access Drive 2", which is located between 9310 and 9180, and (iii) "Access Drive 3", which primarily serves 9180 (FR AZ/TX, LLC- D22667), Grantee covenants to give written notice to Grantor's representative at least thirty (30) days before commencement of construction activities, and to coordinate construction so that at all times Grantor and Grantor's (and/or its affiliate's) agents, employees, tenants, guests and invitees shall have access to both the 9310 and 9180 properties. Further, at any time that Grantee's construction activities may materially and adversely affect ingress and/or egress through any of Access Drive 1, Access Drive 2 or Access Drive 3, Grantee shall contact and consult with Grantor's representative to discuss and agree upon the timing of such construction activities and reasonably limit the duration of any restrictions on access. Notwithstanding the foregoing, in all events: (a) if ingress and egress through Access Drive 2 is materially and adversely affected by Grantee's construction activities at any time, then Grantee shall perform no construction activities on Access Drive 1 and/or Access Drive 3 during such time; (b) if ingress and egress through Access Drive 1 is materially and adversely affected by Grantee's construction activities at any time, then Grantee shall perform no construction activities on Access Drive 2 during such time; and (c) if ingress and egress through Access Drive 3 is materially and adversely affected by Grantee's construction activities at any time, then Grantee shall perform no construction activities on Access Drive 2 during such time.

Access drives are located at the following stations:

Access Drive 1: 1222+56.00
Access Drive 2: 1227+79.00
Access Drive 3: 1232+26.00

Parcel 101-14-002A – Property is responsible for relocating gates, fencing, and boulders. Contractor is responsible for coordinating with the property owner about the relocations. Contractor to begin coordination early in construction as no schedule extensions will be granted for private property relocations.

Parcel 101-06-001N – Property is responsible for installing a taller wall and moving gates to the ROW line. Contractor is responsible for coordinating with the property owner about the relocations. Contractor to begin coordination early in construction as no schedule extensions will be granted for private property relocations.

The Contractor shall coordinate and verify all event schedules with adjacent cities, adjacent property owners, and MCDOT. The Contractor shall also coordinate construction

activities to avoid impacting traffic operations during major events and seasonal peak times for the warehouses, other businesses, and residents.

Maintaining Existing Traffic Signals and Lighting Systems:

The Contractor shall phase the new traffic signal equipment construction to minimize downtime. This may include splice pits to integrate the new traffic signal equipment with the existing traffic signal system. Temporary traffic signals are required as part of the construction, the Contractor shall submit a traffic control plan showing the temporary traffic signal layout for review and approval by the Engineer. The cost of temporary traffic signals shall be paid under bid items Temporary Traffic Signal.

Certificate of Insurance:

One traffic control company sets up an entire plan for all work required. Then when the permit contractor is working within the Prime Contractor traffic control, the permit contractor needs to provide the COI from their company naming the Prime as an additional insured.

Other Contractor's Permit Work:

Contractor to be advised if permit work is issued within the ROW, additional accommodations to provide traffic control may be required as directed by the Engineer.

401.7 PAYMENT, add the following:

Payment for temporary striping will use item "Temporary Paint Stripe".

No separate measurement or payment will be made for pre-marking the roadway. Pre-marking the roadway consists of placing dots of paint to help layout the striping. The cost will be considered as included in the applicable final striping bid items.

Traffic control work shall be paid under section 109.5 of the MAG specifications.

No separate measurement or payment will be made for coordination with any developments within the project limits including but not limited to Logic Park.

No separate measurement or payment will be made to coordinate or phase the reconstruction of the Pima Street connection to 91st Avenue or any temporary AC needed on the project. The cost of temporary AC shall be considered incidental and included within the lump sum bid item for "Traffic Control".

SECTION 405 SURVEY MONUMENTS

405.3 CONSTRUCTION, add the following:

405.3.1 Installation:

The County will locate and tie-out the existing survey monuments. The Contractor shall furnish and install new survey markers in the asphalt concrete pavement at locations designated by the Engineer. The Engineer will prepare the list to have the new survey monuments punched and documented.

SECTION 420 CHAIN LINK FENCES

420.1 DESCRIPTION, add the following**:**

This work includes constructing, maintaining, and removing temporary fencing around private properties only, not contractor work zones. Temporary fence shall provide a secure, visible boundary adjacent to protected areas.

420.2 MATERIALS, add the following:

Unless otherwise indicated, type of temporary chain link fencing shall be the Contractor's option.

Following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition
2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.
3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

Gates: Provide vehicle gates based on property usage and access requirements, required for functional access to the site or as specified by the Engineer or property owner.

1. Fabricate of the same material as used for fencing.
2. Vehicle gates:
    a. Minimum width: 20 feet to allow access for emergency vehicles.
    b. Capable of manual operation by one person.

420.3 CONSTRUCTION METHODS:

420.3.4 Temporary Fence Construction:

Submittals:
Shop drawings shall be submitted for approval prior to any temporary fence installation indicating layout of temporary fencing, location and size of gates, existing pavement and roads, access to fire hydrants and hose connections, and other site specific conditions. The drawings shall be prepared after site observation and verification of existing conditions by the Contractor and Engineer.

Construction Layout:
Installation of temporary fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.

1. Maintain 3 feet diameter clear space around fire hydrants.
2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.

Access: Provide gates for personnel, delivery of materials, and access by emergency vehicles.

The Contractor shall field verify the proposed location of fencing with the Engineer and Property Owner.

Installation:
Chain link posts:

1. Space 10-feet maximum.
2. Drive posts, set in holes and backfill, cast concrete plug around posts.
3. For soft and unstable ground conditions, cast concrete plug around post.
4. Posts over pavement: Use Steel post plates or precast concrete blocks.
5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

Fabric: Securely attach to posts.

Gates: Install with required hardware.

MAINTENANCE:

Maintain fencing in good condition at all times. If damaged, immediately repair.

REMOVAL:

Remove temporary fencing upon completion of Work or when no longer required for security or control. Provide 60-days notice to property owners prior to removal to ensure

that their new fencing and gates can be constructed prior to removal to ensure each property is secure at all times. Copy the Engineer on the notice accordingly. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

420.4 MEASUREMENT, add the following:

Temporary chain link fencing and gates shall be measured per linear foot through any gates constructed in accordance with Section 109.5 Actual Cost Work.

420.5 PAYMENTS, add the following:

The price paid out of the allowance under the item noted below shall include full compensation for furnishing all labor, materials, tools, and equipment, and doing all the work involved in constructing and removing the fence or gates complete in place as needed or as specified by the Engineer. This shall include full compensation for furnishing the gates, together with all necessary gate posts, fittings and hardware, and doing all the work involved in installing the gates complete in place and subsequently removing them as specified. This shall also include maintaining the fence while it is in use.

Full compensation for clearing the line of temporary fencing and gates and disposing of the resulting material, excavating high points in existing ground, and any other related work shall be considered as included in the price bid per linear foot of item 421.10000 TEMPORARY SECURITY FENCE and no additional allowance will be made therefore.

No additional payment will be made for the Contractor to coordinate with property owners for gate relocations.

SECTION 430 LANDSCAPING AND PLANTING

430.4 DECOMPOSED GRANITE AREA: add the following:

Decomposed granite shall be native, local, desert, decomposed granite at the size specified on the plans. For landscape restoration areas, the color and size shall match the existing decomposed granite. In areas where decomposed granite does not exist, the color shall be Madison Gold or as specified by the Engineer. The decomposed granite shall be from a single source, free from coating, clay, caliche or organic matter. The CONTRACTOR shall provide the Engineer with a sample of material for approval before installation.

CONTRACTOR must examine the subgrade, verify the elevations, and observe the conditions under which the work is to be performed. The existing grade shall be fine graded and raked free of organic matter and other debris one inch diameter and larger and then compacted.

Any existing weeds or Bermuda grass growing in designated landscape areas shall be treated with a post-emergent spray, such as Round-Up or approved equal. Any existing

or new trees or vegetation shall be protected from the spray drift. There will be no separate payment for the weed spraying. Bermuda grass or weeds must be completely eradicated from all areas of the landscape and where designated by the Engineer. The CONTRACTOR shall remove all non-planted vegetation from all areas designated to receive decomposed granite (by chemical or mechanical means) and maintain the designated areas “vegetation-free” for a minimum period of 40 working days prior to placement of the decomposed granite, or as specified by the Engineer. Prior to placement of the decomposed granite, designated areas to receive decomposed granite shall be completely free of all grass, weeds, or other miscellaneous vegetation growth. All dead grass and weeds shall be removed and properly disposed. There will be no separate payment for the weed spraying.

All weed control products and herbicides shall be approved for use by the Engineer prior to any applications. The CONTRACTOR shall submit copies of all product manufacturer specifications and application rates to the Engineer for review and approval prior to application. Herbicides and weed control shall only be performed by a licensed applicator; CONTRACTOR shall supply information on applicator to the Engineer for approval.

The CONTRACTOR shall apply two (2) applications of pre-emergent. One application of pre- emergent herbicide as per manufacturer’s directions prior to installing granite and one application after granite has been installed, compacted, and raked level. If the second application is applied more than three months from the expected substantial completion date, a third application shall be applied within two months of the substantial completion date at no additional cost to the project. The pre-emergent herbicide shall be applied in the manner recommended by the manufacturer to prevent germination of noxious weeds, and shall be equivalent to Gallery, Surflan, or an approved equal, and shall be applied at a rate per manufacturers recommendations. Pre-emergent herbicide shall be applied to the designated granite areas, prior to the final water settling operation. The Engineer is to be notified prior to all pre- emergent applications. Water to activate the pre-emergent herbicide shall be applied to the areas of the herbicide application as recommended by the manufacturer's label. The amount of water specified by the manufacturer may be adjusted due to rainfall, if approved by the Engineer.

After the first application of pre-emergent, the granite shall be installed and shall be rolled or raked to remove any irregularities, tire marks etc. Installation shall provide a two-inch depth of decomposed granite after compacting. During the final spreading and final grading operations, all surfaces within the decomposed granite areas shall be passed over by the spreading and grading equipment a minimum of two (2) times. Equipment operations for spreading, grading, raking, chemical application, water settling, and any other operations shall be done in a manner that uniformly maximizes the vehicle(s) wheel compaction over the surface area. All vehicles used for spreading, grading and raking the decomposed granite shall have one set of wheels with floatation tires having a minimum width of 18-inches to allow equal compaction of the granite mulch. The use or application of granite by any method (conveyor belt etc.) shall not relieve the CONTRACTOR of providing granite compaction to a level approved by the Engineer.

Methods of compacting such as rolling, water settling, etc., shall be approved by the Engineer.

After placing, spreading, compacting, and grading the decomposed granite the CONTRACTOR shall water settle the total thickness of the decomposed granite to remove the fine material from the surface. The water settling operation, noted above, shall be completed by applying water at minimum depth of one-half inch over the decomposed granite areas placed or as approved by the Engineer. This water settling technique can be used to water-in the second application of pre-emergent in compliance with pre-emergent Manufacturer recommendations and as approved by the Engineer.

Unless otherwise specified in the drawings, granite finish grade shall be one inch (1”) below top of curb or adjacent sidewalk surfaces.

CONTRACTOR shall supply and place decomposed granite in areas as designated on the plans. Graduation requirements for the decomposed granite 3/4” minus are as follows:

Decomposed Granite 3/4 Inch Minus

Sieve Size	Percent Passing
3/4 Inch	100
1/4 Inch	50-60

430.5 TREE, SHRUB AND GROUND COVER PLANTING:

430.5.8 Hydro Seeding:

430.5.8.1 Seed Mixture, add the following:

Certificates of Compliance for the seed mixture to be used on the project shall be submitted ot the Engineer at least 10 days prior to ordering the luminaires for the project.

430.10 MEASUREMENT AND PAYMENT, add the following:

Measurement and Payment for Decomposed Granite (3/4" Minus) will be at the contract unit price bid per Square Yard for the inert materials as shown on the project plans, details, and special provisions and shall include all costs, materials, equipment, labor, and operations necessary for the installation and associated weed control and pre-emergent applications.

SECTION 440 SPRINKLER IRRIGATION SYSTEM INSTALLATION

440.1 DESCRIPTION: add the following:

The work under this item shall consist of restoring the existing landscape and irrigation in areas that are disturbed by construction as identified on the project plans. The decomposed granite installation for these areas is included in this bid item. Contractor shall renew and replace the existing decomposed granite to match replaced decomposed granite within these restoration areas. Work in this bid item also includes any irrigation restoration associated with the disturbed areas.

440.3 MATERIALS: add the following:

Any disturbed existing irrigation system will require that the contractor re-construct the irrigation system using the emitters, sprinklers, valves, piping, fittings, controllers, wiring, and other components, of sizes and types to match existing equipment.

All replacement or repair materials shall match the existing materials that have been damaged. Irrigation materials and components shall be from the same manufacturer as originally installed. Emitters and sprinklers shall have the same volume output as original. PVC pipe may be from a different manufacturer but the grade shall be as originally installed. All mainline fittings shall be Schedule 80, all lateral fittings shall be Schedule 40. Salvage and reuse of existing materials is acceptable if they are in proper working order and good condition.

Landscape materials and decomposed granite shall be replaced to match existing conditions. Contractor shall walk site with Engineer to inspect Landscape and Irrigation Restoration areas prior to construction activities.

440.4 LANDSCAPE IRRIGATION SYSTEM REMOVAL AND RESTORATION: add the following:

Contractor shall verify exact limits of disturbance with Engineer in areas designated on the plans as Landscape and Irrigation Restoration Areas. All work shall be in accordance with these Special Provisions.

Contractor shall identify and coordinate limits of disturbance areas where appropriate with the Engineer prior to beginning of construction activities. Contractor shall contact the Engineer for review and approval of all Landscape and Irrigation Restoration materials. Contractor shall replace all existing landscape materials in all disturbed areas that are disturbed, damaged or removed as a result of this project and shall bring disturbed areas back to original condition. Contractor shall contact the Engineer for review and approval of Landscape and Irrigation Restoration materials prior to installation.

The work shall also consist of reconstructing, rerouting, modifying, or repairing the existing irrigation system in areas designated on the plans. The contractor shall be

required to repair and/or replace all disturbed or damaged irrigation components, returning their operation to 100 percent within 24 hours following initial disturbance of the irrigation components. The existing irrigation that will be impacted includes the drip irrigation system for trees, shrubs and ground covers. The work shall include furnishing and installing the various irrigation sleeves, piping, drip emitters, gate valves, electric control valves, wiring, and valve boxes, in needed, including required excavation and backfill at the designated locations shown on the project plans or as directed by the Engineer.

All work shall be in accordance with the details shown on the project plans, or as directed by the Engineer and the requirements of these Specifications. The existing irrigation components shall be protected and maintained in their current condition where feasible or repaired, replaced, extended and reconnected in areas including, but not limited to, those areas that are disturbed during the construction, areas shown on the project plans or as directed by the Engineer. The contractor shall be required to maintain water to all existing plant materials throughout the duration of the contract using repairs, reconnections, replacements or rerouting of the system as approved by the Engineer. The contractor shall ensure that the entire existing and new irrigation systems within the project limits are operational and functional and shall test and receive approval from the Engineer prior to proceeding with other related work. The Engineer shall inspect and give approval prior to backfilling.

The system shall be constructed to grades and conform to areas and locations as shown on the drawings.

Protection of Existing Vegetation:

The work shall include the protection of all existing plant material. Contractor shall take great care to protect in place all existing plant material. Contractor shall replace in like kind and size existing plant material removed, damaged, or destroyed at no cost to the Project and to the satisfaction of the Engineer. The contractor shall identify and the Engineer shall review existing plant materials within the disturbance areas. Salvage and relocate or replace all plant material in conflict with the construction as designated in Landscape and Irrigation Restoration Areas in like kind and size per the direction of the Engineer.

Verification of Conditions:

Prior to the start of construction, Contractor shall conduct onsite inspections of plants and vegetation with the Engineer, and identify and inventory the plants and vegetation that are to remain in place during this area tour. Field measure and stake Project improvements as needed for establishing the location and limits of disturbance.

Protecting, Restoring, or Modifying Irrigation System:

The work under this item shall consist of testing, reconstructing, or modifying the existing irrigation systems that are damaged by the construction or as designated on the plans for restoration. Prior to construction activities, the contractor shall stake areas that are designated to be disturbed. The contractor, along with the Engineer, shall meet with the maintenance representative, County, or County's representative, for each area within the project that is designated to be disturbed to determine where the existing and functioning irrigation system is located and how it is operated. The contractor shall be required to repair and or replace all disturbed or damaged irrigation components to 100 percent operational. Contractor shall ensure that all reconnections (water and power) have been tested and approved by the Engineer prior to back filling. Prior to final acceptance and during the maintenance period specified, the contractor and the Engineer shall meet again with the designated representative to engage every irrigation system that has been disturbed or that is adjacent to this project. The contractor shall ensure that each system has been returned to a fully operational and functional system and that all deficiencies have been corrected.

The underground location of the irrigation facilities is unknown. The contractor shall take care to minimize disturbance to these areas.

All construction shall be coordinated to ensure that the existing irrigation system and its associated electrical controls are fully functional within 24 hours of modifications. Work activities that require more than 24 hours of outage shall be coordinated with the Engineer for approval and alternate irrigation methods such as truck watering or temporary systems shall be required as directed by the Engineer. The cost of alternate irrigation methods necessary due to extended irrigation system outages will be at the contractor's expense.

All work shall be in accordance with the details shown on the project plans, or as directed by the Engineer and the requirements of these Specifications. All work shall be inspected and approved by the Engineer prior to backfilling and shall comply with all the requirements of MAG Sections 430 and 440.
Repair/Restoration:

Contractor shall restore all landscape areas and other surface improvements that were to remain in place, but that have been damaged by the contractor's actions or omissions. Restore landscape areas as nearly as possible to the original condition.

Repairing Damaged Plants:

Where damage to vegetation has occurred, contractor shall prune plants in accordance with Tree Care Industry Association (TCIA) standards to remove branches from the work area, and where needed to maintain the health of the plant. Remove material in a manner that yields minimal impact and is approved by the Engineer.

Replacing Damaged Plants:

Contractor shall remove plants that were identified by the Engineer to remain in place, but that are damaged during the course of the work to an extent that they cannot be repaired; and replace the damaged plants with new plants of the same type and value. Remove and replace damaged plants as directed by the Engineer. Base the value of plants that are to be replaced on the criteria found in the Council of Tree and Landscape Appraisers' "Guide for Plant Appraisal", as evaluated by the Engineer. Contractor shall remove and replace damaged plants at no additional cost to the Project. Plants shall be replaced at the following sizes or as directed by the Engineer:

Existing Plant Material Size	Replacement Size
Trees:	
2" Caliper	24" Box
4" Caliper	36" Box
6" Caliper	54" Box
All Existing Shrubs	5 Gallon

Clean up the ground areas under plants remaining in place as directed by the Engineer. Wash off foliage that becomes soiled, or when directed to do so by the Engineer. Remove materials that fall or flow into protected areas. Provide protective barriers as needed or as directed by the Engineer to prevent materials from falling or flowing into protected areas.

Waste Management:

Contractor shall gather and dispose of spoils and vegetative waste, including dead and damaged plants and the trimmings accumulated from the operations to clear and remove existing vegetation. Dispose of spoils and vegetative waste off-site in conformance with the regulations imposed by the local authorities, and in an area approved for such disposal by the local authorities.
Maintenance of Vegetation:

Contractor shall care for and maintain existing vegetation within protected areas. Provide water and labor as needed for plant health, growth, and for washing down soiled foliage. Provide fertilizer, deep root fertilization, pesticides, anti-desiccants, and other materials and labor as needed to maintain the existing plants in a healthy and growing condition. Provide plant maintenance for the duration of the Contract, until Final Acceptance.

Record Drawings:

The contractor shall keep and maintain separate record drawings ("field redlined record drawings"), corrected shop drawings, or other drawings necessary for the Engineer to show the landscape and irrigation work as constructed. These field redlined record drawings shall be kept on the worksite and they shall be maintained clear, accurate and current as changes occur that may differ with the bid set construction documents and

addenda. All landscape and irrigation related elements buried or backfilled shall be recorded in the “field redlined record drawings” prior to burial and backfilling occurs. The contractor shall submit the updated field redlined record drawings with monthly pay estimates to the Engineer. Complete field redlined record drawings that the contractor maintains shall be submitted to the Engineer in a format that will allow the Engineer to create the formal record drawings. The contractor shall submit the field redlined record drawings to the Engineer prior to the end of each construction phase. No extra measurement or direct payment will be made for this work; the cost being considered included in the price of the contract items. Record drawings shall be 11x17 editable electronic PDF’s that can be used for incorporation into the final record drawing plans for the project.

440.6 PIPE INSTALLATION, add the following:

The contractor shall as-built the stations and offsets to each side of each pipe sleeve installed. The as-built information shall be submitted to the Engineer as an editable electronic PDF markup of the plan sheets showing the installation of the pipe sleeve and shall clearly note the location of each end of each pipe sleeve.

The Contractor shall cap and extend sleeve ends twelve inches beyond edge of hard scape, driveways, or sidewalks. At no additional cost the Contractor shall provide and install 9" round irrigation controller boxes at each end of the pipe sleeve installed. The color of the irrigation controller boxes shall match the decomposed granite in the vicinity of the pull box to the greatest extent possible. Tracer wire shall be installed through the sleeve and 10-feet of additional tracer wire shall be spooled into each irrigation controller box for future locating.

All sleeves shall be installed prior to final asphalt and concrete paving. Cutting new pavement for sleeve installation is not permitted.

440.11 MEASUREMENT AND PAYMENT, add the following:

Measurement and Payment for Landscape and Irrigation Restoration will be at the contract unit price as an Allowance under bid item 440.10001 LANDSCAPE / IRRIGATION RESTORATION. The price paid out of the allowance shall be full compensation for furnishing all labor, materials, tools and equipment, and performing all work necessary for the furnishing and full restoration of all plant materials, decomposed granite, drip and sprinkler irrigation, and other miscellaneous items to the satisfaction of the Engineer. 50% of each pay request will be withheld until as-builts are submitted and accepted by the Engineer.

No separate measurement or payment will be made for excavation, removal, backfill, salvage, or disposal of removed materials associated with construction, or for the cost of earthwork required in areas designated for landscape and irrigation restoration, the cost of such work being considered included in the contract price for this item.

SECTION 462 THERMOPLASTIC AND PREFORMED PAVEMENT MARKINGS

462.2 MATERIALS:

462.2.1 General Requirements, add the following:

Green bike lane symbols shall be green traffic/bike lane acrylic waterborne pavement marking paint, Part #985216-5p – Fast Dry, not High Build for use on asphalt or portland cement concrete pavement surfaces.

All material used in the formulation of the pavement marking paint shall meet the requirements herein specified. Any materials not specifically covered shall meet the approval of the Engineer.

The design of the green paint for bike lanes shall follow the Federal design requirements including the following:

a. The daytime chromaticity coordinates for the color used for green color pavement shall be as follows:

1		2		3		4	
X	Y	X	Y	X	Y	X	Y
0.230	0.754	0.266	0.500	0.367	0.500	0.444	0.555

b. The nighttime chromaticity coordinates for the color used for green colored pavement shall be as follows:

1		2		3		4	
X	Y	X	Y	X	Y	X	Y
0.230	0.754	0.336	0.540	0.450	0.500	0.479	0.520

Certificates of Compliance conforming to the requirements of Arizona State Department of Transportation Standard Specifications for Road and Bridge Construction 2021 edition, section 106-05shall be submitted for each lot of batch of paint prior to its use.

462.3 CONSTRUCTION, add the following:

The City of Phoenix (COP) is responsible for doing the signing and marking inside the MCDOT and COP ROW per MCDOT IGA with COP. MCDOT Contractor is responsible for coordinating early with the COP to plan the schedule and traffic control necessary for COP work. The MCDOT Contractor is responsible for doing the signing and marking inside the City of Tolleson (COT) ROW.

COP will be responsible for designing and procuring their own traffic control for this operation. MCDOT Contractor is responsible for coordinating approval of all COP traffic control with MCDOT and the project schedule. MCDOT Contractor to ensure that COP

traffic control and sign installation do not conflict with their approved project traffic control. MCDOT Contractor is responsible for covering all COP signs installed that are in conflict with current traffic control. MCDOT Contractor to ensure all permanent signs that are covered are not damaged in the process. Any damaged signs as determined by the Engineer shall be replaced by the Contractor at no additional expense to the County. All replacement signs shall be procured from the COP.

MCDOT Contractor shall schedule their concurrent construction activities such that they do not result in conflicting work areas or conflicting traffic control when and where COP requires traffic control to perform their installation of signing and striping.

In the event that the COP is not able to perform signing and pavement marking for any reason and cannot meet the agreed upon schedule with MCDOT's Contractor, and the only way to finish the striping is for MCDOT's Contractor to self-perform the work, MCDOT Contractor will be paid out of the "City of Phoenix Striping (Contingent)" and "City of Phoenix Signing (Contingent)" allowances using the Contract Bid Item unit prices for similar items of work located in the COT ROW.

SECTION 470 GENERAL REQUIREMENTS FOR TRAFFIC SIGNAL AND INTERSECTION LIGHTING SYSTEMS

470.5 MARICOPA COUNTY FURNISHED MATERIAL AND EQUIPMENT, add the following:

MCDOT will furnish the following materials and equipment for installation:

1. Traffic Signal Type A Poles
2. Traffic Signal Type R Poles with 55' Mast Arm
3. Traffic Signal Type R Pole with 50' Mast Arm
4. Traffic Signal Type K Pole with 45' Mast Arm
5. Traffic Signal Type PB, Push Button Pole
6. All Luminaire Mast Arms and Luminaires
7. All Signal and Pedestrian Signal Indications Including Mounting Assemblies
8. Pedestrian Push Buttons with Signs
9. Video Detection System

Traffic signal material and equipment furnished by Maricopa County Department of Transportation or tested by Maricopa County Department of Transportation will be made available at the following address:

Maricopa County Department of Transportation Warehouse
Procurement Distribution Center
2222 South 27th Avenue
Phoenix, Arizona 85009-6357

The Contractor shall contact the MCDOT Traffic Signal Supervisor at (602) 506-8660 five

working days prior to desired pick-up date to confirm the item list, availability, date and time. Warehouse hours for pick-up and delivery are 6:00 am – 2:00 pm Monday through Thursday. A map of the warehouse loading area will be made available upon request.

470.6 REMOVAL AND SALVAGE OF EXISTING FACILITIES, add the following:

The Contractor shall remove and salvage all existing traffic signal equipment as specified in the project plans, or as directed by the Engineer. This work consists of furnishing all necessary equipment, materials, and labor for the removal of signal and pedestrian indications, luminaire mast arms and fixtures, traffic signal poles and mast arms, pedestrian push buttons, wireless antenna equipment, and video detection equipment. The work shall include the removal and disposal of the existing signal pole foundation. Salvageable material shall be dismantled and stockpiled, prior to project completion, as directed by the Engineer.

All traffic signal equipment and materials to be salvaged shall be the property of the County.

All traffic signal equipment damaged or destroyed by improper care or handling shall be replaced with new equipment. Unless otherwise specified, it shall be the responsibility of the Contractor to remove and dispose of all discarded materials not salvaged. Holes resulting from removal of pull boxes, foundations, and other material shall be backfilled and compacted with material equivalent to the surrounding area or as designated by the Engineer.

The Contractor is responsible for hauling the salvaged traffic signal materials to the County Salvage Area.

470.8 CITY FURNISHED MATERIAL AND EQUIPMENT

The City of Phoenix will furnish the following materials and equipment for installation:

1. Emergency Pre-emption Cables Only for the intersection of MC-85 and 91st Avenue.

The Contractor shall contact the City of Phoenix Signal Shop Foreman for the fire pre-emption cables at least two weeks prior to desired pick-up date to confirm the item list, availability, date and time. The installation of the pre-emption cables shall be covered under item 478.01000. Pre-emption detection devices shall be installed in the future.

City of Phoenix	Contact Name	Work Phone Number	Mobile Phone Number
Signal Shop Superintendent	Vince Gigliotti	602-319-5162	

SECTION 474 TRAFFIC SIGNAL POLE INSTALLATIONS

474.1 DESCRIPTION, add the following:

The work under this section shall consist of furnishing and installing light poles, mast arms, and foundations in accordance with the plans, the referenced details, the special provisions, and these specifications.

Poles shall include a shaft, base, mast arms (if required), and other hardware required to support the street lighting apparatus or other supported items.

Foundations shall be spread footing or direct buried as determined by pothole in accordance with the drawings. If spread footings are necessary to provide the required utility clearance, the Contractor shall provide shop drawings sealed by a registered professional engineer for review and approval by the Engineer.

The Contractor shall be responsible for all coordination and notifications necessary to energize and deenergize existing lighting. Each agency and or utility company has a different process necessary to complete this task and it shall be the contractors responsibility to determine the process and comply with the agencies requirements. The contractor is to maintain existing light levels on all travel lanes throughout construction and phase the installation of proposed lighting to accommodate the roadway being lit during the entire duration of construction. If the light levels are not maintained or restored for new pavement or temporary pavement where detours are needed, the Contractor will not be allowed to open new pavement or detour pavement to traffic.The contractor shall not be compensated for any traffic control changes delayed by the energize deenergize process and is to plan accordingly in advance of traffic control changes necessary for construction phasing.

474.3 TYPES OF POLES, add the following:

Types of light poles and mast arms to be installed are as follows:

1. STANDARD COP ARTERIAL STREET LIGHT POLE, 8’x8’ MAST ARM (OWNER FURNISHED CONTRACTOR INSTALL) as detailed on drawings
2. STREET LIGHT 9 FT POLE AND 11’-6” MAST ARM PER SRP SPECIALTY POLE DETAIL A
3. STREET LIGHT 9 FT POLE AND 11’-6” MAST ARM PER SRP SPECIALTY POLE DETAIL A (OWNER FURNISHED CONTRACTOR INSTALL)
4. STREET LIGHT 9 FT POLE AND 11’-6” MAST ARM PER SRP SPECIALTY POLE DETAIL A (CONTRACTOR PROCURE AND DELIVER)
5. STANDARD COP ARTERIAL STREET LIGHT POLE (CONTRACTOR FURNISH AND INSTALL)
6. 20”X6’ MAST ARM (CONTRACTOR FURNISH AND INSTALL) as detailed on drawings

7. 8’X8’ MAST ARM (CONTRACTOR FURNISH AND INSTALL) as detailed on drawings

(E) Luminaire Mast Arms, add the following:

Mast arms shall be provided per drawings. All pole and mast arms shall be submitted with foundation for Engineer’s approval.

7 poles, heads and mast arms for the STANDARD COP ARTERIAL STREET LIGHT POLE, 8’x8’ MAST ARM (OWNER FURNISHED CONTRACTOR INSTALL) are currently being stored at the address below. Contractor to coordinate with Bo Larson for pickup (Bo Larson: bo@marwest.net, (602) 388-2472).

APN #: 101-13-004H
CRPMARWEST LOGIC PARK OWNER LLC
1500 S 91ST AVE TOLLESON 85353

14 poles, heads and mast arms for 1. STREET LIGHT 9 FT POLE AND 11’-6” MAST ARM PER SRP SPECIALTY POLE DETAIL A (OWNER FURNISHED CONTRACTOR INSTALL) are stored at MCDOT’s storage facility listed at the address below. Contractor to coordinate with MCDOT Lead Inventory Specialist John Armstrong for pickup (John Armstrong: John.Armstrong@Maricopa.Gov. Coordination should be done five working days prior to desired pick-up date to confirm the item list, availability, date and time. Warehouse hours for pick-up and delivery are 6:00 am – 2:00 pm Monday through Thursday.

Maricopa County Department of Transportation Warehouse Procurement Distribution Center 114
2222 South 27th Ave.▪ Phoenix, AZ 85009

Contractor is to procure and deliver the number of poles shown in the bid schedule to the City of Phoenix and the Contractor is to coordinate the delivery location with the City of Phoenix and deliver the poles at no additional cost.

474.6 MEASUREMENT, add the following:

Light poles and mast arms shall be measured by the each as noted in the bid schedule installed complete in place. The poles, mast arms and all materials required for installation shall be furnished by the contractor unless otherwise indicated. No additional measurement or payment shall be made for coordination, pickup, transport or delivery of install only equipment referenced anywhere within these specifications.

474.7 PAYMENT, add the following:

The accepted quantities of poles will be paid for at the contract unit price. Potholes will be paid out of bid item 355.21000 CONSTRUCTION POTHOLES. Spread footers will be

paid out of bid item 472.64000 LIGHT POLE SPREAD FOOTING. Payment shall be full compensation for the work, COMPLETE IN PLACE. No additional payment will be made for pickup and delivery of STREET LIGHT 9 FT POLE AND 11'-6" MAST ARM PER SRP SPECIALTY POLE DETAIL A (OWNER FURNISHED CONTRACTOR INSTALL) or STANDARD COP ARTERIAL STREET LIGHT POLE, 8'x8' MAST ARM (OWNER FURNISHED CONTRACTOR INSTALL).

For owner furnished poles, no additional measurement or payment will be made removing pole wrap and installing corrosion protection wrap. This cost beign considered incidental to and included within the install of the County furnished pole.

SECTION 477 INTERSECTION LIGHTING

477.2 MATERIALS:

477.2.1 General, add the following:

Certificates of Compliance for luminaires to be installed with the project shall be submitted ot the Engineer at least 10 days prior to ordering the luminaires for the project.

SECTION 505 CONCRETE STRUCTURES

505.1 DESCRIPTION, add the following:

The work under this section shall consist of constructing concrete scuppers, spillways and catch basins at the locations shown on the Plans. The structure locations shown on the plans is the center of the structure at the face of curb. The type of scuppers, spillways and catch basins shall be constructed per the plans and shown details. Concrete used for the new spillways shall be Class A and shall follow the requirements set forth in section 725 of the of the MAG Specifications and Details.

505.1.1 Minor Structures, add the following:

Catch basins being constructed at locations where existing catch basins where previously removed as part of this project shall be cast-in-place. The catch basins shall be constructed so the existing pipe elevations are maintained. The locations of these catch basins are shown on the plans.

505.2 SUBGRADE FOR CONCRETE STRUCTURES, add the following:

In locations where new spillways cross SRP irrigation pipe that will remain in place, contractor shall verify location of irrigation pipe and corresponding joint locations. The locations of these spillways are shown on the Scupper Design Summary Sheets (D1 and D2). Contractor shall notify engineer if existing SRP irrigation pipe, including the bell sections, are less than one foot clear to bottom of new spillway improvements. Contractor

is hereby notified that spillway shifts may be required to gain one foot clearance from bottom of spillway to top of SRP irrigation pipe.

505.11 MEASUREMENT, add the following:

Catch basins and scuppers will be measured by the number of each type of catch basin constructed and accepted. Concrete spillways will be measured by the number of linear feet of spillway measured along the middle of the spillway.

No additional measurement or payment will be made for the grading required to install the spillway, this cost is considered incidental to the construction of the spillway.

No additional measurement or payment will be made for increasing the height of the sides of the spillway to tie to finished grade. This cost is considered incidental to the construction of the spillway.

505.12 PAYMENT, add the following:

Payment shall be made at the contract unit price for each catch basin of the designated type(s).

Payment shall be made at the contract unit price for each scupper of the designated type(s).
Payment shall be made at the contract unit price for each lineal feet of spillway as designated on the plans and shall be full compensation for:

- Labor and materials for locating existing SRP irrigation pipe and joints.
- Coordination for any required shifting of the new spillways due to vertical clearance requirements with irrigation pipes and joints.
- Doweling into existing spillways.

SECTION 520 STEEL AND ALUMINUM HANDRAILS

520.2 FABRICATION, add the following:

Handrail shall be fabricated offsite as a complete unit. Handrails shall be painted Prescott Tan MV 44024 after they erected and accepted by the Engineer.

520.5 PAYMENT, add the following:

No additional payment will be made for painting the handrail. The cost is considered included within the handrail item included in the bid schedule.

SECTION 611 WATER, SEWER AND STORM DRAIN TESTING

611.6 POST INSTALLATION INSPECTION OF NEW MAINLINE STORM DRAINS:

(A) Video Inspection, add the following

The video inspection shall be completed prior to the preparation of subgrade and installing pavement above any pipes installed with the project.

SECTION 621 CORRUGATED METAL PIPE AND ARCHES

621.1 DESCRIPTION, add the following:

Work shall include constructing end sections per ADOT standard detail C-13.25.

621.3 INSTALLATION, add the following:

The end section shall connect to the new corrugated metal pipe shown on the plans with the connection type shown on the plans.

621.5 MEASUREMENT, add the following:

Measurement for the end section will be each.

621.6 PAYMENT, add the following:

Payment for the end section will be made at the contract unit price bid per each end section installed. The payment shall be compensation in full for furnishing and installing the end section as specified, including removal of obstructions, excavation, backfilling, compacting, testing, and all incidental costs not specifically covered for the end section.

SECTION 725 PORTLAND CEMENT CONCRETE

725.2 CEMENTITIOUS MATERIALS, the second sentence of the fourth paragraph replace with the following:

The Contractor shall obtain and deliver to the Engineer a Certification of Compliance conforming to the requirements of Section 106.2. The Contractor shall include the specific weight in the Certificate of Compliance.

Appendix A –
Design Phase Pothole Data

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 1Y	3'X10' Pole Hole	Conflicts Found	2	See Comments			Rocky	Core & Reinstate	1235+64.40	L 59.97 FT	336411.46	596731.30	1001.69	10.51		991.18			1/8/2021	Conflicts found. See PH1Y-A, PH1Y-B, & PH1Y-C for details.
PH 1Y-A	UNKNOWN	Unknown	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1235+54.57	L 60.20 FT	336411.35	596721.53	1001.65	4.01	4.21	997.64	997.44	2.38	12/28/2020	Found in PH1Y Pole Clearing hole. 2" white PVC running side by side with the electric. Not sure if this is an electric line but it is in the same trench. Located electromagnetically and the line does continue East & West with the electric.
PH 1Y-B	SRP	Electric	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1235+55.47	L 62.10 FT	336413.28	596722.36	1001.66	3.45	3.65	998.21	998.01	2.38	12/28/2020	On the north edge of PH1Y pole clearing hole. Running side by side with 2" white PVC (Potholes - 1Y-A/1Y-C)
PH 1Y-C	UNKNOWN	Unknown	1	2"	PVC	EAST & WEST	Rocky	None Off-Road	1235+62.22	L 60.18 FT	336411.59	596729.13	1001.58	4.00	4.20	997.58	997.38	2.38	1/8/2021	Found in PH1Y Pole clearing hole - Same conduit as PH 1Y-C.
PH 2Y	3'X6' Pole Hole	Conflicts Found	1	See Comments			Native Backfill	None Off-Road	1235+84.71	L 81.62 FT	336433.82	596750.67	1002.04			#VALUE!			12/28/2020	Electric found - See PH 2Y-A.
PH 2Y-A	SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1235+84.04	L 83.04 FT	336435.22	596749.96	1001.95	4.46	4.86	997.49	997.09	4.80	12/28/2020	
PH 3Y	3'X10' Pole Hole	No Conflicts	0	0			Rocky	Core & Reinstate	1236+95.73	L 85.18 FT	336442.09	596860.50	1001.29						1/11/2021	
PH 4Y	2'X5" Pole Hole	Conflicts Found	1	See Comments			Rocky	Core & Reinstate	1237+14.75	L 67.41 FT	336425.27	596880.22	1001.31	5.22		996.09			1/12/2021	Conflict found in 2' X 5' pole clearing hole. 1 -3" SRP electric conduit. See PH4Y-A for details.
PH4Y-A	SRP	Electric	1	3"	PVC	EAST & WEST	Rocky	Core & Reinstate	1237+15.00	L 67.74 FT	336425.61	596880.45	1001.20	2.81	3.10	998.39	998.09	3.50	1/12/2021	
PH 5Y	3'X10' Pole Hole	Conflicts Found	2	See Comments			Native Backfill	None Off-Road	1237+06.02	R 63.25 FT	336294.34	596878.02	1001.59	10.15	10.47	991.44	991.12	3.80	12/23/2020	2 conflicts found. See potholes 5Y-A & 5-YB.
PH 5Y-A	UNKNOWN	Unknown	1	1"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1237+08.90	R 62.93 FT	336294.80	596880.90	1001.53	1.85	1.96	999.68	999.57	1.32	12/23/2020	Found on westside of 5Y pole clearing hole. No bluestake marks at this location. Possible Traffic Signal electric conduit. Attempted to locate electromagnetically but did not get a signal. Conduit is heading towards TS j-box. J-box is filled with dirt. Could not confirm if the conduit enters the vault.
PH 5Y-B	Cox	Comm	4	2"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1237+04.57	R 62.15 FT	336295.37	596876.51	1001.56	2.36	2.69	999.20	998.86	4.00	12/23/2020	Found on eastside of 5Y pole clearing hole.
PH 6Y	3'X5' Pole Hole	Conflicts Found	1	See Comments			Rocky	Core & Reinstate	1236+81.24	R 80.80 FT	336275.61	596853.93	1001.06	6.60		994.46			1/8/2021	CLN Comm in conflict. Looks like a direct buried cable but it could be a 2" black PE conduit. See PH 6YA for details.

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 6Y-A	CenturyLink	Comm	1	2"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate	1236+80.63	R 79.92 FT	336276.46	596853.28	1001.08	2.53	2.86	998.55	998.22	4.00	1/8/2021	
PH 7Y	3'X10' Pole Hole	No Conflicts	0				Native Backfill	None Off-Road	123571.96	R 82.46	336269.38	596743.91	1001.21						12/29/2020	No conflicts found
PH 8Y	3'X5' Pole Hole	Conflicts Found	1	See Comments			Native Backfill	None Off-Road	1235+65.61	R 67.78 FT	336283.83	596736.99	1001.22	6.13		995.09			12/28/2020	Conflict found - See PH 8Y-A
PH 8Y-A	Private	Irrigation	1	12"	PVC	EAST & WEST	Native Backfill	None Off-Road	1235+66.39	R 65.83 FT	336285.80	596737.71	1001.39	4.03	5.13	997.36	996.26	13.20	12/28/2020	Found private IRR well fill line on the north side of the pole clearing hole. IRR comes from a private well site to the West and dumps in to an SRP IRR box to the East.
PH 9Y	CenturyLink	Comm	1	1"	Direct Buried Cable	EAST & WEST	Rocky	Core & Reinstate	320+88.23	R 49.19 FT	336453.62	596856.50	1001.42	3.10	3.20	998.32	998.21	1.25	1/6/2021	
PH 10Y	CenturyLink	Comm	2	4"	PE	EAST & WEST	Rocky	Core & Reinstate	321+53.50	R 42.33 FT	336518.98	596850.56	1001.64	2.62	3.02	999.02	998.62	4.80	1/6/2021	
PH 11Y	6'X6' Structure	Conflicts Found	2	See Comments					321+61.46	R 43.09 FT	336526.92	596851.43	1001.75						1/4/2021	SD structure clearing hole 6' x 6' - Conflicts found - see potholes 11Y-A, 11Y-B & 11Y-C
PH 11Y A	UNKNOWN	Unknown	1	4"	PE	EAST & WEST	Native Backfill	Core & Reinstate	321+57.90	R 44.80 FT	336523.35	596853.08	1001.59	3.84	4.24	997.75	997.35	4.80	1/4/2021	Black ABS plastic - Same conduit as 11Y-B.
PH 11Y B	UNKNOWN	Unknown	1	4"	PE	EAST & WEST	Native Backfill	Core & Reinstate	321+58.06	R 41.16 FT	336523.56	596849.45	1001.65	3.97	4.37	997.68	997.28	4.80	1/4/2021	Black ABS plastic - Same conduit as 11Y-A.
PH 11Y C	SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Screened Backfill	Core & Reinstate	321+59.59	R 40.08 FT	336525.10	596848.39	1001.64	8.84	9.22	992.80	992.43	4.50	1/4/2021	Found 5.00't East of the SWG bluestake marks.
PH 12Y	SRP	Electric	6	3"	PVC	NORTH & SOUTH	Screened Backfill	Core & Reinstate	321+61.74	R 46.49 FT	336527.16	596854.83	1001.59	7.59	8.42	994.00	993.17	10.00	1/4/2021	Visually verified 6 conduits. Hard caliche soil directly below the conduits. Could not clear below the 6 conduits. Verify conduit count with utility owner.
PH 13Y	SRP	Electric	3	3"	PVC	NORTH & SOUTH	Screened Backfill	None Off-Road	321+60.17	R 50.98 FT	336525.53	596859.30	1001.55	6.15	6.57	995.40	994.98	5.00	1/4/2021	
PH 14Y	City of Tolleson	Water	1	16"	ACP	SE & NW	Screened Backfill	None Off-Road	321+58.62	R 63.15 FT	336523.81	596871.44	1001.83	5.45	7.02	996.38	994.81	18.79	12/22/2020	
PH 15Y	CenturyLink	Comm	13+	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	321+61.53	R 66.13 FT	336526.68	596874.47	1002.01	4.14	9.56	997.87	992.46	65.00	12/22/2020	13+ Conduits visually verified. Hit caliche directly below the lowest conduits. Verify conduit count with utility owner.

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 16Y	CenturyLink	Comm	11+	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	321+61.65	R 68.97 FT	336526.76	596877.31	1002.15	3.79	10.21	998.36	991.94	77.00	12/22/2020	11+ Conduits. Hit caliche directly below the conduits. Bottom measurement is to the bottom of the lowest visible conduit. Verify conduit count with utility owner.
PH 17Y	Cox	Comm	2	2"	PVC	SE & NW	Screened Backfill	None Off-Road	321+62.30	R 115.29 FT	336526.76	596923.64	1001.92	11.54	12.15	990.38	989.77	7.30	12/23/2020	Stacked conduits.
PH 18Y	CenturyLink	Comm	2	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	330+51.32	L 40.99 FT	337417.92	596780.63	1004.91	8.60	9.10	996.31	995.81	6.00	12/29/2020	
PH 19Y	CenturyLink	Comm	1	1"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	329+30.27	L 46.22 FT	337296.97	596773.54	1004.82	4.85	4.96	999.97	999.86	1.32	12/29/2020	
PH 20Y	CenturyLink	Comm	2	1-DBC 1-4"	PVC	EAST & WEST	Rocky	None Off-Road	326+25.78	L 53.65 FT	336992.62	596761.45	1002.66	3.90	4.30	998.76	998.36	4.80	1/20/2021	Side by Side
PH 21Y	SW Gas	Gas	Not Dug	See Comments																Did not dig. No evidence of gas at this location.
PH 22Y	CenturyLink	Comm	Not Dug	See Comments																No access to the area. Could not get vac truck in to the retention area. Pothole is located behind fenced area on private property.
PH 23Y	Private	SD	Cleared Hole	See Comments			Native Backfill	None Off-Road	320+90.73	L 68.90 FT	336457.77	596738.46	1000.41	6.00		994.41			1/20/2021	Exploratory pothole for possible SD line found on old map records. Cleared down to 6.00' deep and 2.00' wide.
PH 24Y	SRP	Electric	1	4"	HDPE	EAST & WEST	Native Backfill	None Off-Road	320+68.30	L 76.18 FT	336435.45	596730.87	1001.94	4.65	5.05	997.29	996.89	4.80	12/18/2020	Pothole request calls for CLN and SRP at this location However, the SRP conduit appears to be further North and was missed at this location. Only found CLN at this location. SRP was found 20.00' to the East at a similar depth. SRP is believed to be a couple feet North of CLN at this location.
PH 25Y	CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	320+63.45	L 77.18 FT	336430.62	596729.80	1001.98	4.08	4.48	997.90	997.50	4.80	12/18/2020	
PH 26Y-A	MCDOT	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	320+56.52	L 84.78 FT	336423.79	596722.10	1001.82	3.23	3.63	998.59	998.19	4.80	12/18/2020	
PH 26Y-B	MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	320+57.76	L 83.96 FT	336425.02	596722.94	1001.86	7.01	7.41	994.85	994.45	4.80	12/18/2020	
PH 27Y	SW Gas	Gas High Pressure	1	12"	Steel	EAST & WEST	Native Backfill	Core & Reinstate	320+09.28	L 86.83 FT	336376.59	596719.39	1001.51	14.45	15.51	987.06	985.99	12.75	1/20/2021	SW Gas inspector did not want us to expose the entire pipe for "safety reasons". 12" steel per map records and per onsite inspector.

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 28Y	MCI	Comm	2	2"	PVC	EAST & WEST	Rocky	Core & Reinstate	319+94.57	L 83.18 FT	336363.27	596722.77	1001.46	12.10	12.39	989.36	989.07	3.50	1/15/2021	
PH 29Y-A	SRP	Electric	3+	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	319+54.20	L 86.12 FT	336323.02	596718.57	1001.44	5.99	6.87	995.45	994.57	10.50	12/17/2020	Visually verified 3 conduits. Could not clear below due to large river rocks and hard soil around the utility. Verify conduit count with the utility owner.
PH 29Y-B	SRP	Irrigation	1	36"	RCP	EAST & WEST	Native Backfill	None Off-Road	319+49.20	L 85.64 FT	336318.01	596718.89	1001.48	2.62	6.29	998.86	995.19	44.00	12/17/2020	36" RCP per map records.
PH 30Y	CenturyLink	Comm	1	1"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate	320+50.53	R 39.88 FT	336416.05	596846.67	1001.22	7.68	7.78	993.54	993.43	1.25	1/12/2021	
PH 30Y-A	CenturyLink	Comm	2	4" sxs	PVC	EAST & WEST	Rocky	Core & Reinstate	320+53.32	R 41.81 FT	336418.82	596848.63	1001.49	4.11	4.51	997.38	996.98	4.80	1/7/2021	GPR scan picked up trench at this location. Determined that these are empty CLN conduits.
PH 30Y-B	SRP	Electric	6	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	320+48.63	R 46.89 FT	336414.06	596853.65	1001.43	7.18		994.25			1/7/2021	SRP duct bank
PH30Y-C	SW Gas	Gas High Pressure	1	4"	Steel	NORTH & SOUTH	Rocky	Core & Reinstate	320+48.63	R 46.89 FT	336414.06	596853.65	1001.43	9.11	9.49	992.32	991.94	4.50	1/7/2021	
PH 30Y-D	UNKNOWN	GPR SCAN	Cleared Hole	See Comments			Rocky	Core & Reinstate	320+53.96	R 42.53 FT	336419.45	596849.37	1001.26	7.20		994.06			1/8/2021	GPR scan picked up a trench line at this location. Nothing Found. Cleared down to 7.72' by 3.00' wide.
PH 31Y	SRP	Electric	3	4″	PE	NORTH & SOUTH	Rocky	Core & Reinstate	320+50.14	R 55.14 FT	336415.46	596861.92	1001.35	7.06'					1/6/2021	
PH 31Y-A	UNKNOWN	Unknown	1	8" wide	Concrete Slurry	EAST & WEST	Rocky	Core & Reinstate	320+51.57	R 57.87 FT	336416.84	596864.67	1001.35	1.32		1000.03			1/6/2021	Unknown encasement. Attempted to locate electromagnetically but did not get a signal. No bluestake marks at this location. Called in unknown utility but no one showed up to claim ownership.
PH 31Y-B	CenturyLink	Comm	4+	4″	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	320+49.80	R 58.77 FT	336415.06	596865.55	1001.32	8.64	9.14	992.68	992.18	6.00	1/6/2021	Visually verified 4 conduits. Could not see below. There could be additional conduits below that we could not visually verify. Verify conduit count with utility owner.
PH 32Y	CenturyLink	Comm	3	4″	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	320+48.46	R 60.61 FT	336413.70	596867.37	1001.38	9.22	9.72	992.16	991.66	6.00	1/6/2021	
PH 32Y-A	CenturyLink	Unknown	6+	4″	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	320+49.93	R 61.85 FT	336415.15	596868.63	1001.24	8.32	9.15	992.92	992.09	10.00	1/6/2021	Running with 32-Y but is dropping in elevation. Could not clear around the conduits due large chunks of debris and slurry. Could be additional conduits in the area that could not be visually verified. Verify conduit count with utility owner.

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 32Y-B	CenturyLink	Unknown	4+	4"	PE	NORTH & SOUTH	Rocky	Core & Reinstate	320+48.52	R 62.03 FT	336413.74	596868.79	1001.30	6.92	7.34	994.38	993.97	5.00	1/6/2021	Appears to be 2 conduits. Could not clear around the conduits due large chunks of debris and slurry. Could be additional conduits in the area that could not be visually verified. Verify conduit count with utility owner.
PH 32Y-C	UNKNOWN	Unknown	1	2"	PVC	EAST & WEST	Rocky	Core & Reinstate	320+49.82	R 60.78 FT	336415.06	596867.56	1001.30	1.72	1.92	999.58	999.38	2.38	1/6/2021	Same as 31Y-A - Broke through the slurry and exposed conduit. Attempted to locate electromagnetically but did not get a signal. No bluestake marks at this location. Called in unknown utility but no one showed up to claim ownership.
PH 33Y-A	SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Rocky	Core & Reinstate	320+51.26	R 64.22 FT	336416.44	596871.02	1001.25	7.32	7.70	993.93	993.55	4.50	1/6/2021	Found unmarked gas line. Possibly abandoned.
PH 34Y	CenturyLink	Comm	1	16" sleeve	Unknown Metal Sleeve	NORTH & SOUTH	Rocky	Core & Reinstate	320+51.02	R 67.02 FT	336416.16	596873.81	1001.20	11.08	12.41	990.12	988.78	16.00	1/13/2021	Appears to be a 16" aluminum or light weight metal sleeve with a black coating.
PH 35Y	MCDOT	Comm	1	4"	PVC	EAST & WEST	Screened Backfill	None Off-Road	1237+95.57	L 61.52 FT	336423.76	596960.71	1001.13	10.17	10.57	990.96	990.56	4.80	12/23/2020	
PH 36Y	SRP	Electric	Not Dug	See Comments																Electric no longer in place. Electric was removed when new IRR was installed.
PH 37Y	SW Gas	Gas (Cathodic Protection)	1	1"	PE	NORTH & SOUTH	Native Backfill	None Off-Road	1210+21.89	L 43.92 FT	336403.24	594191.09	998.47	2.11	2.22	996.36	996.25	1.32	12/21/2020	SW gas cathodic protection for 12" HP gas.
PH 38Y	CenturyLink	Comm	1	1"	PVC	NE & SW	Native Backfill	None Off-Road	1209+08.89	R 108.42 FT	336250.74	594078.29	995.90	1.83	1.94	994.07	993.96	1.32	12/17/2020	
PH 39Y	CenturyLink	Comm	1	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1208+96.00	L 39.57 FT	336398.72	594065.21	997.94	6.76	7.16	991.18	990.78	4.80	12/21/2020	
PH 40Y	CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1216+47.45	L 54.18 FT	336414.32	594816.64	999.89	3.83	4.14	996.06	995.75	3.70	12/22/2020	
PH 41Y	MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1216+46.12	L 58.08 FT	336418.21	594815.30	999.84	7.83	8.23	992.01	991.61	4.80	12/22/2020	
PH 42Y	City of Tolleson	Water	1	8"	DIP	EAST & WEST	Native Backfill	None Off-Road	1216+46.75	L 61.84 FT	336421.97	594815.93	999.83	5.22	5.97	994.61	993.86	9.05	12/22/2020	
PH 43Y	CenturyLink	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1216+44.33	L 69.70 FT	336429.83	594813.50	999.91	3.73	4.13	996.18	995.78	4.80	12/21/2020	Side by side conduits.
PH 44Y	SRP	Electric	1	3"	PVC	EAST & WEST	Native Backfill	None Off-Road	1216+43.67	L 72.05 FT	336432.17	594812.83	999.87	6.67	6.96	993.20	992.91	3.50	12/21/2020	

Horizontal and vertical locations of utilities obtained by actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are estimated visually and may not be exact.

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 45Y	CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1222+04.93	L 52.79 FT	336413.65	595374.12	1000.44	4.46	4.66	995.98	995.78	2.38	12/21/2020	
PH 46Y	MCDOT	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1222+04.59	L 67.25 FT	336428.11	595373.75	999.83	3.11	3.94	996.72	995.89	10.00	12/21/2020	Stacked conduits.
PH 47Y	MCI	Comm	Not Found	See Comments		EAST & WEST		Core & Reinstate	1232+27.84	L 22.15 FT	336367.67	596396.90	1001.09	1.67		999.42			1/15/2021	Hit second layer of concrete below the roadway and could not break through.
PH 48Y	SW Gas	Gas High Pressure	1	12"	Steel	EAST & WEST	Rocky	Core & Reinstate	1232+24.32	L 33.55 FT	336379.07	596393.39	1001.02	6.28	7.34	994.74	993.68	12.75	1/15/2021	
PH 49Y	CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1231+89.80	L 64.87 FT	336410.44	596359.08	1000.88	3.03	3.23	997.85	997.65	2.38	12/18/2020	
PH 50Y	MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1231+86.71	L 77.70 FT	336423.28	596356.06	1000.60	5.72	6.03	994.88	994.57	3.70	12/18/2020	
PH 51Y	CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1231+86.45	L 85.22 FT	336430.80	596355.83	1000.15	6.13	6.96	994.02	993.18	10.00	12/21/2020	PH 51Y an 52Y joint trench - Stacked conduits.
PH 52Y	CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1231+87.24	L 84.78 FT	336430.36	596356.61	1000.17	6.13	6.96	994.04	993.20	10.00	12/21/2020	PH 51Y an 52Y joint trench - Stacked conduits.
PH 53Y	AT&T	Comm	1	12"	Steel	EAST & WEST	Rocky	Cut & Patch	1233+49.11	R 7.75 FT	336338.61	596518.28	1000.95	5.57	6.63	995.38	994.32	12.75	1/20/2021	
PH 54Y	SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road	1233+46.76	R 16.26 FT	336330.06	596516.04	1000.96	3.29	3.69	997.67	997.27	4.80	12/17/2020	
PH 55Y-A	SRP	Electric	1	1"	PVC	EAST & WEST	Native Backfill	None Off-Road	1233+47.24	R 19.52 FT	336326.81	596516.56	1000.94	2.42	2.53	998.52	998.41	1.32	12/17/2020	Also found SRP IRR - See pothole 55Y-B.
PH 55Y-B	SRP	Irrigation	1	36"	RCP	EAST & WEST	Native Backfill	None Off-Road	1233+47.73	R 21.69 FT	336324.65	596517.08	1000.92	3.24	6.91	997.68	994.01	44.00	12/17/2020	
PH 56Y	City of Tolleson	Water	1	12"	DIP	NORTH & SOUTH	Rocky	Core & Reinstate	318+00.60	R 17.22 FT	336166.25	596817.03	1001.34	4.24	5.34	997.10	996.00	13.20	1/14/2021	
PH 57Y	SW Gas	Gas	1	4"	PE	NORTH & SOUTH	Rocky	Core & Reinstate	318+00.17	R 24.93 FT	336165.57	596824.71	1001.36	3.34	3.67	998.02	997.69	4.00	1/14/2021	
PH 58Y	SRP	Electric	4+	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	317+98.60	R 35.54 FT	336163.67	596835.27	1001.26	4.85	5.31	996.41	995.95	5.50	1/14/2021	Visually verified 4 conduits side by side. Attempted to clear below but could not get through the hard soil.
PH 59Y	CenturyLink	Comm	1	1"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate	318+00.66	R 40.14 FT	336165.58	596839.93	1001.20	4.46	4.56	996.74	996.63	1.25	1/8/2021	

Horizontal and vertical locations of utilities obtained by actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are estimated visually and may not be exact.

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 60Y	SRP	Electric	6+	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate	318+00.90	R 43.57 FT	336165.71	596843.37	1001.13	4.31	4.60	996.82	996.53	3.50	1/8/2021	Visually verified 6 conduits. Hard caliche soil directly below the conduits. Could not clear below the 6 conduits. Verify conduit count with utility owner.
PH 61Y	CenturyLink	Comm	1	2"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate	318+00.62	R 49.30 FT	336165.25	596849.09	1001.03	3.24	3.57	997.79	997.45	4.00	1/8/2021	
PH 62Y	SRP	Electric	2	2"	PE	NORTH & SOUTH	Rocky	None Off-Road	326+25.89	L 47.93 FT	336992.65	596767.17	1003.22	4.62	4.82	998.60	998.40	2.38	1/20/2021	Side by Side.
PH 63Y	SRP	Electric	0	See Comments					326+25.47	L 44.71 FT	336992.18	596770.38	1003.28	7.00		996.28			1/20/2021	Found joint trench with PH 62Y . Bluestake marked at this location so we cleared marks down to 7.00'.
PH 64Y	CenturyLink	Comm	1	4"	PE	NORTH & SOUTH	Rocky	None Off-Road	326+27.08	L 42.09 FT	336993.75	596773.04	1003.57	6.80	7.20	996.77	996.37	4.80	1/21/2021	
PH 65Y	AT&T	Comm	2	2"	PE	NORTH & SOUTH	Rocky	None Off-Road	326+26.51	L 37.07 FT	336993.10	596778.04	1003.76	5.30	5.50	998.46	998.27	2.38	1/21/2021	
PH 66Y	AT&T	Comm	3	1"	PE	NORTH & SOUTH	Native Backfill	None Off-Road	330+49.84	L 45.23 FT	337416.51	596776.36	1005.02	4.93		1000.09			12/29/2020	
PH 67Y	SRP	Electric	2	3"	PVC	NORTH & SOUTH	Rocky	None Off-Road	0	0	337496.58	596791.54	1004.70	7.91	8.20	996.79	996.50	3.50	1/20/2021	Stacked conduits.
PH 68Y-A	CenturyLink	Comm	1	1"	Direct Buried Cable	EAST & WEST	Native Backfill	None Off-Road	303+27.24	L 64.64 FT	334695.71	596709.91	998.90	3.89	3.99	995.01	994.90	1.25	12/17/2020	
PH 68Y-B	Private	Comm	4	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	303+41.19	L 65.28 FT	334708.54	596709.63	998.95	3.88	4.19	995.07	994.77	3.70	12/17/2020	Side by Side.
PH 69 EM DEPTH	SRP	Electric	3	1.5"	DBC	EAST & WEST	See Comments		303+59.62	L 66.05 FT	334726.98	596709.12	998.92					3.70		Abandoned Electric 3) 1.5" Direct Buried Cables. Did not pothole. EM Depth only - EM depth shows between 3.5' & 4.00'.
PH 70Y	SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	303+65.24	L 67.92 FT	334732.62	596707.33	999.36	3.73	4.13	995.63	995.23	4.80	12/16/2020	
PH 71Y-A	Cox	F/O	3	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	303+88.27	L 65.20 FT	334755.61	596710.37	999.42	6.21	6.79	993.21	992.62	7.00	12/16/2020	
PH 71Y-B	Cox	F/O	4	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	303+93.44	L 65.75 FT	334760.79	596709.90	999.44	6.48	6.99	992.96	992.45	6.10	12/16/2020	
PH 72Y-A	City of Phoenix	Water	1	8"	DIP	EAST & WEST	Native Backfill	None Off-Road	304+22.98	L 64.70 FT	334790.31	596711.36	1000.26	12.10	12.85	988.16	987.40	9.05	12/16/2020	

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 72Y-B	City of Phoenix	Water	1	2"	Copper	EAST & WEST	Native Backfill	None Off-Road	304+26.74	L 64.47 FT	334794.07	596711.65	1000.23	10.17	10.37	990.06	989.87	2.38	12/16/2020	
PH 72Y-C	City of Phoenix	Water	1	1"	Copper	EAST & WEST	Native Backfill	None Off-Road	304+28.20	L 64.52 FT	334795.52	596711.61	1000.12	10.09	10.40	990.03	989.72	3.70	12/16/2020	
PH 73Y	City of Tolleson	Water	1	8"	Steel	EAST & WEST	Native Backfill	None Off-Road	303+77.46	L 67.80 FT	334744.84	596707.62	999.43	10.63	11.69	988.80	987.74	12.75	12/16/2020	
PH 74Y	SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road	303+82.81	L 66.13 FT	334750.17	596709.36	999.38	11.36	11.67	988.02	987.71	3.70	12/16/2020	
PH 75Y	SRP	Electric	3	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1224+52.21	R 88.71 FT	336271.93	595620.82	1000.70	10.10	10.93	990.60	989.76	10.00	12/17/2020	Pothole located in the running line of proposed SRP IRR. Had to adjust the survey pin to the South to avoid getting destroyed. Construction crews were already trenching in the new IRR. We exposed the electric for the construction crew.
PH 76Y	City of Phoenix	Water	1	30"	Steel	NORTH & SOUTH	Native Backfill	None Off-Road	1212+43.76	R 82.99 FT	336276.62	594413.12	997.12	7.01	9.51	990.11	987.61	30.00	12/17/2020	Cast iron sleeve for multiple water lines. Could not expose the entire sleeve due to soft soil conditions collapsing back in to the hole. Appears to be a 30" pipe. Verify size with utility owner.
PH 77Y	Private	Comm	4	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1210+88.78	R 84.28 FT	336275.13	594258.15	997.47	7.45	8.33	990.02	989.15	10.50	12/21/2020	
PH 78Y	SRP	Electric	3	3"	PVC	EAST & WEST	Native Backfill	Core & Reinstate	314+57.25	L 75.17 FT	335824.62	596715.39	1000.12	4.93	5.26	995.19	994.86	4.00	12/29/2020	
PH 79-Y	SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road	304+45.88	L 66.16 FT	334813.23	596710.22	999.96	11.79	12.19	988.17	987.77	4.80	12/17/2020	
PH 81Y	AT&T	Comm	Not Found	See Comments		NORTH & SOUTH	Rocky	Core & Reinstate	1236+30.28	L 57.15 FT	336411.16	596796.85	1001.26	0.00					1/14/2021	Hit solid caliche at 16.74'. Got EM depth at the proposed PH location. EM Depth shows 18.5'.
PH 81Y-1	AT&T	Comm	Not Found	See Comments			Native Backfill	Jackhammer & Coldpatch	1236+31.81	L 91.83 FT	336445.87	596796.92	1001.18	0.00					1/20/2021	Hit solid caliche at 14.42'. Got EM depth at the proposed PH location - EM Depth shows between 16' & 17'
PH 82-85 Slot Trench	Slot Trench	Cleared (No Conflict)	slot trench	See Comments			Native Backfill	None Off-Road	303+74.25	L 81.92 FT	334741.83	596693.46	999.40	6.76		992.64			12/28/2020	Dug trench for new electric line. 12" Wide X 6' Deep X 19' Long.
PH 82Y	SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	303+65.28	L 81.37 FT	334732.85	596693.88	999.03	3.72	4.12	995.31	994.91	4.80	12/28/2020	
PH 86Y	Pole Hole	2'X6' Pole Hole	No Conflict				Native Backfill	None Off-Road	303+86.41	L 82.56 FT	334754.00	596692.98	999.14	0.00					12/28/2020	

Test Hole Summary Report

Report Prepared for: Maricopa Department of Transportation - MCDOT

Address: MC 85 from 87th Ave to 95th Ave, Buckeye, AZ

Date of Report: 2/1/2021

Description of Project: MC 85 - 3 TT0651 MC 85 from 87th Ave to 95th Ave

Cust Job #: TT0651

Safe Site Project #: 2011137

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 87Y	Phoenix	Water	1	8"	Steel	EAST & WEST	Native Backfill	None Off-Road	303+77.49	L 58.49 FT	334744.73	596716.93	999.50	7.77	8.83	991.73	990.66	12.75	12/28/2020	Located the 45 degree bend where pipe drops in elevation for the proposed IRR.
IRR structure pothole A	SRP	Electric	1	3"	PVC	EAST & WEST	Rocky	None Off-Road	1235+75.79	L 94.87 FT	336446.75	596741.35	1001.42	4.58	4.87	996.84	996.55	3.50	1/13/2021	Electric Conflict found - 5 Sided IRR Structure Clearing Hole - 7' X 7' X 11' by (8ft Deep)
IRR structure pothole B	6'X6' Prop Structure	No Conflicts	0					Core & Reinstate	1235+59.72	L 56.33 FT	336407.67	596726.78	1001.65	6.78		994.87			1/13/2021	6' X 6' IRR Structure clearing hole - No conflicts.
IRR structure pothole C	CenturyLink	Comm	Bundle	4-4" /1-2"	PVC	EAST & WEST	Rocky	None Off-Road	1237+79.41	L 60.75 FT	336422.07	596944.72	1001.29	4.64		996.65			1/13/2021	6' X 6' IRR Structure clearing hole - Conflict found.
IRR structure pothole c-1	SRP	Irrigation	1	24"	RCP	EAST & WEST	Rocky	None Off-Road	1237+79.55	L 59.09 FT	336420.41	596944.95	1001.26	2.28	4.78	998.98	996.48	30.00	1/13/2021	6' X 6' IRR Structure clearing hole - Conflict found.

Horizontal Control provided by Contractor

PT	NORTHING	EASTING	ELEVATION	DESCRIPTION
60	339054.63	596829.56	0.00	Brass Cap in Handhole Quarter Cor
6019	336420.02	593071.97	996.09	Cap rebar found

Horizontal Control generated from last project

PT	NORTHING	EASTING	ELEVATION	DESCRIPTION
76.00	336675.22	600630.68	1006.54	x
72.00	336300.71	596908.94	1001.73	x

Vertical Control provided by Contractor

PT	NORTHING	EASTING	ELEVATION	DESCRIPTION
6019	336420.02	593071.97	996.09	Cap rebar found

I HEREBY CERTIFY THAT THE MEASUREMENTS AS SHOWN HEREIN WERE MADE UNDER MY DIRECT SUPERVISION OR AS NOTED AND ARE CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR
CERTIFICATE NO
53145
ROBERT H.
CANADY JR.
Date Signed 2-3-2021
ARIZONA, U.S.A.

Robert H Canady

Test Hole #	PH 1Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

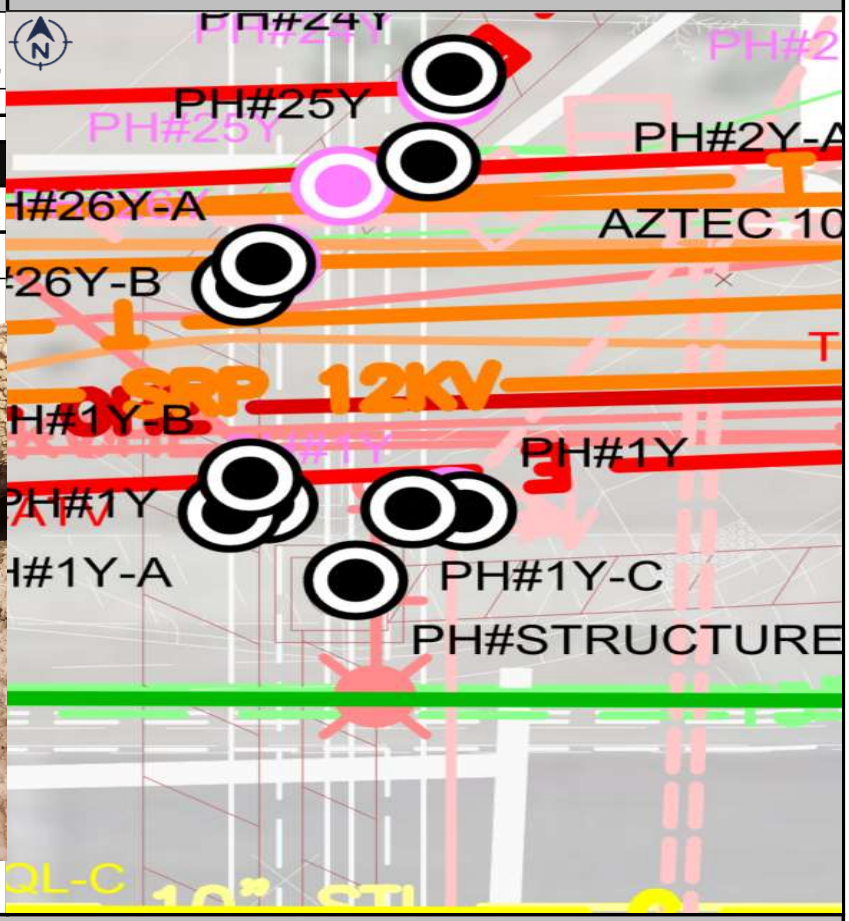
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336411.46	596731.30	1001.69
Station	**Offset**	
1235+64.40	L 59.97 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.69			
Top Elevation	991.18	**Pipe OD or Structure Height (inches)**	10.51	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X10' Pole Hole	Conflicts Found	2	See Comments			Rocky	Core & Reinstate

Comments

Conflicts found. See PH1Y-A, PH1Y-B, & PH1Y-C for details.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 1Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

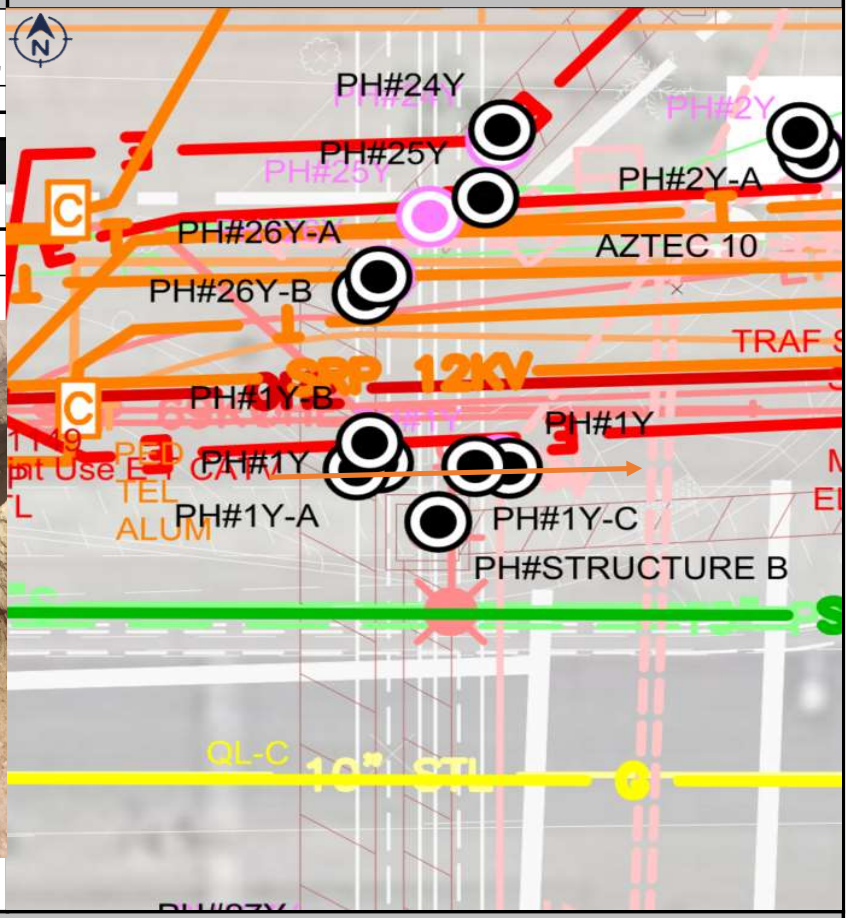
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336411.35	596721.53	1001.65
Station	**Offset**	
1235+54.57	L 60.20 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.65			
Top Elevation	997.64	**Pipe OD or Structure Height (inches)** 2.38	4.01	**Top Depth (FT)**
Bottom Elevation	997.44		4.21	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Found in PH1Y Pole Clearing hole. 2" white PVC running side by side with the electric. Not sure if this is an electric line but it is in the same trench. Located electromagnetically and the line does continue East & West with the electric.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 1Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

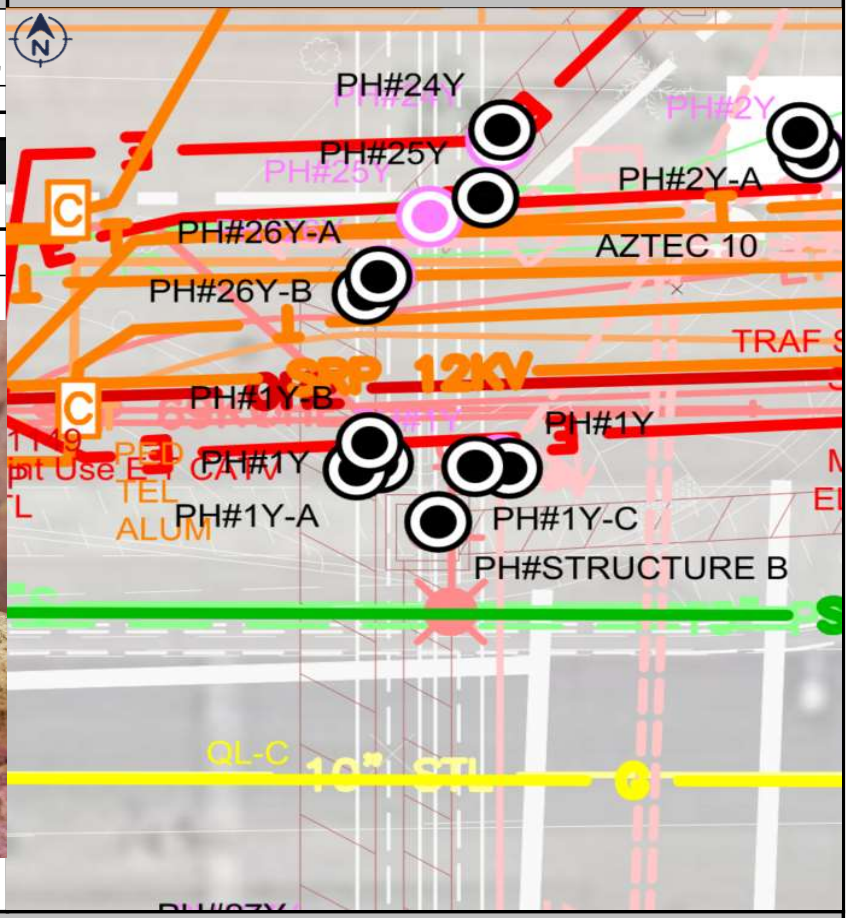
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336413.28	596722.36	1001.66
Station	**Offset**	
1235+55.47	L 62.10 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.66			
Top Elevation	998.21	**Pipe OD or Structure Height (inches)**	3.45	**Top Depth (FT)**
		2.38		
Bottom Elevation	998.01		3.65	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

On the north edge of PH1Y pole clearing hole. Running side by side with 2" white PVC (Potholes - 1Y-A/1Y-C)

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 1Y-C		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

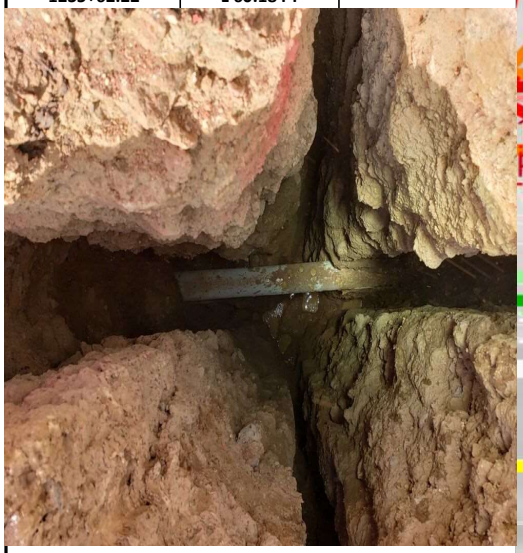
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

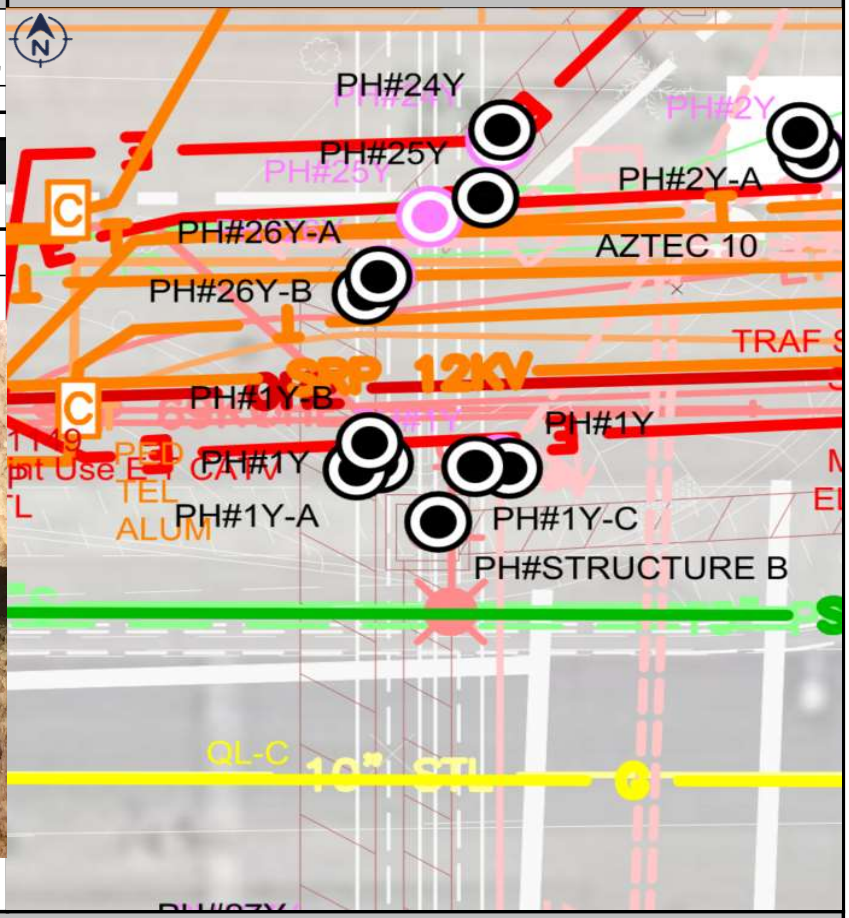
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336411.59	596729.13	1001.58
Station	**Offset**	
1235+62.22	L 60.18 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.58			
Top Elevation	997.58	**Pipe OD or Structure Height (inches)**	4.00	**Top Depth (FT)**
		2.38		
Bottom Elevation	997.38		4.20	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	2"	PVC	EAST & WEST	Rocky	None Off-Road

Comments

Found in PH1Y Pole clearing hole - Same conduit as PH 1Y-C.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 2Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

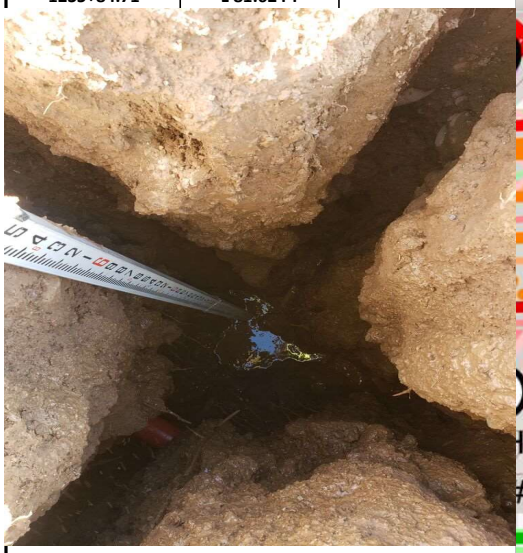
POTHOLE REPORT

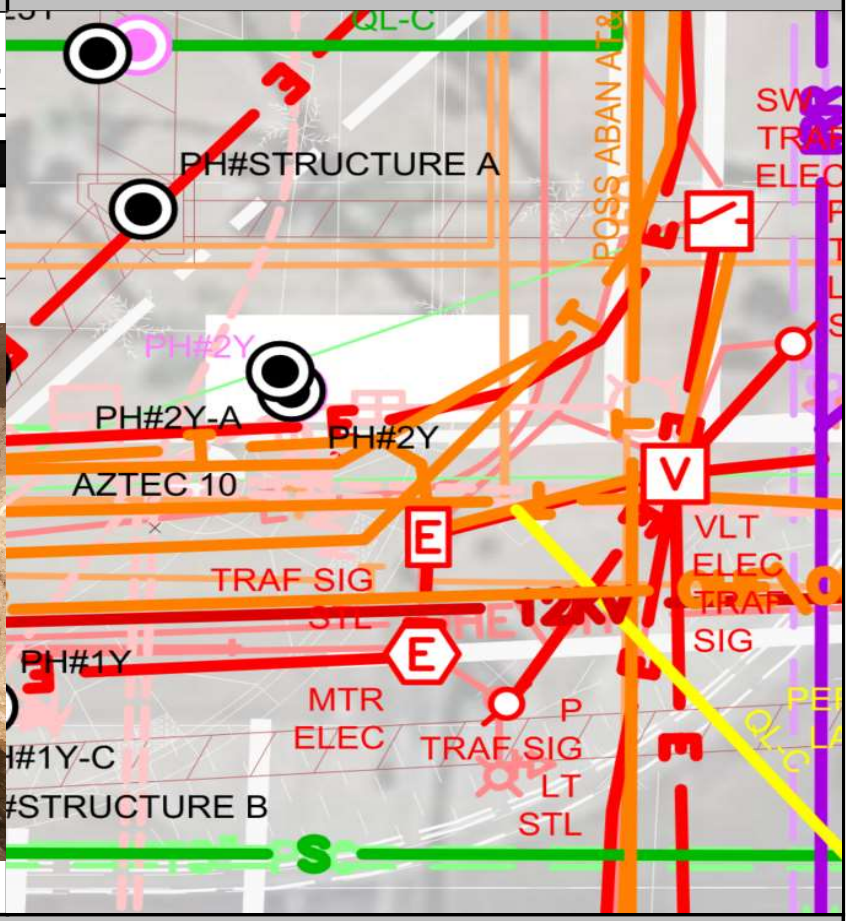
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336433.82	596750.67	1002.04
Station	**Offset**	
1235+84.71	L 81.62 FT	





ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1002.04			
Top Elevation	#VALUE!	**Pipe OD or Structure Height (inches)**		**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X6' Pole Hole	Conflicts Found	1	See Comments			Native Backfill	None Off-Road

Comments

Electric found - See PH 2Y-A.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 2Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

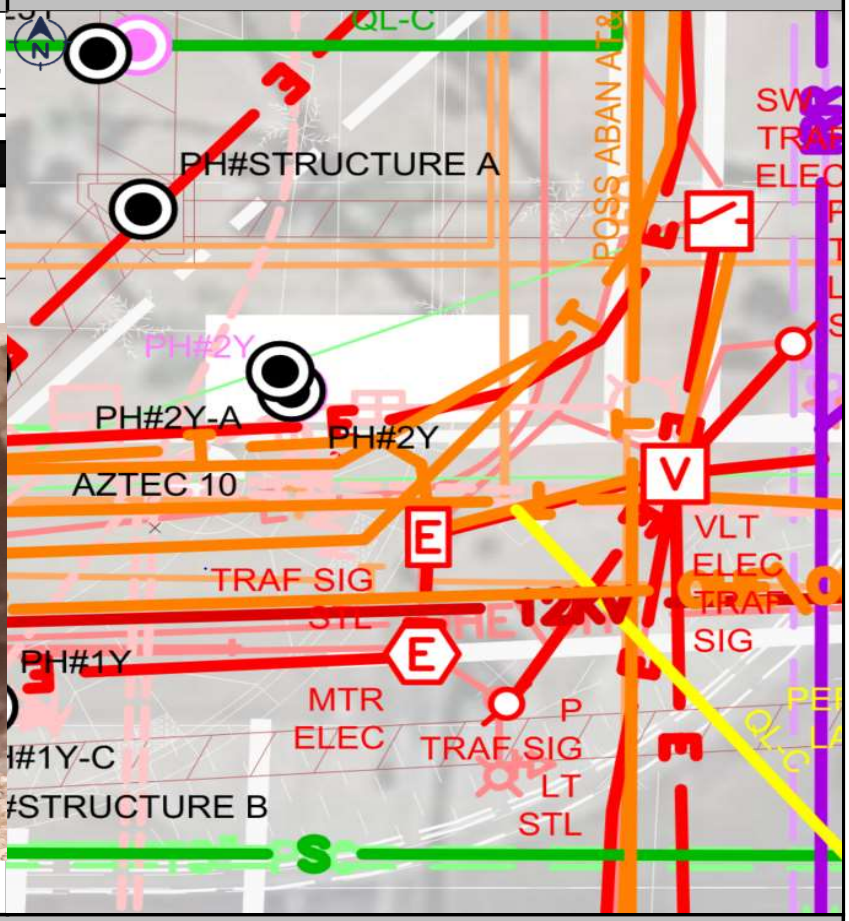
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336435.22	596749.96	1001.95
Station	**Offset**	
1235+84.04	L 83.04 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.95			
Top Elevation	997.49	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.09		4.86	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 3Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/11/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336442.09	596860.50	1001.29
Station	**Offset**	
1236+95.73	L 85.18 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.29		
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	**Top Depth (FT)**
Bottom Elevation		0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X10' Pole Hole	No Conflicts	0	0			Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 4Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/12/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336425.27	596880.22	1001.31
Station	**Offset**	
1237+14.75	L 67.41 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.31			
Top Elevation	996.09	**Pipe OD or Structure Height (inches)**	5.22	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
2'X5" Pole Hole	Conflicts Found	1	See Comments			Rocky	Core & Reinstate

Comments

Conflict found in 2' X 5' pole clearing hole. 1 -3" SRP electric conduit. See PH4Y-A for details.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH4Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/12/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336425.61	596880.45	1001.20
Station	**Offset**	
1237+15.00	L 67.74 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.20			
Top Elevation	998.39	**Pipe OD or Structure Height (inches)**	2.81	**Top Depth (FT)**
		3.50		
Bottom Elevation	998.09		3.10	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	3"	PVC	EAST & WEST	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5Y		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/23/2020		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

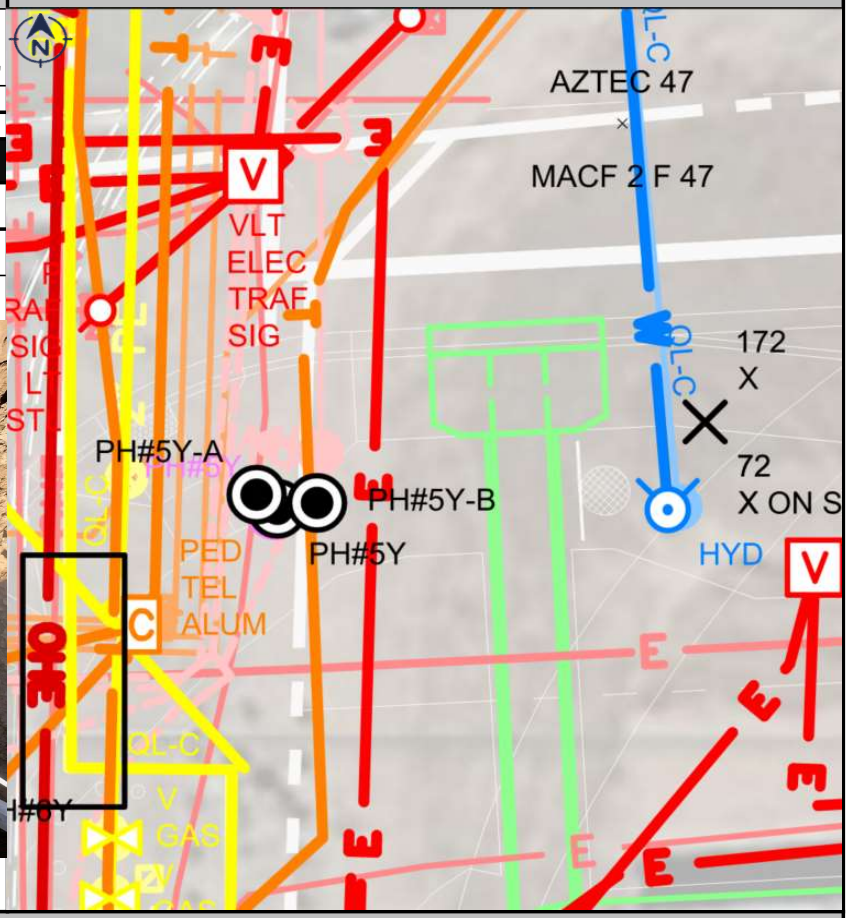
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336294.34	596878.02	1001.59
Station	**Offset**	
1237+06.02	R 63.25 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.59			
Top Elevation	991.44	**Pipe OD or Structure Height (inches)**	10.15	**Top Depth (FT)**
		3.80		
Bottom Elevation	991.12		10.47	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X10' Pole Hole	Conflicts Found	2	See Comments			Native Backfill	None Off-Road

Comments

2 conflicts found. See potholes 5Y-A & 5-YB.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5Y-A		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/23/2020		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

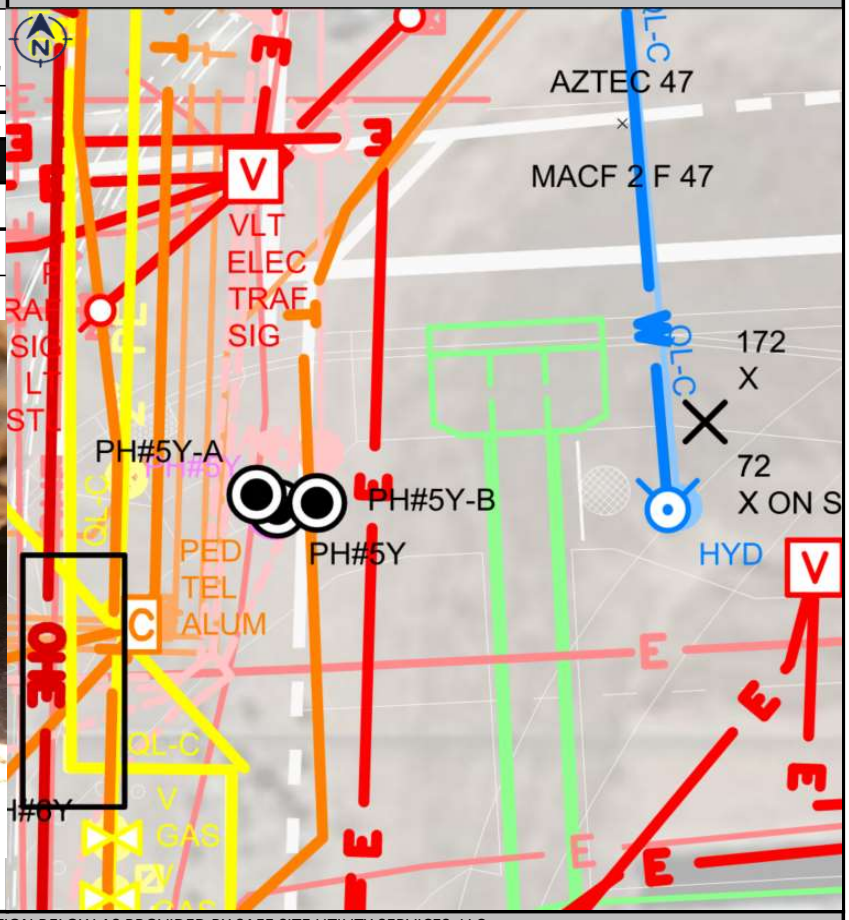
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336294.80	596880.90	1001.53
Station	**Offset**	
1237+08.90	R 62.93 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.53			
Top Elevation	999.68	**Pipe OD or Structure Height (inches)**	1.85	**Top Depth (FT)**
		1.32		
Bottom Elevation	999.57		1.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	1"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Found on westside of 5Y pole clearing hole. No bluestake marks at this location. Possible Traffic Signal electric conduit. Attempted to locate electromagnetically but did not get a signal. Conduit is heading towards TS j-box. J-box is filled with dirt. Could not confirm if the conduit enters the vault.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/23/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

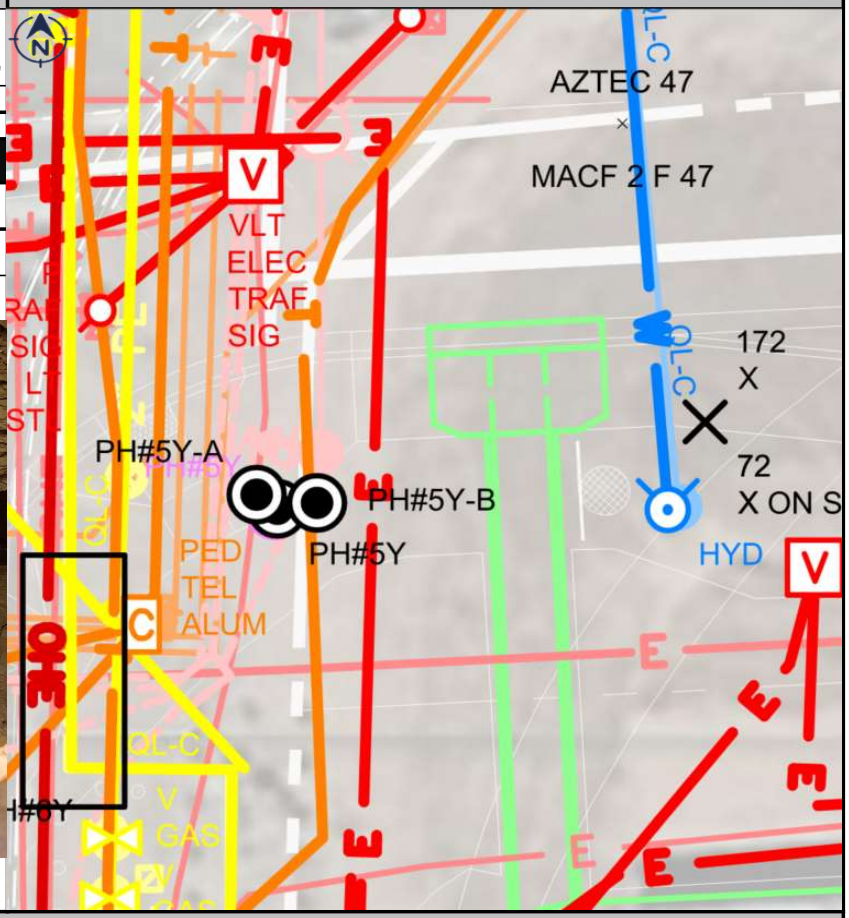
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336295.37	596876.51	1001.56
Station	**Offset**	
1237+04.57	R 62.15 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.56			
Top Elevation	999.20	**Pipe OD or Structure Height (inches)**	2.36	**Top Depth (FT)**
		4.00		
Bottom Elevation	998.86		2.69	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Cox	Comm	4	2"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Found on eastside of 5Y pole clearing hole.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 6Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

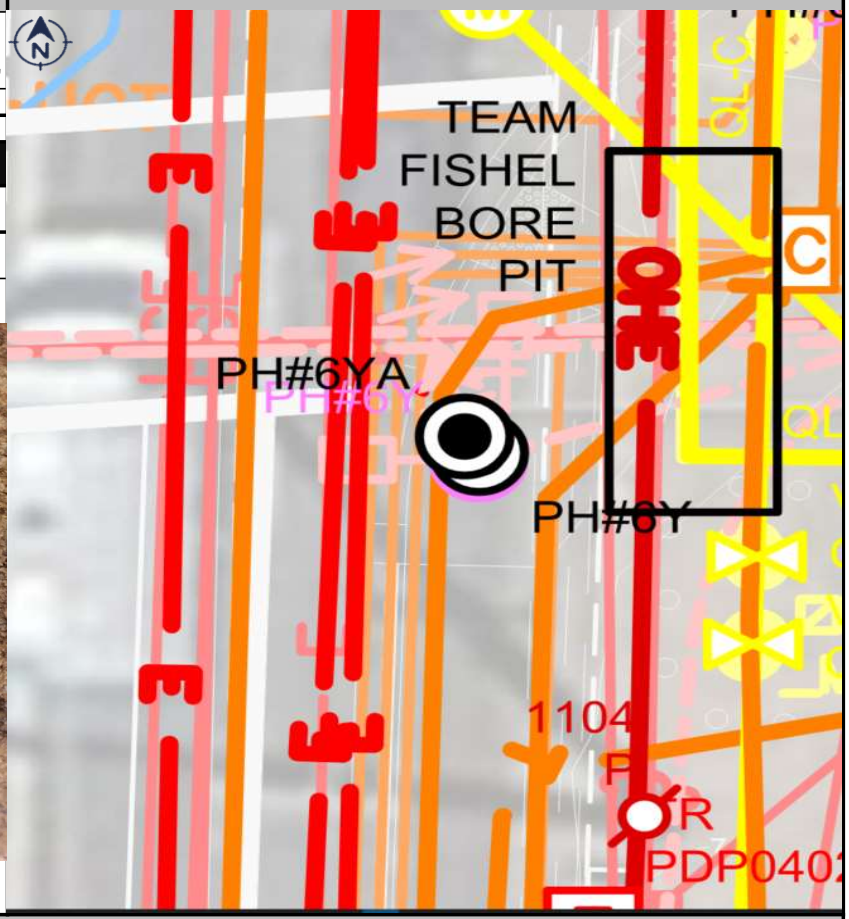
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336275.61	596853.93	1001.06
Station	**Offset**	
1236+81.24	R 80.80 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.06			
Top Elevation	994.46	**Pipe OD or Structure Height (inches)**	6.60	**Top Depth (FT)**
			0.00	
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X5' Pole Hole	Conflicts Found	1	See Comments			Rocky	Core & Reinstate

Comments

CLN Comm in conflict. Looks like a direct buried cable but it could be a 2" black PE conduit. See PH 6YA for details.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 6Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

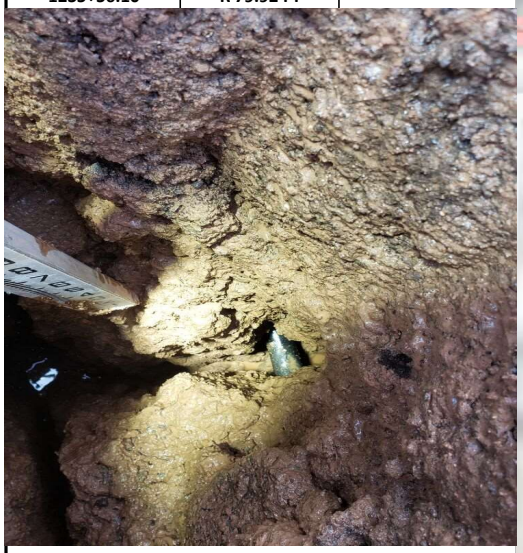
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

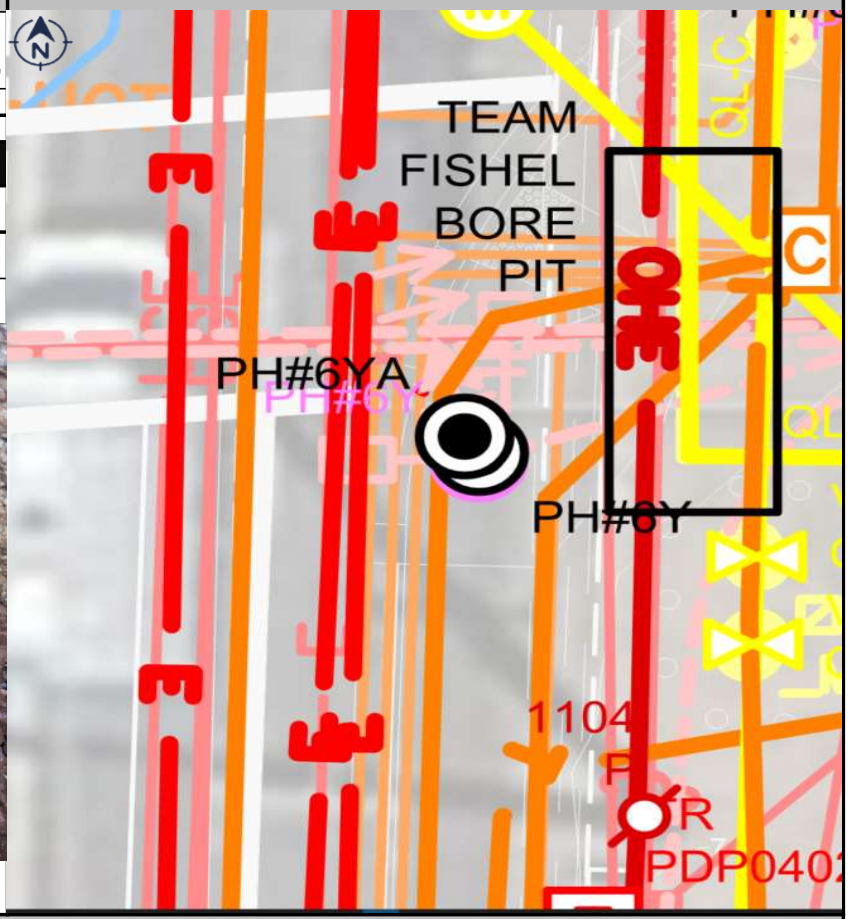
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336276.46	596853.28	1001.08
Station	**Offset**	
1235+56.10	R 79.92 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.08			
Top Elevation	998.55	**Pipe OD or Structure Height (inches)**	2.53	**Top Depth (FT)**
		4.00		
Bottom Elevation	998.22		2.86	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	2"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 7Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/29/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

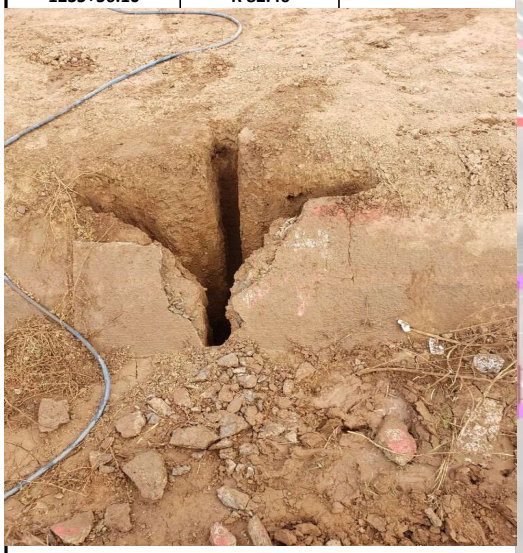
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

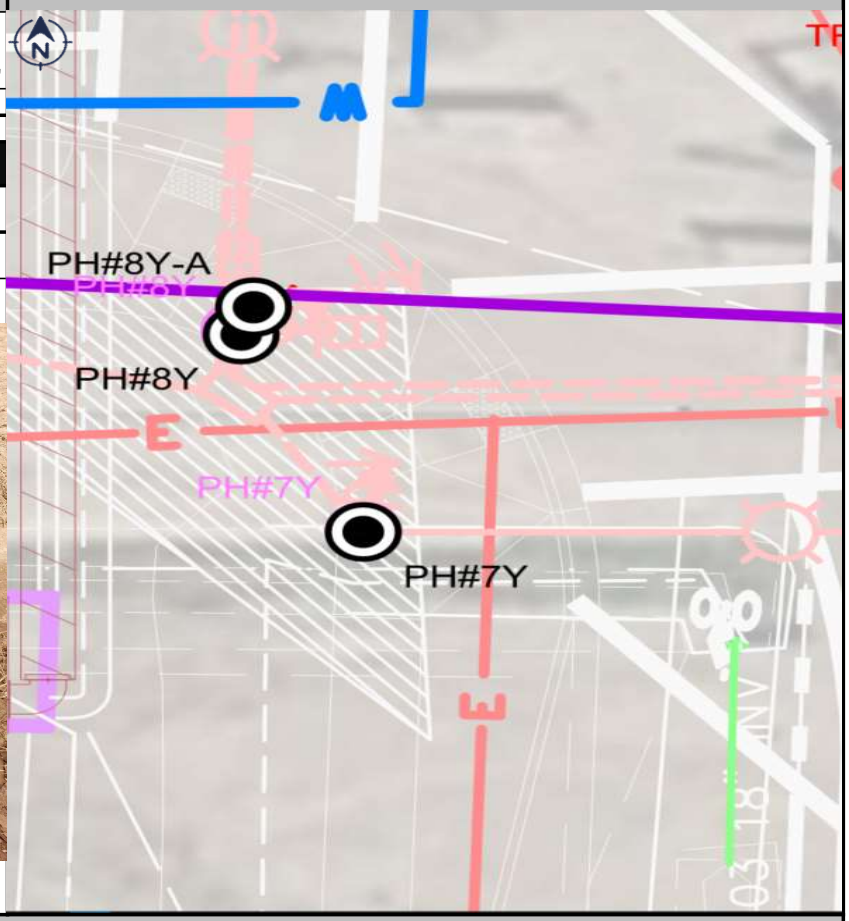
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336269.38	596743.91	1001.21
Station	**Offset**	
1235+56.10	R 82.46	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.21			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**		**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X10' Pole Hole	No Conflicts	0				Native Backfill	None Off-Road

Comments

No conflicts found

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 8Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

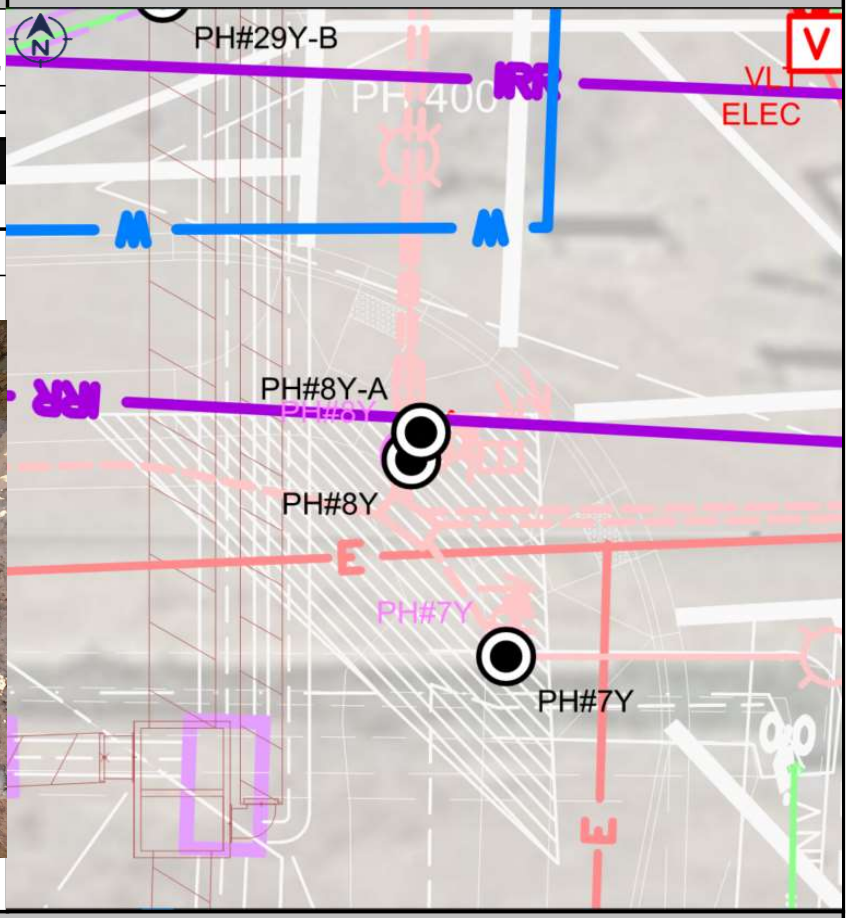
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336283.83	596736.99	1001.22
Station	**Offset**	
1235+56.10	R 67.78 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.22			
Top Elevation	995.09	**Pipe OD or Structure Height (inches)**	6.13	**Top Depth (FT)**
			0.00	
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
3'X5' Pole Hole	Conflicts Found	1	See Comments			Native Backfill	None Off-Road

Comments

Conflict found - See PH 8Y-A

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 8Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

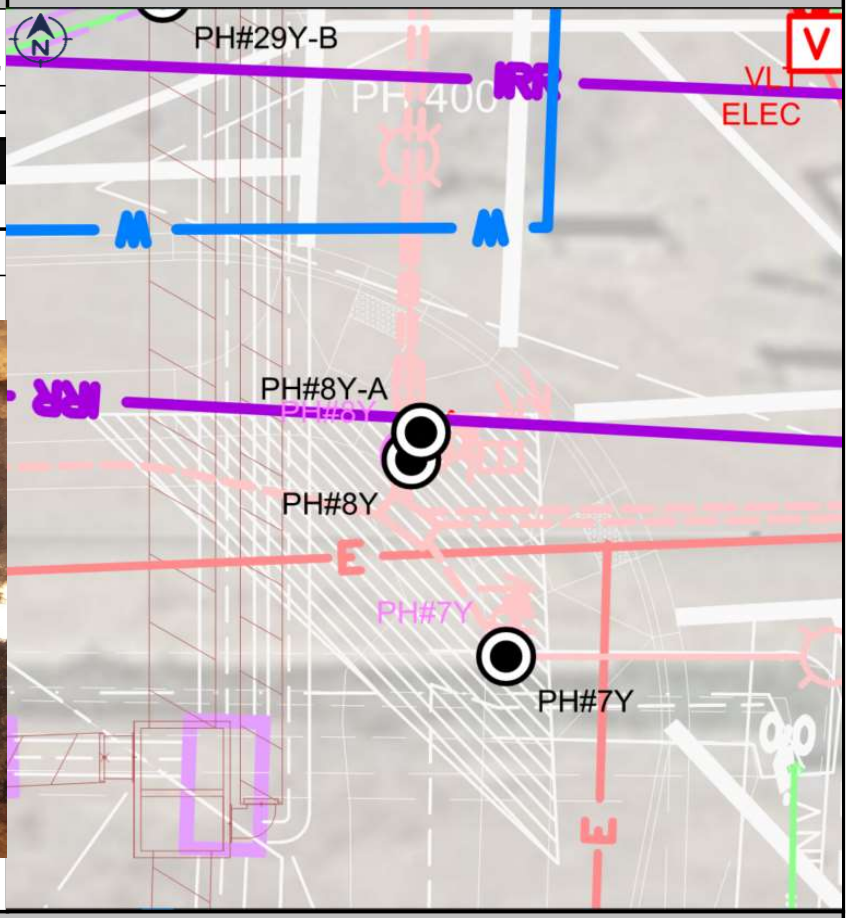
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336285.80	596737.71	1001.39
Station	**Offset**	
1235+66.39	R 65.83 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.39			
Top Elevation	997.36	**Pipe OD or Structure Height (inches)**	4.03	**Top Depth (FT)**
		13.20		
Bottom Elevation	996.26		5.13	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Private	Irrigation	1	12"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Found private IRR well fill line on the north side of the pole clearing hole. IRR comes from a private well site to the West and dumps in to an SRP IRR box to the East.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 9Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336453.62	596856.50	1001.42
Station	**Offset**	
320+88.23	**R 49.19 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.42			
Top Elevation	998.32	**Pipe OD or Structure Height (inches)**	3.10	**Top Depth (FT)**
		1.25		
Bottom Elevation	998.21		3.20	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1”	Direct Buried Cable	EAST & WEST	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 10Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336518.98	596850.56	1001.64
Station	**Offset**	
321+53.50	**R 42.33 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.64			
Top Elevation	999.02	**Pipe OD or Structure Height (inches)**	2.62	**Top Depth (FT)**
		4.80		
Bottom Elevation	998.62		3.02	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	2	4”	PE	EAST & WEST	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 11Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

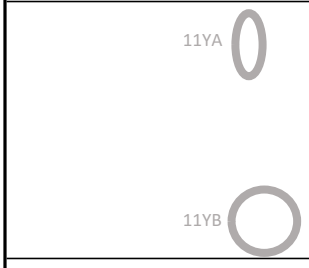
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336526.92	596851.43	1001.75
Station	**Offset**	
321+61.46	R 43.09 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.75		
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	**Top Depth (FT)**
Bottom Elevation		0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
6'X6' Structure	Conflicts Found	2	See Comments				

Comments

SD structure clearing hole 6' x 6' - Conflicts found - see potholes 11Y-A, 11Y-B & 11Y-C

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 11Y A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

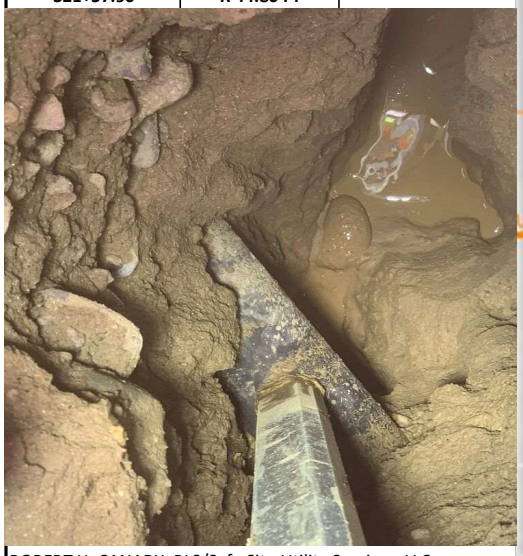
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

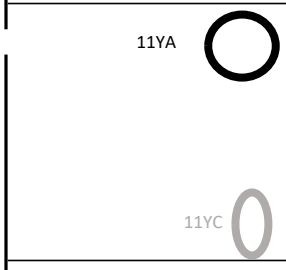
Northing	Easting	Surf Pin Elev
336523.35	596853.08	1001.59
Station	**Offset**	
321+57.90	R 44.80 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.59			
Top Elevation	997.75	**Pipe OD or Structure Height (inches)**	3.84	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.35		4.24	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	4”	PE	EAST & WEST	Native Backfill	Core & Reinstate

Comments

Black ABS plastic - Same conduit as 11Y-B.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 11Y B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

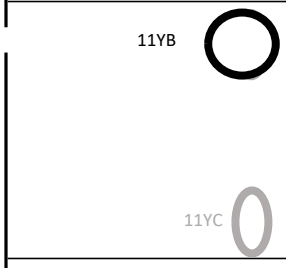
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336523.56	596849.45	1001.65
Station	**Offset**	
321+58.06	R 41.16 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.65			
Top Elevation	997.68	**Pipe OD or Structure Height (inches)**	3.97	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.28		4.37	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	4”	PE	EAST & WEST	Native Backfill	Core & Reinstate

Comments

Black ABS plastic - Same conduit as 11Y-A.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 11Y C	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

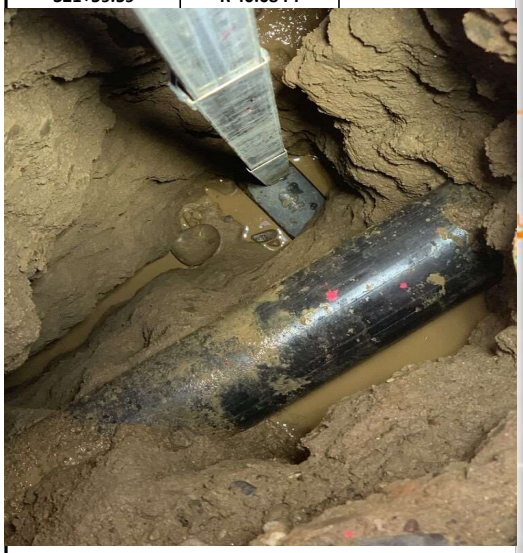
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336525.10	596848.39	1001.64
Station	**Offset**	
321+59.59	**R 40.08 FT**	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.64			
Top Elevation	992.80	**Pipe OD or Structure Height (inches)**	8.84	**Top Depth (FT)**
		4.50		
Bottom Elevation	992.43		9.22	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4”	Steel	NORTH & SOUTH	Screened Backfill	Core & Reinstate

Comments

Found 5.00't East of the SWG bluestake marks.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 12Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

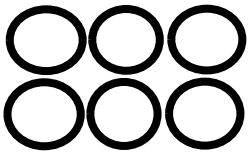
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336527.16	596854.83	1001.59
Station	**Offset**	
321+61.74	R 46.49 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.59			
Top Elevation	994.00	**Pipe OD or Structure Height (inches)**	7.59	**Top Depth (FT)**
		10.00		
Bottom Elevation	993.17		8.42	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	6	3”	PVC	NORTH & SOUTH	Screened Backfill	Core & Reinstate

Comments

Visually verified 6 conduits. Hard caliche soil directly below the conduits. Could not clear below the 6 conduits. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 13Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/4/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336525.53	596859.30	1001.55
Station	**Offset**	
321+60.17	**R 50.98 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.55			
Top Elevation	995.40	**Pipe OD or Structure Height (inches)**	6.15	**Top Depth (FT)**
		5.00		
Bottom Elevation	994.98		6.57	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3	3”	PVC	NORTH & SOUTH	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 14Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

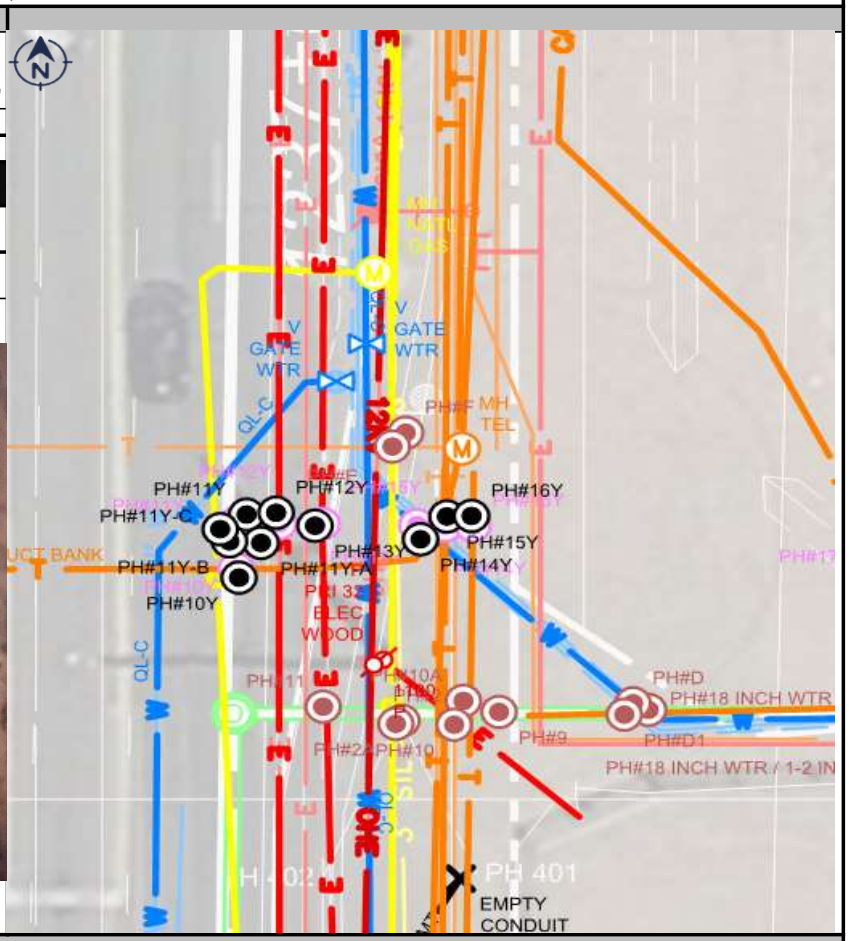
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

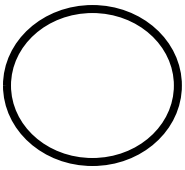
Northing	Easting	Surf Pin Elev
336523.81	596871.44	1001.83
Station	**Offset**	
321+58.62	R 63.15 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING SE

Ref Point Elevation	1001.83			
Top Elevation	996.38	**Pipe OD or Structure Height (inches)**	5.45	**Top Depth (FT)**
		18.79		
Bottom Elevation	994.81		7.02	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Water	1	16”	ACP	SE & NW	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 15Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

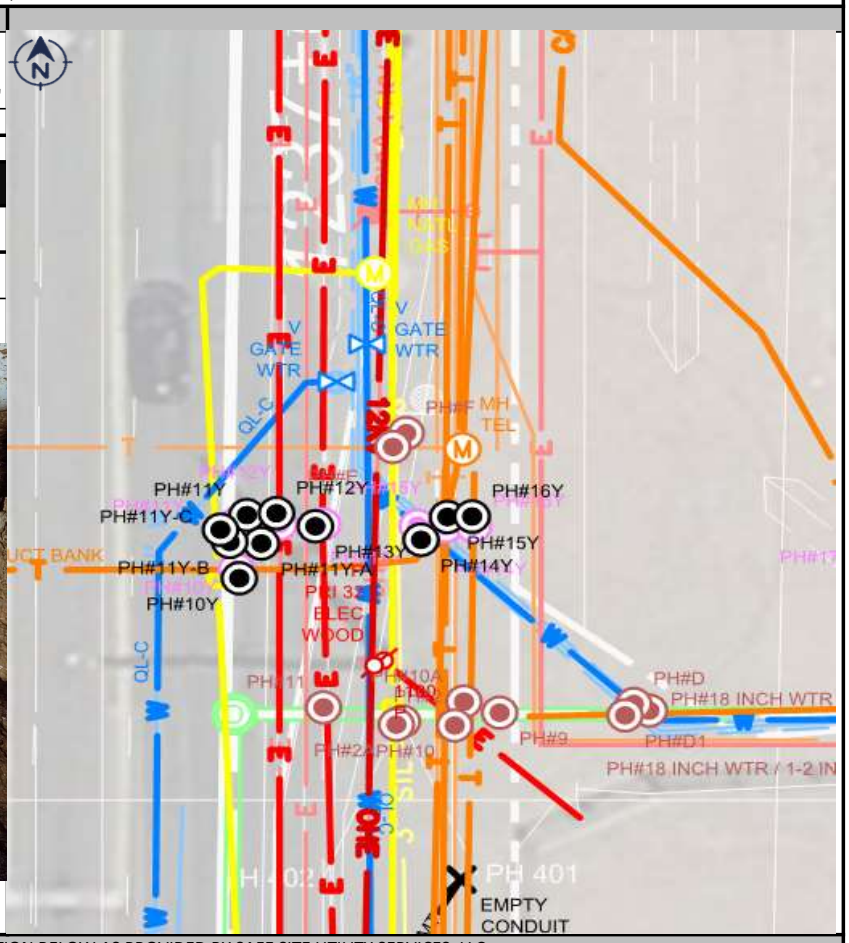
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

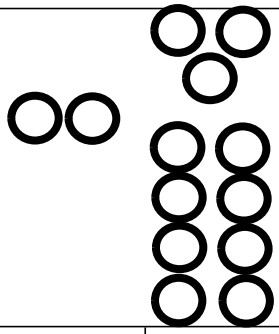
Northing	Easting	Surf Pin Elev
336526.68	596874.47	1002.01
Station	**Offset**	
321+61.53	R 66.13 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1002.01			
Top Elevation	997.87	**Pipe OD or Structure Height (inches)**	4.14	**Top Depth (FT)**
		65.00		
Bottom Elevation	992.46		9.56	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	13+	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

13+ Conduits visually verified. Hit caliche directly below the lowest conduits. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 16Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

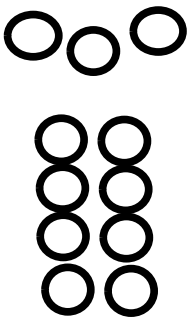
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336526.76	596877.31	1002.15
Station	**Offset**	
321+61.65	R 68.97 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1002.15			
Top Elevation	998.36	**Pipe OD or Structure Height (inches)**	3.79	**Top Depth (FT)**
		77.00		
Bottom Elevation	991.94		10.21	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	11+	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

11+ Conduits. Hit caliche directly below the conduits. Bottom measurement is to the bottom of the lowest visible conduit. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 17Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/23/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

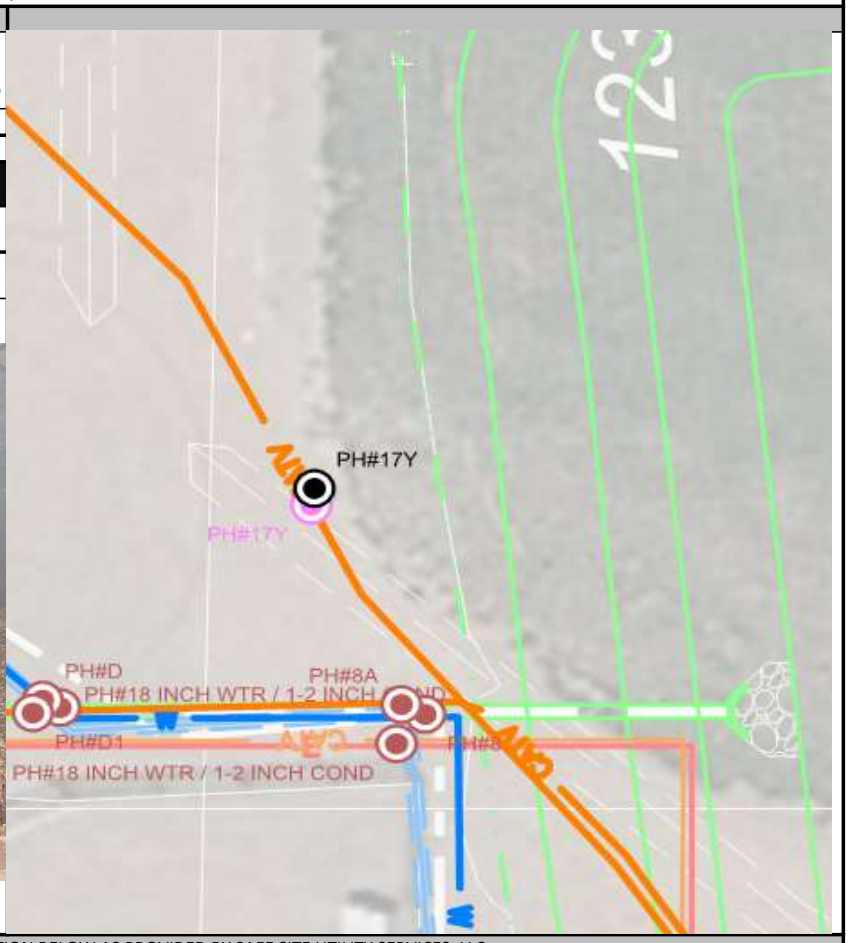
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

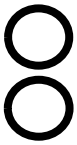
Northing	Easting	Surf Pin Elev
336526.76	596923.64	1001.92
Station	**Offset**	
321+62.30	**R 115.29 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING SE

Ref Point Elevation	1001.92			
Top Elevation	990.38	**Pipe OD or Structure Height (inches)**	11.54	**Top Depth (FT)**
		7.30		
Bottom Elevation	989.77		12.15	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Cox	Comm	2	2"	PVC	SE & NW	Screened Backfill	None Off-Road

Comments

Stacked conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 18Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/29/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

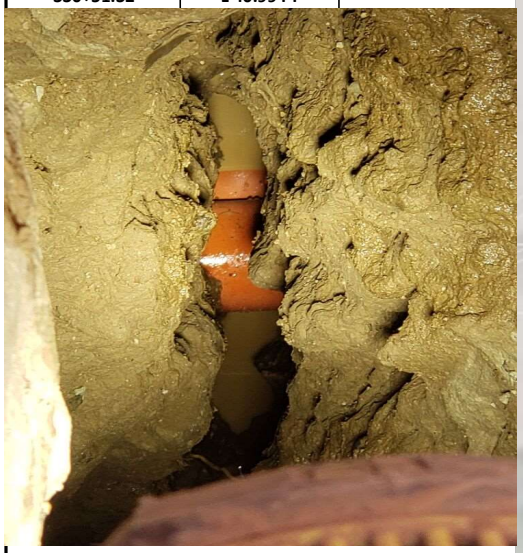
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

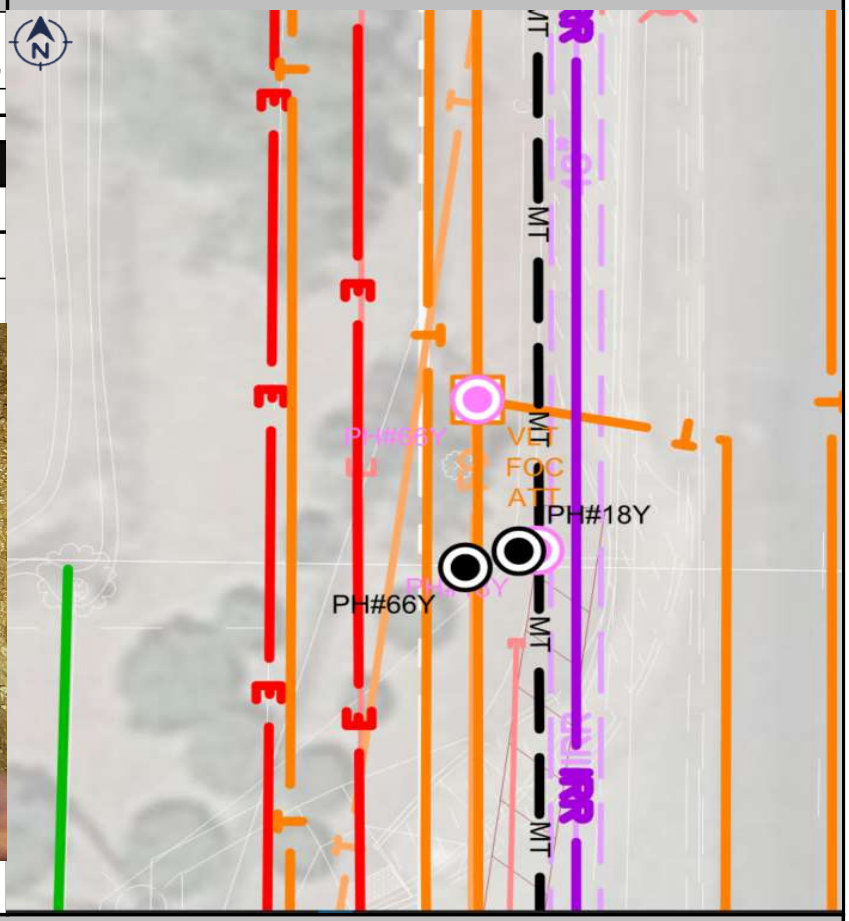
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
337417.92	596780.63	1004.91
Station	**Offset**	
330+51.32	**L 40.99 FT**	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.91			
Top Elevation	996.31	**Pipe OD or Structure Height (inches)**	8.60	**Top Depth (FT)**
		6.00		
Bottom Elevation	995.81		9.10	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	2	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 19Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/29/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

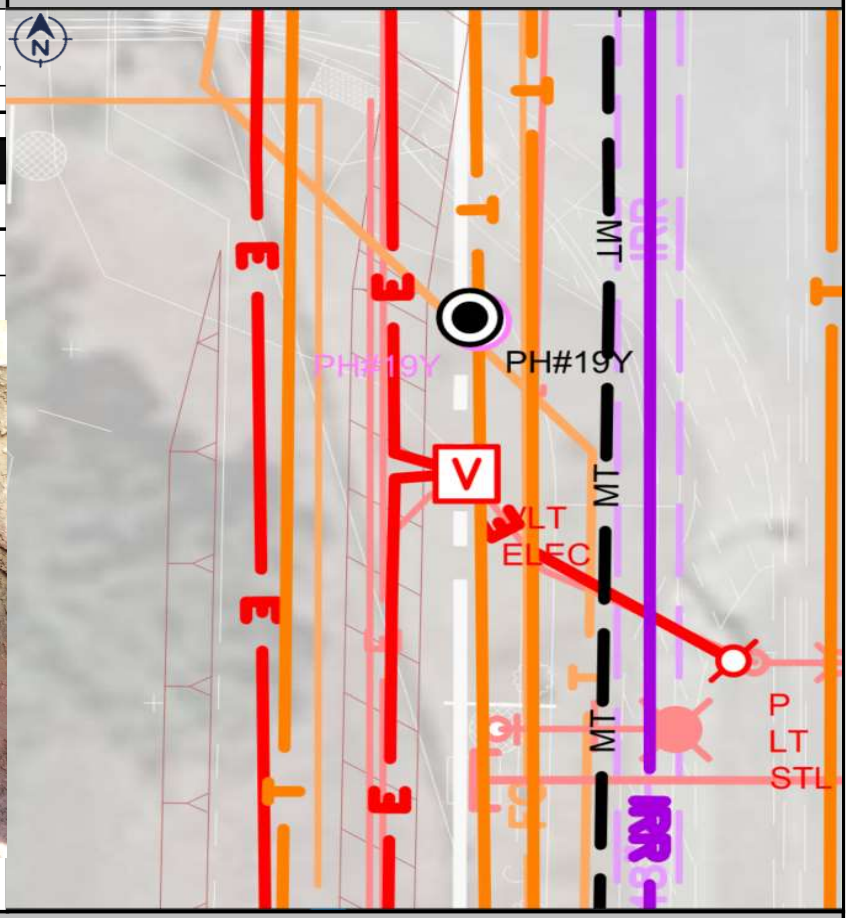
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
337296.97	596773.54	1004.82
Station	**Offset**	
329+30.27	**L 46.22 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.82			
Top Elevation	999.97	**Pipe OD or Structure Height (inches)**	4.85	**Top Depth (FT)**
		1.32		
Bottom Elevation	999.86		4.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 20Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

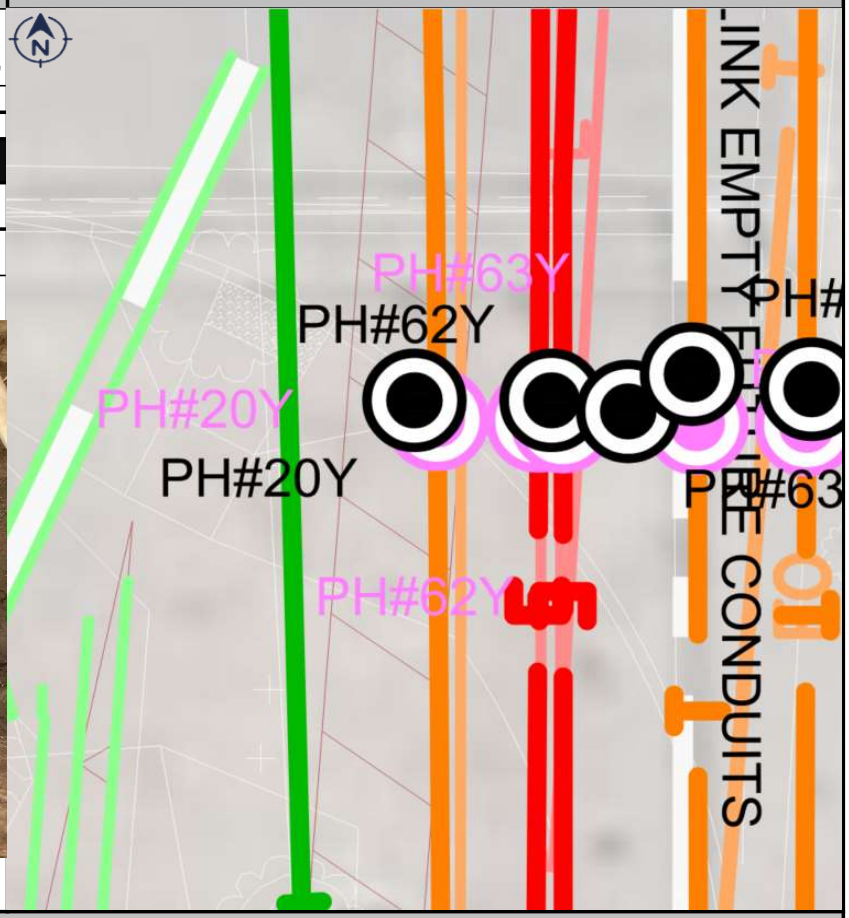
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336992.62	596761.45	1002.66
Station	**Offset**	
326+25.78	**L 53.65 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1002.66			
Top Elevation	998.76	**Pipe OD or Structure Height (inches)**	3.90	**Top Depth (FT)**
		4.80		
Bottom Elevation	998.36		4.30	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	2	1-DBC 1-4"	PVC	EAST & WEST	Rocky	None Off-Road

Comments

Side by Side

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 21Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
0.00	0.00	0.00
Station	**Offset**	
0.00	0.00	

Insert Surveyors Seal here

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	0.00			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**
		0.00		
Bottom Elevation	0.00		0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	Not Dug	See Comments				

Comments

Did not dig. No evidence of gas at this location.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 22Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

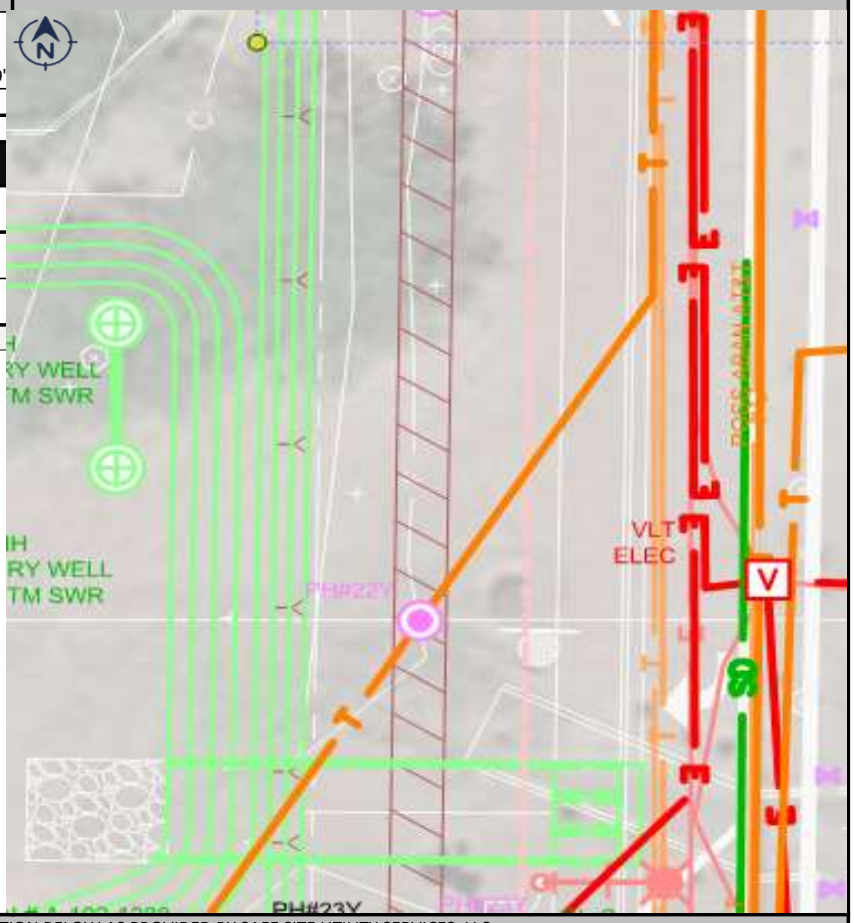
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
0.00	0.00	0.00
Station	**Offset**	
0.00	0.00	

Insert Surveyors Seal here

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	0.00			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**
		0.00		
Bottom Elevation	0.00		0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	Not Dug	See Comments				

Comments

No access to the area. Could not get vac truck in to the retention area. Pothole is located behind fenced area on private property.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 23Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

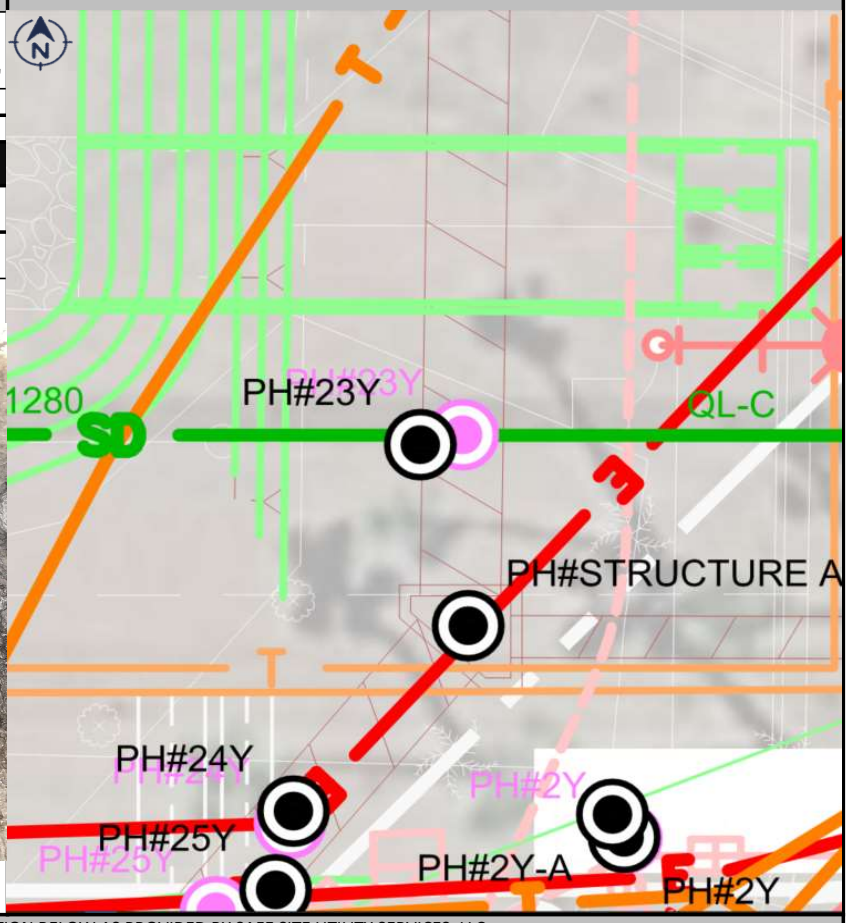
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336457.77	596738.46	1000.41
Station	**Offset**	
320+90.73	L 68.90 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING

Ref Point Elevation	1000.41			
Top Elevation	994.41	**Pipe OD or Structure Height (inches)**	6.00	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Private	SD	Cleared Hole	See Comments			Native Backfill	None Off-Road

Comments

Exploratory pothole for possible SD line found on old map records. Cleared down to 6.00' deep and 2.00' wide.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 24Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

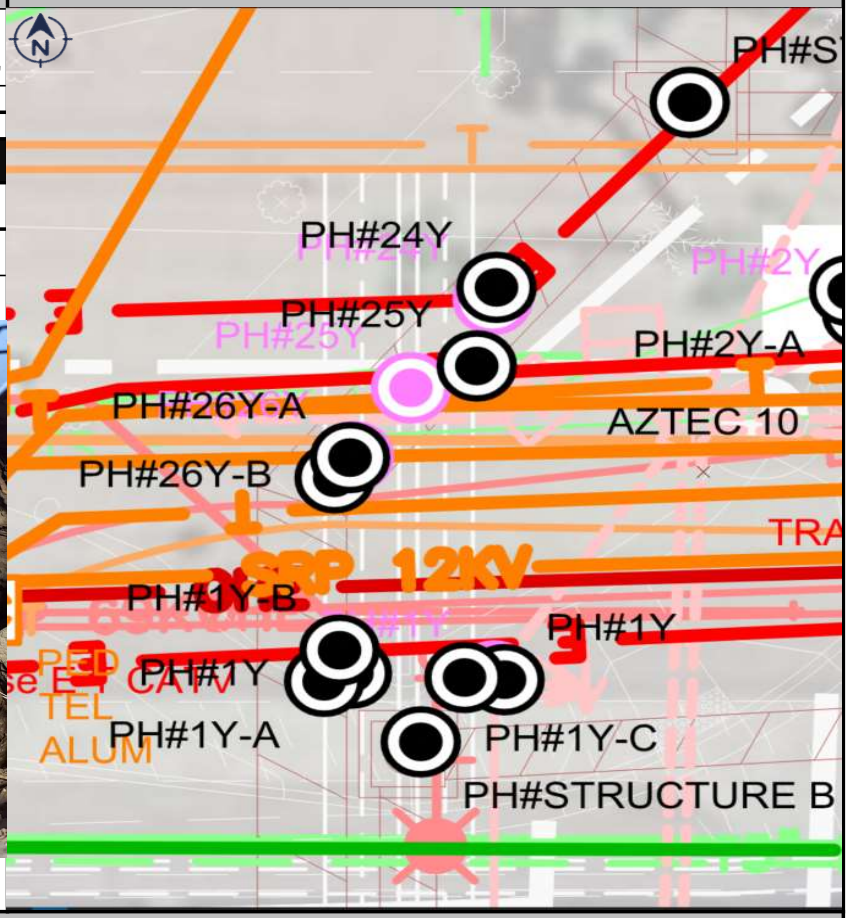
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

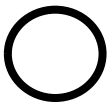
Northing	Easting	Surf Pin Elev
336435.45	596730.87	1001.94
Station	**Offset**	
320+68.30	L 76.18 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.94			
Top Elevation	997.29	**Pipe OD or Structure Height (inches)**	4.65	**Top Depth (FT)**
		4.80		
Bottom Elevation	996.89		5.05	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	4"	HDPE	EAST & WEST	Native Backfill	None Off-Road

Comments

Pothole request calls for CLN and SRP at this location However, the SRP conduit appears to be further North and was missed at this location. Only found CLN at this location. SRP was found 20.00' to the East at a similar depth. SRP is believed to be a couple feet North of CLN at this location.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 25Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

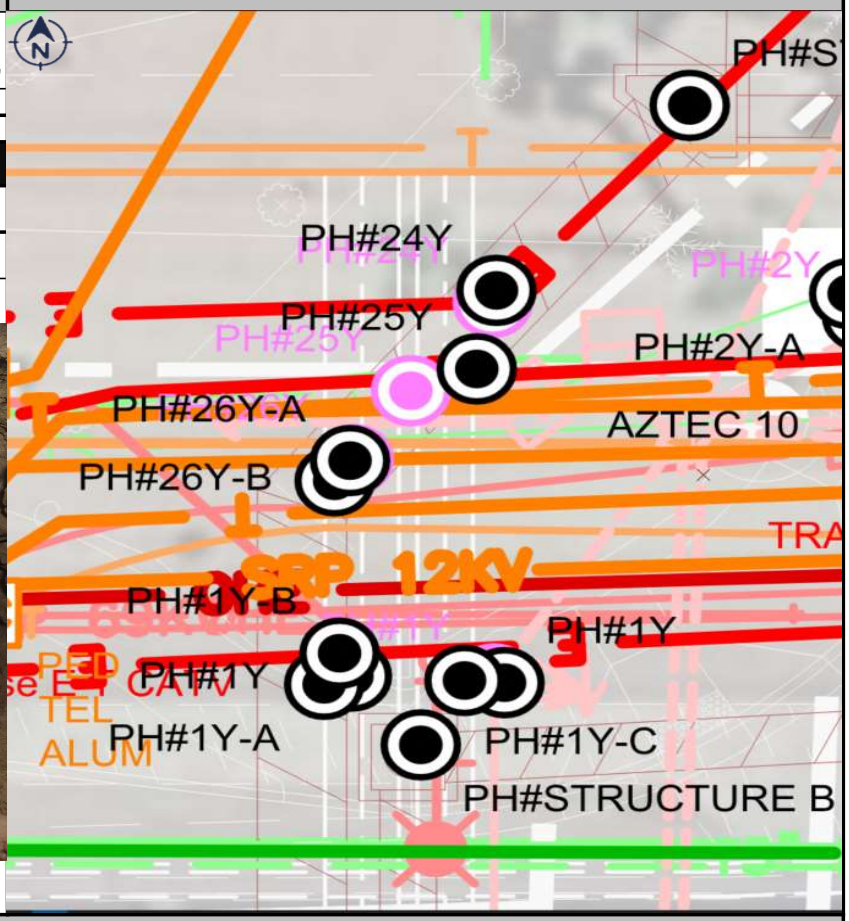
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336430.62	596729.80	1001.98
Station	**Offset**	
320+63.45	L 77.18 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.98			
Top Elevation	997.90	**Pipe OD or Structure Height (inches)**	4.08	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.50		4.48	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 26Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

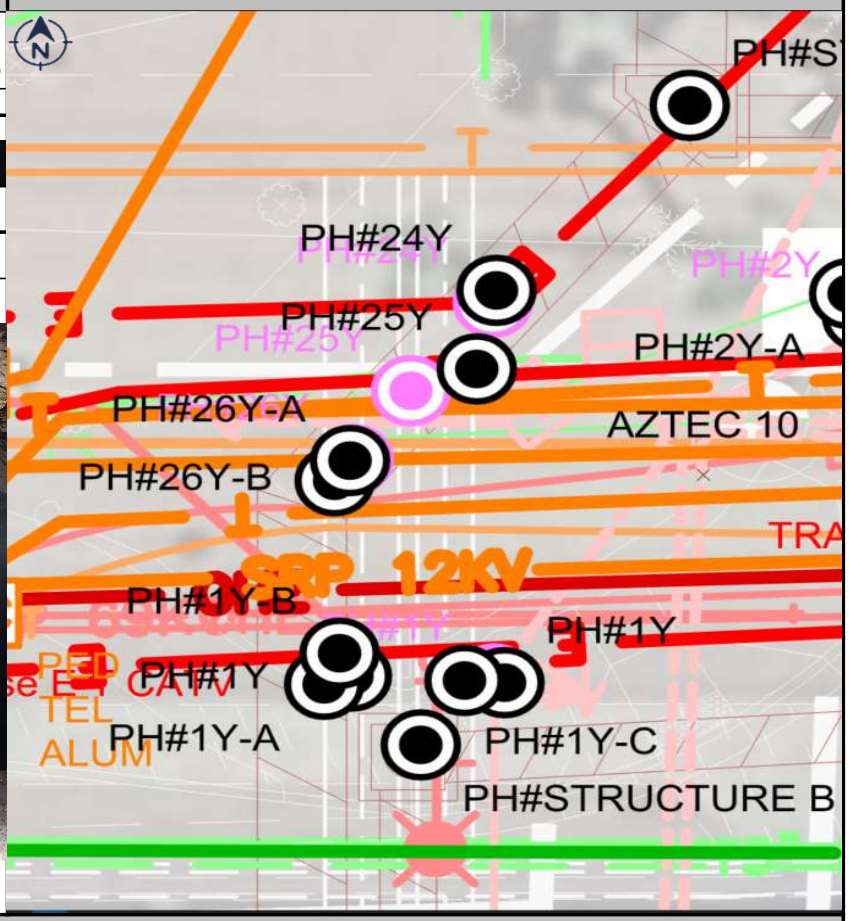
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

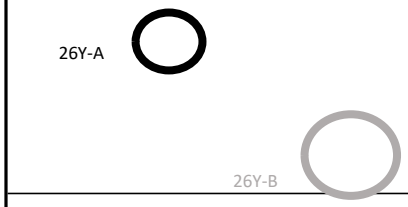
Northing	Easting	Surf Pin Elev
336423.79	596722.10	1001.82
Station	**Offset**	
320+56.52	L 84.78 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.82			
Top Elevation	998.59	**Pipe OD or Structure Height (inches)**	3.23	**Top Depth (FT)**
		4.80		
Bottom Elevation	998.19		3.63	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 26Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

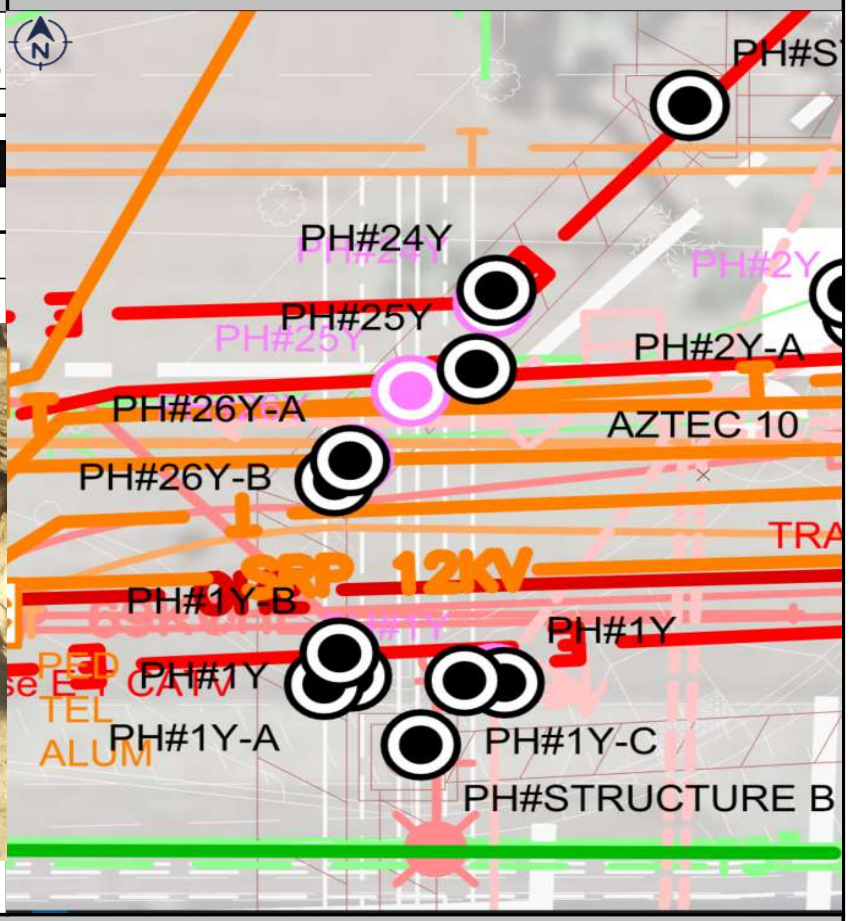
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

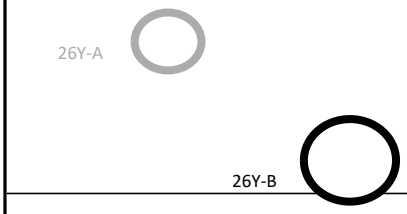
Northing	Easting	Surf Pin Elev
336425.02	596722.94	1001.86
Station	**Offset**	
320+57.76	L 83.96 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.86			
Top Elevation	994.85	**Pipe OD or Structure Height (inches)**	7.01	**Top Depth (FT)**
		4.80		
Bottom Elevation	994.45		7.41	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 27Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

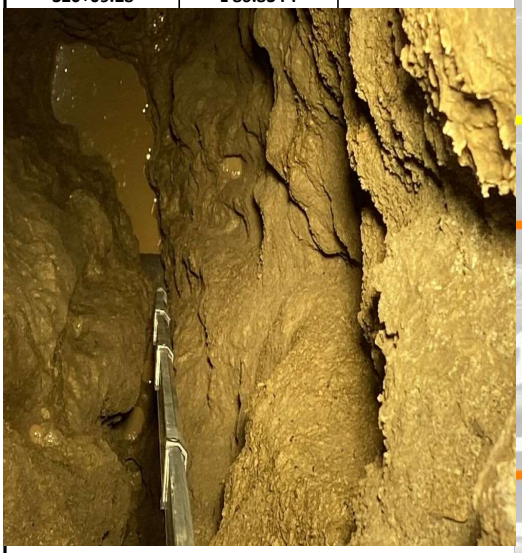
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

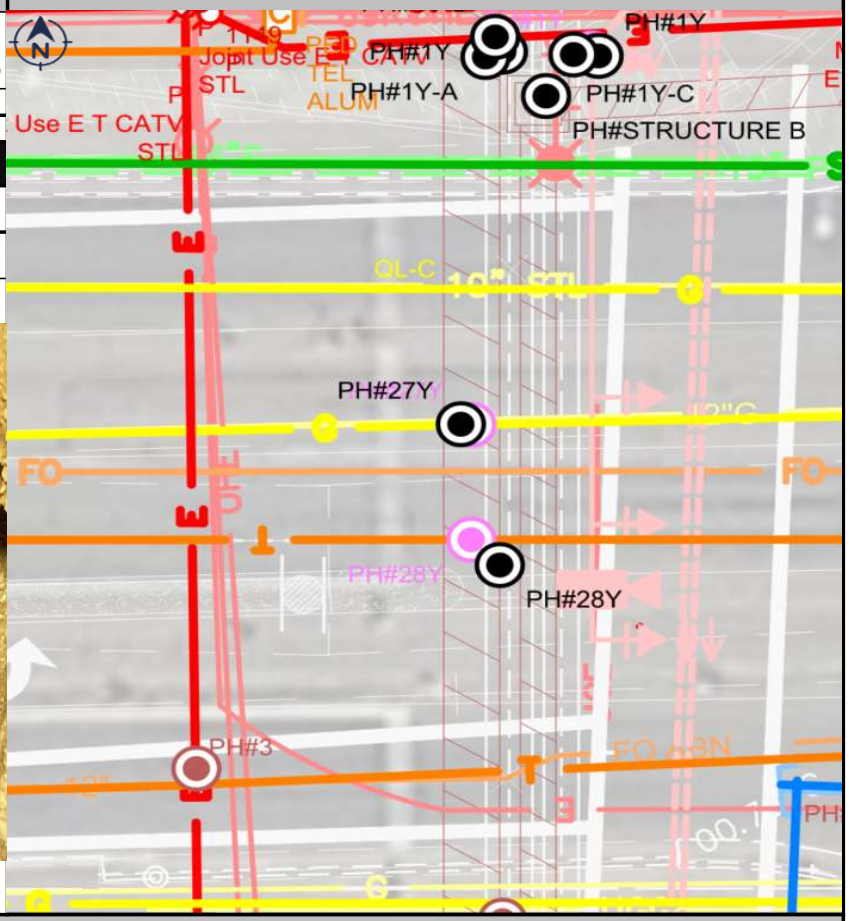
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336376.59	596719.39	1001.51
Station	**Offset**	
320+09.28	L 86.83 FT	

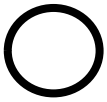


ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.51			
Top Elevation	987.06	**Pipe OD or Structure Height (inches)**	14.45	**Top Depth (FT)**
		12.75		
Bottom Elevation	985.99		15.51	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas High Pressure	1	12”	Steel	EAST & WEST	Native Backfill	Core & Reinstate

Comments

SW Gas inspector did not want us to expose the entire pipe for "safety reasons". 12" steel per map records and per onsite inspector.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 28Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/15/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

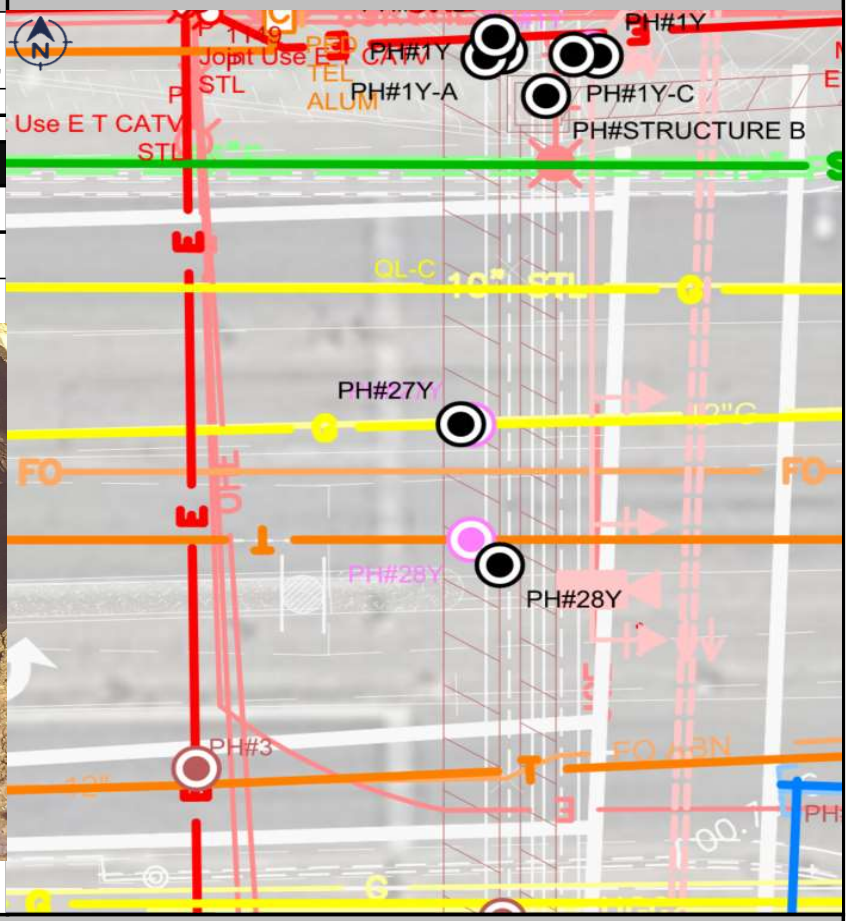
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336363.27	596722.77	1001.46
Station	**Offset**	
319+94.57	L 83.18 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.46			
Top Elevation	989.36	**Pipe OD or Structure Height (inches)**	12.10	**Top Depth (FT)**
		3.50		
Bottom Elevation	989.07		12.39	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCI	Comm	2	2"	PVC	EAST & WEST	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 29Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
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POTHOLE REPORT

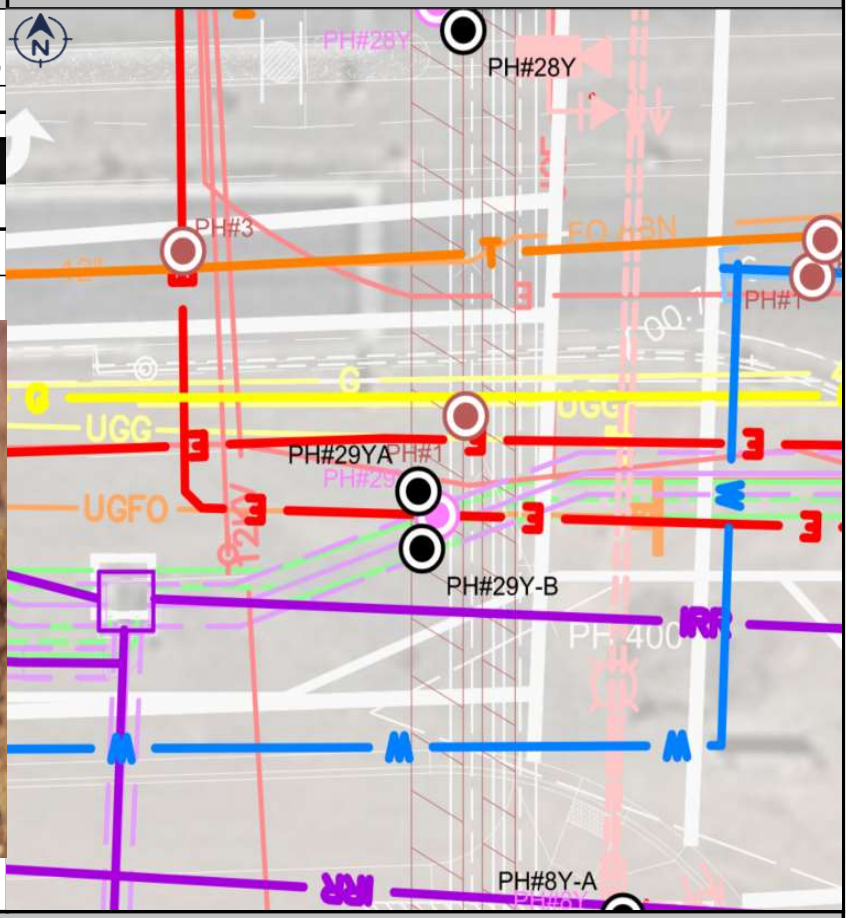
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336323.02	596718.57	1001.44
Station	**Offset**	
319+54.20	L 86.12 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.44			
Top Elevation	995.45	**Pipe OD or Structure Height (inches)**	5.99	**Top Depth (FT)**
		10.50		
Bottom Elevation	994.57		6.87	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3+	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Visually verified 3 conduits. Could not clear below due to large river rocks and hard soil around the utility. Verify conduit count with the utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 29Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

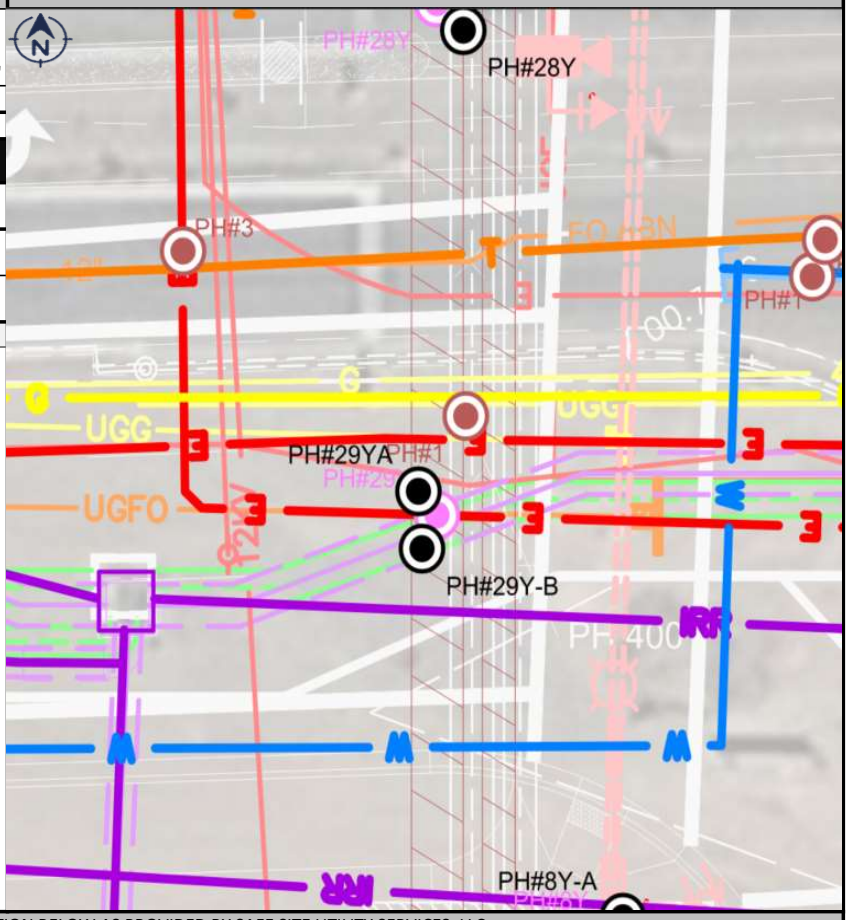
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

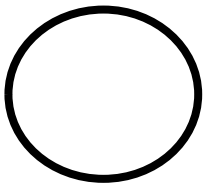
Northing	Easting	Surf Pin Elev
336318.01	596718.89	1001.48
Station	**Offset**	
319+49.20	L 85.64 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

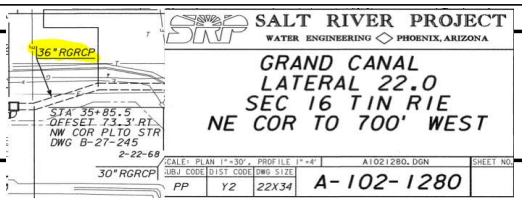
FACING West

Ref Point Elevation	1001.48			
Top Elevation	998.86	**Pipe OD or Structure Height (inches)**	2.62	**Top Depth (FT)**
		44.00		
Bottom Elevation	995.19		6.29	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Irrigation	1	36"	RCP	EAST & WEST	Native Backfill	None Off-Road

Comments

36" RCP per map records.



FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 30Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/12/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

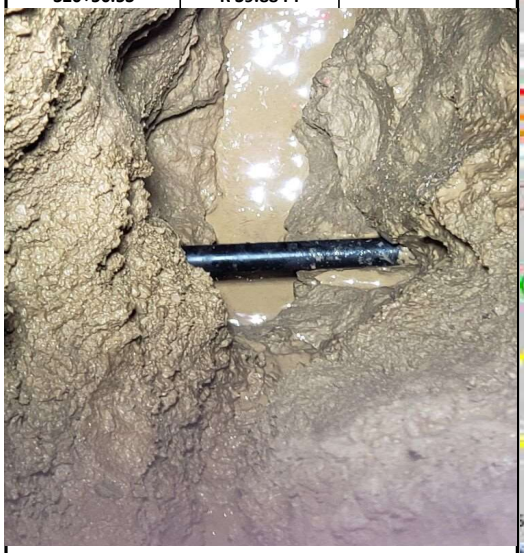
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

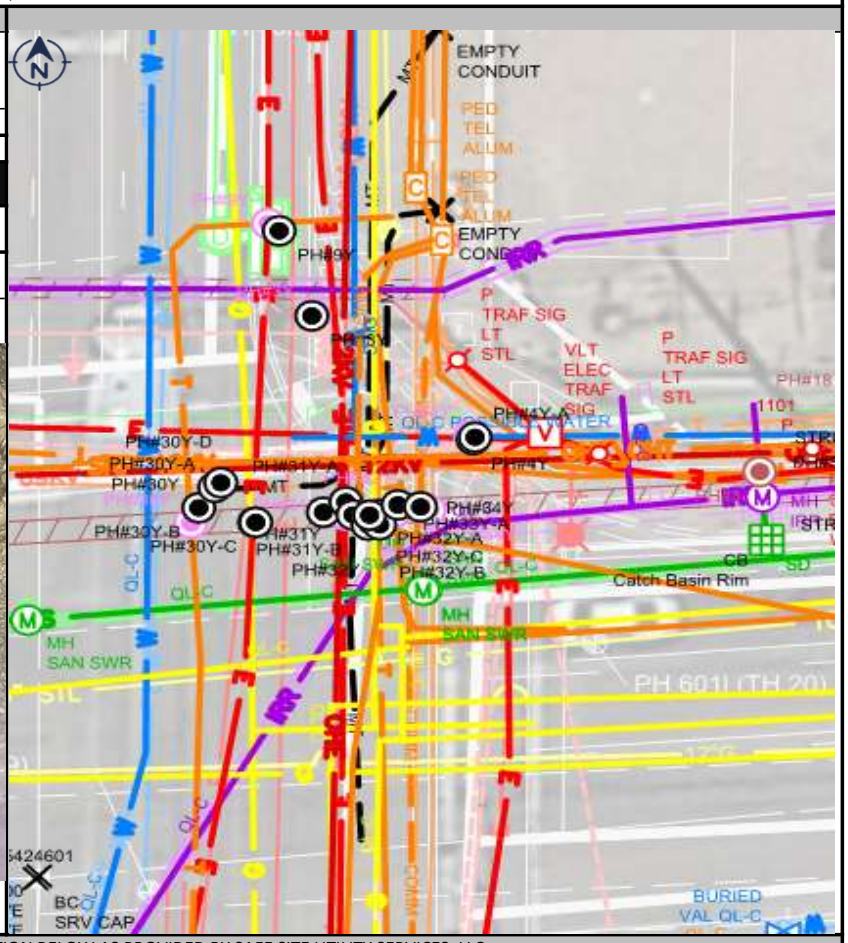
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336416.05	596846.67	1001.22
Station	**Offset**	
320+50.53	R 39.88 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.22			
Top Elevation	993.54	**Pipe OD or Structure Height (inches)**	7.68	**Top Depth (FT)**
		1.25		
Bottom Elevation	993.43		7.78	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 30Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/7/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336418.82	596848.63	1001.49
Station	**Offset**	
320+53.32	R 41.81 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.49			
Top Elevation	997.38	**Pipe OD or Structure Height (inches)**	4.11	**Top Depth (FT)**
		4.80		
Bottom Elevation	996.98		4.51	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	2	4" sxs	PVC	EAST & WEST	Rocky	Core & Reinstate

Comments

GPR scan picked up trench at this location. Determined that these are empty CLN conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 30Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/7/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

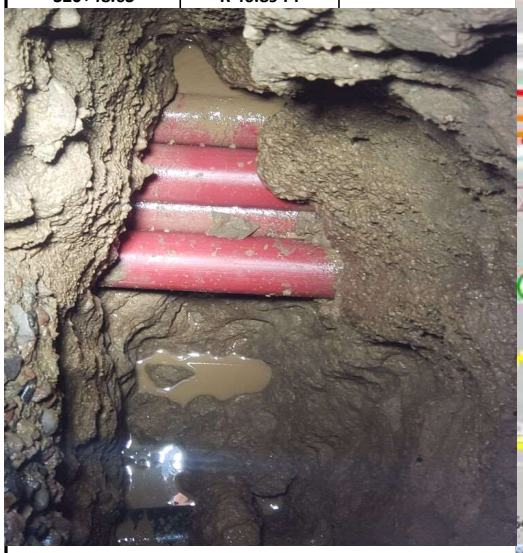
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

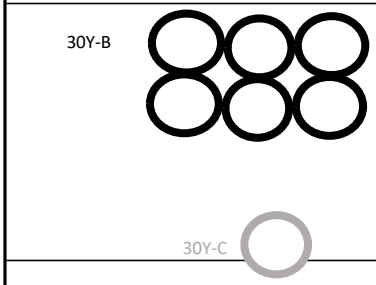
Northing	Easting	Surf Pin Elev
336414.06	596853.65	1001.43
Station	**Offset**	
320+48.63	R 46.89 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.43			
Top Elevation	994.25	**Pipe OD or Structure Height (inches)**	7.18	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	6	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

SRP duct bank

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH30Y-C	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/7/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

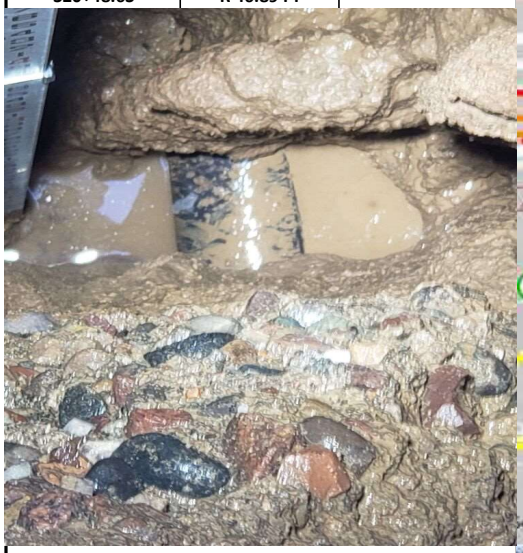
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

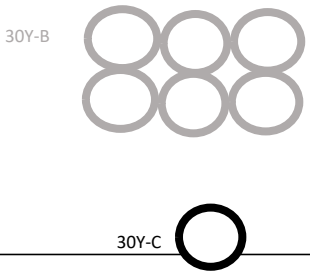
Northing	Easting	Surf Pin Elev
336414.06	596853.65	1001.43
Station	**Offset**	
320+48.63	R 46.89 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.43			
Top Elevation	992.32	**Pipe OD or Structure Height (inches)**	9.11	**Top Depth (FT)**
		4.50		
Bottom Elevation	991.94		9.49	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas High Pressure	1	4"	Steel	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 30Y-D	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336419.45	596849.37	1001.26
Station	**Offset**	
320+53.96	**R 42.53 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.26			
Top Elevation	994.06	**Pipe OD or Structure Height (inches)**	7.20	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	GPR SCAN	Cleared Hole	See Comments			Rocky	Core & Reinstate

Comments

GPR scan picked up a trench line at this location. Nothing Found. Cleared down to 7.72' by 3.00' wide.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 31Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336415.46	596861.92	1001.35
Station	**Offset**	
320+50.14	R 55.14 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.35			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	7.06’	**Top Depth (FT)**
			0.00	
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3	4”	PE	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 31Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336416.84	596864.67	1001.35
Station	**Offset**	
320+51.57	R 57.87 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.35			
Top Elevation	1,000.03	**Pipe OD or Structure Height (inches)**	1.32	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	8" wide	Concrete Slurry	EAST & WEST	Rocky	Core & Reinstate

Comments

Unknown encasement. Attempted to locate electromagnetically but did not get a signal. No bluestake marks at this location. Called in unknown utility but no one showed up to claim ownership.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 31Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

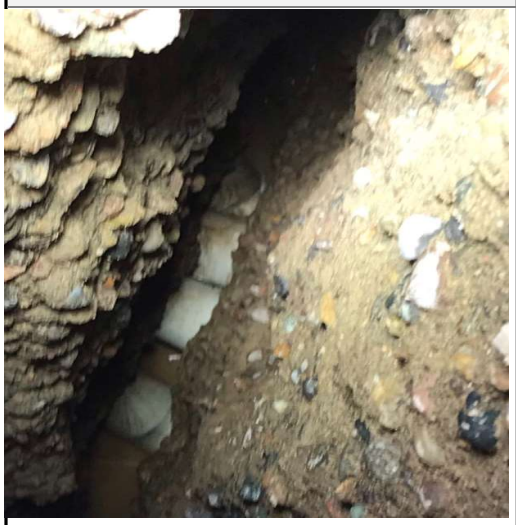
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336415.06	596865.55	1001.32
Station	**Offset**	
320+49.80	R 58.77 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.32			
Top Elevation	992.68	**Pipe OD or Structure Height (inches)**	8.64	**Top Depth (FT)**
		6.00		
Bottom Elevation	992.18		9.14	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	4+	4”	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Visually verified 4 conduits. Could not see below. There could be additional conduits below that we could not visually verify. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 32Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

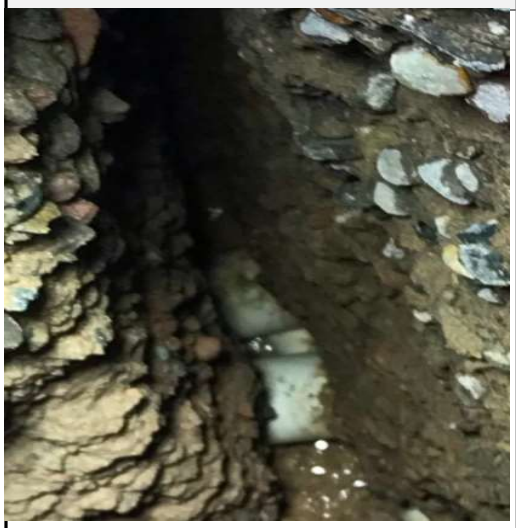
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336413.70	596867.37	1001.38
Station	**Offset**	
320+48.46	R 60.61 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.38			
Top Elevation	992.16	**Pipe OD or Structure Height (inches)**	9.22	**Top Depth (FT)**
		6.00		
Bottom Elevation	991.66		9.72	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	3	4”	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 32Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

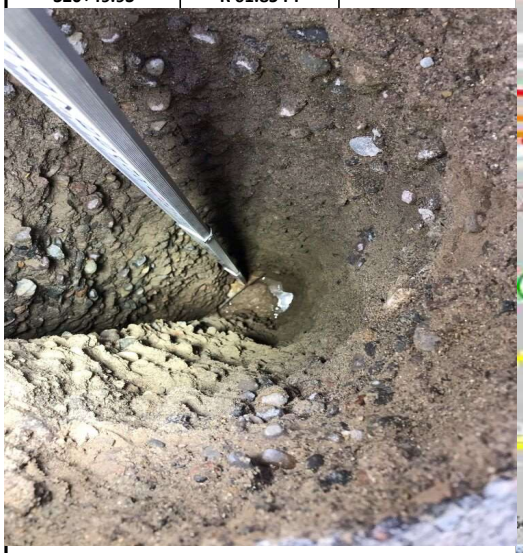
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336415.15	596868.63	1001.24
Station	**Offset**	
320+49.93	R 61.85 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.24			
Top Elevation	992.92	**Pipe OD or Structure Height (inches)**	8.32	**Top Depth (FT)**
		10.00		
Bottom Elevation	992.09		9.15	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Unknown	6+	4”	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Running with 32-Y but is dropping in elevation. Could not clear around the conduits due large chunks of debris and slurry. Could be additional conduits in the area that could not be visually verified. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 32Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336413.74	596868.79	1001.30
Station	**Offset**	
320+48.52	R 62.03 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.30			
Top Elevation	994.38	**Pipe OD or Structure Height (inches)**	6.92	**Top Depth (FT)**
		5.00		
Bottom Elevation	993.97		7.34	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Unknown	4+	4”	PE	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Appears to be 2 conduits. Could not clear around the conduits due large chunks of debris and slurry. Could be additional conduits in the area that could not be visually verified. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 32Y-C	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

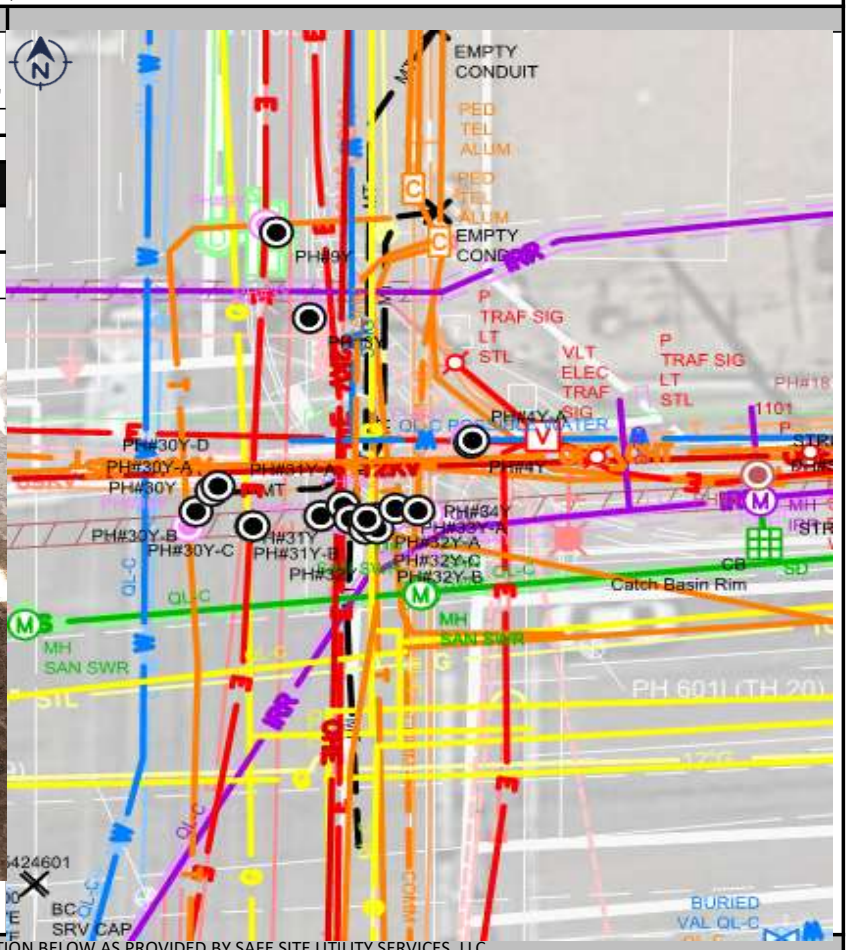
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336415.06	596867.56	1001.30
Station	**Offset**	
320+49.82	R 60.78 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.30			
Top Elevation	999.58	**Pipe OD or Structure Height (inches)**	1.72	**Top Depth (FT)**
		2.38		
Bottom Elevation	999.38		1.92	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
UNKNOWN	Unknown	1	2”	PVC	EAST & WEST	Rocky	Core & Reinstate

Comments

Same as 31Y-A - Broke through the slurry and exposed conduit. Attempted to locate electromagnetically but did not get a signal. No bluestake marks at this location. Called in unknown utility but no one showed up to claim ownership.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 33Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/6/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

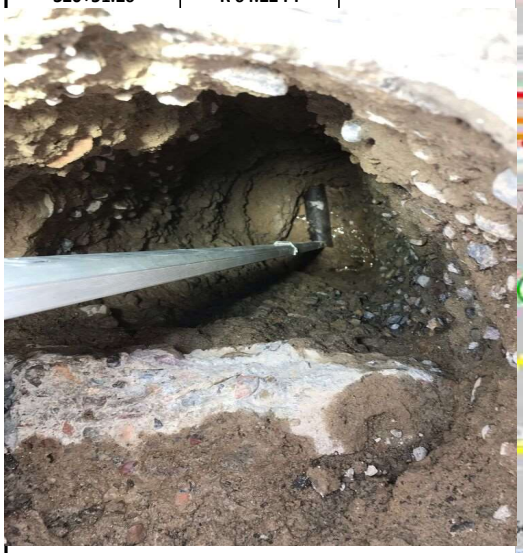
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

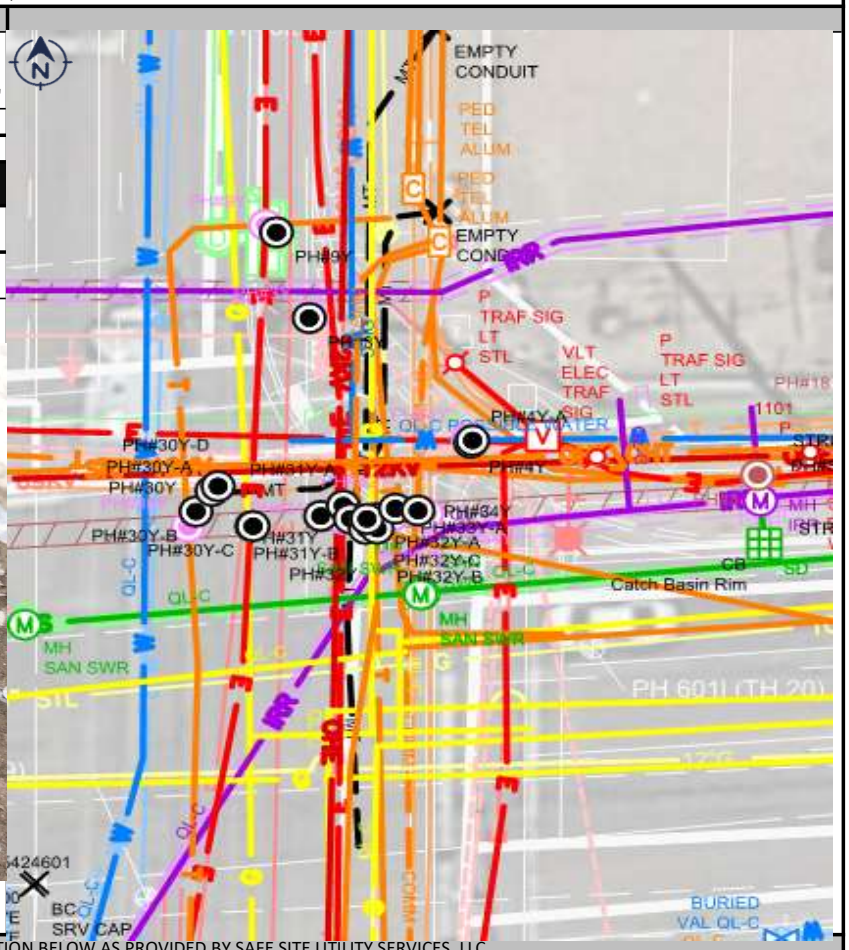
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336416.44	596871.02	1001.25
Station	**Offset**	
320+51.26	R 64.22 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.25			
Top Elevation	993.93	**Pipe OD or Structure Height (inches)**	7.32	**Top Depth (FT)**
		4.50		
Bottom Elevation	993.55		7.70	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4”	Steel	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Found unmarked gas line. Possibly abandoned.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 34Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/13/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

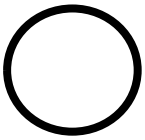
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336416.16	596873.81	1001.20
Station	**Offset**	
320+51.02	R 67.02 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.20			
Top Elevation	990.12	**Pipe OD or Structure Height (inches)**	11.08	**Top Depth (FT)**
		16.00		
Bottom Elevation	988.78		12.41	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	16" sleeve	Unknown Metal Sleeve	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Appears to be a 16" aluminum or light weight metal sleeve with a black coating.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 35Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/23/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

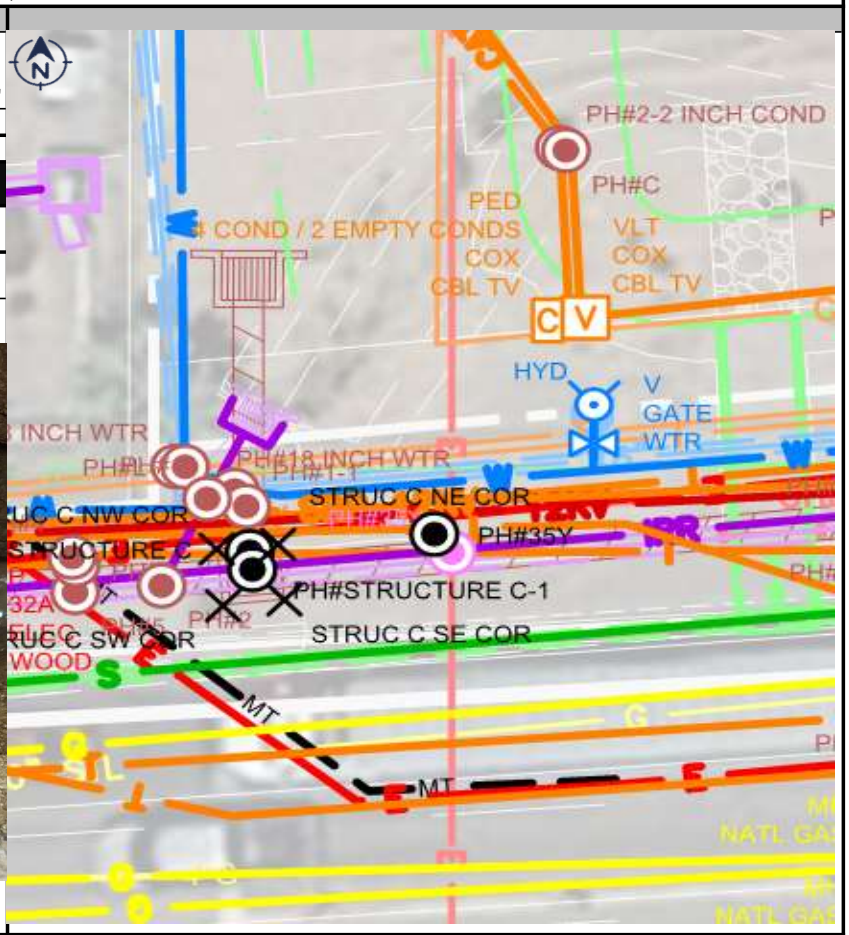
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

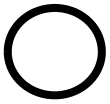
Northing	Easting	Surf Pin Elev
336423.76	596960.71	1001.13
Station	**Offset**	
1237+95.57	L 61.52 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.13			
Top Elevation	990.96	**Pipe OD or Structure Height (inches)**	10.17	**Top Depth (FT)**
		4.80		
Bottom Elevation	990.56		10.57	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	1	4"	PVC	EAST & WEST	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 36Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

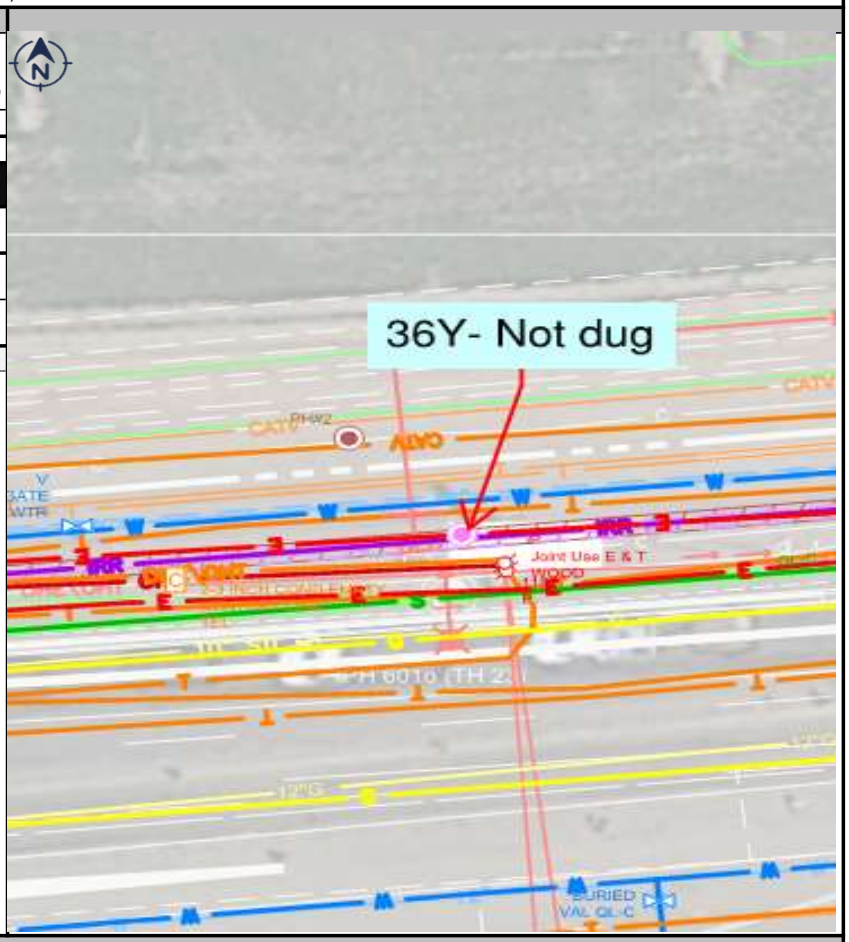
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
0.00	0.00	0.00
Station	**Offset**	
0.00	0.00	

Insert Surveyors Seal here

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	0.00			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**
Bottom Elevation	0.00	0.00	0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	Not Dug	See Comments				

Comments

Electric no longer in place. Electric was removed when new IRR was installed.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 37Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

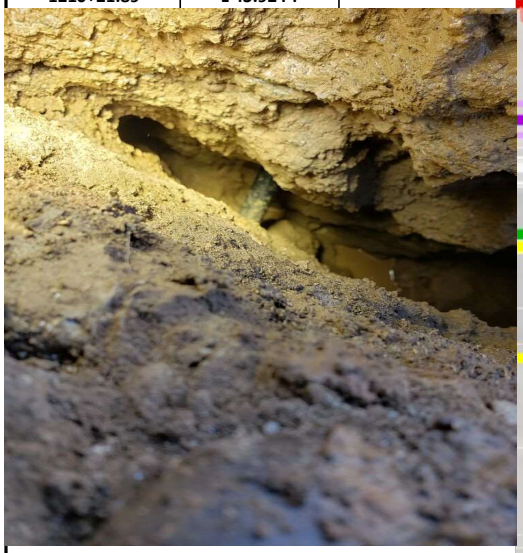
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336403.24	594191.09	998.47
Station	**Offset**	
1210+21.89	L 43.92 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	998.47			
Top Elevation	996.36	**Pipe OD or Structure Height (inches)**	2.11	**Top Depth (FT)**
		1.32		
Bottom Elevation	996.25		2.22	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas (Cathodic Protection)	1	1"	PE	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

SW gas cathodic protection for 12" HP gas.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 38Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

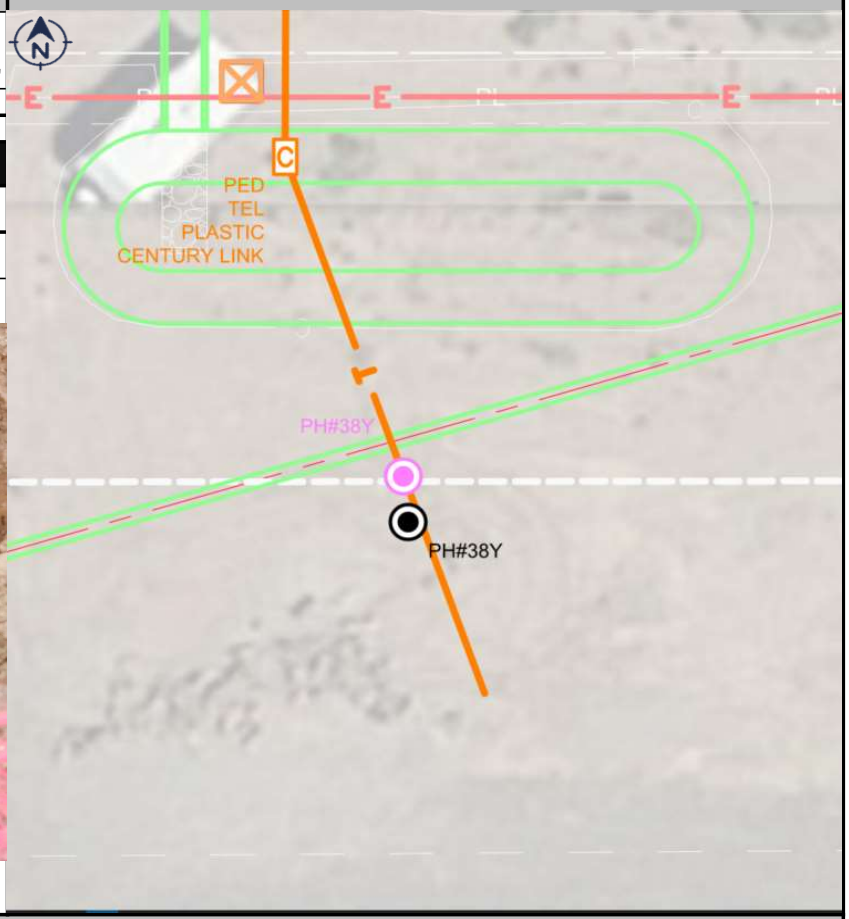
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336250.74	594078.29	995.90
Station	**Offset**	
1209+08.89	R 108.42 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING NE

Ref Point Elevation	995.90			
Top Elevation	994.07	**Pipe OD or Structure Height (inches)**	1.83	**Top Depth (FT)**
		1.32		
Bottom Elevation	993.96		1.94	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1"	PVC	NE & SW	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 39Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336398.72	594065.21	997.94
Station	**Offset**	
1208+96.00	L 39.57 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	997.94			
Top Elevation	991.18	**Pipe OD or Structure Height (inches)**	6.76	**Top Depth (FT)**
		4.80		
Bottom Elevation	990.78		7.16	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 40Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

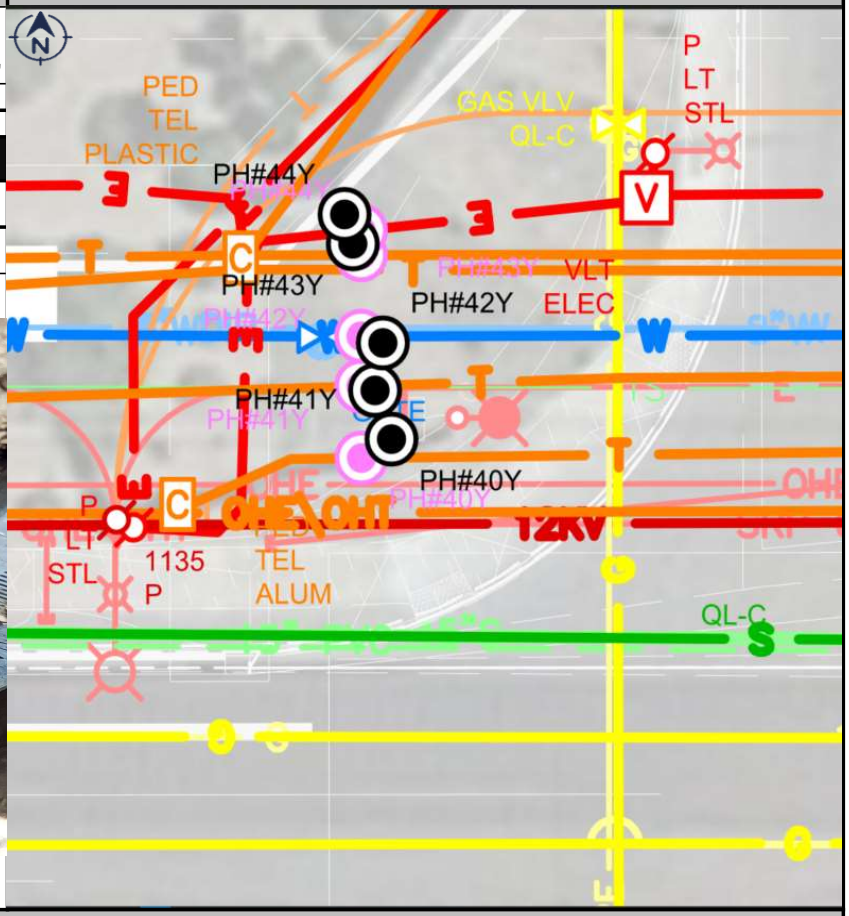
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336414.32	594816.64	0.00
Station	**Offset**	
1216+47.45	L 54.18 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.89			
Top Elevation	996.06	**Pipe OD or Structure Height (inches)**	3.83	**Top Depth (FT)**
		3.70		
Bottom Elevation	995.75		4.14	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 41Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

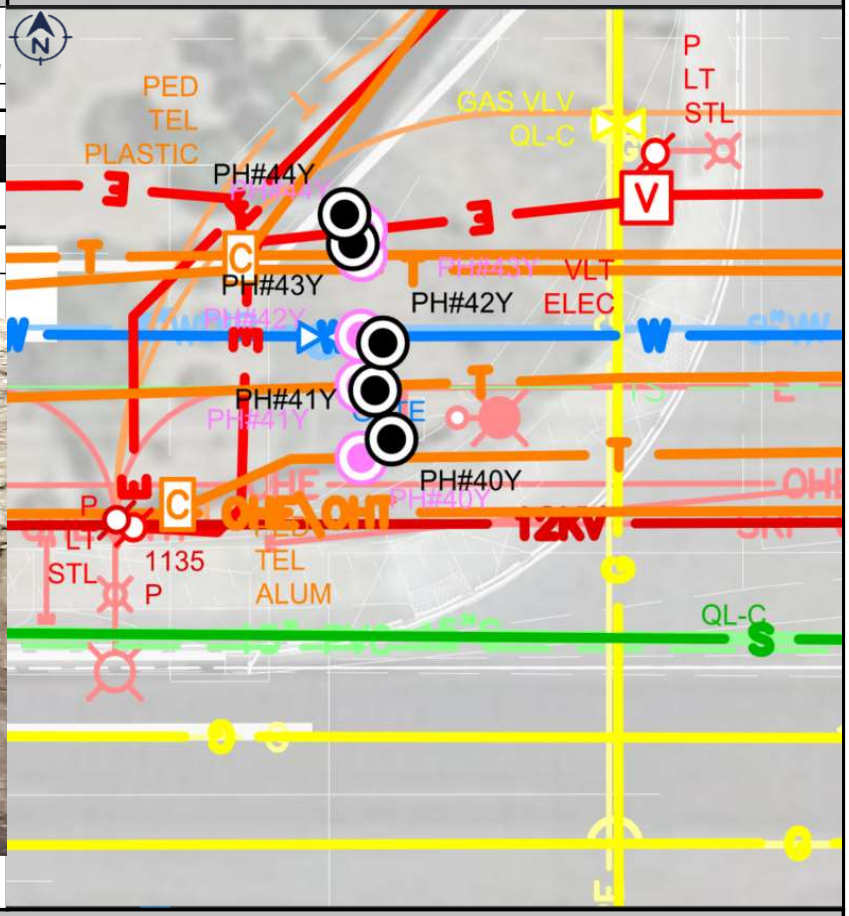
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336418.21	594815.30	0.00
Station	**Offset**	
1216+46.12	L 58.08 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.84			
Top Elevation	992.01	**Pipe OD or Structure Height (inches)**	7.83	**Top Depth (FT)**
		4.80		
Bottom Elevation	991.61		8.23	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 42Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/22/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

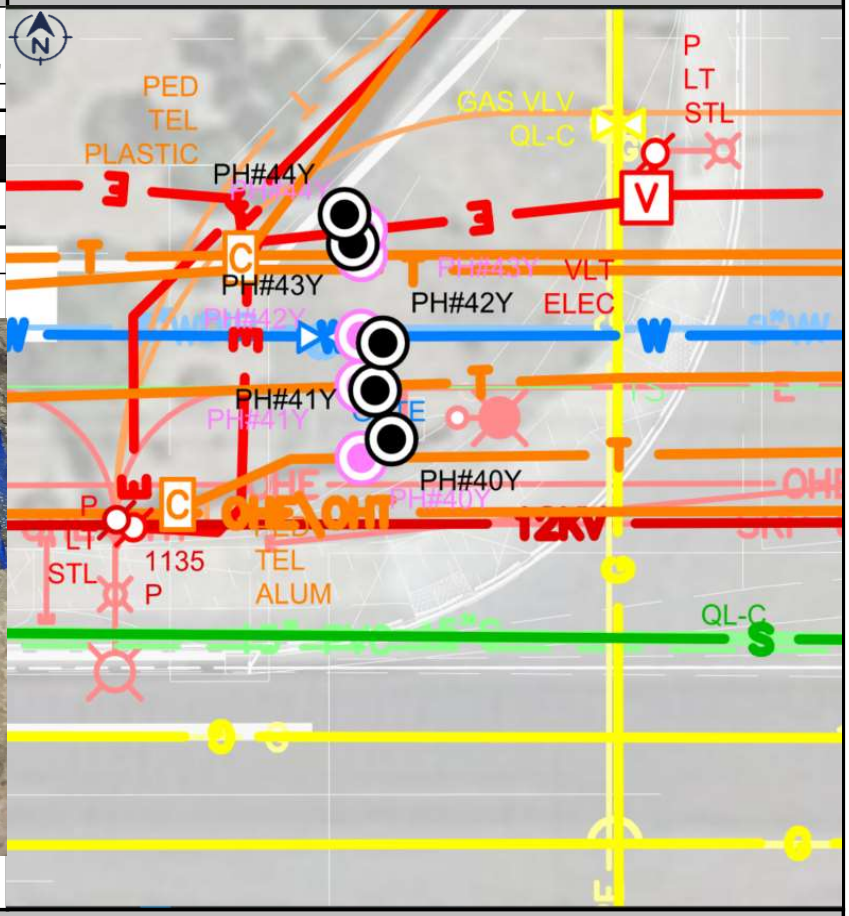
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

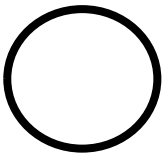
Northing	Easting	Surf Pin Elev
336421.97	594815.93	0.00
Station	**Offset**	
1216+46.75	L 61.84 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.83			
Top Elevation	994.61	**Pipe OD or Structure Height (inches)**	5.22	**Top Depth (FT)**
		9.05		
Bottom Elevation	993.86		5.97	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Water	1	8”	DIP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 43Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

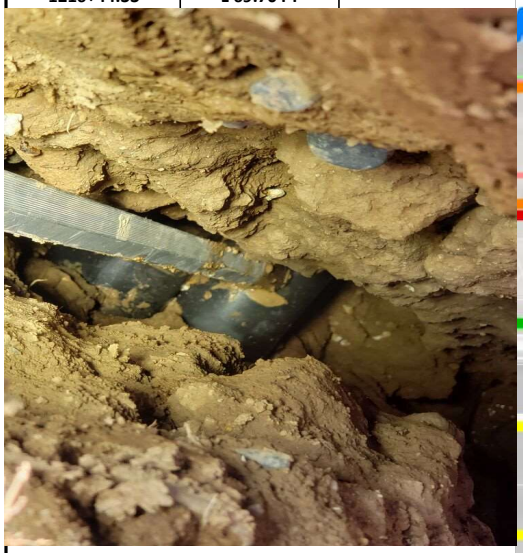
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

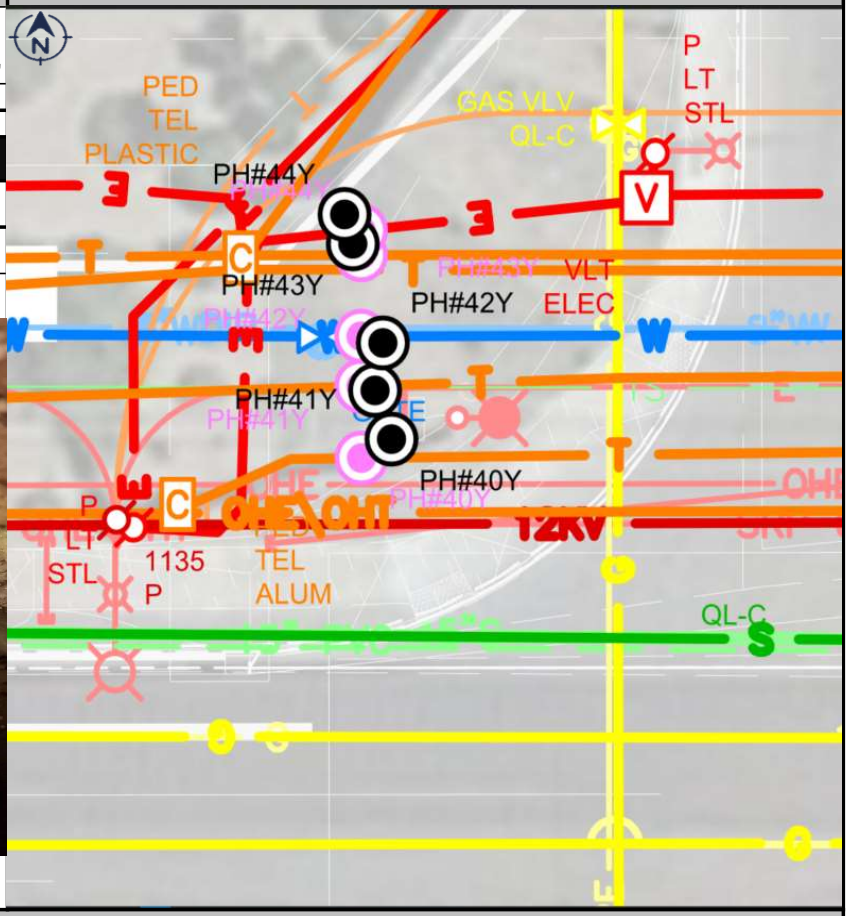
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336429.83	594813.50	0.00
Station	**Offset**	
1216+44.33	L 69.70 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.91			
Top Elevation	996.18	**Pipe OD or Structure Height (inches)**	3.73	**Top Depth (FT)**
		4.80		
Bottom Elevation	995.78		4.13	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Side by side conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 44Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

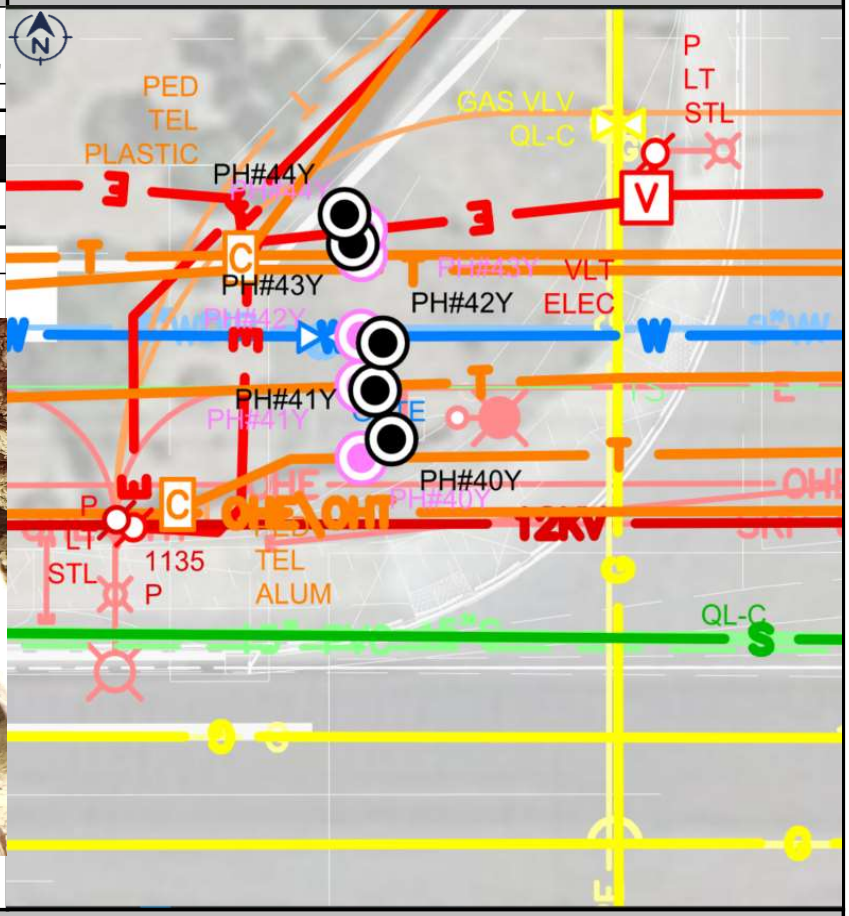
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336432.17	594812.83	0.00
Station	**Offset**	
1216+43.67	L 72.05 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.87			
Top Elevation	993.20	**Pipe OD or Structure Height (inches)**	6.67	**Top Depth (FT)**
		3.50		
Bottom Elevation	992.91		6.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	3"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 45Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
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POTHOLE REPORT

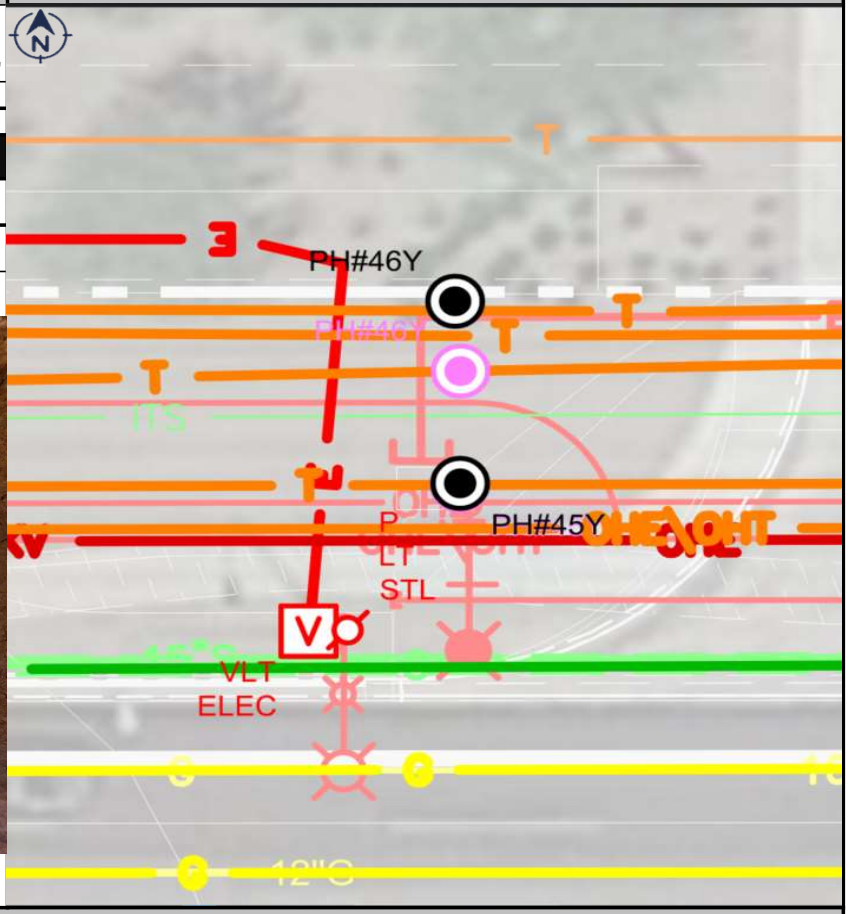
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336413.65	595374.12	0.00
Station	**Offset**	
1222+04.93	L 52.79 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.44			
Top Elevation	995.98	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		2.38		
Bottom Elevation	995.78		4.66	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 46Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

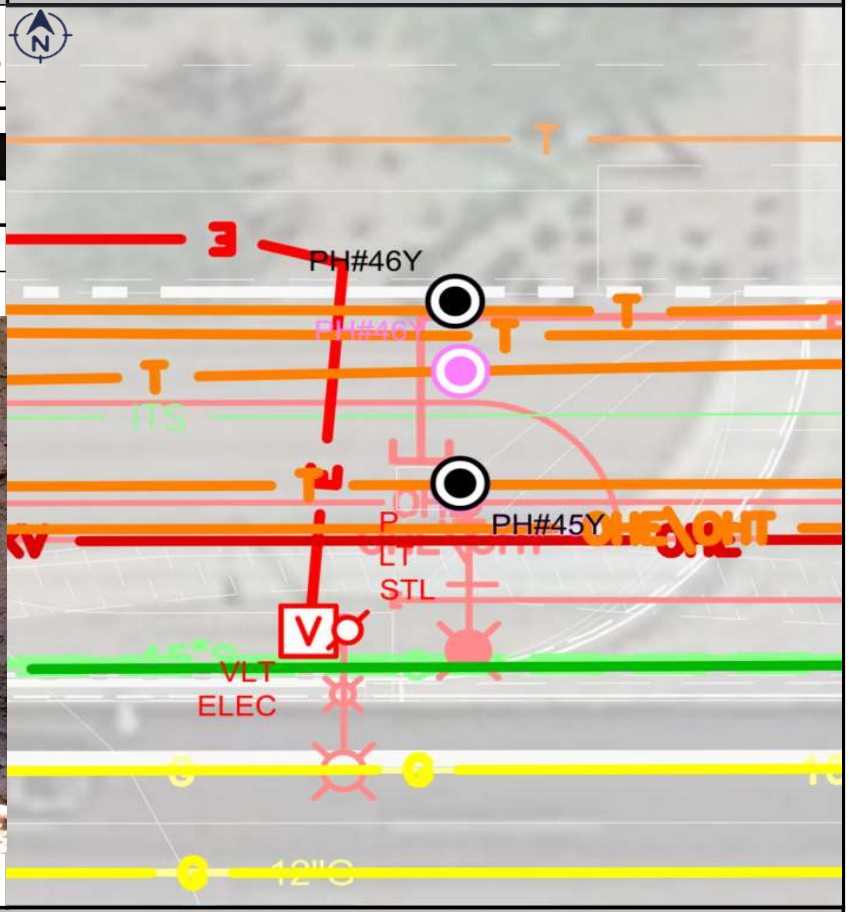
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336428.11	595373.75	0.00
Station	**Offset**	
1222+04.59	L 67.25 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.83			
Top Elevation	996.72	**Pipe OD or Structure Height (inches)**	3.11	**Top Depth (FT)**
		10.00		
Bottom Elevation	995.89		3.94	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Stacked conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 47Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/15/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

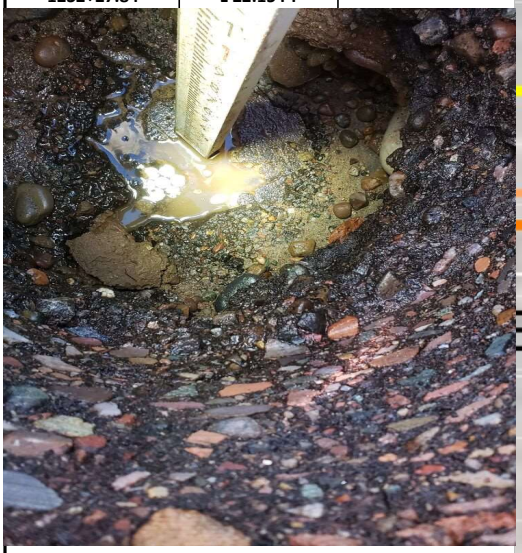
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

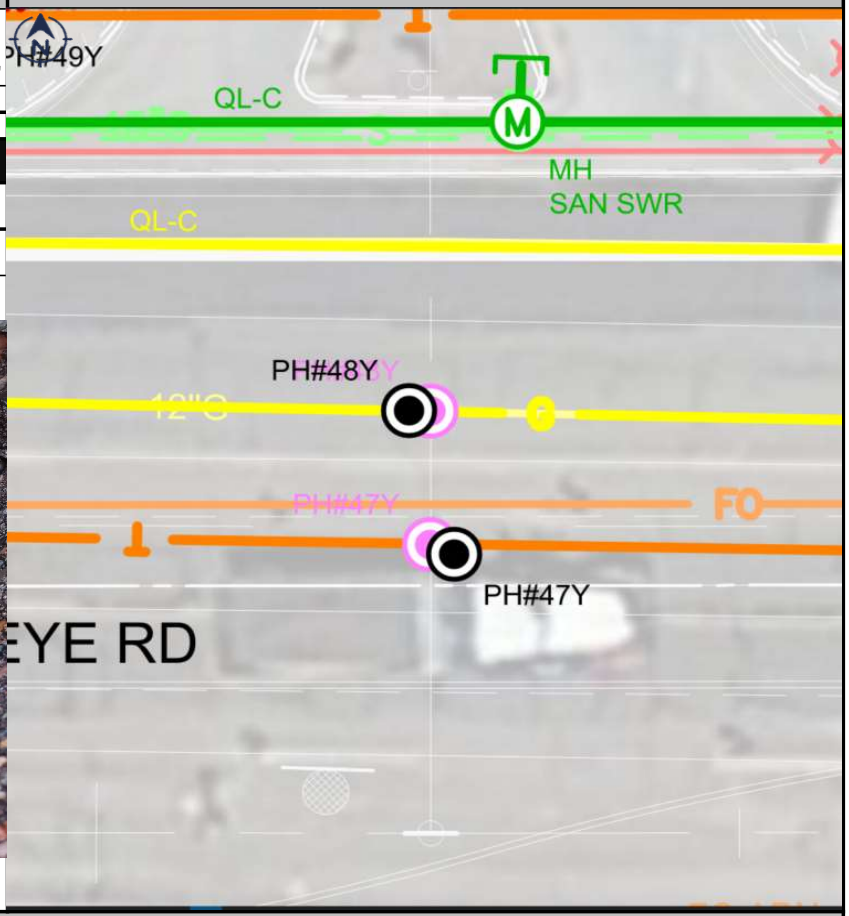
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336367.67	596396.90	0.00
Station	**Offset**	
1232+27.84	L 22.15 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.09			
Top Elevation	999.42	**Pipe OD or Structure Height (inches)**	1.67	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCI	Comm	Not Found	See Comments		EAST & WEST		Core & Reinstate

Comments

Hit second layer of concrete below the roadway and could not break through.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 48Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/15/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

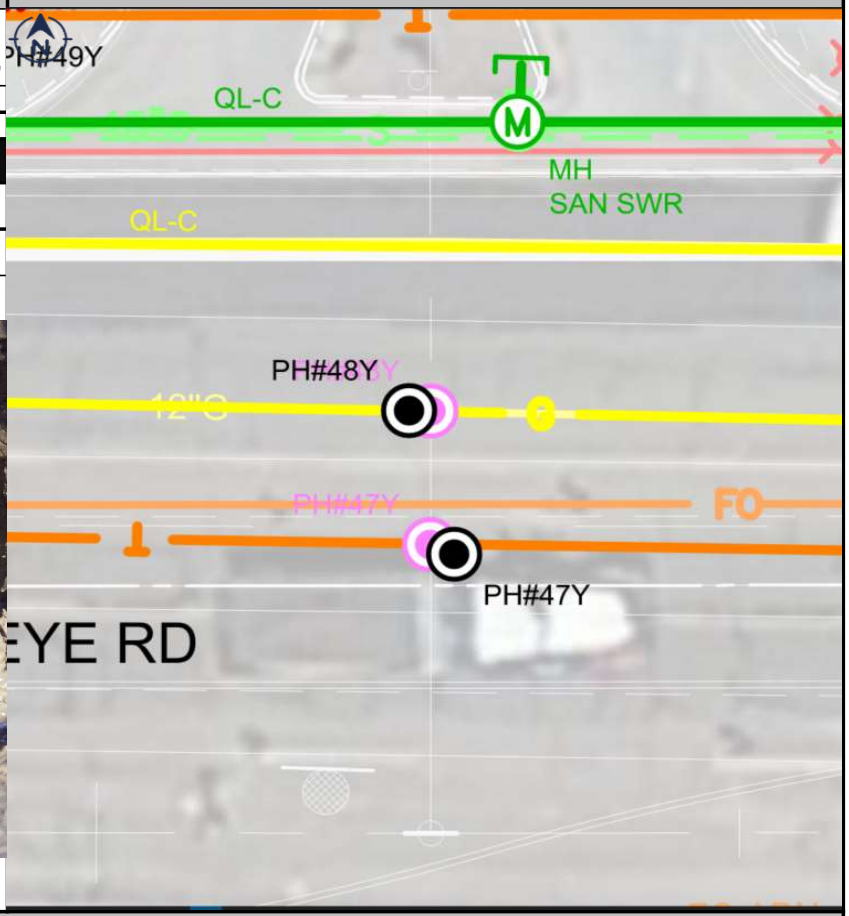
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336379.07	596393.39	0.00
Station	**Offset**	
1232+24.32	L 33.55 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.02			
Top Elevation	994.74	**Pipe OD or Structure Height (inches)**	6.28	**Top Depth (FT)**
		12.75		
Bottom Elevation	993.68		7.34	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas High Pressure	1	12"	Steel	EAST & WEST	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 49Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

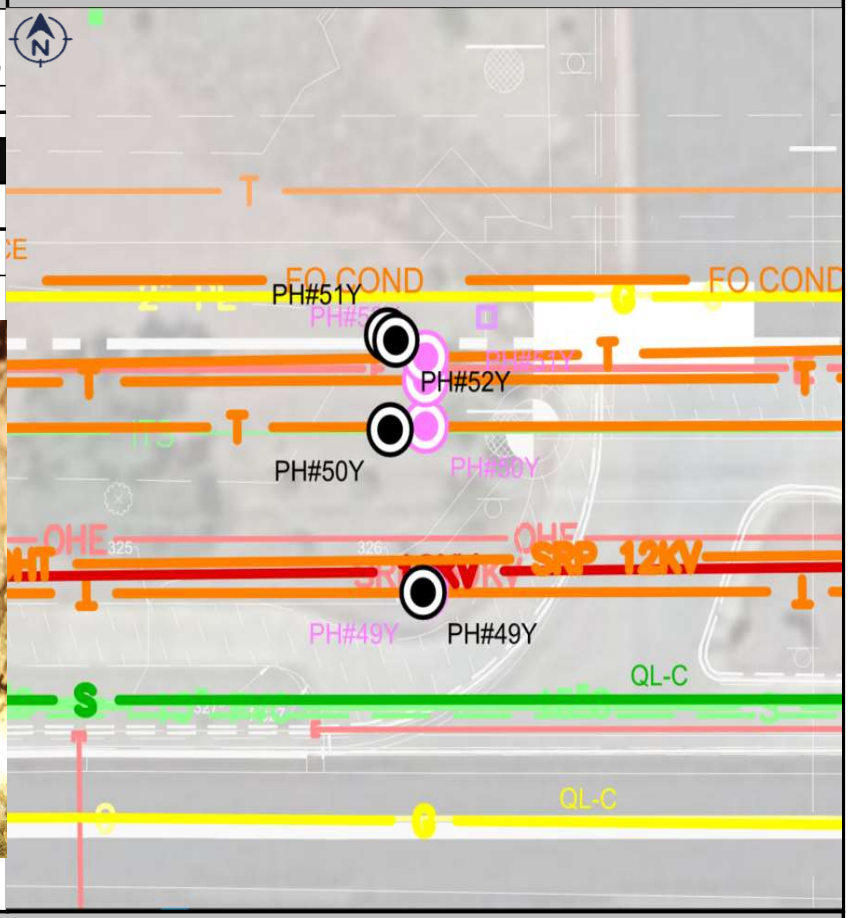
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

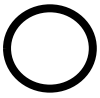
Northing	Easting	Surf Pin Elev
336410.44	596359.08	0.00
Station	**Offset**	
1231+89.80	L 64.87 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.88			
Top Elevation	997.85	**Pipe OD or Structure Height (inches)**	3.03	**Top Depth (FT)**
		2.38		
Bottom Elevation	997.65		3.23	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 50Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/18/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

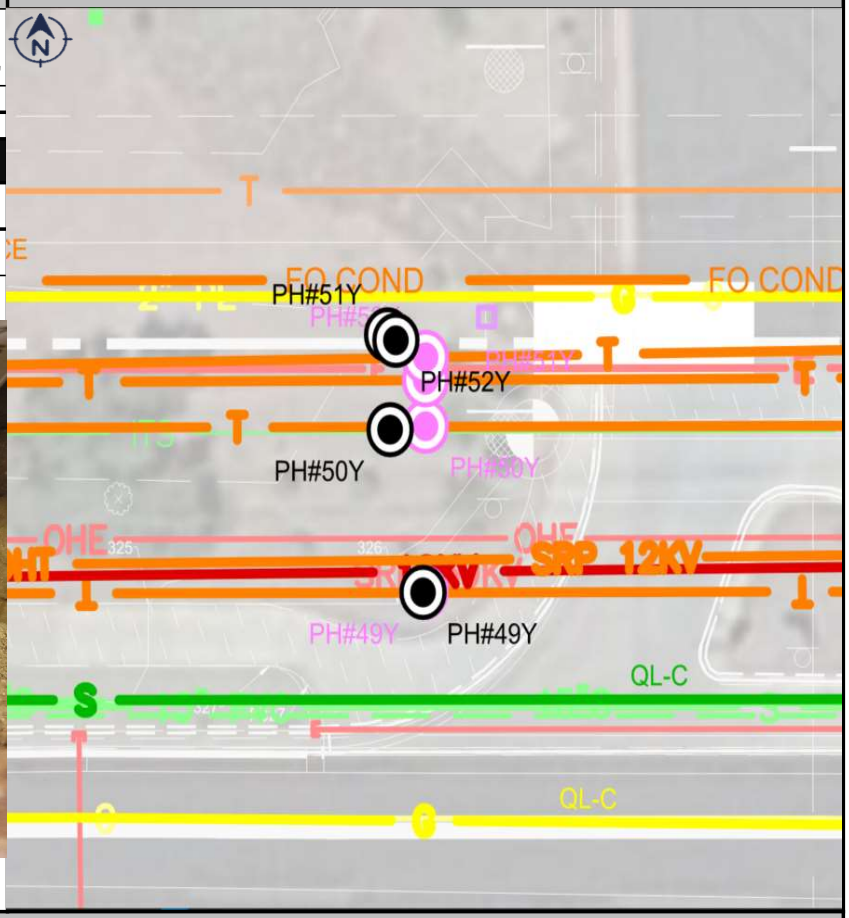
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336423.28	596356.06	0.00
Station	**Offset**	
1231+86.71	L 77.70 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.60			
Top Elevation	994.88	**Pipe OD or Structure Height (inches)**	5.72	**Top Depth (FT)**
		3.70		
Bottom Elevation	994.57		6.03	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
MCDOT	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 51Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

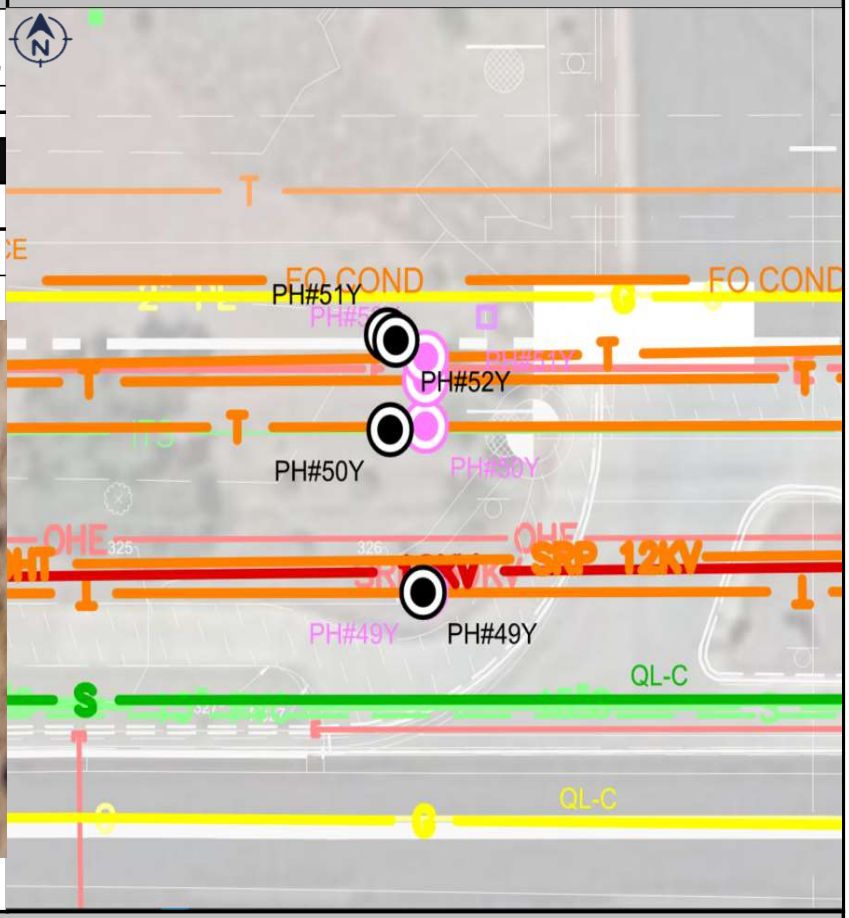
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336430.80	596355.83	0.00
Station	**Offset**	
1231+86.45	L 85.22 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.15			
Top Elevation	994.02	**Pipe OD or Structure Height (inches)**	6.13	**Top Depth (FT)**
		10.00		
Bottom Elevation	993.18		6.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

PH 51Y an 52Y joint trench - Stacked conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 52Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

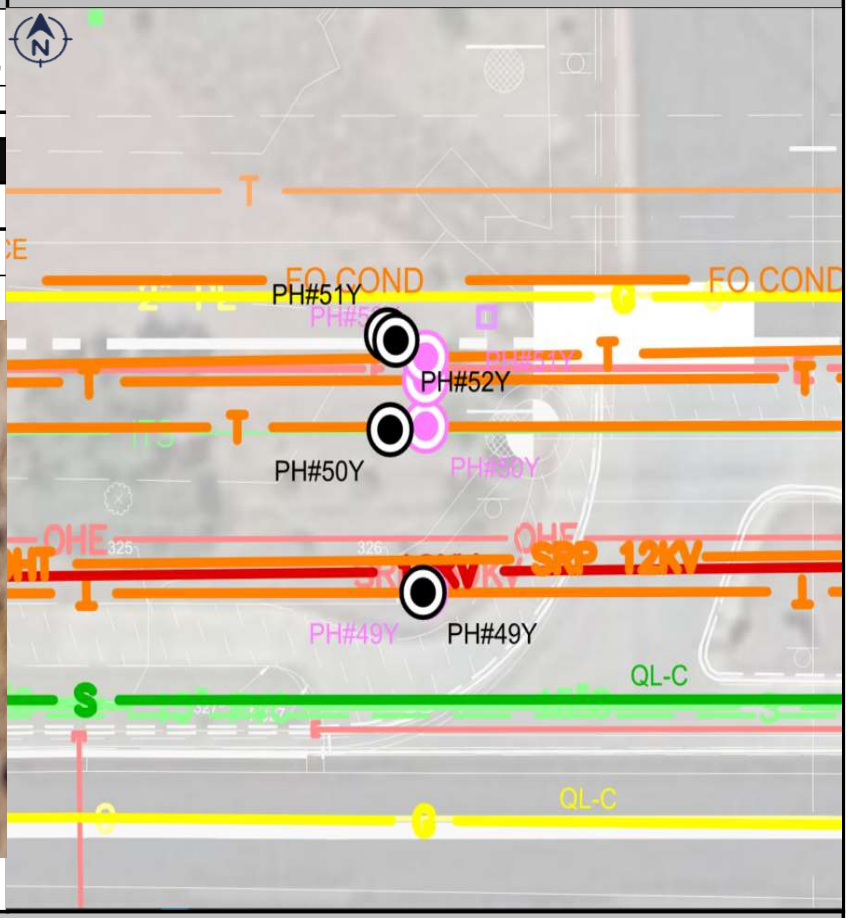
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

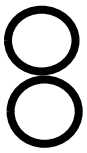
Northing	Easting	Surf Pin Elev
336430.36	596356.61	0.00
Station	**Offset**	
1231+87.24	L 84.78 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.17			
Top Elevation	994.04	**Pipe OD or Structure Height (inches)**	6.13	**Top Depth (FT)**
		10.00		
Bottom Elevation	993.20		6.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

PH 51Y an 52Y joint trench - Stacked conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 53Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

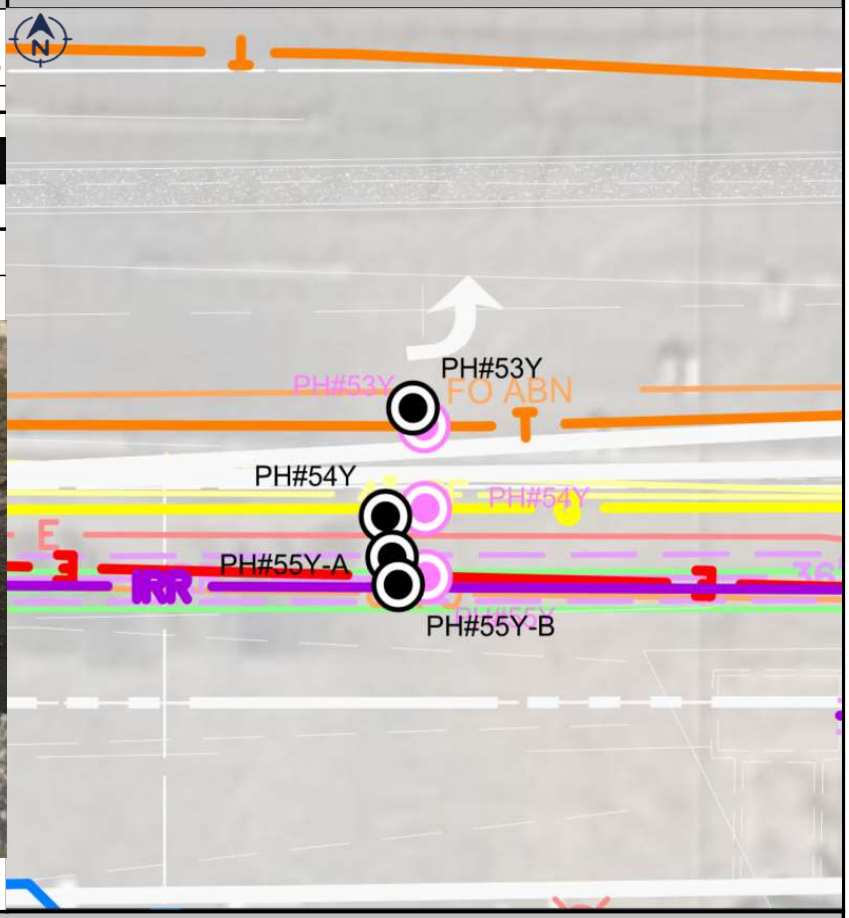
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

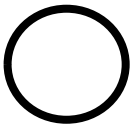
Northing	Easting	Surf Pin Elev
336338.61	596518.28	0.00
Station	**Offset**	
1233+49.11	R 7.75 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.95			
Top Elevation	995.38	**Pipe OD or Structure Height (inches)**	5.57	**Top Depth (FT)**
		12.75		
Bottom Elevation	994.32		6.63	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
AT&T	Comm	1	12”	Steel	EAST & WEST	Rocky	Cut & Patch

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 54Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

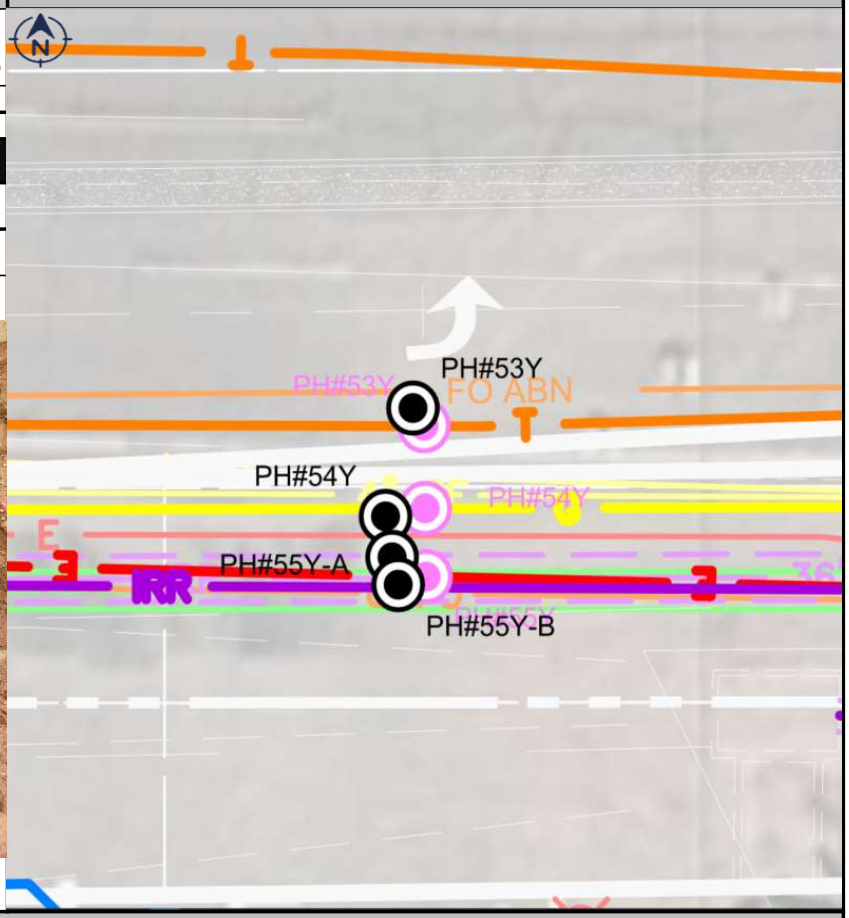
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336330.06	596516.04	0.00
Station	**Offset**	
1233+46.76	R 16.26 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.96			
Top Elevation	997.67	**Pipe OD or Structure Height (inches)**	3.29	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.27		3.69	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 55Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

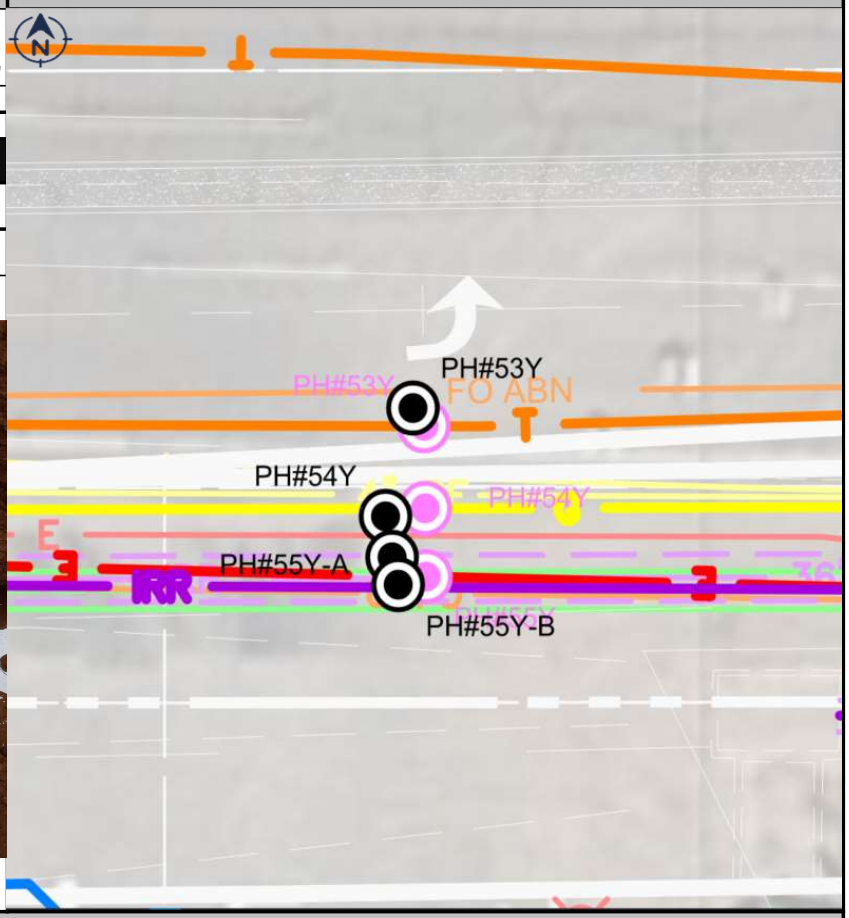
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336326.81	596516.56	0.00
Station	**Offset**	
1233+47.24	R 19.52 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.94			
Top Elevation	998.52	**Pipe OD or Structure Height (inches)**	2.42	**Top Depth (FT)**
		1.32		
Bottom Elevation	998.41		2.53	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	1"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Also found SRP IRR - See pothole 55Y-B.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 55Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

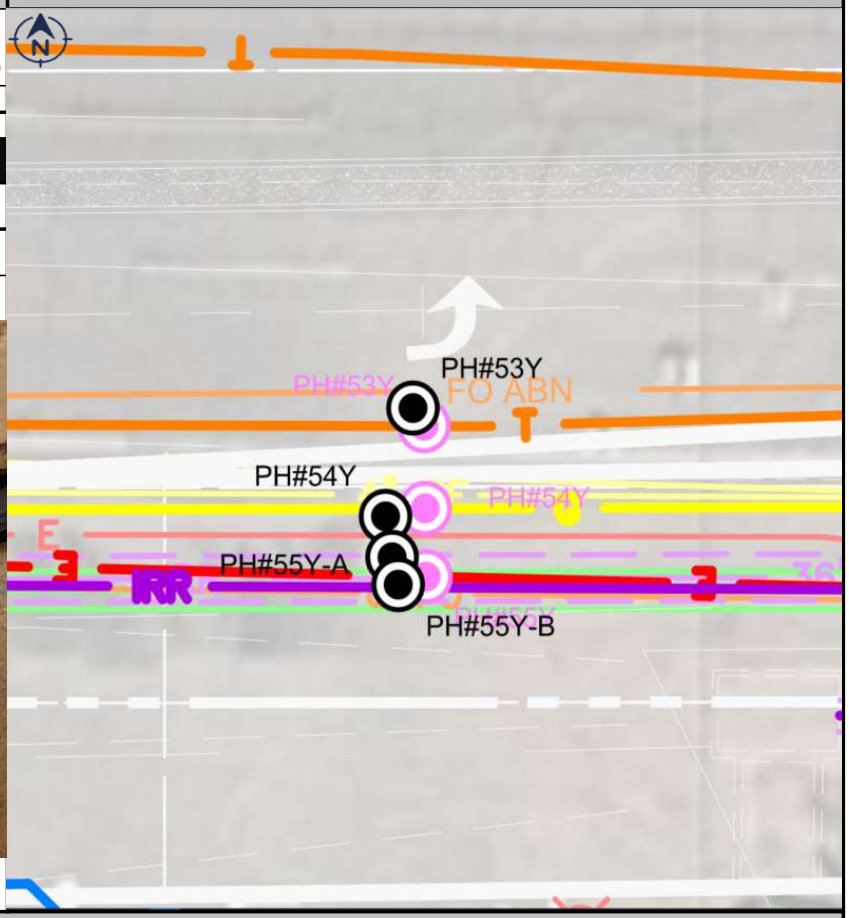
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336324.65	596517.08	0.00
Station	**Offset**	
1233+47.73	R 21.69 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.92			
Top Elevation	997.68	**Pipe OD or Structure Height (inches)**	3.24	**Top Depth (FT)**
		44.00		
Bottom Elevation	994.01		6.91	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Irrigation	1	36"	RCP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 56Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/14/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

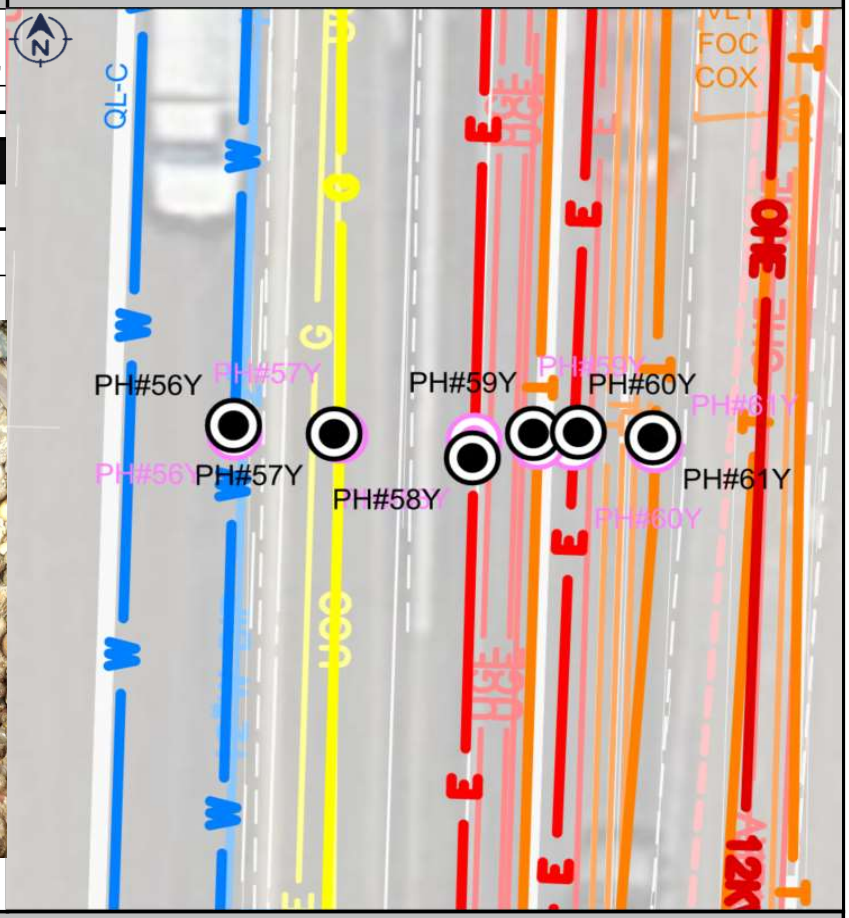
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

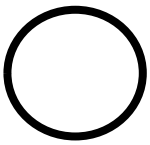
Northing	Easting	Surf Pin Elev
336166.25	596817.03	0.00
Station	**Offset**	
318+00.60	R 17.22 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.34			
Top Elevation	997.10	**Pipe OD or Structure Height (inches)**	4.24	**Top Depth (FT)**
		13.20		
Bottom Elevation	996.00		5.34	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Water	1	12"	DIP	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 57Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/14/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

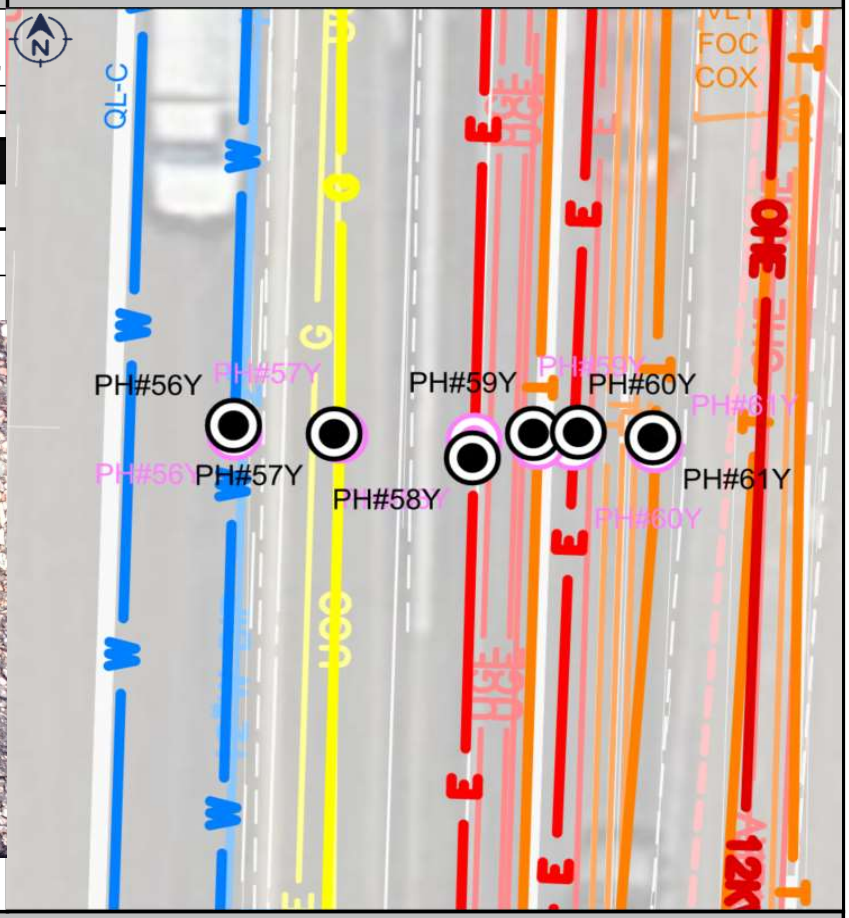
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336165.57	596824.71	0.00
Station	**Offset**	
318+00.17	R 24.93 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.36			
Top Elevation	998.02	**Pipe OD or Structure Height (inches)**	3.34	**Top Depth (FT)**
		4.00		
Bottom Elevation	997.69		3.67	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4"	PE	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 58Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/14/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

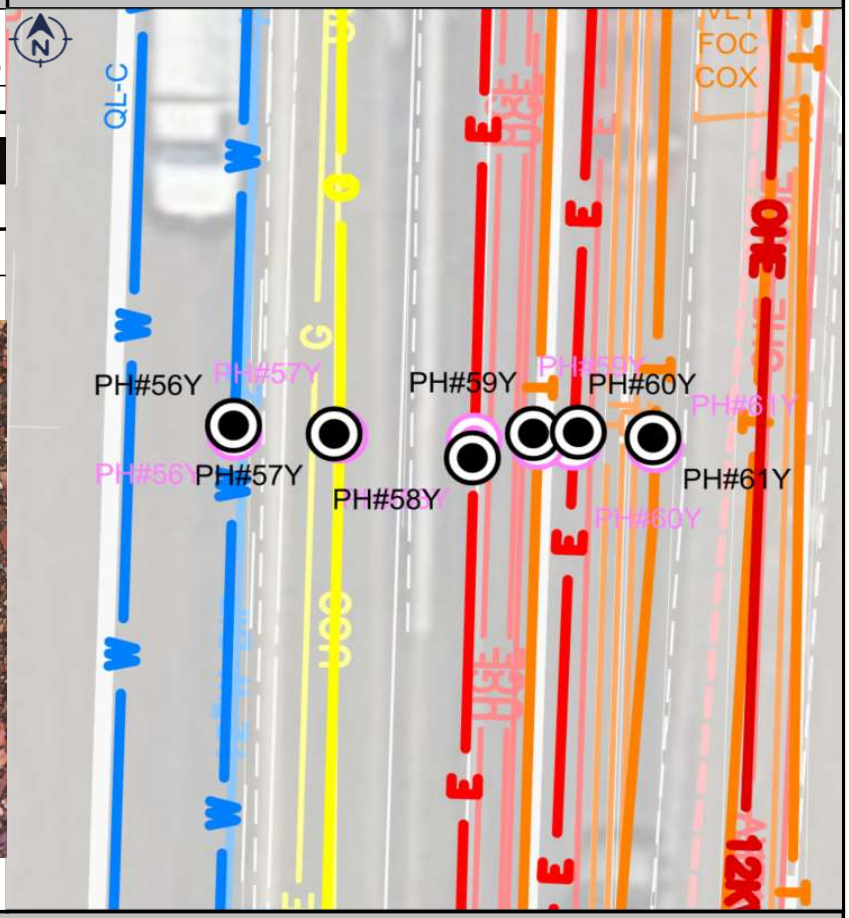
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336163.67	596835.27	0.00
Station	**Offset**	
317+98.60	R 35.54 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.26			
Top Elevation	996.41	**Pipe OD or Structure Height (inches)**	4.85	**Top Depth (FT)**
		5.50		
Bottom Elevation	995.95		5.31	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	4+	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Visually verified 4 conduits side by side. Attempted to clear below but could not get through the hard soil.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 59Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

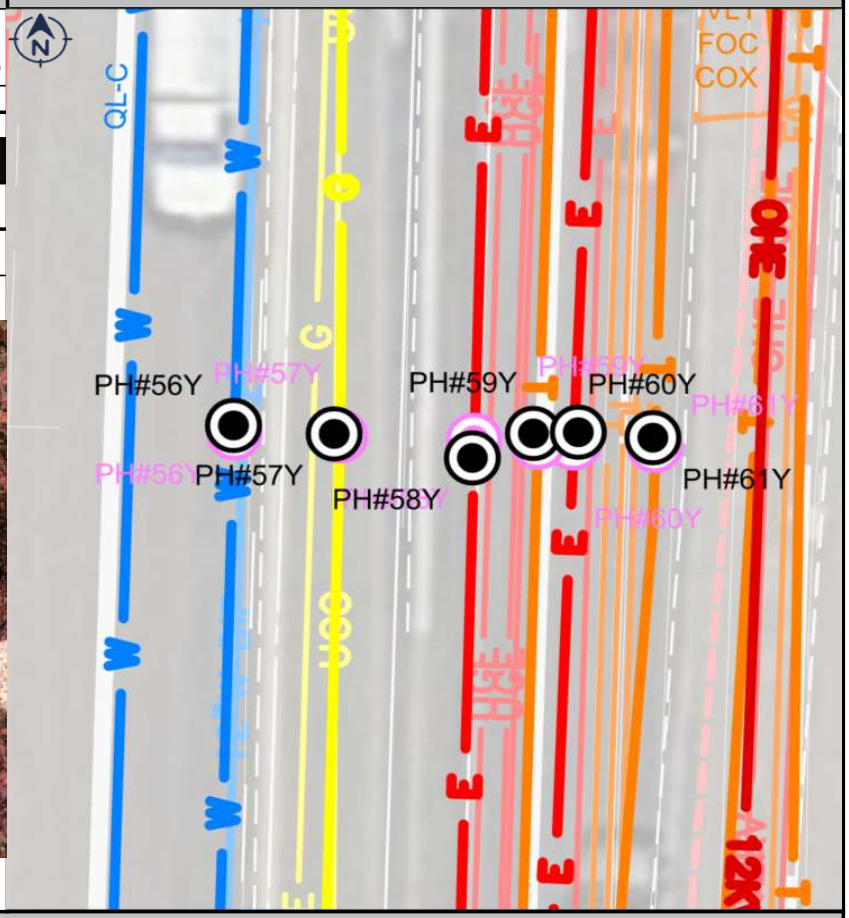
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336165.58	596839.93	0.00
Station	**Offset**	
318+00.66	R 40.14 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.20			
Top Elevation	996.74	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		1.25		
Bottom Elevation	996.63		4.56	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 60Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

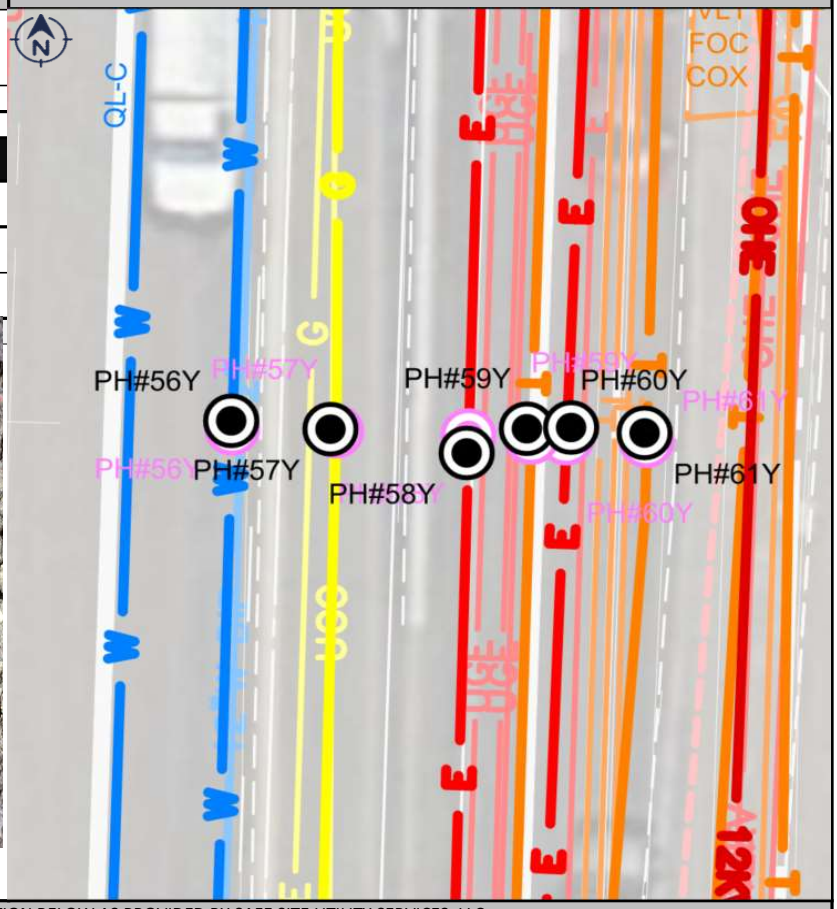
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

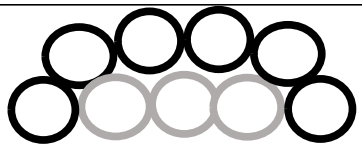
Northing	Easting	Surf Pin Elev
336165.71	596843.37	0.00
Station	**Offset**	
318+00.90	R 43.57 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



Not able to visually verify all conduits

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.13			
Top Elevation	996.82	**Pipe OD or Structure Height (inches)**	4.31	**Top Depth (FT)**
		3.50		
Bottom Elevation	996.53		4.60	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	6+	3"	PVC	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Visually verified 6 conduits. Hard caliche soil directly below the conduits. Could not clear below the 6 conduits. Verify conduit count with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 61Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/8/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

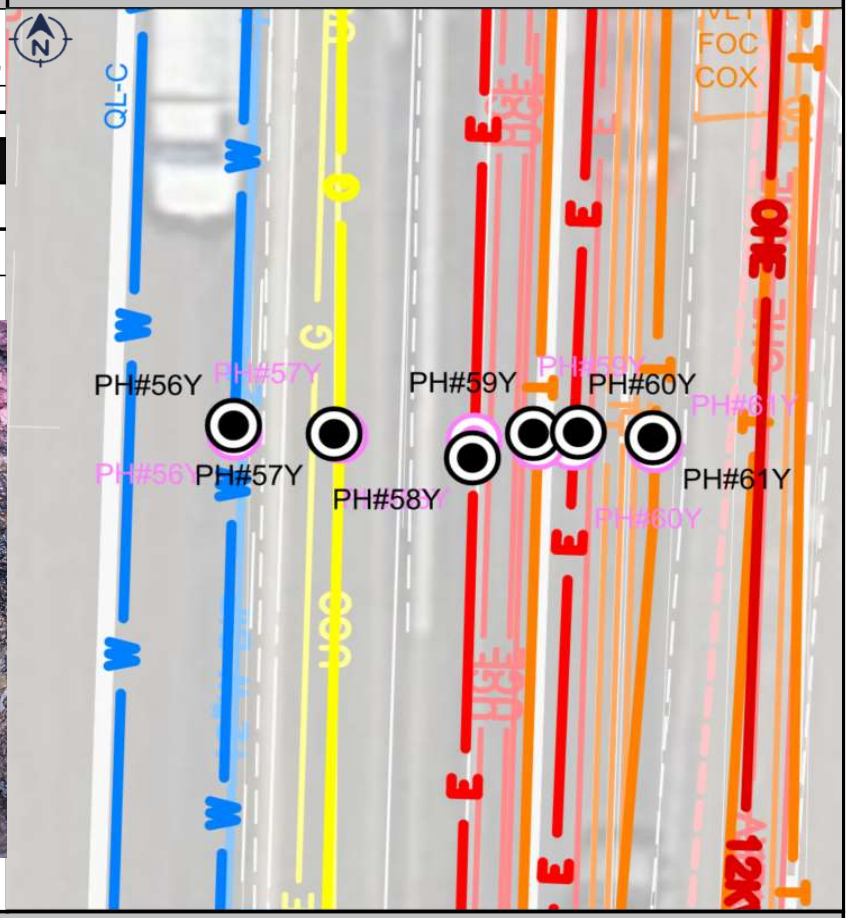
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336165.25	596849.09	0.00
Station	**Offset**	
318+00.62	R 49.30 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.03			
Top Elevation	997.79	**Pipe OD or Structure Height (inches)**	3.24	**Top Depth (FT)**
		4.00		
Bottom Elevation	997.45		3.57	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	2"	Direct Buried Cable	NORTH & SOUTH	Rocky	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 62Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

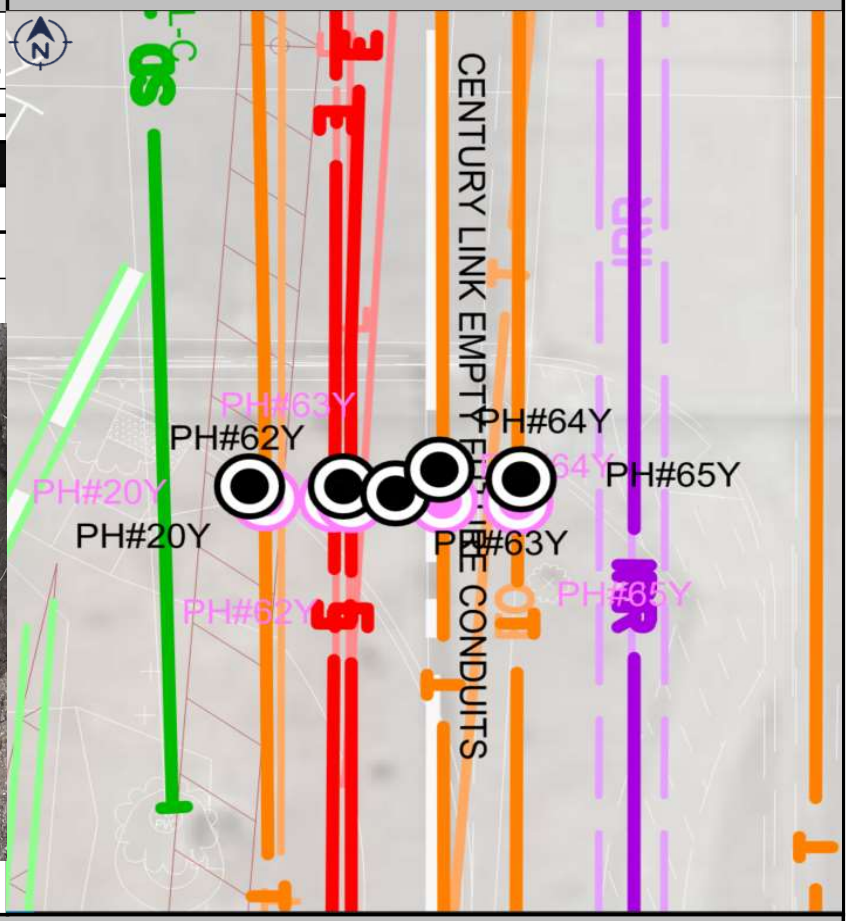
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336992.65	596767.17	0.00
Station	**Offset**	
326+25.89	**L 47.93 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1003.22			
Top Elevation	998.60	**Pipe OD or Structure Height (inches)**	4.62	**Top Depth (FT)**
		2.38		
Bottom Elevation	998.40		4.82	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	2	2”	PE	NORTH & SOUTH	Rocky	None Off-Road

Comments

Side by Side.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 63Y		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

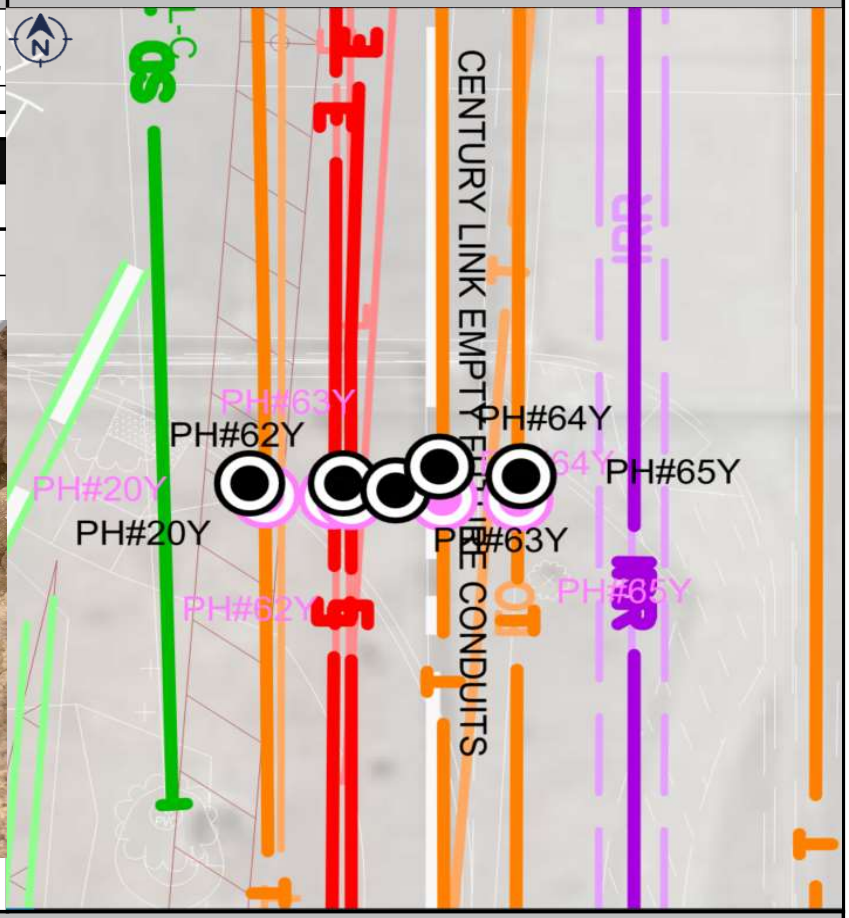
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336992.18	596770.38	0.00
Station	**Offset**	
326+25.47	L 44.71 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1003.28			
Top Elevation	996.28	**Pipe OD or Structure Height (inches)**	7.00	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	0	See Comments				

Comments

Found joint trench with PH 62Y . Bluestake marked at this location so we cleared marks down to 7.00'.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 64Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/21/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

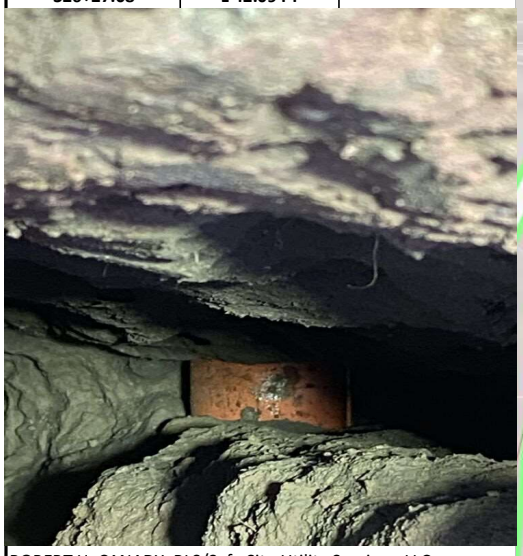
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

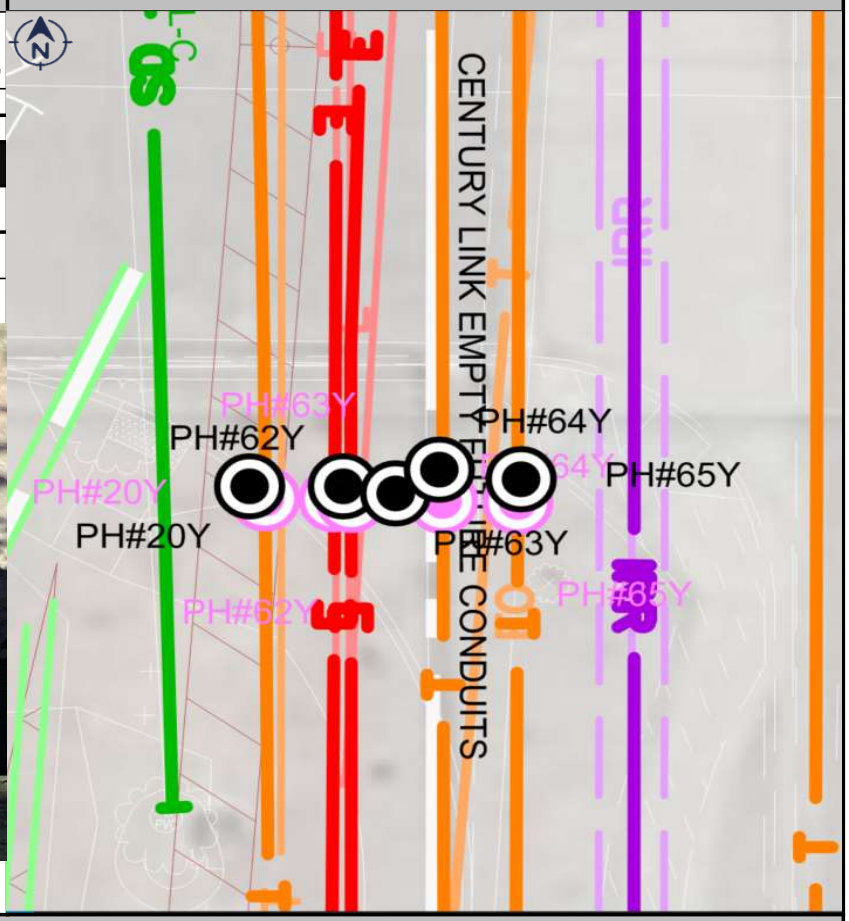
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336993.75	596773.04	0.00
Station	**Offset**	
326+27.08	L 42.09 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1003.57			
Top Elevation	996.77	**Pipe OD or Structure Height (inches)**	6.80	**Top Depth (FT)**
		4.80		
Bottom Elevation	996.37		7.20	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	4”	PE	NORTH & SOUTH	Rocky	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 65Y		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/21/2021		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

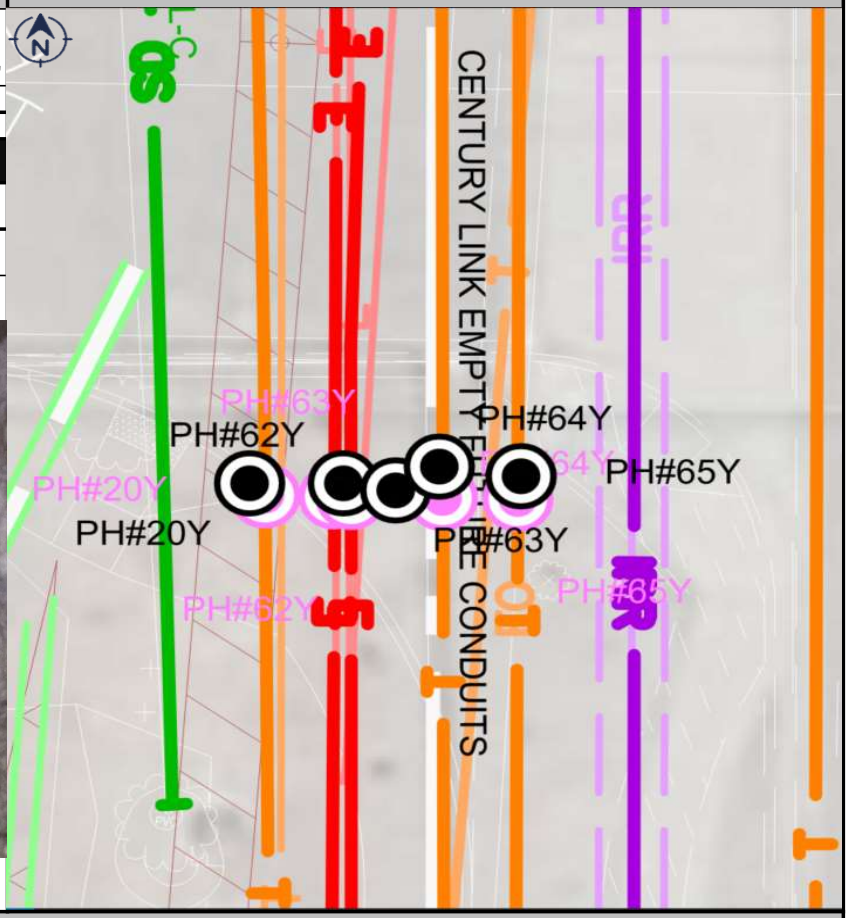
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336993.10	596778.04	0.00
Station	**Offset**	
326+26.51	**L 37.07 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1003.76			
Top Elevation	998.46	**Pipe OD or Structure Height (inches)**	5.30	**Top Depth (FT)**
		2.38		
Bottom Elevation	998.27		5.50	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
AT&T	Comm	2	2”	PE	NORTH & SOUTH	Rocky	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 66Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/29/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

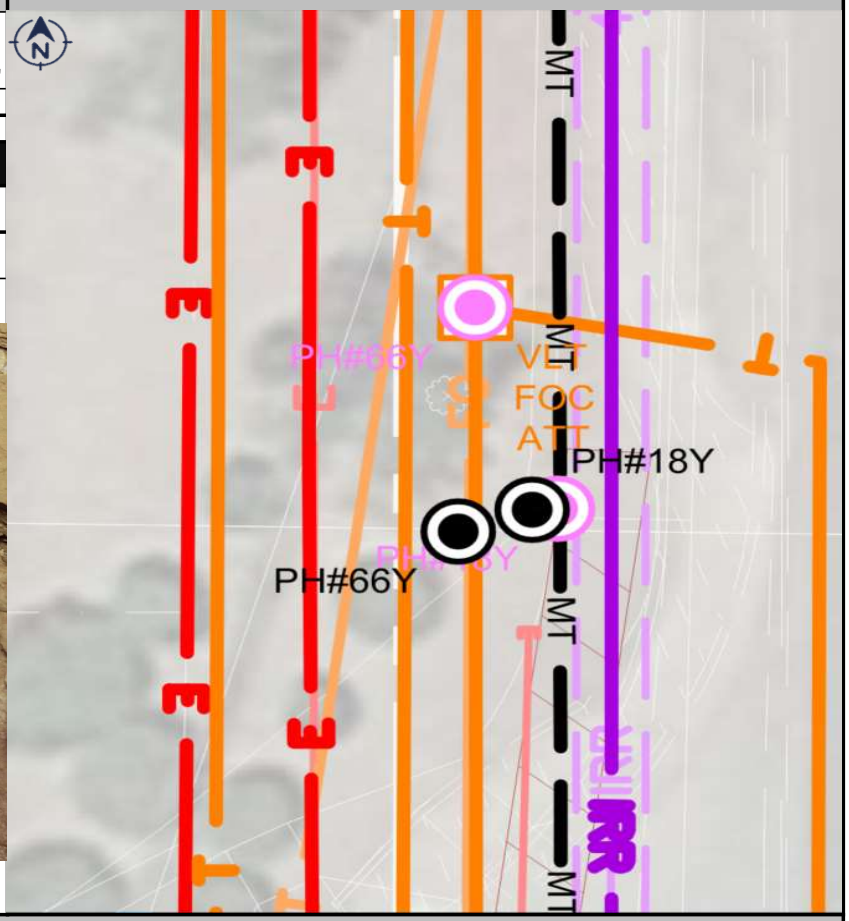
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
337416.51	596776.36	0.00
Station	**Offset**	
330+49.84	L 45.23 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1005.02			
Top Elevation	1,000.09	**Pipe OD or Structure Height (inches)**	4.93	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
AT&T	Comm	3	1"	PE	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 67Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

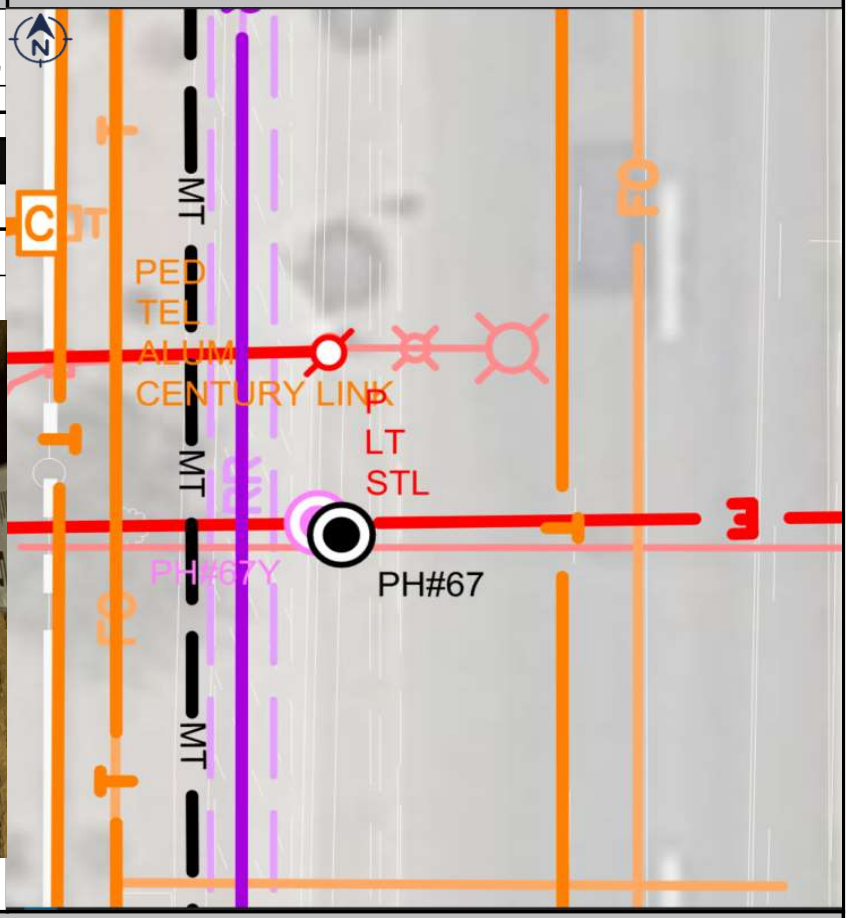
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

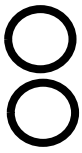
Northing	Easting	Surf Pin Elev
337496.58	596791.54	0.00
Station	**Offset**	
0.00	0.00	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.70			
Top Elevation	996.79	**Pipe OD or Structure Height (inches)**	7.91	**Top Depth (FT)**
		3.50		
Bottom Elevation	996.50		8.20	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	2	3”	PVC	NORTH & SOUTH	Rocky	None Off-Road

Comments

Stacked conduits.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 68Y-A		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334695.71	596709.91	0.00
Station	**Offset**	
303+27.24	**L 64.64 FT**	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.90			
Top Elevation	995.01	**Pipe OD or Structure Height (inches)**	3.89	**Top Depth (FT)**
		1.25		
Bottom Elevation	994.90		3.99	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	1	1"	Direct Buried Cable	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 68Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334708.54	596709.63	0.00
Station	**Offset**	
303+41.19	L 65.28 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

Insert aerial photo with location here

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.95			
Top Elevation	995.07	**Pipe OD or Structure Height (inches)**	3.88	**Top Depth (FT)**
		3.70		
Bottom Elevation	994.77		4.19	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Private	Comm	4	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Side by Side.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 69 EM DEPTH	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

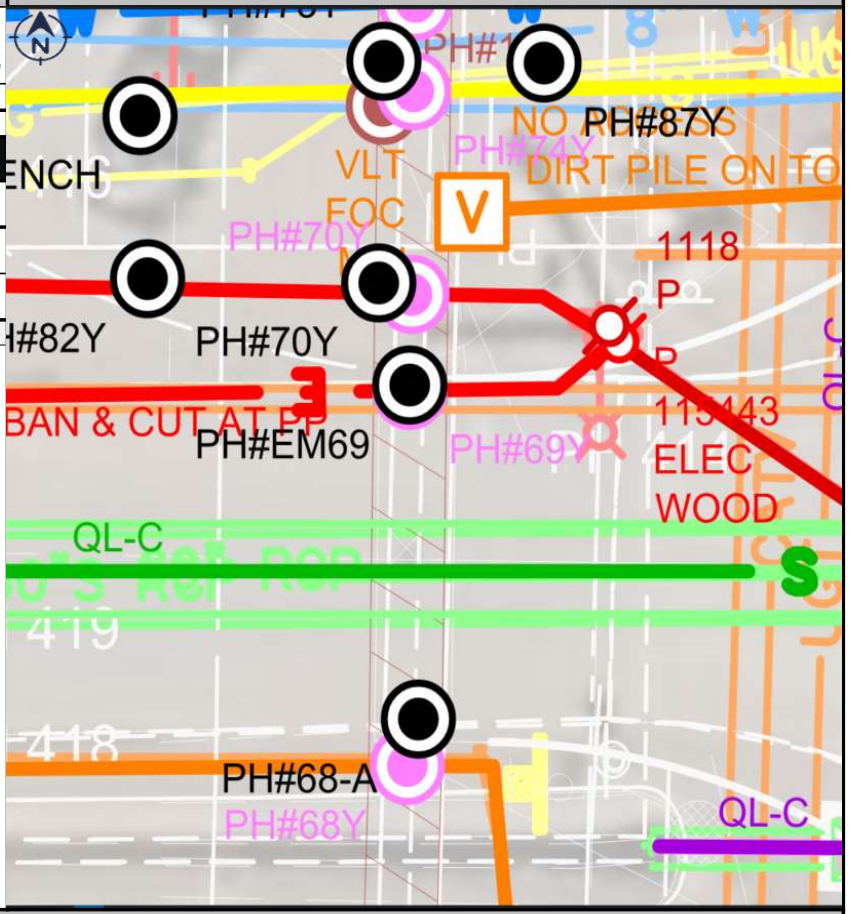
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334726.98	596709.12	0.00
Station	**Offset**	
303+59.62	L 66.05 FT	

Insert Surveyors Seal here

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	998.92			
Top Elevation	0.00	**Pipe OD or Structure Height (inches)**		**Top Depth (FT)**
Bottom Elevation	0.00	3.70	0.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3	1.5"	DBC	EAST & WEST	See Comments	

Comments

Abandoned Electric 3) 1.5" Direct Buried Cables. Did not pothole. EM Depth only - EM depth shows between 3.5' & 4.00'.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 70Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

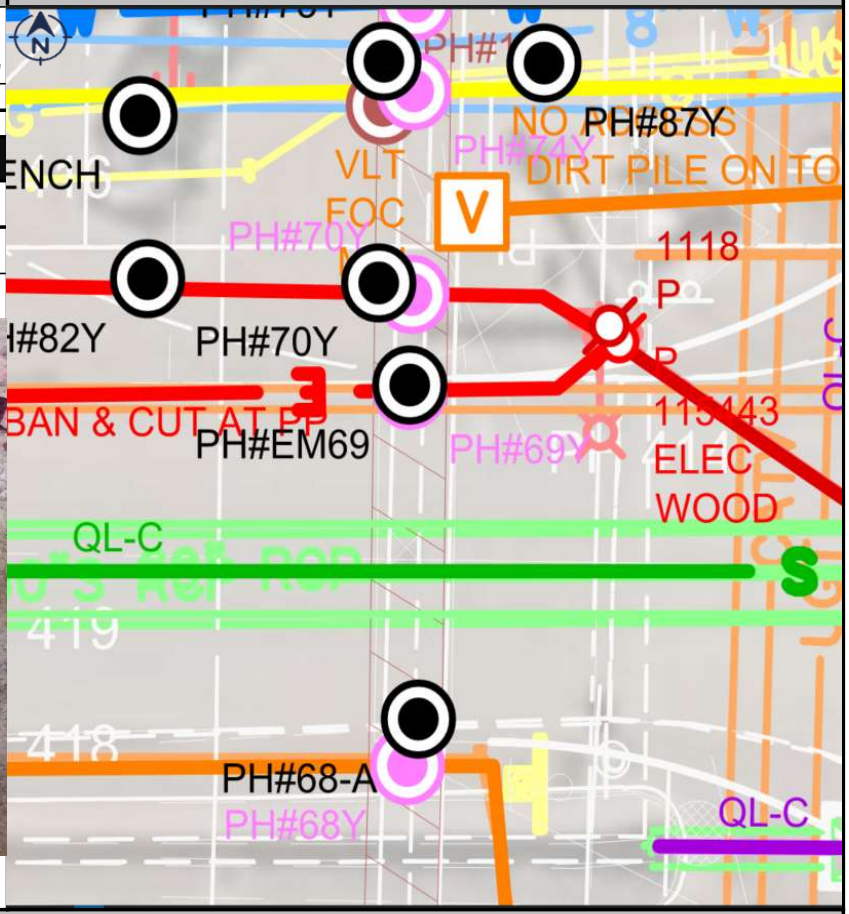
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334732.62	596707.33	0.00
Station	**Offset**	
303+65.24	L 67.92 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.36			
Top Elevation	995.63	**Pipe OD or Structure Height (inches)**	3.73	**Top Depth (FT)**
		4.80		
Bottom Elevation	995.23		4.13	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 71Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

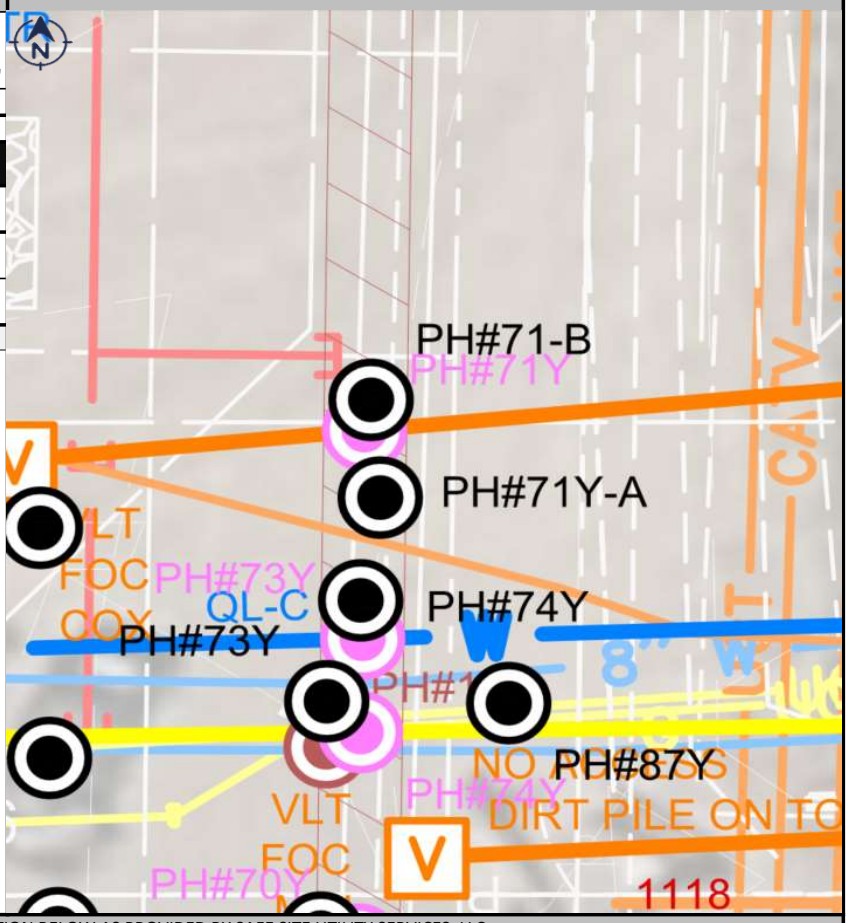
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334755.61	596710.37	0.00
Station	**Offset**	
303+88.27	L 65.20 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.42			
Top Elevation	993.21	**Pipe OD or Structure Height (inches)**	6.21	**Top Depth (FT)**
		7.00		
Bottom Elevation	992.62		6.79	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Cox	F/O	3	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 71Y-B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

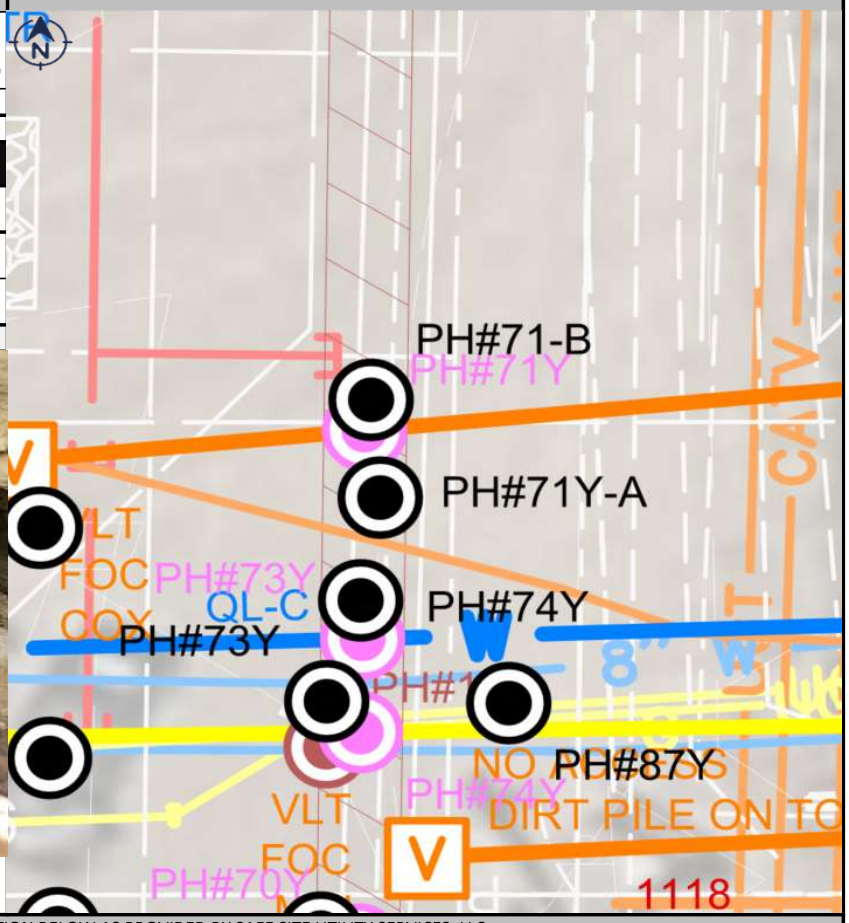
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334760.79	596709.90	0.00
Station	**Offset**	
303+93.44	L 65.75 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.44			
Top Elevation	992.96	**Pipe OD or Structure Height (inches)**	6.48	**Top Depth (FT)**
		6.10		
Bottom Elevation	992.45		6.99	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Cox	F/O	4	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 72Y-A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

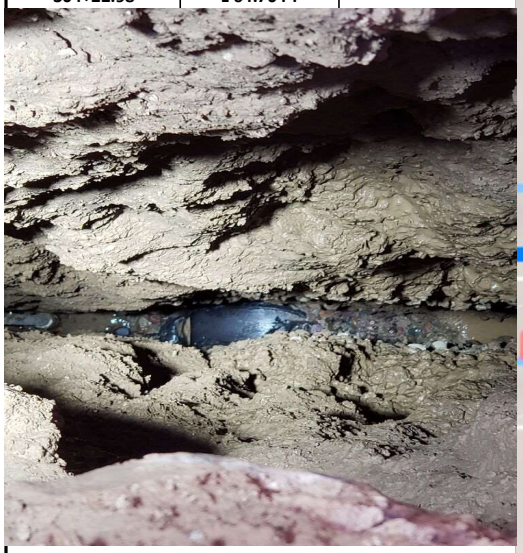
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

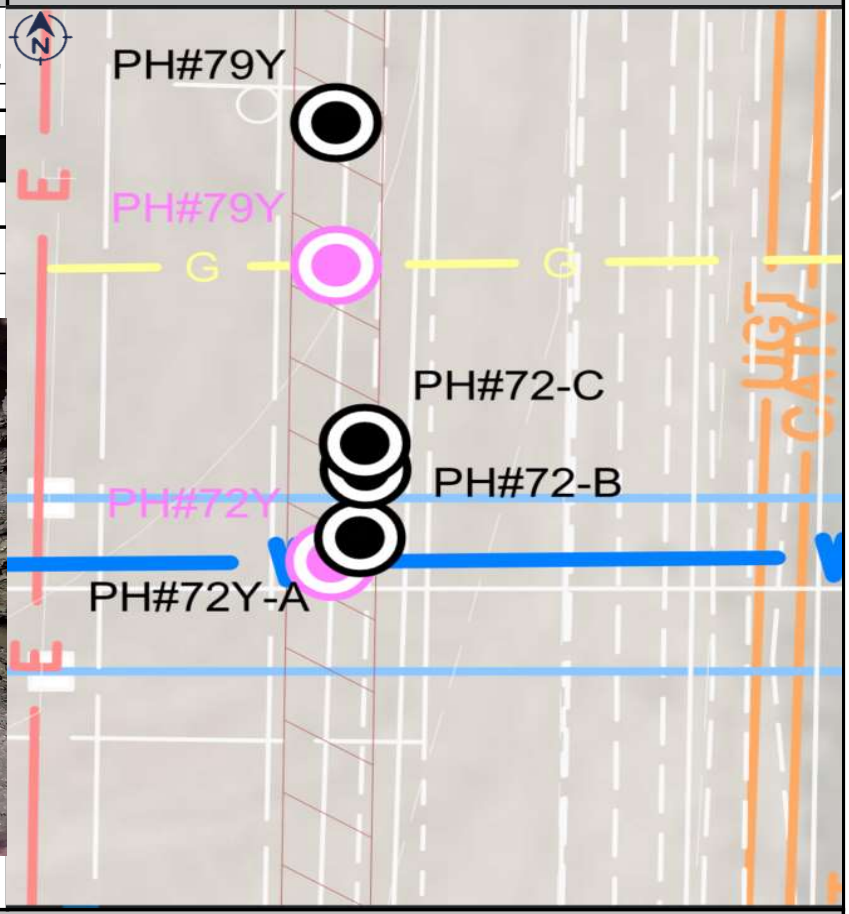
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334790.31	596711.36	0.00
Station	**Offset**	
304+22.98	L 64.70 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.26			
Top Elevation	988.16	**Pipe OD or Structure Height (inches)**	12.10	**Top Depth (FT)**
		9.05		
Bottom Elevation	987.40		12.85	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Phoenix	Water	1	8"	DIP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 72Y-B		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

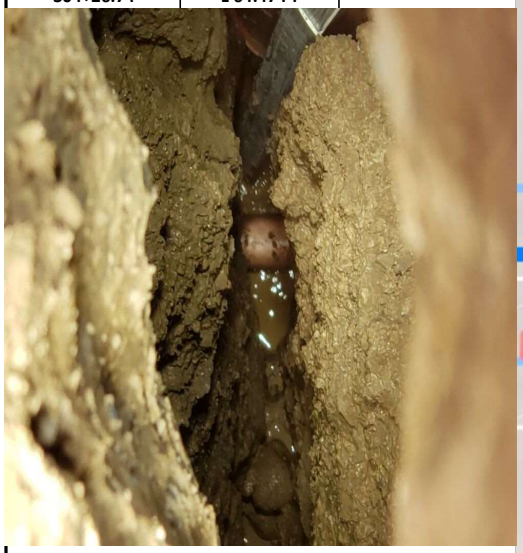
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

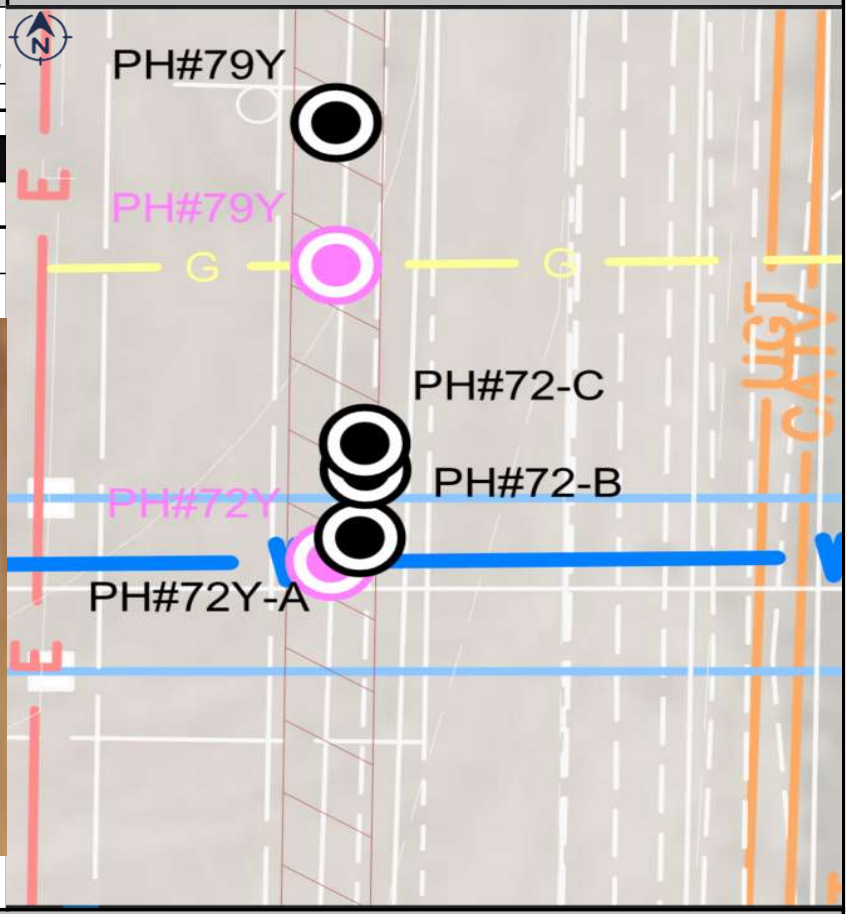
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334794.07	596711.65	0.00
Station	**Offset**	
304+26.74	L 64.47 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.23			
Top Elevation	990.06	**Pipe OD or Structure Height (inches)**	10.17	**Top Depth (FT)**
		2.38		
Bottom Elevation	989.87		10.37	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Phoenix	Water	1	2"	Copper	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 72Y-C	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

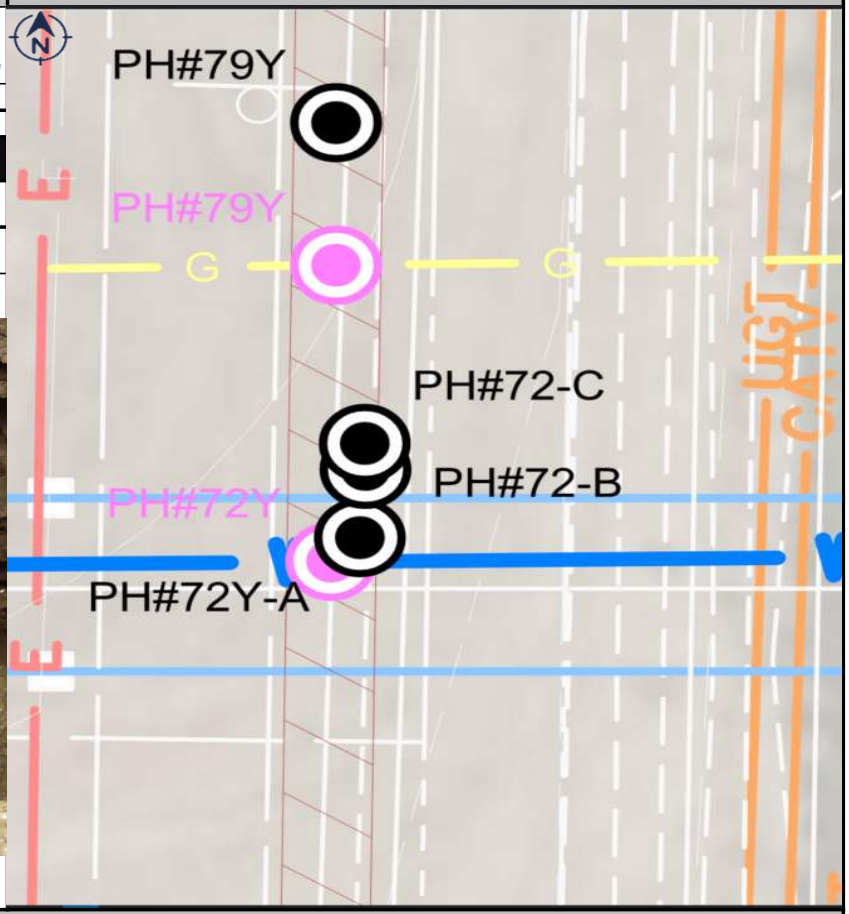
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334795.52	596711.61	0.00
Station	**Offset**	
304+28.20	L 64.52 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.12			
Top Elevation	990.03	**Pipe OD or Structure Height (inches)**	10.09	**Top Depth (FT)**
		3.70		
Bottom Elevation	989.72		10.40	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Phoenix	Water	1	1"	Copper	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 73Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

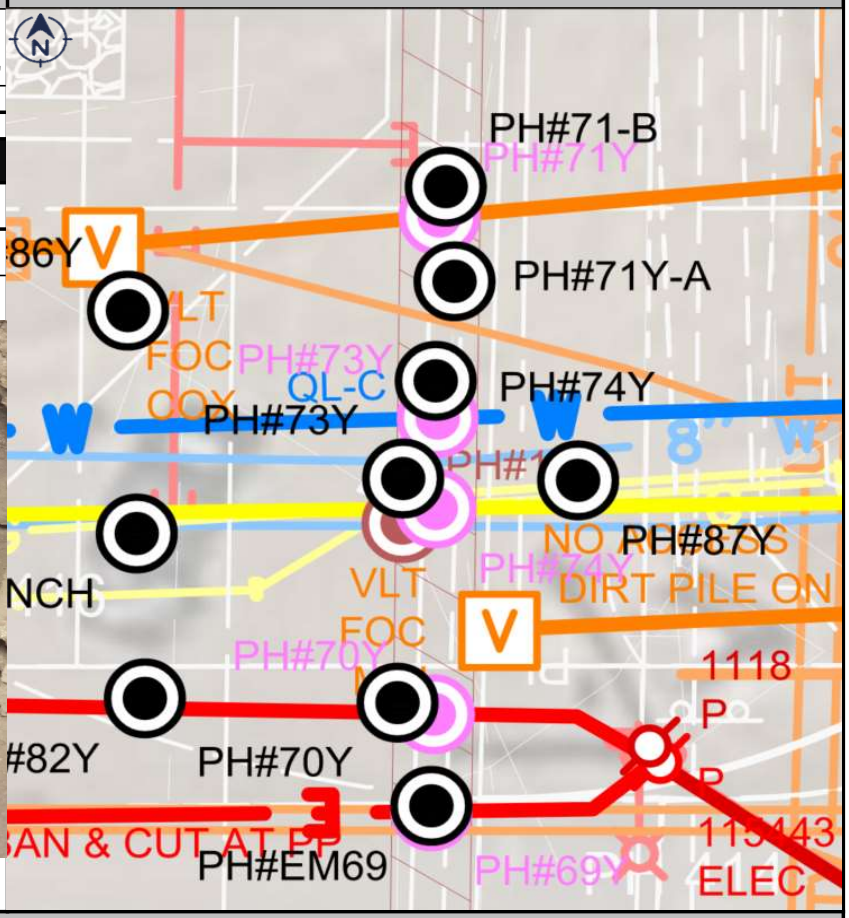
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

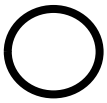
Northing	Easting	Surf Pin Elev
334744.84	596707.62	0.00
Station	**Offset**	
303+77.46	L 67.80 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.43			
Top Elevation	988.80	**Pipe OD or Structure Height (inches)**	10.63	**Top Depth (FT)**
		12.75		
Bottom Elevation	987.74		11.69	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Water	1	8"	Steel	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 74Y		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/16/2020		Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th		City	Phoenix
Project#	2011137		County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

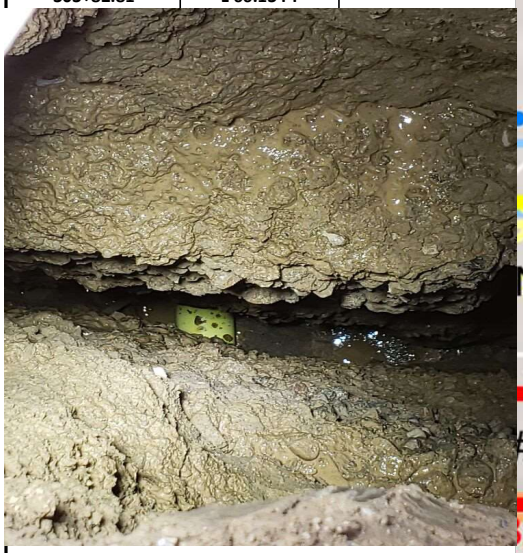
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

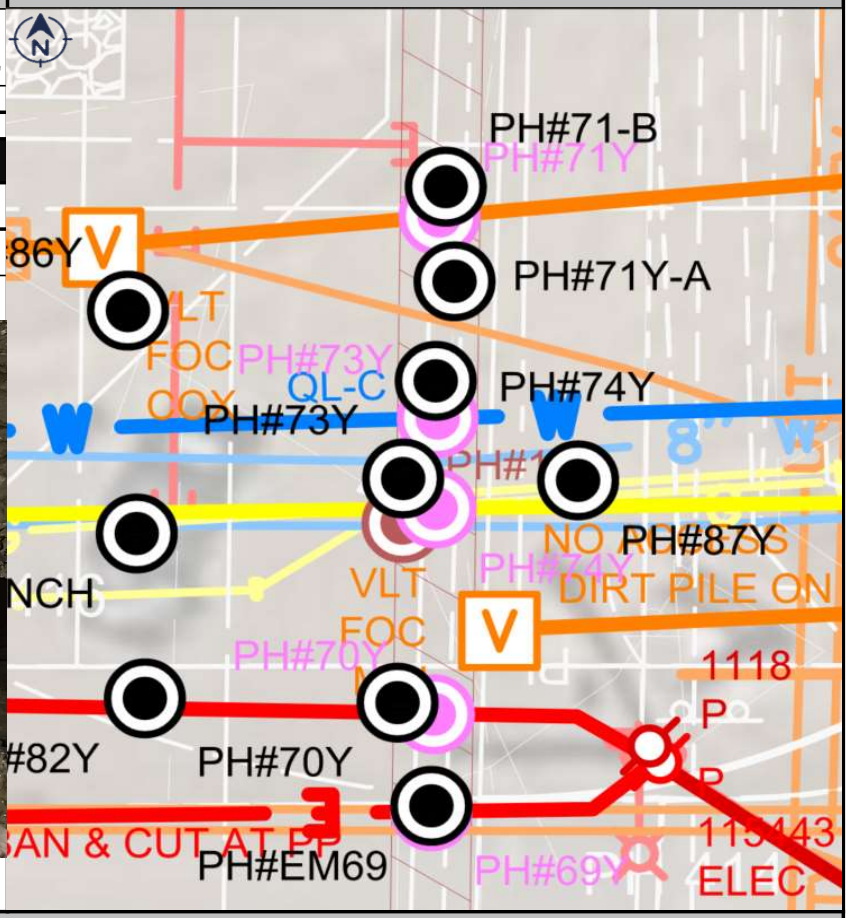
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334750.17	596709.36	0.00
Station	**Offset**	
303+82.81	L 66.13 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.38			
Top Elevation	988.02	**Pipe OD or Structure Height (inches)** 3.70	11.36	**Top Depth (FT)**
Bottom Elevation	987.71		11.67	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 75Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

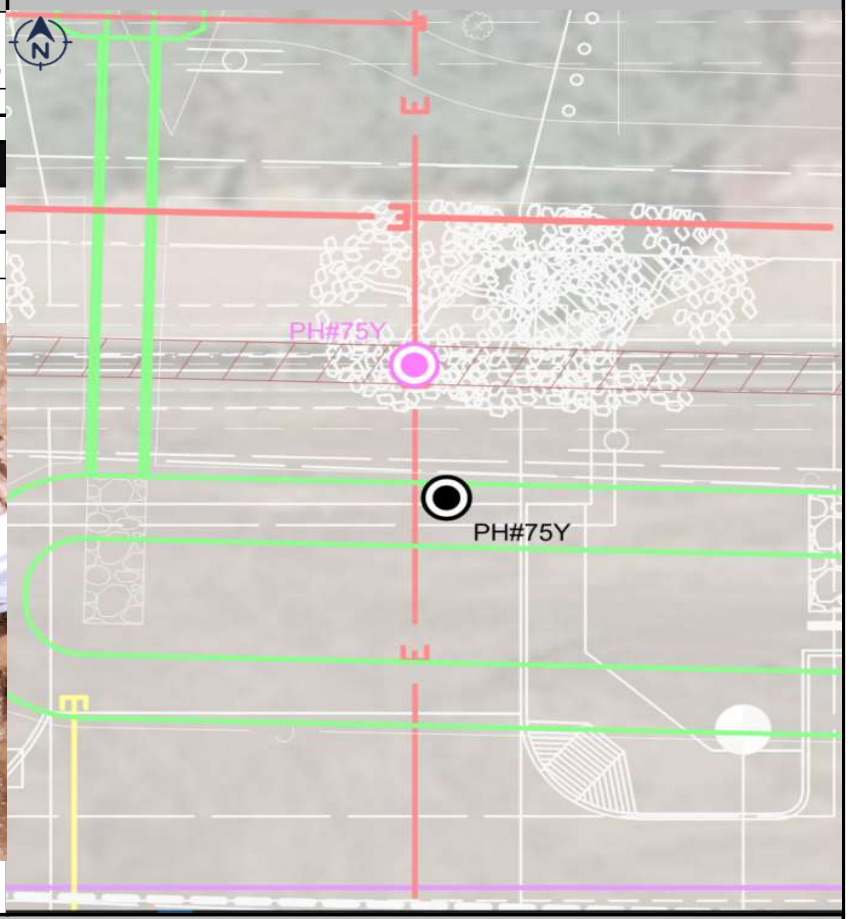
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336271.93	595620.82	0.00
Station	**Offset**	
1224+52.21	R 88.71 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1000.70			
Top Elevation	990.60	**Pipe OD or Structure Height (inches)**	10.10	**Top Depth (FT)**
		10.00		
Bottom Elevation	989.76		10.93	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Pothole located in the running line of proposed SRP IRR. Had to adjust the survey pin to the South to avoid getting destroyed. Construction crews were already trenching in the new IRR. We exposed the electric for the construction crew.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 76Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

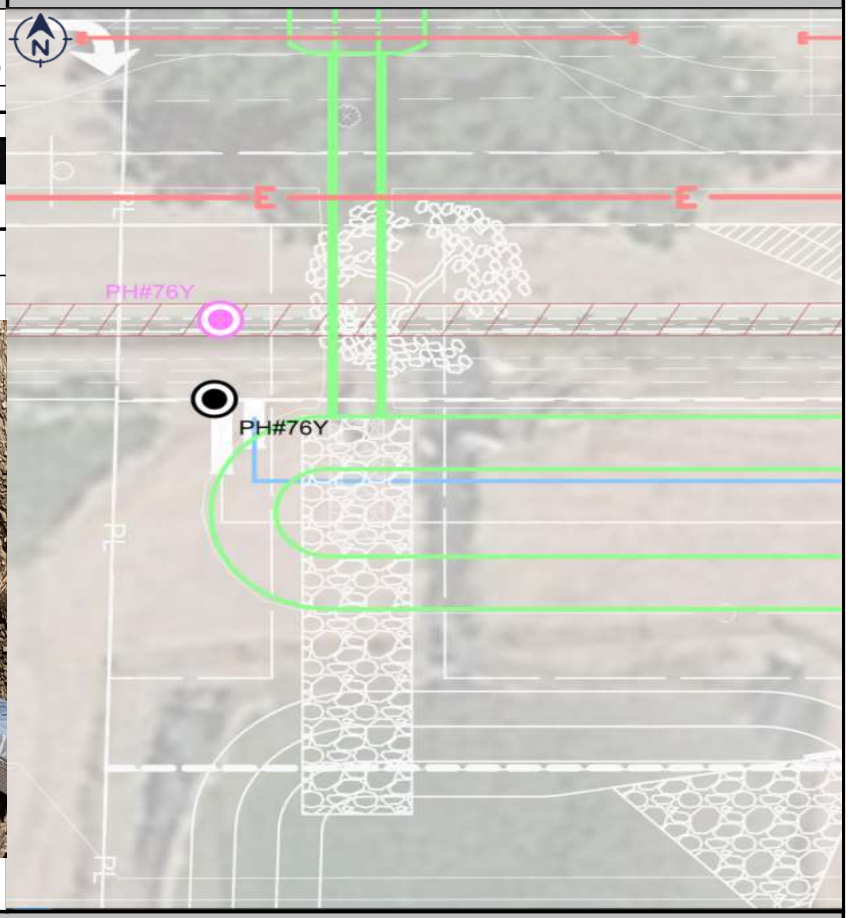
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

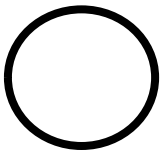
Northing	Easting	Surf Pin Elev
336276.62	594413.12	0.00
Station	**Offset**	
1212+43.76	R 82.99 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	997.12			
Top Elevation	990.11	**Pipe OD or Structure Height (inches)**	7.01	**Top Depth (FT)**
		30.00		
Bottom Elevation	987.61		9.51	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Phoenix	Water	1	30"	Steel	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Cast iron sleeve for multiple water lines. Could not expose the entire sleeve due to soft soil conditions collapsing back in to the hole. Appears to be a 30" pipe. Verify size with utility owner.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 77Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/21/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

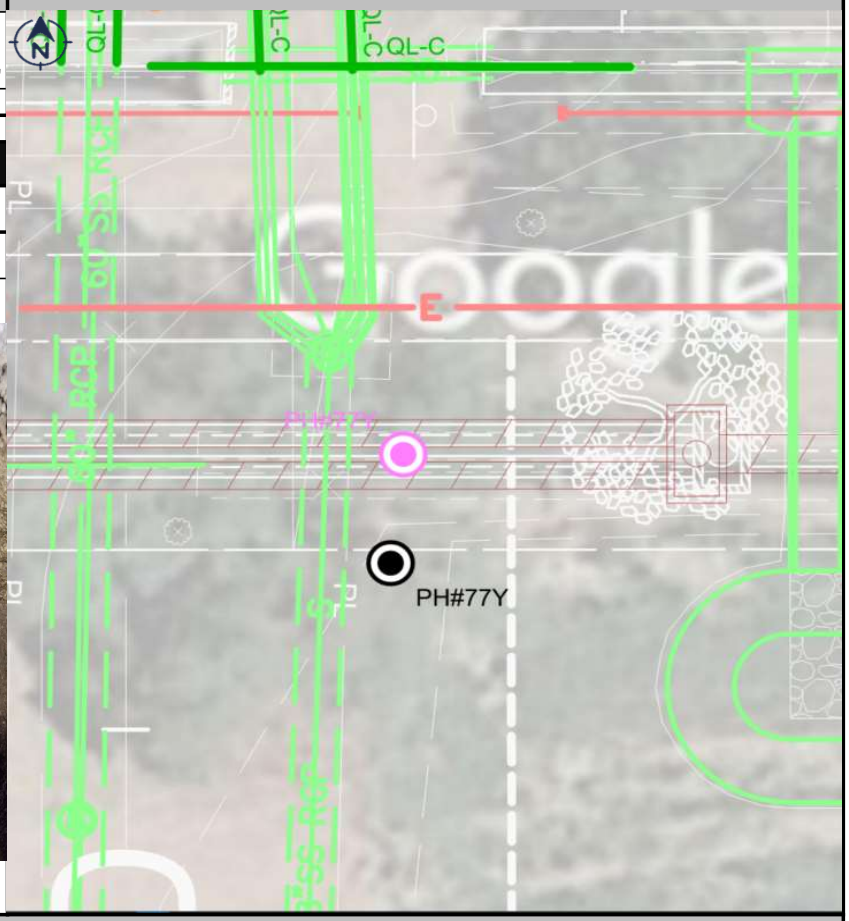
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336275.13	594258.15	0.00
Station	**Offset**	
1210+88.78	R 84.28 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	997.47			
Top Elevation	990.02	**Pipe OD or Structure Height (inches)**	7.45	**Top Depth (FT)**
		10.50		
Bottom Elevation	989.15		8.33	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Private	Comm	4	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 78Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/29/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

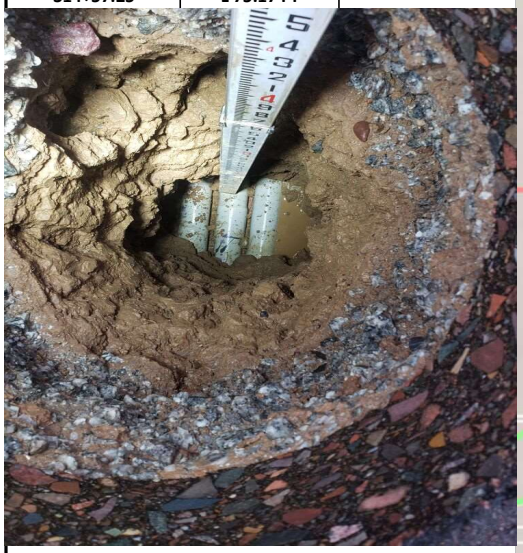
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

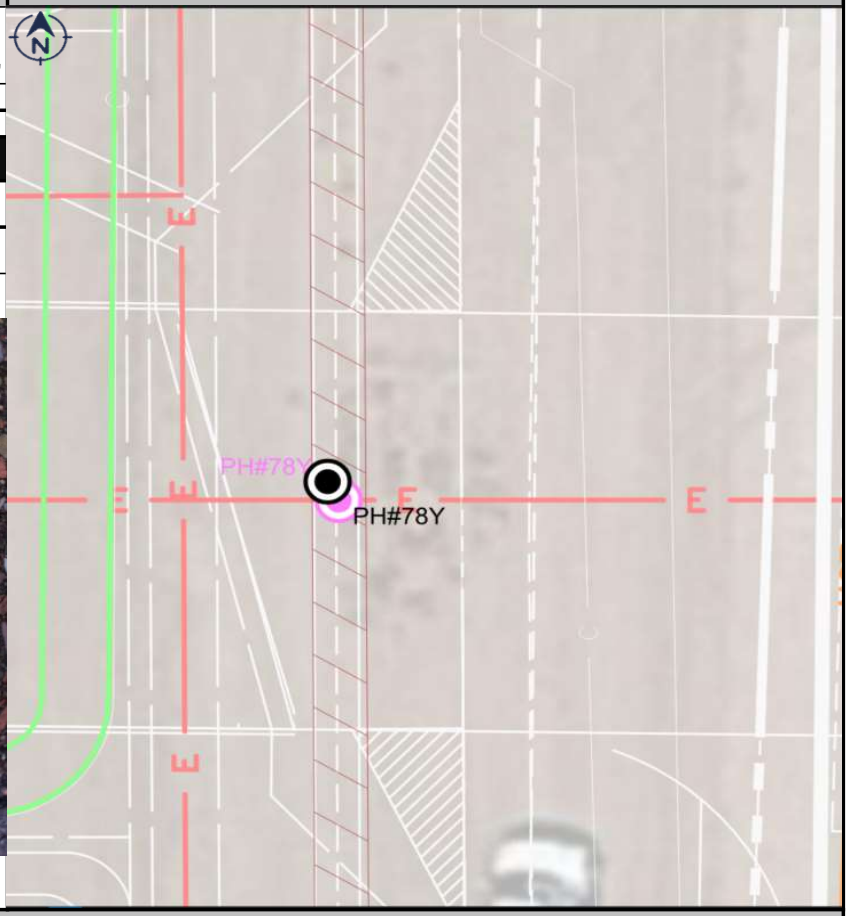
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
335824.62	596715.39	0.00
Station	**Offset**	
314+57.25	L 75.17 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.12			
Top Elevation	995.19	**Pipe OD or Structure Height (inches)**	4.93	**Top Depth (FT)**
		4.00		
Bottom Elevation	994.86		5.26	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	3	3"	PVC	EAST & WEST	Native Backfill	Core & Reinstate

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 79-Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/17/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

The Professional Choice

POTHOLE REPORT

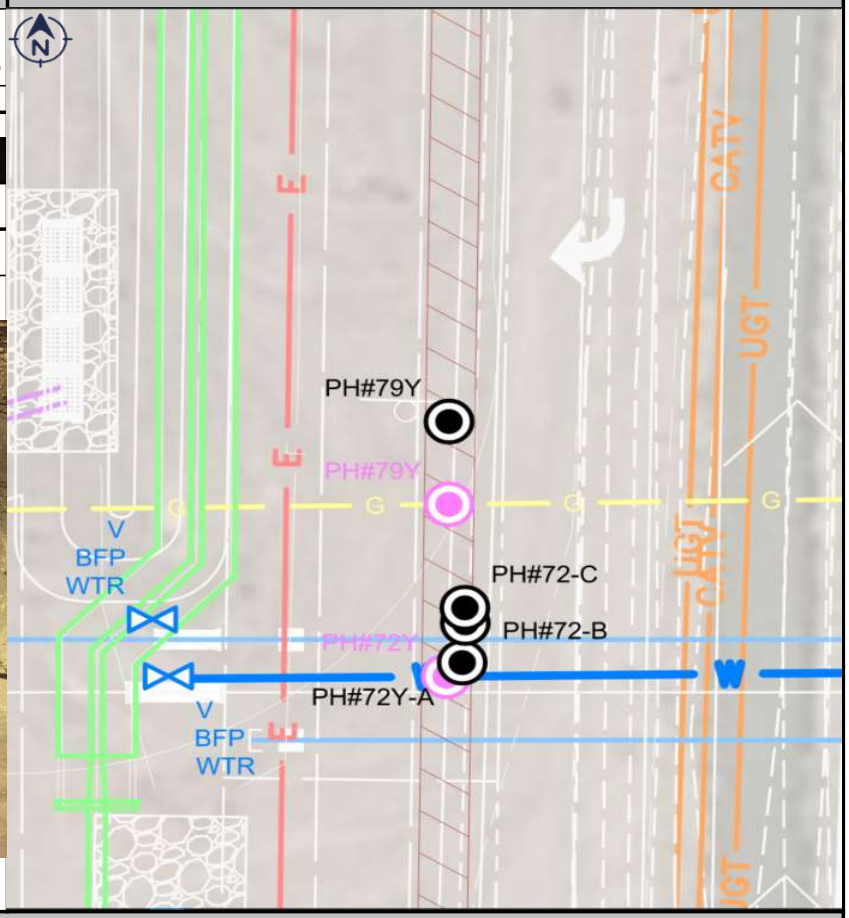
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334813.23	596710.22	0.00
Station	**Offset**	
304+45.88	L 66.16 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.96			
Top Elevation	988.17	**Pipe OD or Structure Height (inches)** 4.80	11.79	**Top Depth (FT)**
Bottom Elevation	987.77		12.19	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 81Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/14/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

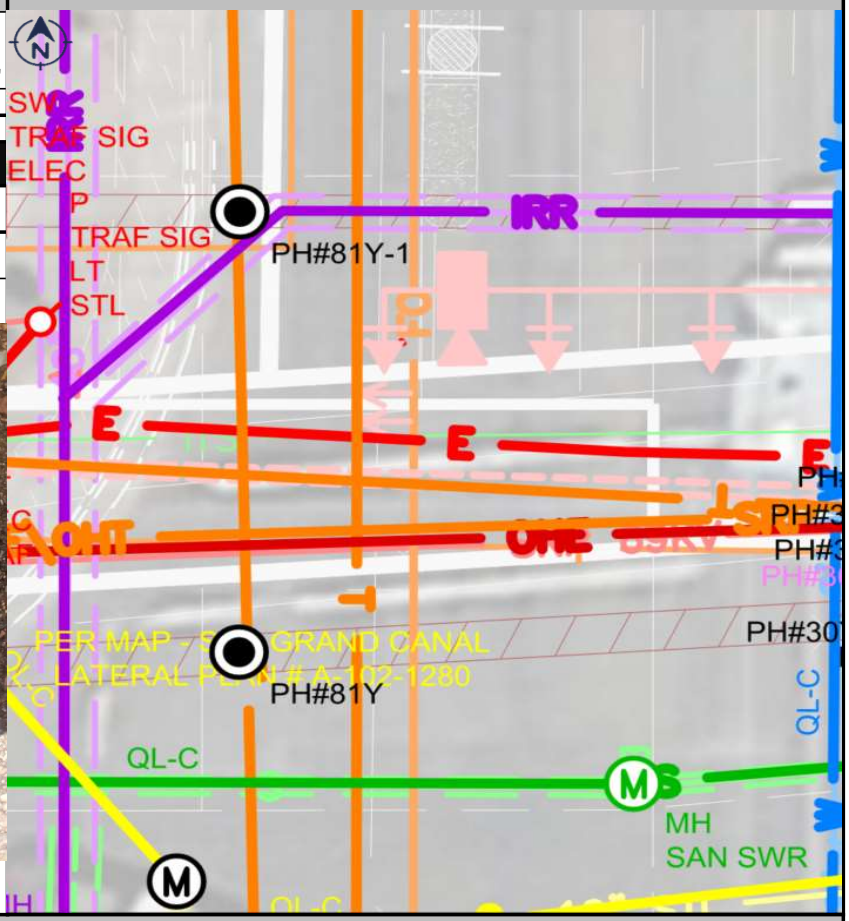
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336411.16	596796.85	0.00
Station	**Offset**	
1236+30.28	L 57.15 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.26			
Top Elevation		**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**
Bottom Elevation		0.00		**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
AT&T	Comm	Not Found	See Comments		NORTH & SOUTH	Rocky	Core & Reinstate

Comments

Hit solid caliche at 16.74'. Got EM depth at the proposed PH location. EM Depth shows 18.5'.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 81Y-1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/20/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

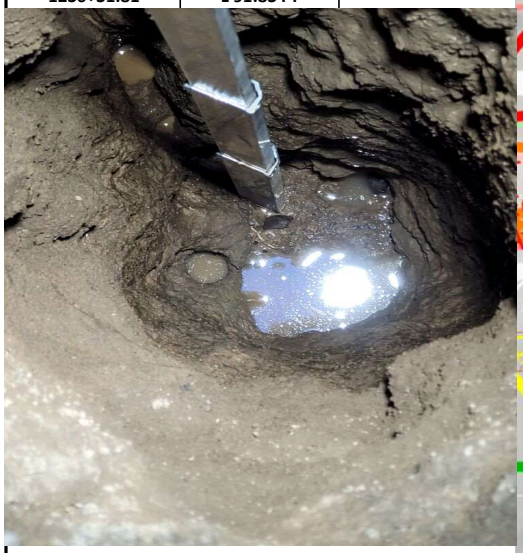
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

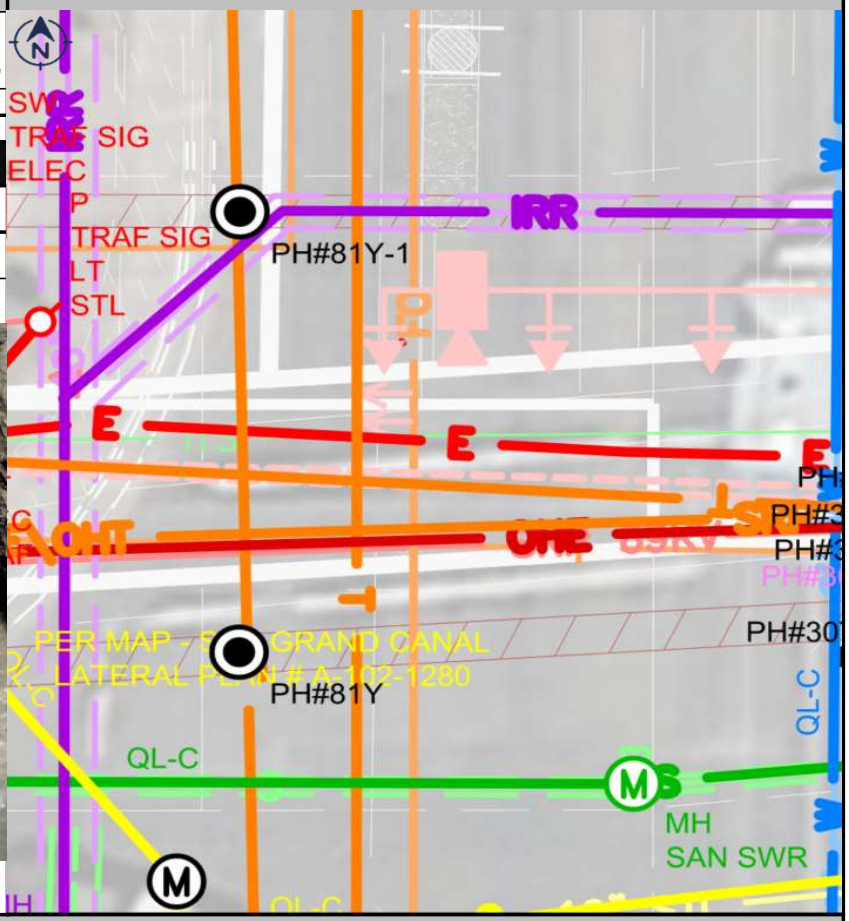
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336445.87	596796.92	0.00
Station	**Offset**	
1236+31.81	L 91.83 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING

Ref Point Elevation	1001.18			
Top Elevation		**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**
Bottom Elevation		0.00		**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
AT&T	Comm	Not Found	See Comments			Native Backfill	Jackhammer & Coldpatch

Comments

Hit solid caliche at 14.42'. Got EM depth at the proposed PH location - EM Depth shows between 16' & 17'

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 82-85 Slot Trench	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

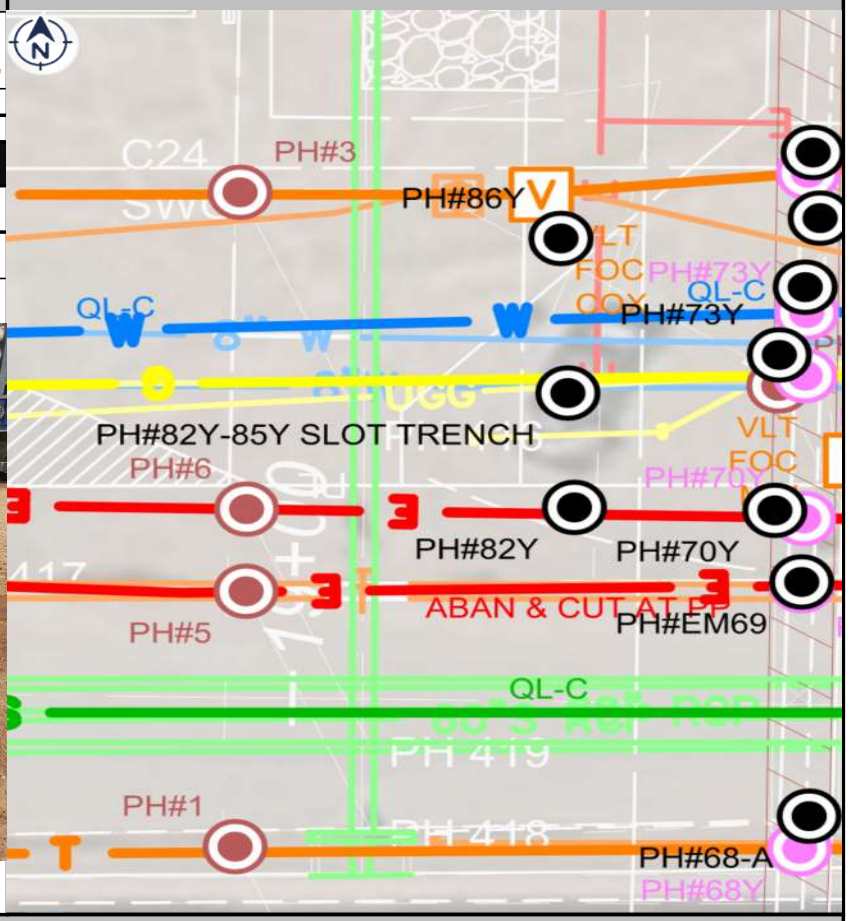
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334741.83	596693.46	0.00
Station	**Offset**	
303+74.25	L 81.92 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	999.40			
Top Elevation	992.64	**Pipe OD or Structure Height (inches)**	6.76	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Slot Trench	Cleared (No Conflict)	slot trench	See Comments			Native Backfill	None Off-Road

Comments

Dug trench for new electric line. 12" Wide X 6' Deep X 19' Long.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 82Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

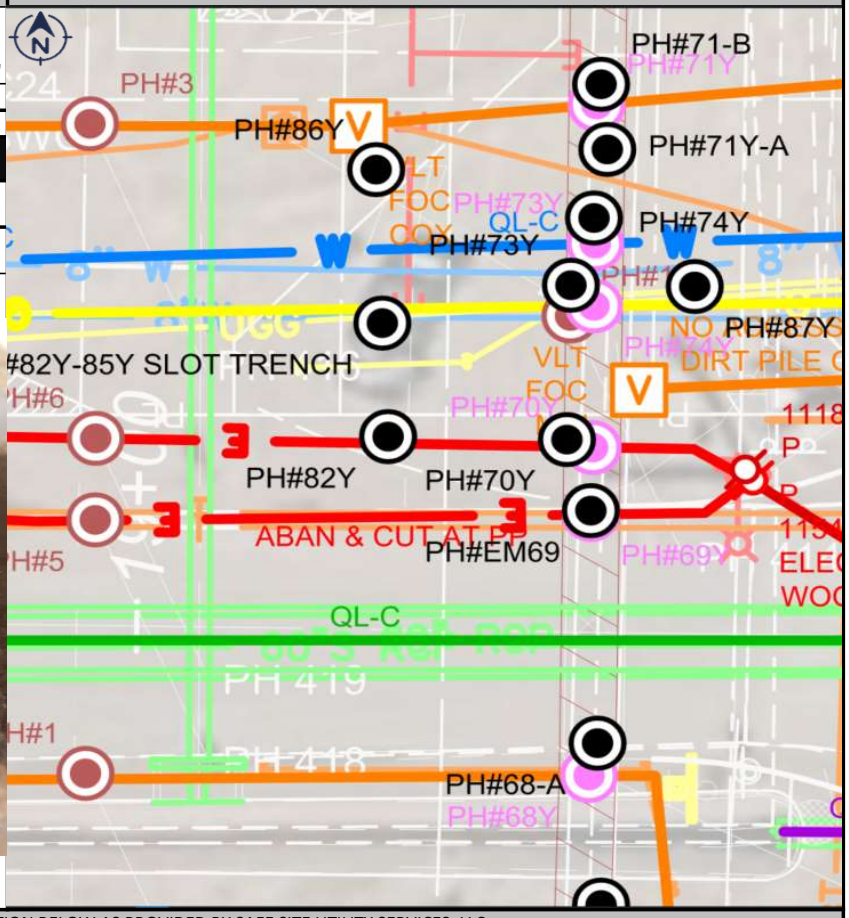
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334732.85	596693.88	0.00
Station	**Offset**	
303+65.28	L 81.37 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.03			
Top Elevation	995.31	**Pipe OD or Structure Height (inches)**	3.72	**Top Depth (FT)**
		4.80		
Bottom Elevation	994.91		4.12	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 86Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

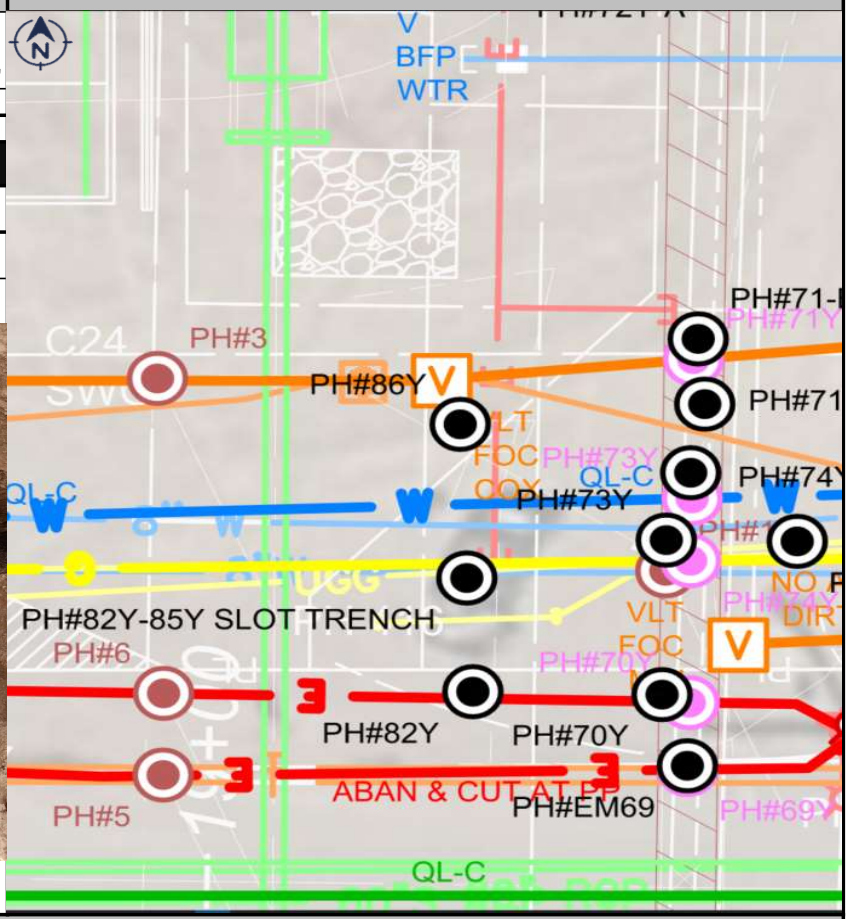
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334754.00	596692.98	0.00
Station	**Offset**	
303+86.41	L 82.56 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	999.14				
Top Elevation		**Pipe OD or Structure Height (inches)**	0.00	**Top Depth (FT)**	
Bottom Elevation			0.00	**Bottom Depth (FT)**	

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Pole Hole	2'X6' Pole Hole	No Conflict				Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 87Y	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	12/28/2020	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

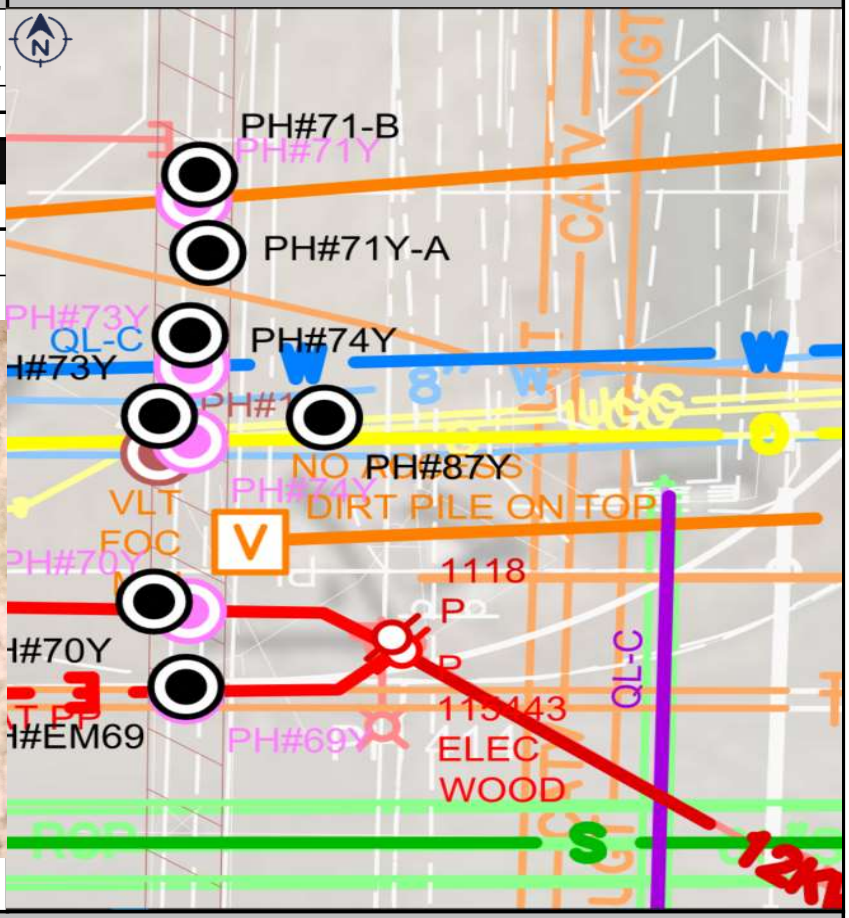
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
334744.73	596716.93	0.00
Station	**Offset**	
303+77.49	L 58.49 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	999.50			
Top Elevation	991.73	**Pipe OD or Structure Height (inches)** 12.75	7.77	**Top Depth (FT)**
Bottom Elevation	990.66		8.83	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
Phoenix	Water	1	8"	Steel	EAST & WEST	Native Backfill	None Off-Road

Comments

Located the 45 degree bend where pipe drops in elevation for the proposed IRR.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	IRR structure pothole A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/13/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

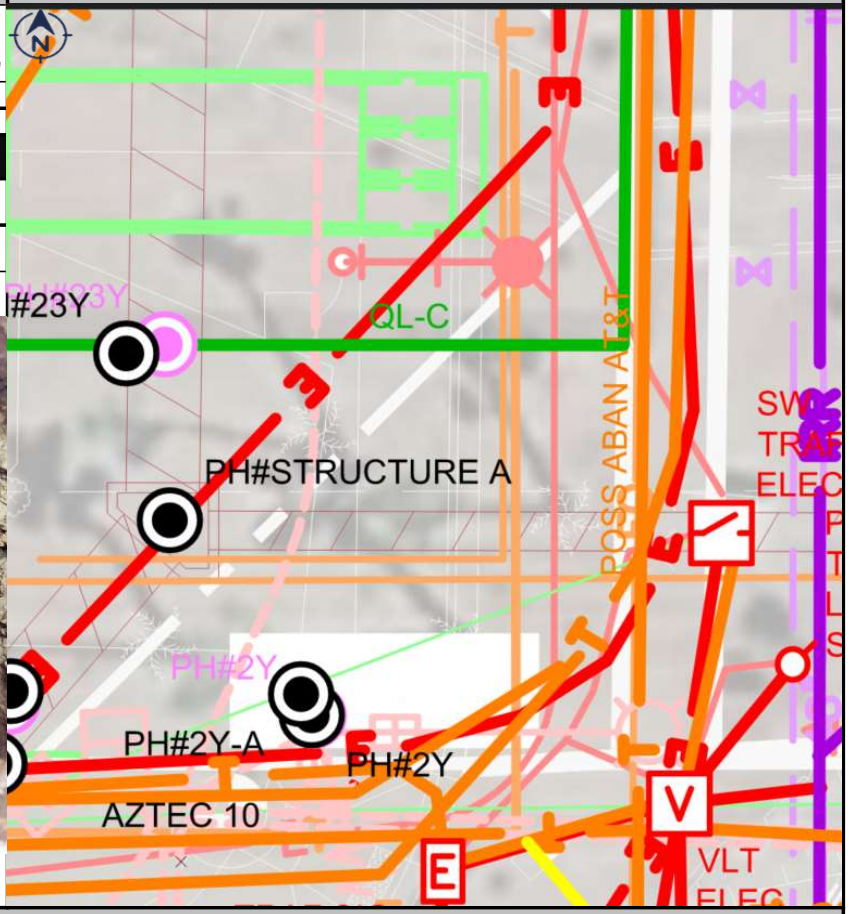
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336446.75	596741.35	0.00
Station	**Offset**	
1235+75.79	L 94.87 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.42			
Top Elevation	996.84	**Pipe OD or Structure Height (inches)**	4.58	**Top Depth (FT)**
		3.50		
Bottom Elevation	996.55		4.87	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Electric	1	3"	PVC	EAST & WEST	Rocky	None Off-Road

Comments

Electric Conflict found - 5 Sided IRR Structure Clearing Hole - 7' X 7' X 11' by (8ft Deep)

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	IRR structure pothole B	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/13/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

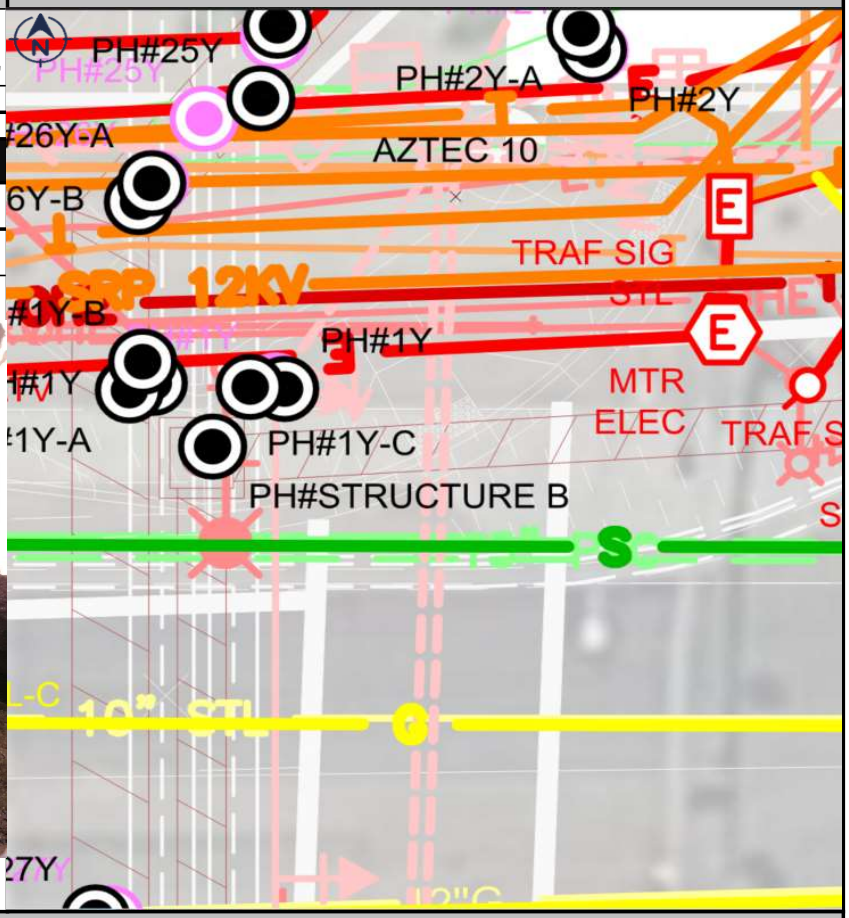
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336407.67	596726.78	0.00
Station	**Offset**	
1235+59.72	L 56.33 FT	

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.65			
Top Elevation	994.87	**Pipe OD or Structure Height (inches)**	6.78	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
6'X6' Prop Structure	No Conflicts	0					Core & Reinstate

Comments

6' X 6' IRR Structure clearing hole - No conflicts.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	IRR structure pothole C	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/13/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

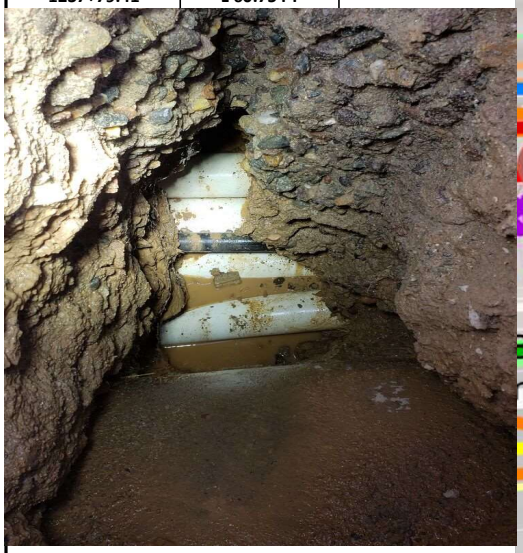
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

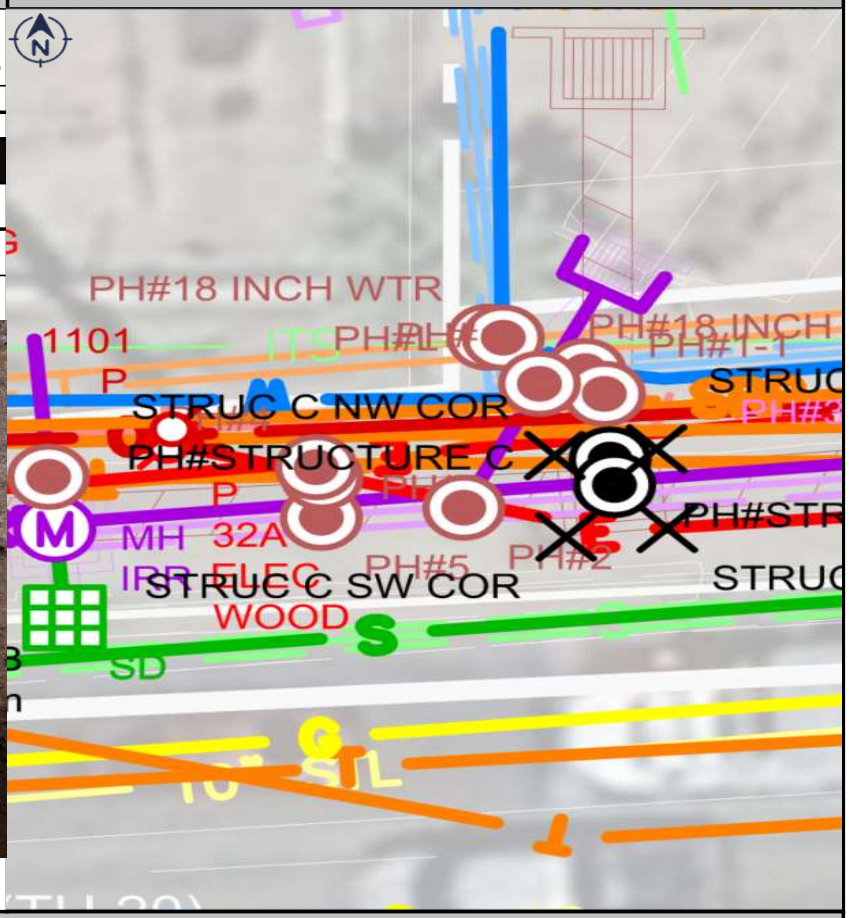
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336422.07	596944.72	0.00
Station	**Offset**	
1237+79.41	L 60.75 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.29			
Top Elevation	996.65	**Pipe OD or Structure Height (inches)**	4.64	**Top Depth (FT)**
		0.00		
Bottom Elevation				**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
CenturyLink	Comm	Bundle	4-4" /1-2"	PVC	EAST & WEST	Rocky	None Off-Road

Comments

6' X 6' IRR Structure clearing hole - Conflict found.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	IRR structure pothole c-1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	1/13/2021	Survey	Safe Site Utility Services, LLC
Project Name	MC 85-3 TT0651- MC 85: 87th Ave to 95th	City	Phoenix
Project#	2011137	County	Maricopa
Location	MC 85 from 87th Ave to 95th Ave, Buckeye, AZ		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

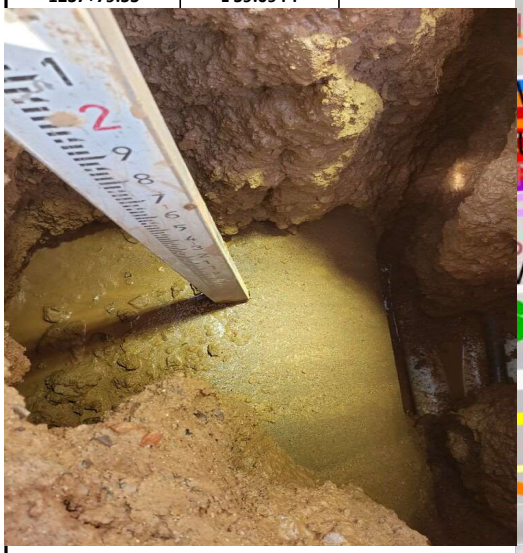
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

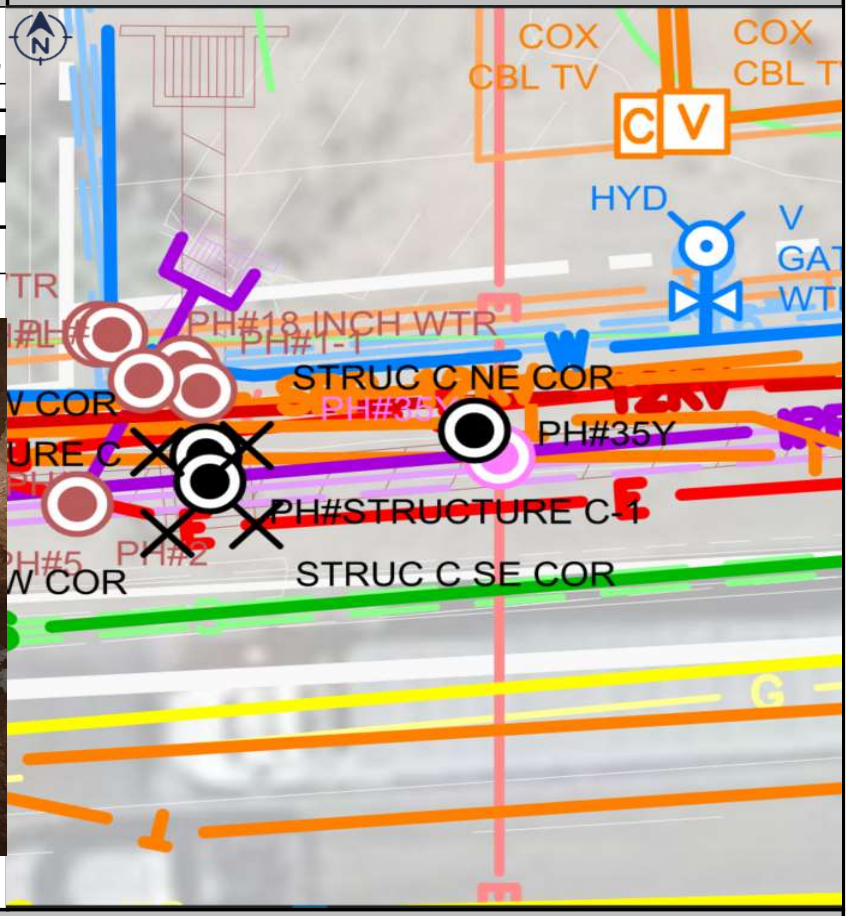
SITE BENCHMARK = Site Benchmark: Cap Rebar - Elev: 996.09'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336420.41	596944.95	0.00
Station	**Offset**	
1237+79.55	L 59.09 FT	



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.26			
Top Elevation	998.98	**Pipe OD or Structure Height (inches)**	2.28	**Top Depth (FT)**
		30.00		
Bottom Elevation	996.48		4.78	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
SRP	Irrigation	1	24"	RCP	EAST & WEST	Rocky	None Off-Road

Comments

6' X 6' IRR Structure clearing hole - Conflict found.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole Summary Report

Report Prepared for: MCDOT

Address: MC 85 from 75th Ave to 95th Ave, Phoenix, AZ 85043

Date of Report: 2/20/2020

Description of Project: TT0345 - MC 85: 75th Ave to 95th Ave

Cust Job #: 2018-061-4

Safe Site Project #: 2001289

ADOT #	Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 1	Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1240+63.64	81.71LT	336463.10	597224.64	1001.36	2.83	3.03	998.53	998.33	2.40	02/12/20	
PH 2	Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill	None Off-Road	1239+88.51	82.47LT	336457.76	597150.34	1001.57	3.03	3.23	998.54	998.34	2.40	02/12/20	
PH 3	CenturyLink	Comm	5	4) 4" PVC and 1) 2" Direct Buried Cable	Duct bank	EAST & WEST	Native Backfill	None Off-Road	1237+64.20	60.44LT	336420.89	596929.63	1001.32	4.46	5.64	996.86	995.68	14.10	02/12/20	Joint Trench with MCDOT Traffic Signal. See PH 4
PH 4	MCDOT	TS Electric	1	1"	PVC	EAST & WEST	Native Backfill	None Off-Road	1237+63.92	61.12LT	336421.56	596929.32	1001.24	3.96	4.07	997.28	997.17	1.32	02/12/20	Joint Trench with CLN Comm. See PH 3
PH 5	SRP	Irrigation	1	30"	RCP	EAST & WEST	Native Backfill	None Off-Road	1237+63.99	57.79LT	336418.24	596929.57	1001.10	2.21	5.29	998.89	995.81	37.00	02/12/20	
PH 6	SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	Jackhammer & Coldpatch	1240+71.07	0.79LT	336383.13	597238.99	1001.62	3.21	3.88	998.41	997.75	8.00	02/12/20	
PH 7	SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road	1243+16.99	41.28LT	336447.73	597479.16	1000.19	5.65	6.32	994.54	993.87	8.00	02/12/20	Stacked & Side by Side
PH 8	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1237+74.14	140.69LT	336501.57	596934.97	1001.36	4.56	6.13	996.80	995.23	18.79	02/12/20	Original Pothole performed by on site MCDOT GC. Waterline was not found/ exposed by GC. Safe Site techs opened hole and trenched over to expose utility. Additional comm line also found see PH8A
PH 8A	Cox	Comm	2	2"	PVC	SE & NW	Native Backfill	None Off-Road	1237+71.75	141.95LT	336502.69	596932.55	1001.28	2.51	2.71	998.77	998.58	2.38	02/12/20	Side by Side - Not Located by 811 - Possible empty conduits
PH 9	CenturyLink	Comm	1	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1237+18.937	144.13LT	336502.10	596880.46	1002.18	3.75	4.15	998.43	998.03	4.80	02/12/20	
PH 10	CenturyLink	Comm	4	4"	Duct bank	NORTH & SOUTH	Native Backfill	None Off-Road	1237+13.63	142.77LT	336500.47	596875.31	1001.89	3.07	4.50	998.82	997.39	17.10	02/12/20	Duct bank is sloping back up in elevation after diving under electric encasement. Top and bottom elevation reflects the highest and lowest point of slope. See PH 10A for Elec encasement details
PH 10A	SRP	Electric			Encased	SE & NW	Native Backfill	None Off-Road	1237+14.84	145.72LT	336503.48	596876.35	1001.72	0.60	3.15	1,001.12	998.57	30.60	02/12/20	Electric encasement is crossing comm duct bank . See PH 10 for comm details
PH 11	SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road	1236+98.45	145.78LT	336502.74	596860.22	1001.58	4.46	5.13	997.12	996.45	8.00	02/12/20	
PH 12	SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill	None Off-Road	1238+35.41	60.42LT	336425.05	597000.29	1001.16	7.90	8.28	993.26	992.88	4.50	02/12/20	
PH 12A	CenturyLink	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1238+37.21	58.62LT	336423.37	597002.18	1001.14	3.45	3.85	997.69	997.29	4.80	02/12/20	Side by Side
PH 13	SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road	1240+70.54	34.48LT	336416.64	597235.55	999.64	4.94	5.61	994.70	994.03	8.00	02/12/20	
PH 14	SRP	Electric		16" Wide	Encased	NORTH & SOUTH	Native Backfill	None Off-Road	1255+33.69	52.33LT	336596.55	598687.20	1005.21	3.20	4.20	1,002.01	1,001.01	12.00	02/13/20	
PH 14A	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1255+35.58	51.08LT	336595.51	598689.20	1005.22	5.60	7.17	999.62	998.06	18.79	02/13/20	
PH 15	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1249+73.76	54.75LT	336541.04	598129.66	1003.88	5.08	6.65	998.80	997.24	18.79	02/13/20	
PH 16	SRP	Electric		16" Wide	Encased	EAST & WEST	Native Backfill	None Off-Road	1254+26.18	48.72LT	336581.92	598580.62	1004.96	3.69	4.69	1,001.27	1,000.27	12.00	02/13/20	
PH 17	MCDOT	Comm	1	15" Wide	Encased	EAST & WEST	Native Backfill	None Off-Road	1249+72.69	46.54LT	336532.76	598129.49	1003.36	4.08	5.68	999.28	997.68	19.20	02/13/20	
PH 18	SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1254+26.53	52.09LT	336585.31	598580.62	1004.00	5.34	6.91	998.66	997.09	18.79	02/13/20	
PH 19	SRP	Electric	3	3"	PVC	EAST & WEST	Native Backfill	Jackhammer & Coldpatch	1250+39.94	50.81LT	336544.25	598196.08	1003.71	7.48	8.06	996.23	995.65	7.00	02/13/20	Pothole located on 90 degree sweep. Line is heading North / South and sweeping East.
PH 20	SRP	Electric	5+	2"	Encased / PVC	EAST & WEST	Native Backfill	None Off-Road	1255+55.58	72.45LT	336618.82	598706.90	1005.18	4.29	4.96	1,000.89	1,000.22	8.00	02/13/20	1/2 sack Slurry encased PVC. Able to chip through slurry - 2" PVCs visible - duct bank side by side possibly stacked
PH 21	SW Gas	Gas	1	10"	Steel	EAST & WEST	Native Backfill	None Off-Road	1250+18.64	31.29LT	336522.57	598176.92	1002.14	3.64	4.54	998.50	997.60	10.75	02/13/20	Abandoned Gas
PH 22	Cox	F/O		24" Wide	Encased	SE & NW	Native Backfill	None Off-Road	1255+14.45	71.94LT	336614.09	598666.04	1005.55	2.19	3.36	1,003.36	1,002.19	14.00	02/13/20	Duct bank is running directly above SRP irrigation and immediately starts to drop in elevation West of SRP.
PH 23	City of Tolleson	Water	1	16" / 4"	ACP	EAST & WEST	Native Backfill	None Off-Road	1251+96.86	53.33LT	336562.95	598352.04	1004.18	4.95	6.52	999.23	997.66	18.79	02/13/20	Also found 4" T connection line heading North. 4" line was previously unknown / not marked by 811 . Possible domestic feed for commercial building to the North of the pothole location. Is missing from the utility location map above. Line will be added to the CAD

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

Test Hole Summary Report

Report Prepared for: MCDOT

Address: MC 85 from 75th Ave to 95th Ave, Phoenix, AZ 85043

Date of Report: 2/20/2020

Description of Project: TT0345 - MC 85: 75th Ave to 95th Ave

Cust Job #: 2018-061-4

Safe Site Project #: 2001289

ADOT #	Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 24	SRP	Irrigation	1	24"	RCP	NORTH & SOUTH	Native Backfill	None Off-Road	1255+16.64	73.64LT	336616.01	598668.04	1005.65	2.28	4.78	1,003.37	1,000.87	30.00	02/13/20	
PH 25	City of Tolleson	Water	1	16"	ACP	NE & SW	Native Backfill	None Off-Road	1252+90.25	53.05LT	336572.27	598444.96	1004.64	5.48	7.05	999.16	997.60	18.79	02/13/20	
PH 26	SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1253+81.44	52.08LT	336580.67	598535.77	1004.48	5.16	6.73	999.32	997.75	18.79	02/13/20	
PH 27	SRP	Electric	1	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1252+87.15	51.84LT	336570.74	598442.01	1004.68	4.31	4.60	1,000.37	1,000.08	3.50	02/13/20	Joint Trench with PH29 & PH31
PH 29	SRP	Electric	3	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1252+88.27	51.62LT	336570.64	598443.14	1004.76	4.14	4.43	1,000.62	1,000.33	3.50	02/13/20	Stacked - Joint Trench with PH27 & PH31
PH 30	SRP	Electric	3	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1243+16.00	54.48Right	336352.46	597488.86	1001.41	4.46	4.75	996.95	996.66	3.50	02/14/20	Stacked & Side by Side
PH 31	CenturyLink	Comm	1	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road	1252+88.33	49.98LT	336569.02	598443.37	1004.79	3.13	3.42	1,001.66	1,001.37	3.50	02/13/20	Joint Trench with PH29 & PH27
PH 32	Cox	Comm	6	2" Bundle	PVC	EAST & WEST	Native Backfill	None Off-Road	1258+42.91	64.65LT	336640.57	598993.51	1005.21	6.23	6.73	998.98	998.48	6.00	02/14/20	
PH 33	SW Gas	Gas	1	10"	Steel	EAST & WEST	Native Backfill	None Off-Road	1252+25.23	29.56LT	336542.23	598382.70	1002.41	3.36	4.26	999.05	998.16	10.75	02/13/20	Abandoned Gas
PH 34	City of Tolleson	Storm Drain Catch Basin	1	14"	Concrete	NORTH & SOUTH		None Off-Road	1237+50.26	52.48LT	336412.19	596916.23	1000.76						02/14/20	SD Cleanout / Invert & Pipe size
PH 35	CenturyLink	Comm	3	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1252+26.14	35.94LT	336548.66	598382.96	1002.23	2.46	3.14	999.77	999.09	8.20	02/13/20	Stacked & Side by Side
PH 36	SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road	1258+34.80	52.59LT	336627.75	598986.69	1005.15	5.24	6.81	999.91	998.35	18.79	02/13/20	
PH 37	CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road	1258+36.07	43.72LT	336619.05	598988.86	1005.53	6.03	6.43	999.50	999.10	4.80	02/13/20	
MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only																				
PH A	Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill		1238+64.02	83.85LT	336450.25	597027.12	1001.12	2.57	2.82	998.55	998.30	3.00	02/12/20	
PH B	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill		1238+71.81	68.27LT	336435.22	597035.86	1001.40	5.35	6.92	996.05	994.49	18.79	02/12/20	
PH C	Cox	Comm	2	2"	PVC	NORTH & SOUTH	Native Backfill		1238+09.23	97.03LT	336460.01	596972.11	1000.77	5.61	5.86	995.16	994.91	3.00	02/12/20	
PH D	City of Tolleson	Water	1	16"	ACP	SE & NW	Native Backfill		1237+34.61	144.43LT	336503.19	596895.87	1002.10	5.44	7.01	996.66	995.09	18.79	02/12/20	
PH D1	Cox	TV	1	2"	PVC	EAST & WEST	Native Backfill		1237+33.51	143.03LT	336501.74	596894.86	1002.08	2.87	3.07	999.21	999.01	2.38	02/12/20	
PH E	SW Gas	Gas	1	2"	HDPE	NORTH & SOUTH	Native Backfill		1237+08.20	178.08LT	336535.47	596868.21	1001.75	4.92	5.12	996.83	996.64	2.38	02/12/20	
PH F	SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill		1237+09.82	179.76LT	336537.23	596869.72	1001.74	4.80	5.18	996.94	996.57	4.50	02/12/20	
PH G	CenturyLink	Comm	1	1.5"	Direct Buried Cable	EAST & WEST	Native Backfill		1238+40.74	41.97LT	336406.97	597006.73	1000.16	1.40	1.56	998.76	998.60	1.90	02/12/20	
PH G1	SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill		1238+36.97	42.48LT	336407.25	597002.95	1000.40	7.26	7.64	993.14	992.77	4.50	02/12/20	
PH H	CenturyLink	Comm	1	1.5"	Direct Buried Cable	EAST & WEST	Native Backfill		1238+87.91	42.91LT	336410.99	597053.54	1000.05	1.12	1.28	998.93	998.77	1.90	02/12/20	
PH I	CenturyLink	Comm	3	2) 4" PVC and 1) 2" Direct Buried Cable	Duct bank	EAST & WEST	Native Backfill		1241+26.36	58.44LT	336445.48	597288.74	1001.81	3.50	4.00	998.31	997.81	6.00	02/12/20	
PH J	Cox	Comm	4	2"	PVC	EAST & WEST	Native Backfill		1255+34.69	65.90LT	336610.16	598686.80	1005.62	3.47	3.97	1,002.15	1,001.65	6.00	02/13/20	
PH K	Cox	Comm	1	2"	PVC	EAST & WEST	Native Backfill		1255+20.66	66.33LT	336609.14	598672.80	1005.48	1.77	1.97	1,003.71	1,003.51	2.38	02/13/20	
PH K-1	SRP	Irrigation	1	24"	RCP	NORTH & SOUTH	Native Backfill		1255+16.08	64.71LT	336607.06	598668.41	1005.47	2.13	4.63	1,003.34	1,000.84	30.00	02/13/20	
PH L	SRP	Water	1	16"	ACP	NORTH & SOUTH	Native Backfill		1237+74.26	69.10LT	336430.11	596939.13	1001.19	5.21	6.78	995.98	994.42	18.79	02/13/20	
PH M	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill		1255+28.74	51.13LT	336594.85	598682.39	1005.34	5.43	7.00	999.91	998.35	18.79	02/13/20	
PH N	City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill		1255+58.87	51.81LT	336598.63	598712.30	1004.77	5.31	6.88	999.46	997.89	18.79	02/13/20	

Horizontal Datum:	1983 State Plane Grid Coorinates with the Northing Coordinates Truncated by subtracting-550,000 from each Value For further details see Control Notes of Maricopa County Department Of Transportation Plans for Construction of MC 85 at 83rd Ave and Center turn lane expansion (MC 85: 95 th Avenue to 75th Avenue) Page 2 Use MC 85 Const Centerline Alignment Points
Vertical Datum:	NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

Horizontal and vertical locations of utilities obtained by actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are estimated visually and may not be exact.

Test Hole #	PH 1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

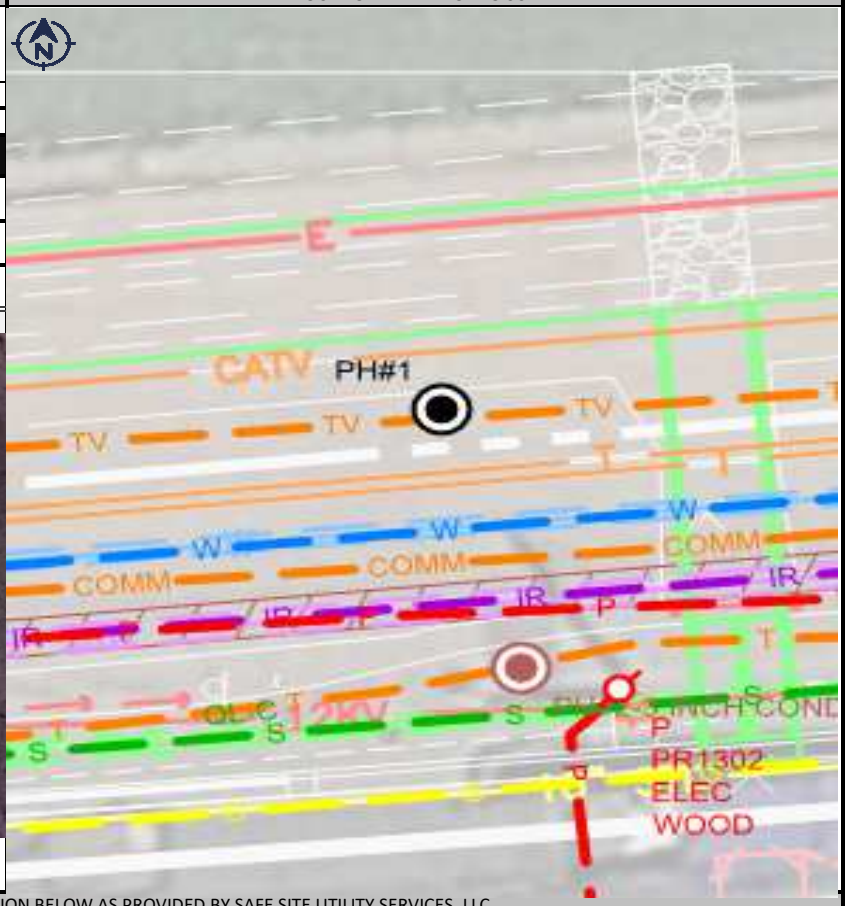
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336463.10	597224.64	1001.36

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.36			
Top Elevation	998.53	**Pipe OD or Structure Height (inches)**	2.83	**Top Depth (FT)**
		2.40		
Bottom Elevation	998.33		3.03	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 2	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336457.76	597150.34	1001.57

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.57			
Top Elevation	998.54	**Pipe OD or Structure Height (inches)**	3.03	**Top Depth (FT)**
		2.40		
Bottom Elevation	998.34		3.23	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 3	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

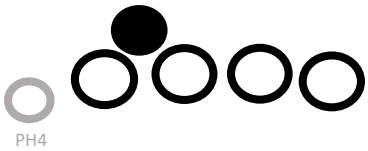
Northing	Easting	Surf Pin Elev
336420.89	596929.63	1001.32

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING East

Ref Point Elevation	1001.32			
Top Elevation	996.86	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		14.10		
Bottom Elevation	995.68		5.64	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	5	4) 4" PVC and 1) 2" Direct Buried Cable	Duct bank	EAST & WEST	Native Backfill	None Off-Road

Comments

Joint Trench with MCDOT Traffic Signal. See PH 4

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 4	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336421.56	596929.32	1001.24

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.24			
Top Elevation	997.28	**Pipe OD or Structure Height (inches)**	3.96	**Top Depth (FT)**
		1.32		
Bottom Elevation	997.17		4.07	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
MCDOT	TS Electric	1	1"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Joint Trench with CLN Comm. See PH 3

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

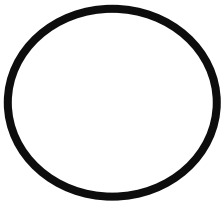
Northing	Easting	Surf Pin Elev
336418.24	596929.57	1001.10

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.10			
Top Elevation	998.89	**Pipe OD or Structure Height (inches)**	2.21	**Top Depth (FT)**
		37.00		
Bottom Elevation	995.81		5.29	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Irrigation	1	30"	RCP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 6	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

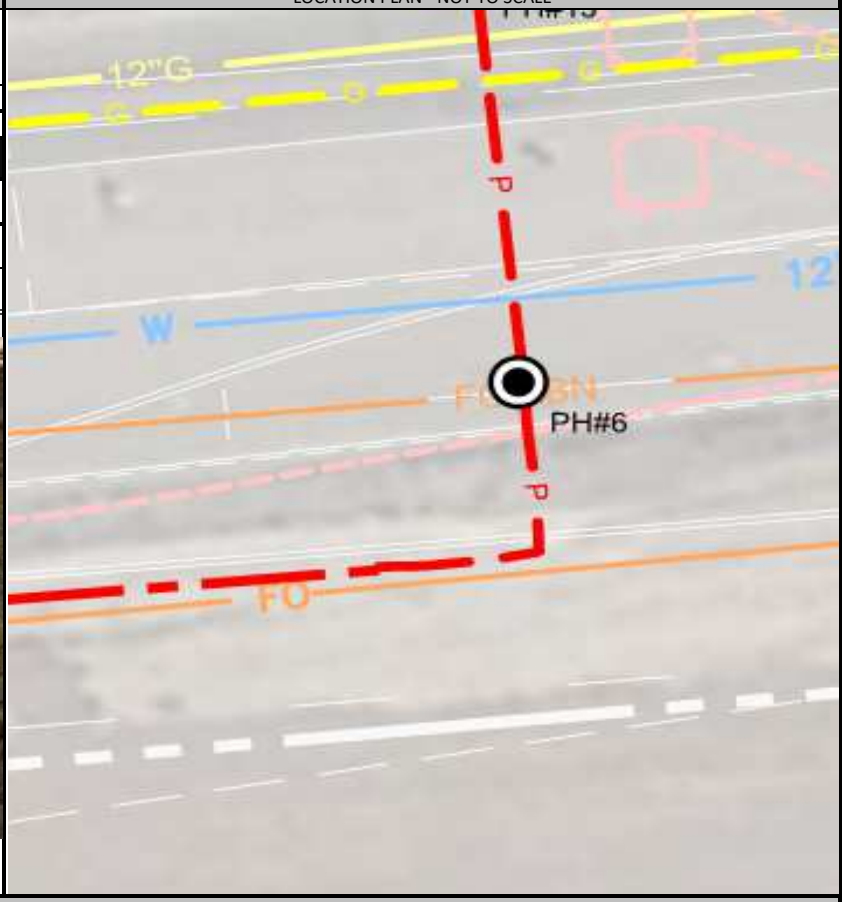
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336383.13	597238.99	1001.62

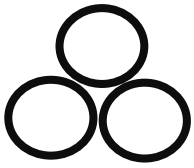
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.62			
Top Elevation	998.41	**Pipe OD or Structure Height (inches)**	3.21	**Top Depth (FT)**
		8.00		
Bottom Elevation	997.75		3.88	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	Jackhammer & Coldpatch

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 7	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

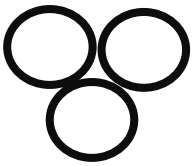
Northing	Easting	Surf Pin Elev
336447.73	597479.16	1000.19

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1000.19			
Top Elevation	994.54	**Pipe OD or Structure Height (inches)**	5.65	**Top Depth (FT)**
		8.00		
Bottom Elevation	993.87		6.32	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Stacked & Side by Side

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 8		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

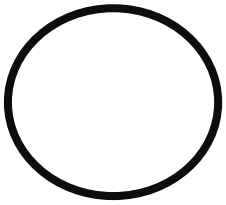
Northing	Easting	Surf Pin Elev
336501.57	596934.97	1001.36

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.36			
Top Elevation	996.80	**Pipe OD or Structure Height (inches)**	4.56	**Top Depth (FT)**
		18.79		
Bottom Elevation	995.23		6.13	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

Original Pothole performed by on site MCDOT GC. Waterline was not found/ exposed by GC. Safe Site techs opened hole and trenched over to expose utility. Additional comm line also found see PH8A

Brown PH icon in location map is the location of the original open hole performed by MCDOT GC. The black PH icon is the actual location of the utility

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 8A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336502.69	596932.55	1001.28

AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING South East

Ref Point Elevation	1001.28			
Top Elevation	998.77	**Pipe OD or Structure Height (inches)**	2.51	**Top Depth (FT)**
		2.38		
Bottom Elevation	998.58		2.71	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	2	2"	PVC	SE & NW	Native Backfill	None Off-Road

Comments

Side by Side - Not Located by 811 - Possible empty conduits

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 9	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336502.10	596880.46	1002.18

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1002.18			
Top Elevation	998.43	**Pipe OD or Structure Height (inches)**	3.75	**Top Depth (FT)**
		4.80		
Bottom Elevation	998.03		4.15	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	1	4"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Pothole is located out of original Safe Site designating & mapping boundary. Pothole was added after locating and mapping phase was completed. Location map includeds utility information provided by MCDOT. Utility information does not reflect actual location. Utility is located where pothole icon is plotted.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 10	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

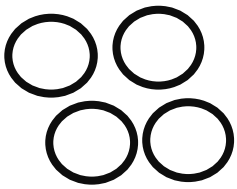
Northing	Easting	Surf Pin Elev
336500.47	596875.31	1001.89

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.89			
Top Elevation	998.82	**Pipe OD or Structure Height (inches)**	3.07	**Top Depth (FT)**
		17.10		
Bottom Elevation	997.39		4.50	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	4	4"	Duct bank	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Duct bank is sloping back up in elevation after diving under electric encasement. Top and bottom elevation reflects the highest and lowest point of slope. See PH 10A for Elec encasement details

Pothole is located out of original Safe Site designating & mapping boundary. Pothole was added after locating and mapping phase was completed. Location map includeds utility information provided by MCDOT. Utility information does not reflect actual location. Utility is located where pothole icon is plotted.

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 10A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336503.48	596876.35	1001.72

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING Northwest

Ref Point Elevation	1001.72			
Top Elevation	1,001.12	**Pipe OD or Structure Height (inches)**	0.60	**Top Depth (FT)**
		30.60		
Bottom Elevation	998.57		3.15	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric			Encased	SE & NW	Native Backfill	None Off-Road

Comments

Electric encasement is crossing comm duct bank . See PH 10 for comm details

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 11		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

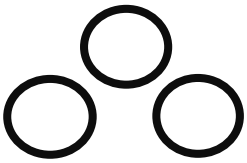
Northing	Easting	Surf Pin Elev
336502.74	596860.22	1001.58

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.58			
Top Elevation	997.12	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		8.00		
Bottom Elevation	996.45		5.13	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Pothole is located out of original Safe Site designating & mapping boundary. Pothole was added after locating and mapping phase was completed. Location map includeds utility information provided by MCDOT. Utility information does not reflect actual location. Utility is located where pothole icon is plotted.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 12		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

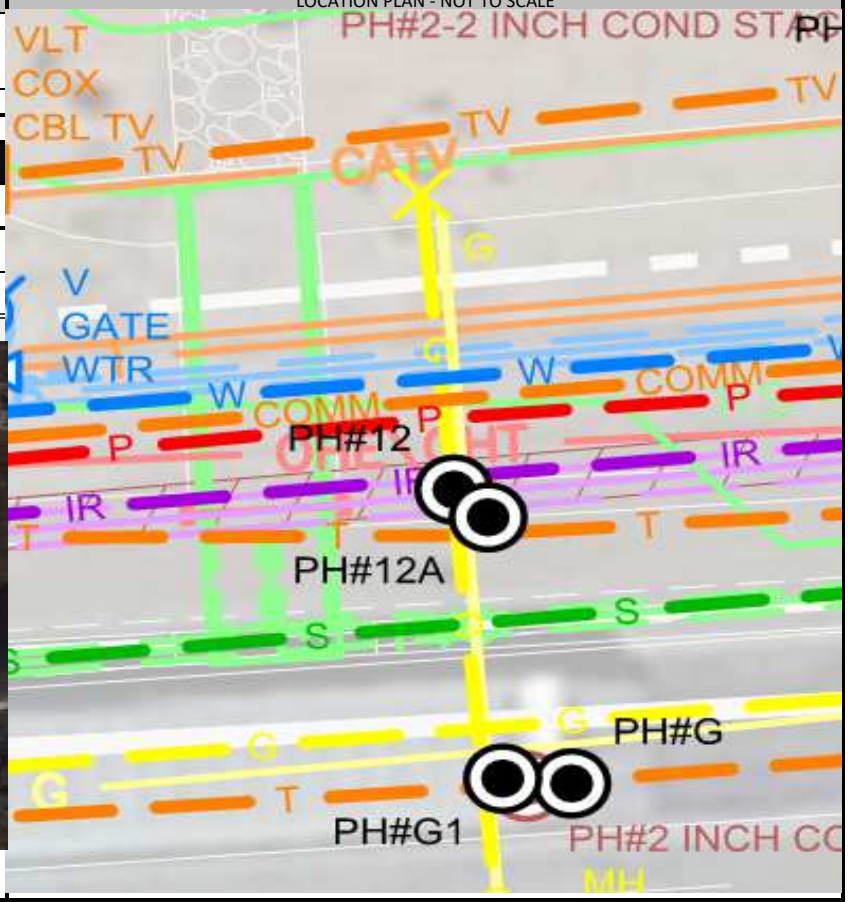
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336425.05	597000.29	1001.16

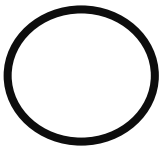
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.16			
Top Elevation	993.26	**Pipe OD or Structure Height (inches)**	7.90	**Top Depth (FT)**
		4.50		
Bottom Elevation	992.88		8.28	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 12A		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

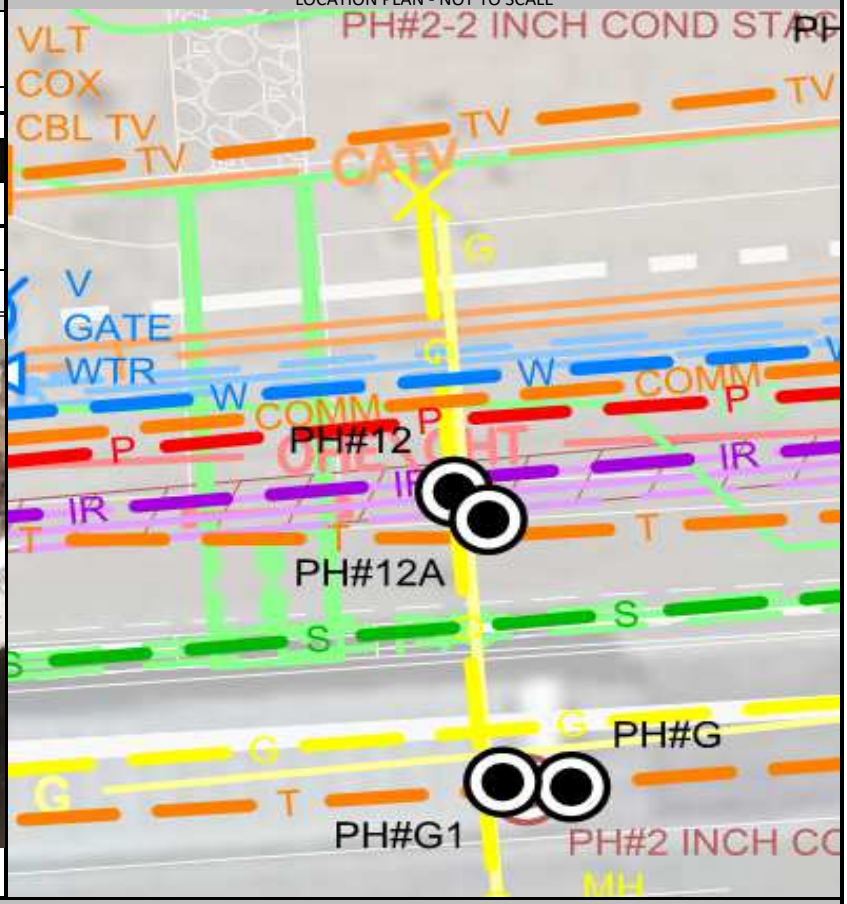
Northing	Easting	Surf Pin Elev
336423.37	597002.18	1001.14

PREPARED BY: **RLA**

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.14			
Top Elevation	997.69	**Pipe OD or Structure Height (inches)**	3.45	**Top Depth (FT)**
		4.80		
Bottom Elevation	997.29		3.85	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	2	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Side by Side

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 13	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336416.64	597235.55	999.64

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	999.64			
Top Elevation	994.70	**Pipe OD or Structure Height (inches)**	4.94	**Top Depth (FT)**
Bottom Elevation	994.03	8.00	5.61	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	HDPE	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 14	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

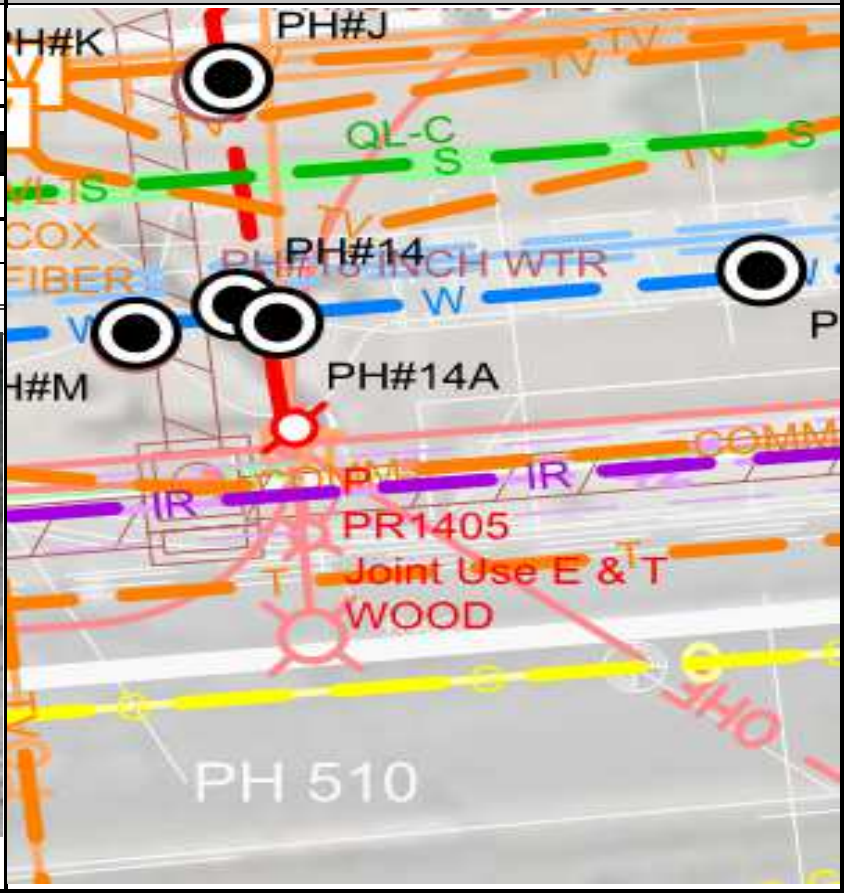
Northing	Easting	Surf Pin Elev
336596.55	598687.20	1005.21

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1005.21			
Top Elevation	1,002.01	**Pipe OD or Structure Height (inches)**	3.20	**Top Depth (FT)**
		12.00		
Bottom Elevation	1,001.01		4.20	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric		16" Wide	Encased	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 14A		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336595.51	598689.20	1005.22

PREPARED BY: RLA

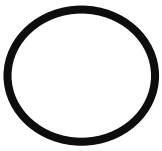
SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.22			
Top Elevation	999.62	**Pipe OD or Structure Height (inches)**	5.60	**Top Depth (FT)**
		18.79		
Bottom Elevation	998.06		7.17	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 15	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

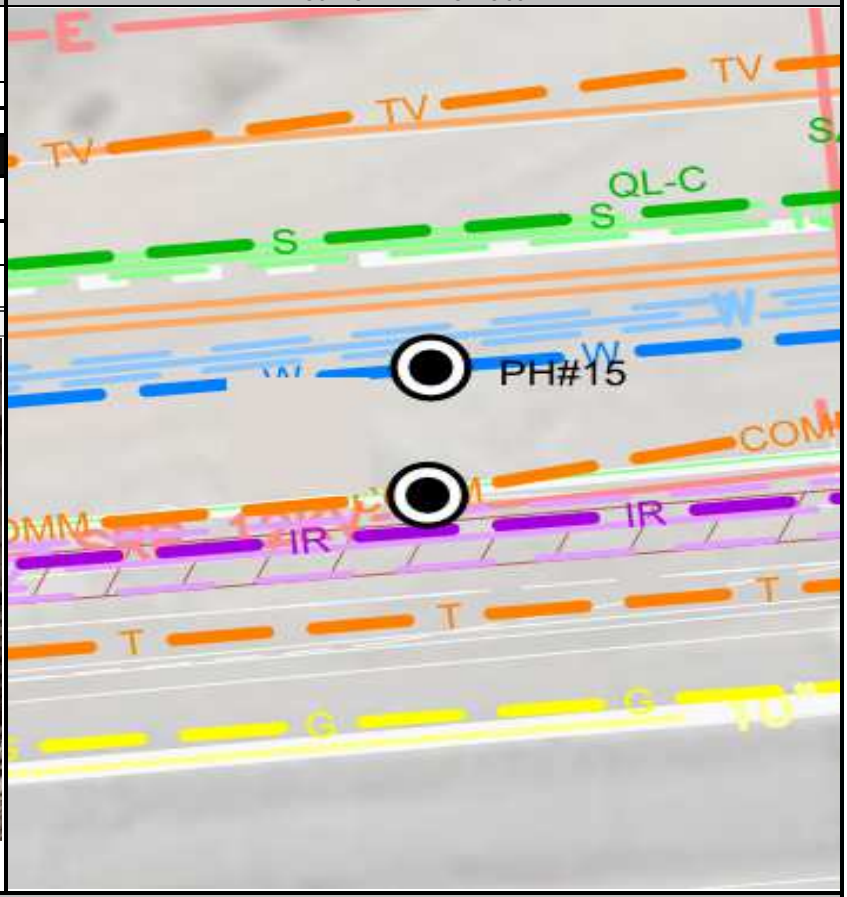
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336541.04	598129.66	1003.88

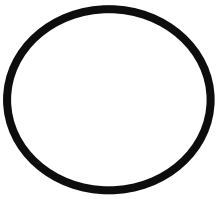
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1003.88			
Top Elevation	998.80	**Pipe OD or Structure Height (inches)**	5.08	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.24		6.65	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 16	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

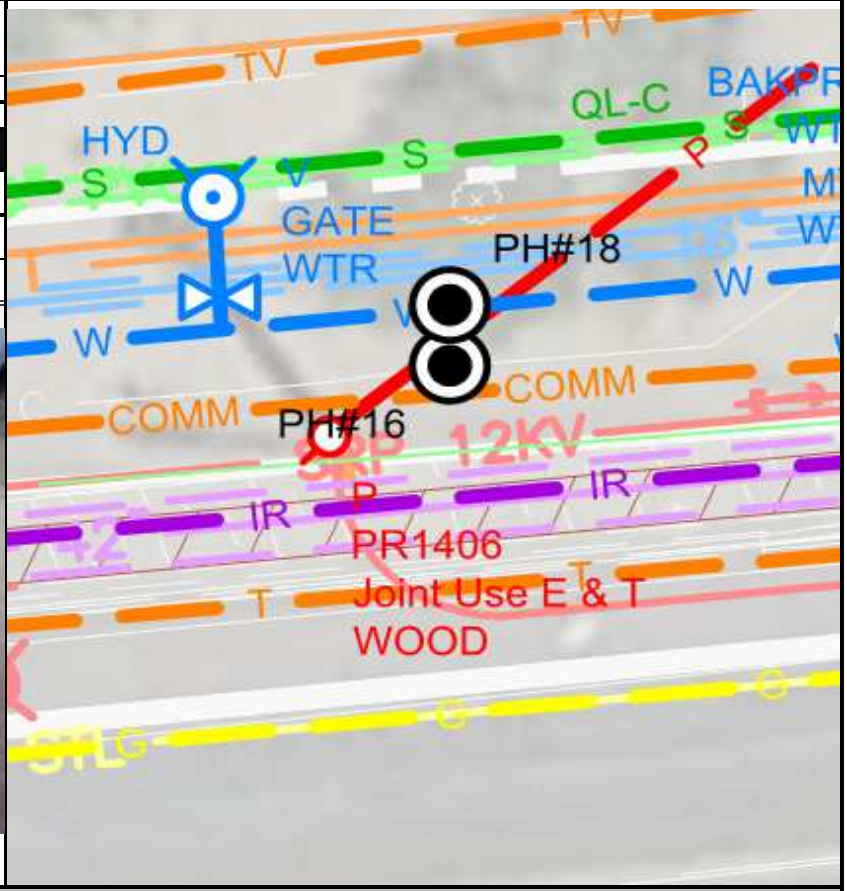
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336581.92	598580.62	1004.96

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1004.96			
Top Elevation	1,001.27	**Pipe OD or Structure Height (inches)**	3.69	**Top Depth (FT)**
		12.00		
Bottom Elevation	1,000.27		4.69	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric		16" Wide	Encased	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 17	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

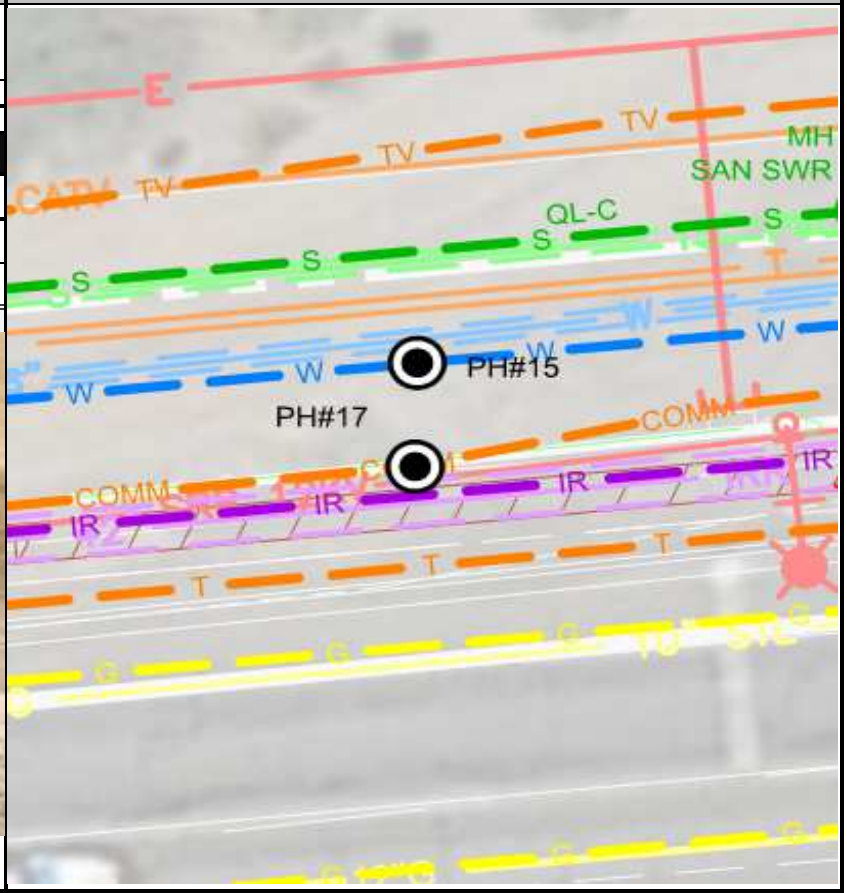
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336532.76	598129.49	1003.36

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1003.36			
Top Elevation	999.28	**Pipe OD or Structure Height (inches)**	4.08	**Top Depth (FT)**
		19.20		
Bottom Elevation	997.68		5.68	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
MCDOT	Comm	1	15" Wide	Encased	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 18		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

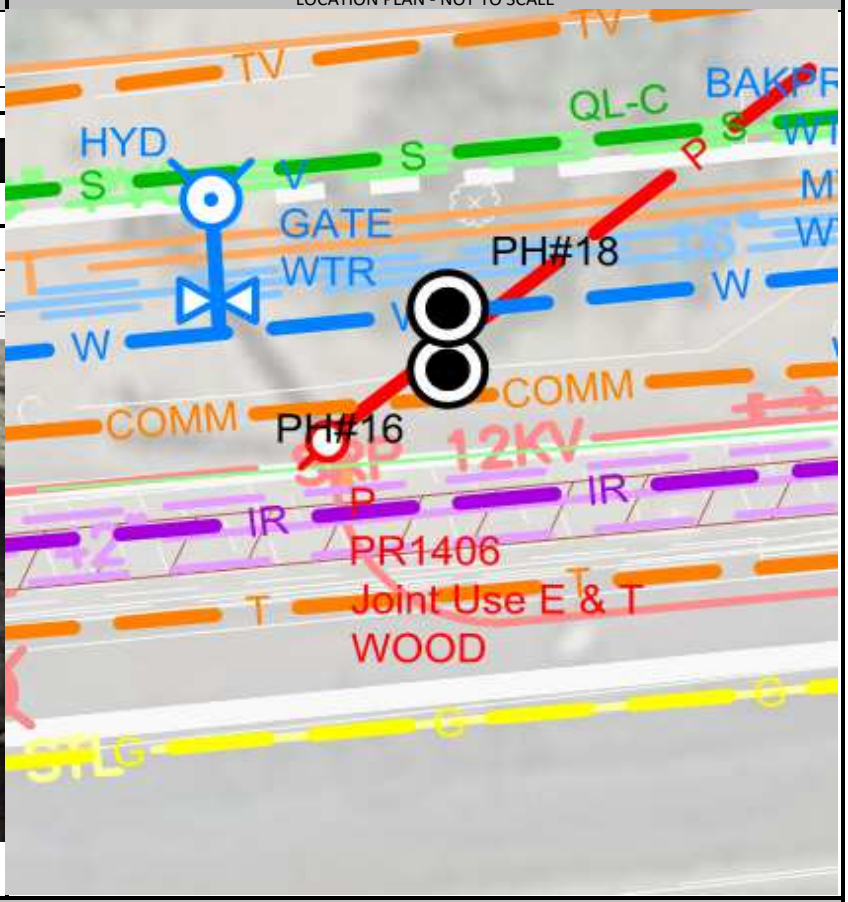
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336585.31	598580.62	1004.00

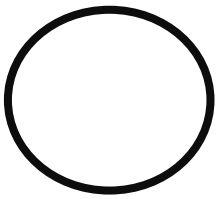
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1004.00			
Top Elevation	998.66	**Pipe OD or Structure Height (inches)**	5.34	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.09		6.91	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 19	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

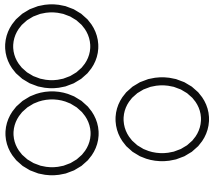
Northing	Easting	Surf Pin Elev
336544.25	598196.08	1003.71

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1003.71			
Top Elevation	996.23	**Pipe OD or Structure Height (inches)**	7.48	**Top Depth (FT)**
		7.00		
Bottom Elevation	995.65		8.06	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	PVC	EAST & WEST	Native Backfill	Jackhammer & Coldpatch

Comments

Pothole located on 90 degree sweep. Line is heading North / South and sweeping East.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 20	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

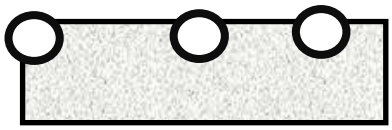
Northing	Easting	Surf Pin Elev
336618.82	598706.90	1005.18

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



1/2 slurry partially encased duct bank - 2" PVCs - Number of PVC conduits unknown / not visible

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.18			
Top Elevation	1,000.89	**Pipe OD or Structure Height (inches)**	4.29	**Top Depth (FT)**
		8.00		
Bottom Elevation	1,000.22		4.96	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	5+	2"	Encased / PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

1/2 sack Slurry encased PVC. Able to chip through slurry - 2" PVCs visible - duct bank side by side possibly stacked

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 21	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336522.57	598176.92	1002.14

PREPARED BY: RLA

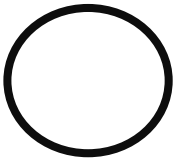
SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1002.14			
Top Elevation	998.50	**Pipe OD or Structure Height (inches)**	3.64	**Top Depth (FT)**
		10.75		
Bottom Elevation	997.60		4.54	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	10"	Steel	EAST & WEST	Native Backfill	None Off-Road

Comments

Abandoned Gas

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 22	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336614.09	598666.04	1005.55

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING Northwest

Ref Point Elevation	1005.55			
Top Elevation	1,003.36	**Pipe OD or Structure Height (inches)**	2.19	**Top Depth (FT)**
		14.00		
Bottom Elevation	1,002.19		3.36	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	F/O		24" Wide	Encased	SE & NW	Native Backfill	None Off-Road

Comments

Duct bank is running directly above SRP irrigation and immediately starts to drop in elevation West of SRP.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 23		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

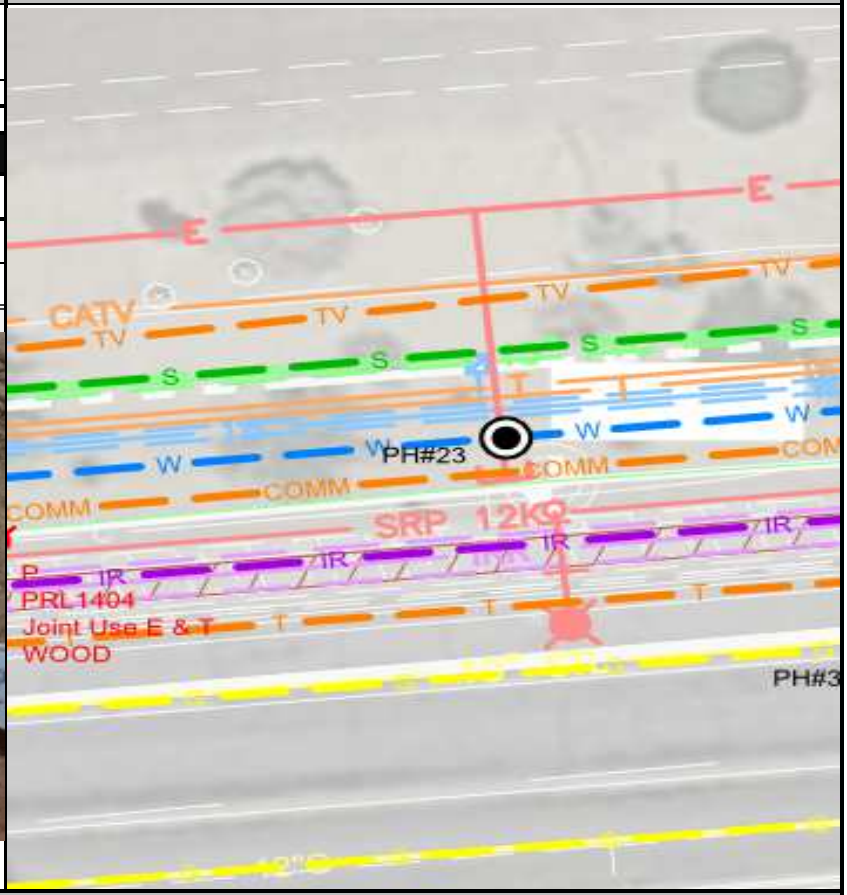
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336562.95	598352.04	1004.18

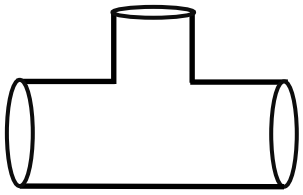
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North / West

Ref Point Elevation	1004.18			
Top Elevation	999.23	**Pipe OD or Structure Height (inches)**	4.95	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.66		6.52	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16" / 4"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

Also found 4" T connection line heading North. 4" line was previously unknown / not marked by 811 . Possible domestic feed for commercial building to the North of the pothole location. Is missing from the utility location map above. Line will be added to the CAD

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 24		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

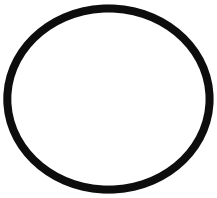
Northing	Easting	Surf Pin Elev
336616.01	598668.04	1005.65

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1005.65			
Top Elevation	1,003.37	**Pipe OD or Structure Height (inches)**	2.28	**Top Depth (FT)**
		30.00		
Bottom Elevation	1,000.87		4.78	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Irrigation	1	24"	RCP	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 25		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

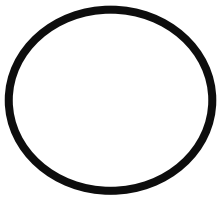
Northing	Easting	Surf Pin Elev
336572.27	598444.96	1004.64

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING Northeast

Ref Point Elevation	1004.64			
Top Elevation	999.16	**Pipe OD or Structure Height (inches)**	5.48	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.60		7.05	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	NE & SW	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 26	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

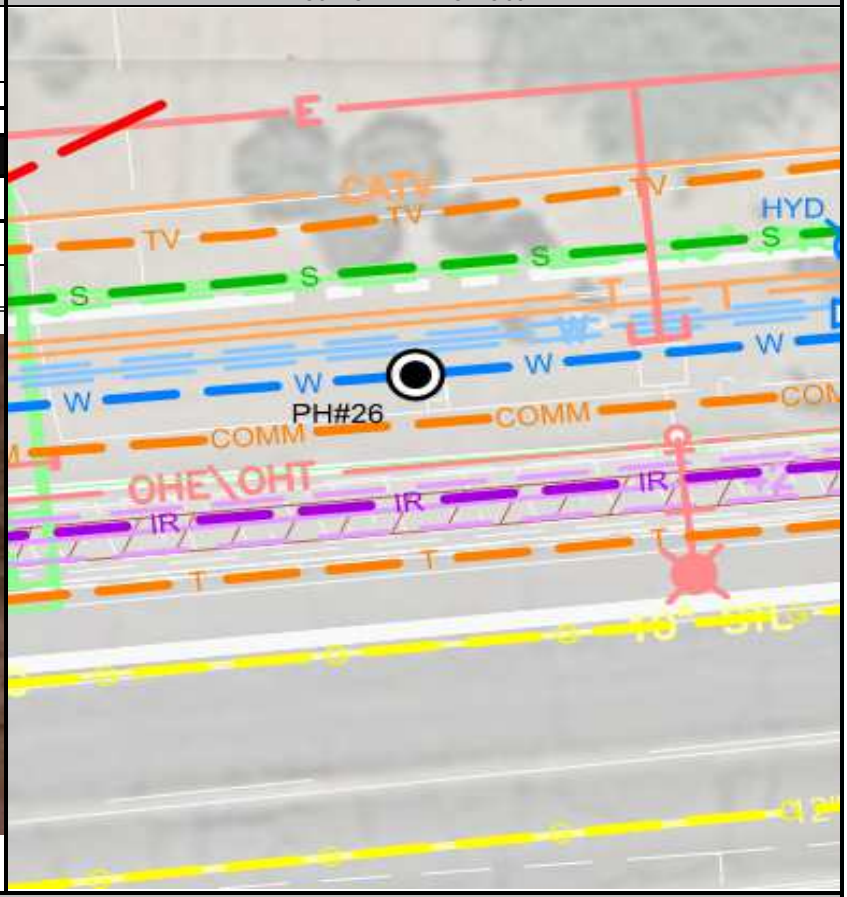
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336580.67	598535.77	1004.48

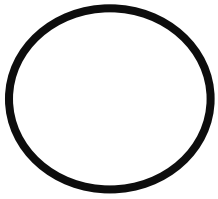
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1004.48			
Top Elevation	999.32	**Pipe OD or Structure Height (inches)**	5.16	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.75		6.73	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 27	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

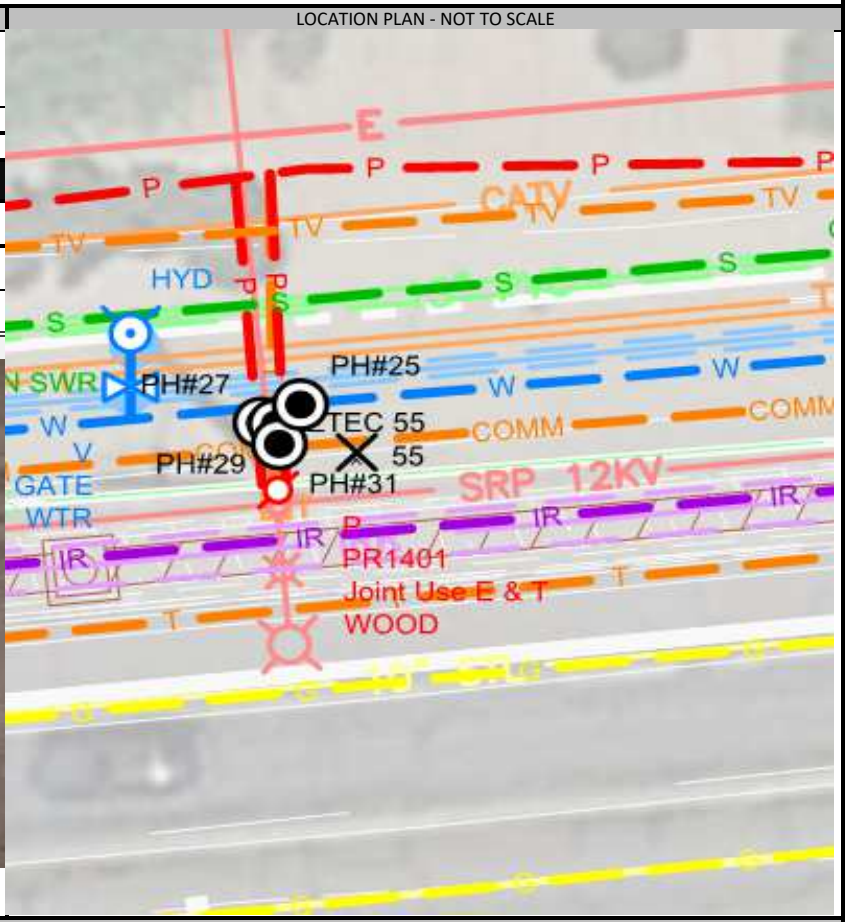
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336570.74	598442.01	1004.68

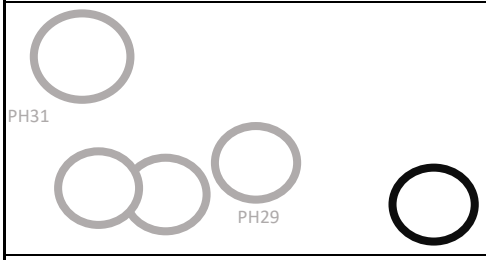
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.68			
Top Elevation	1,000.37	**Pipe OD or Structure Height (inches)**	4.31	**Top Depth (FT)**
		3.50		
Bottom Elevation	1,000.08		4.60	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	1	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Joint Trench with PH29 & PH31

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 29	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

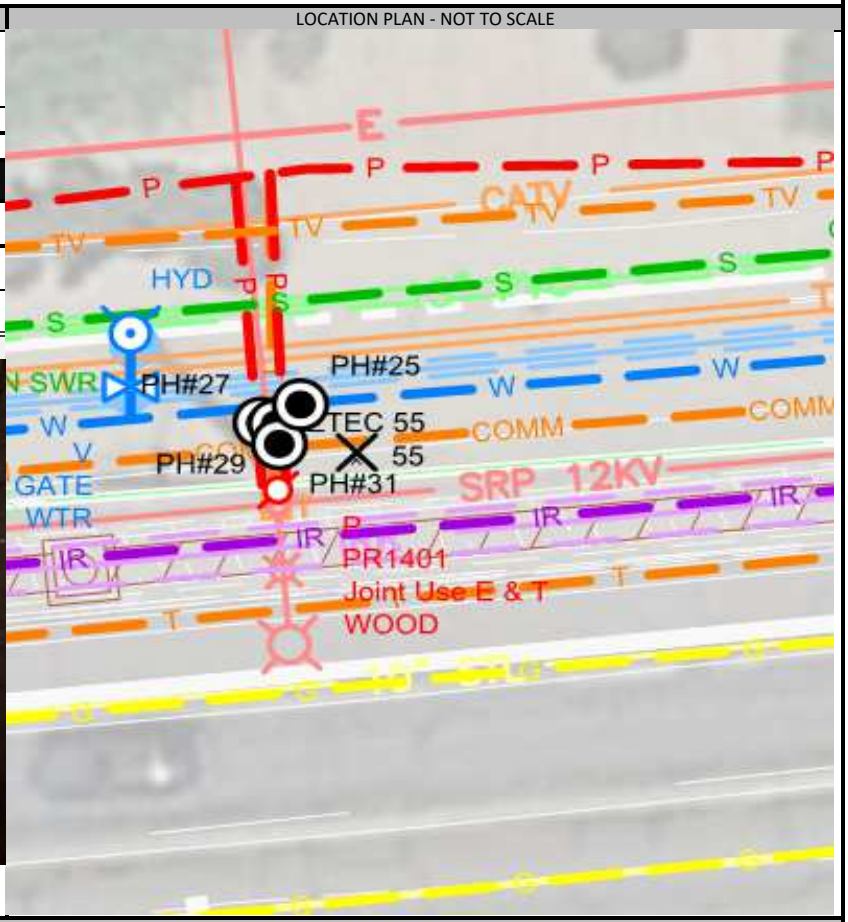
Northing	Easting	Surf Pin Elev
336570.64	598443.14	1004.76

PREPARED BY: RLA

SURVEYOR'S SEAL

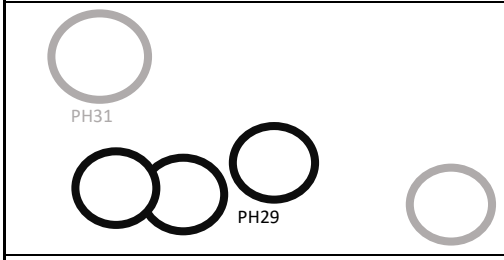
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.76			
Top Elevation	1,000.62	**Pipe OD or Structure Height (inches)**	4.14	**Top Depth (FT)**
		3.50		
Bottom Elevation	1,000.33		4.43	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

0

Comments

Stacked - Joint Trench with PH27 & PH31

FOR SAFE SITE UTILITY SERVICES, LLC:

Test Hole #	PH 30	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/14/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

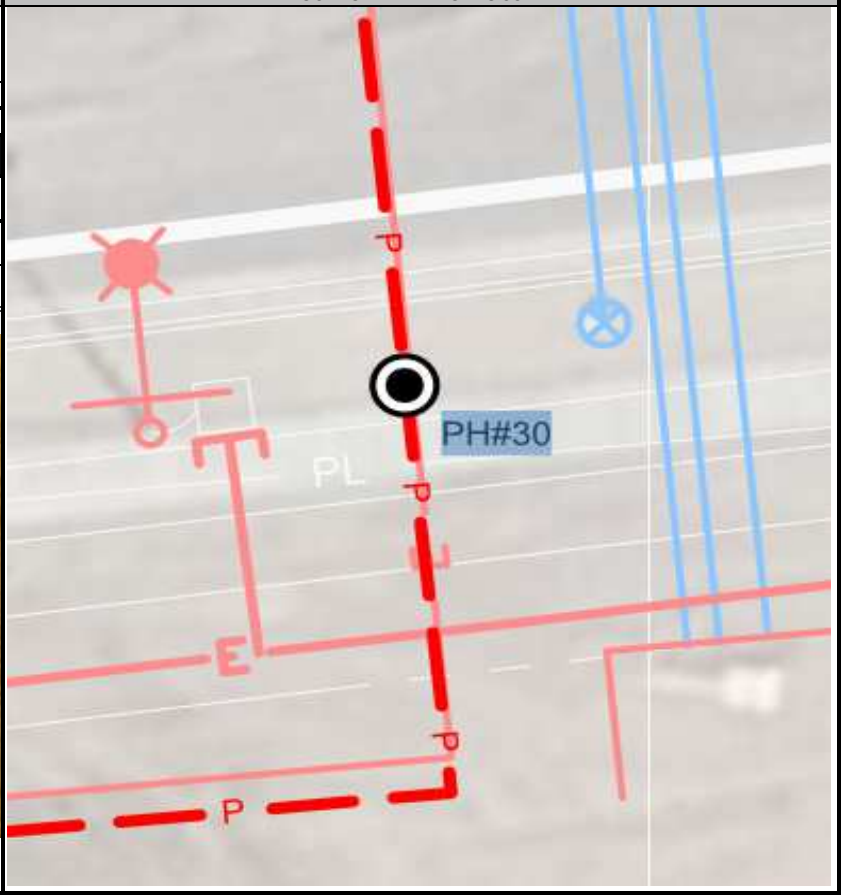
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336352.46	597488.86	1001.41

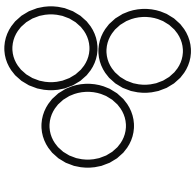
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.41			
Top Elevation	996.95	**Pipe OD or Structure Height (inches)**	4.46	**Top Depth (FT)**
		3.50		
Bottom Elevation	996.66		4.75	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Stacked & Side by Side

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 31	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

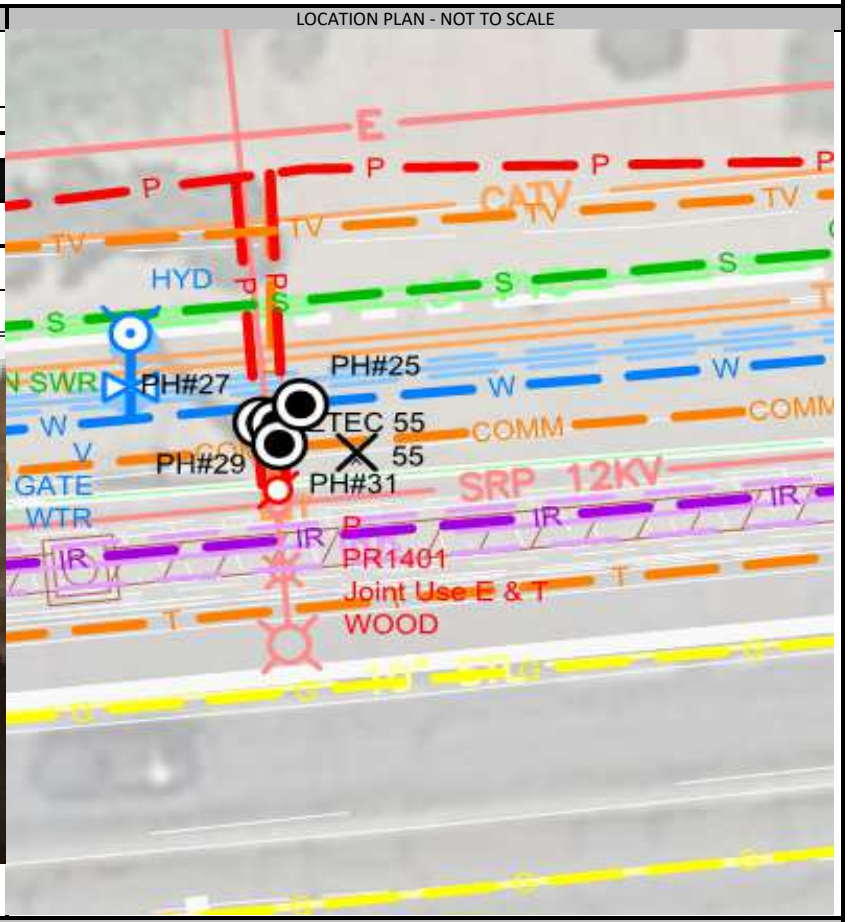
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336569.02	598443.37	1004.79

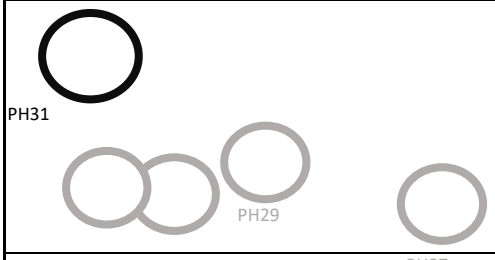
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1004.79			
Top Elevation	1,001.66	**Pipe OD or Structure Height (inches)**	3.13	**Top Depth (FT)**
Bottom Elevation	1,001.37	3.50	3.42	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	1	3"	PVC	NORTH & SOUTH	Native Backfill	None Off-Road

Comments

Joint Trench with PH29 & PH27

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 32	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/14/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

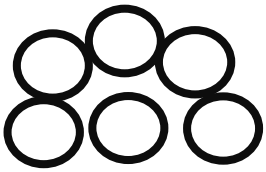
Northing	Easting	Surf Pin Elev
336640.57	598993.51	1005.21

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.21			
Top Elevation	998.98	**Pipe OD or Structure Height (inches)**	6.23	**Top Depth (FT)**
		6.00		
Bottom Elevation	998.48		6.73	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	6	2" Bundle	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 33	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

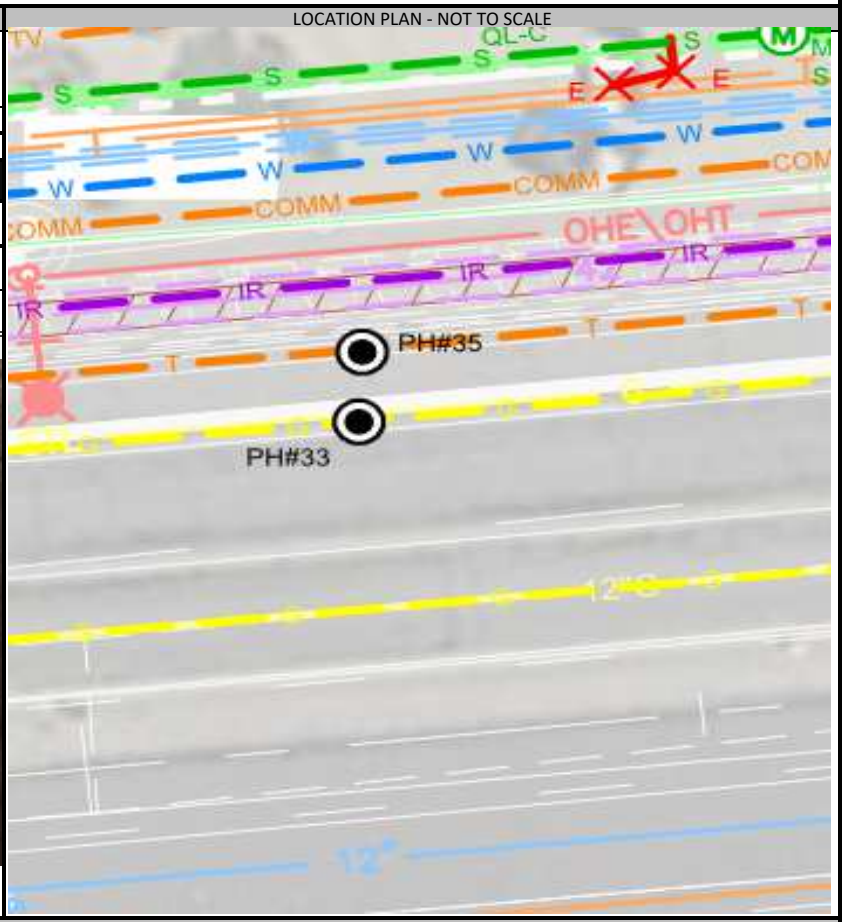
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336542.23	598382.70	1002.41

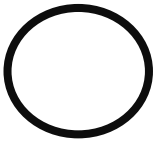
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1002.41			
Top Elevation	999.05	**Pipe OD or Structure Height (inches)**	3.36	**Top Depth (FT)**
		10.75		
Bottom Elevation	998.16		4.26	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	10"	Steel	EAST & WEST	Native Backfill	None Off-Road

Comments

Abandoned Gas

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 34		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/14/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

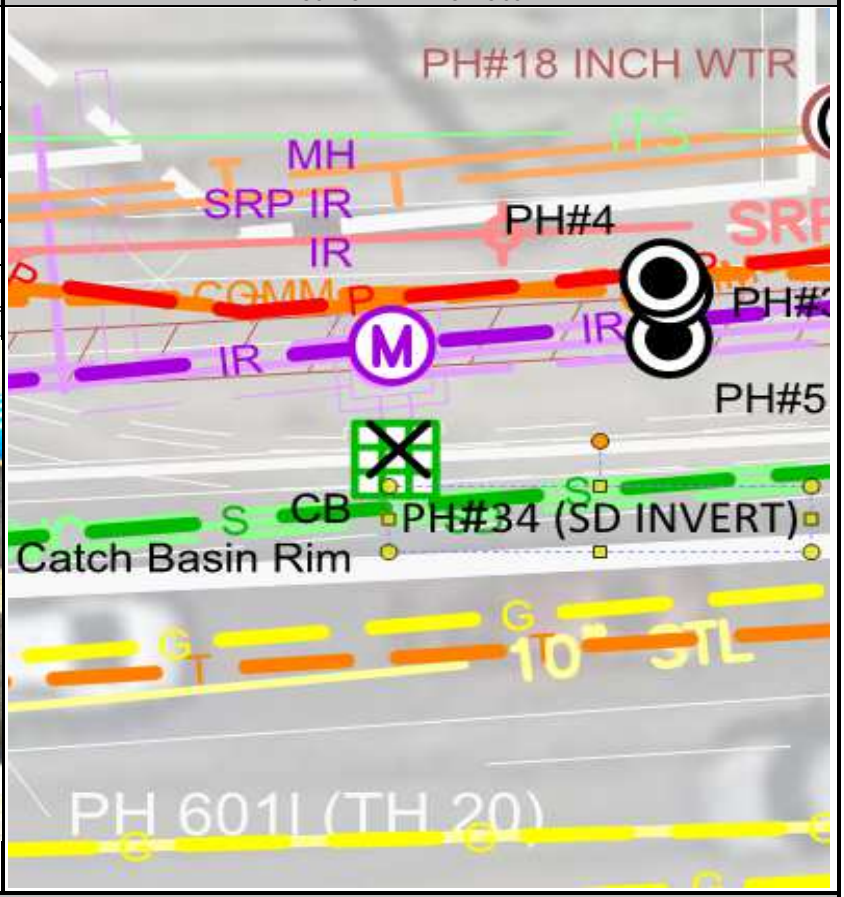
REFERENCE POINT

Northing	Easting	Surf Pin Elev
336412.19	596916.23	1000.76

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

N/A

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1000.76			
Top Elevation	N/A	**Pipe OD or Structure Height (inches)** N/A	N/A	**Top Depth (FT)**
Bottom Elevation	N/A		N/A	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	orm Drain Catch Bas	1	14"	Concrete	NORTH & SOUTH		None Off-Road

Comments

SD Cleanout / Invert & Pipe size

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 35	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

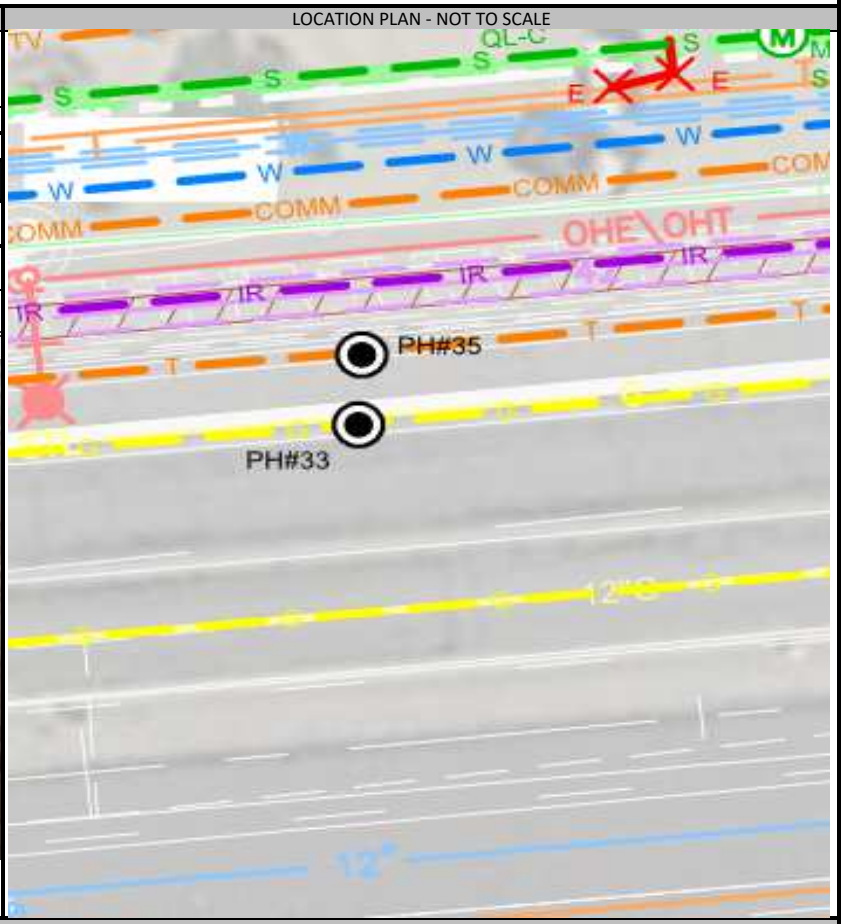
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336548.66	598382.96	1002.23

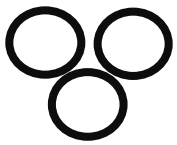
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1002.23			
Top Elevation	999.77	**Pipe OD or Structure Height (inches)**	2.46	**Top Depth (FT)**
		8.20		
Bottom Elevation	999.09		3.14	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	3	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

Stacked & Side by Side

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 36	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

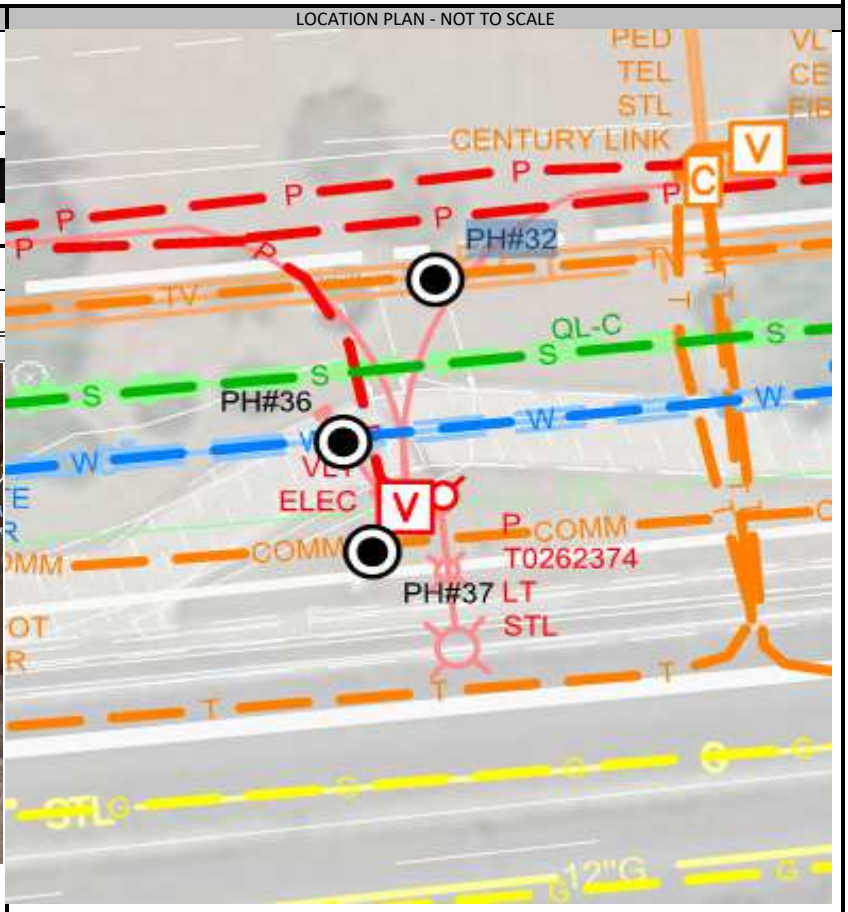
Northing	Easting	Surf Pin Elev
336627.75	598986.69	1005.15

PREPARED BY: RLA

SURVEYOR'S SEAL

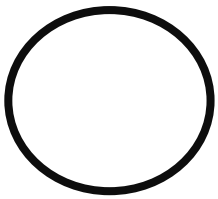
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.15			
Top Elevation	999.91	**Pipe OD or Structure Height (inches)**	5.24	**Top Depth (FT)**
		18.79		
Bottom Elevation	998.35		6.81	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Water	1	16"	ACP	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 37	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

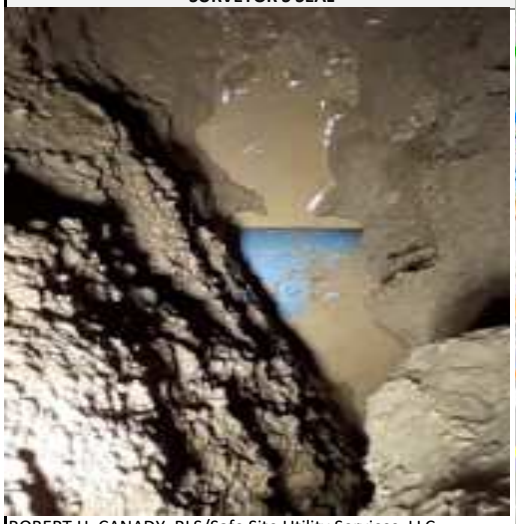
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336619.05	598988.86	1005.53

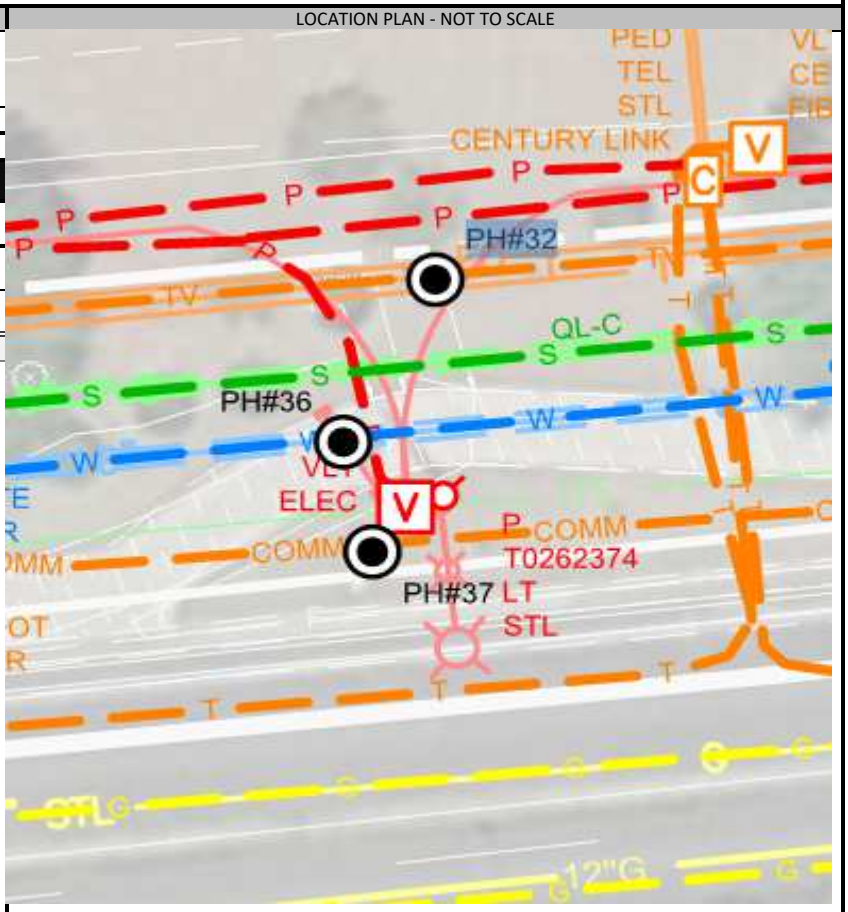
PREPARED BY: RLA

SURVEYOR'S SEAL



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.53			
Top Elevation	999.50	**Pipe OD or Structure Height (inches)**	6.03	**Top Depth (FT)**
		4.80		
Bottom Elevation	999.10		6.43	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	1	4"	PVC	EAST & WEST	Native Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH A	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

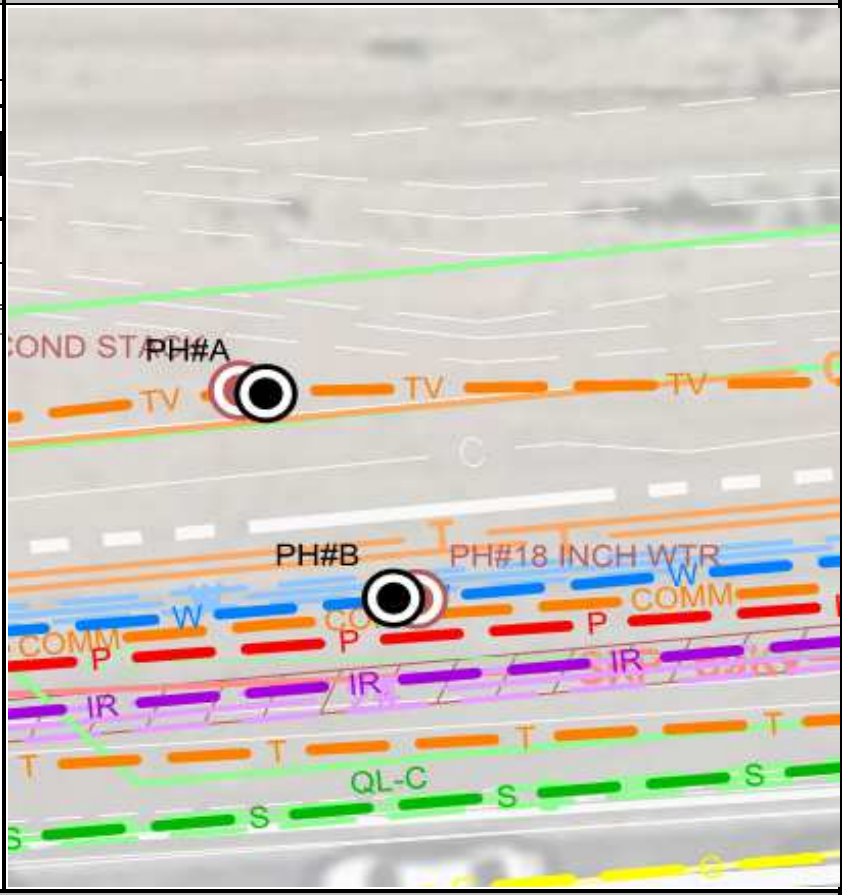
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336450.25	597027.12	1001.12

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.12			
Top Elevation	998.55	**Pipe OD or Structure Height (inches)**	2.57	**Top Depth (FT)**
		3.00		
Bottom Elevation	998.30		2.82	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	2	2"	PVC	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH B		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

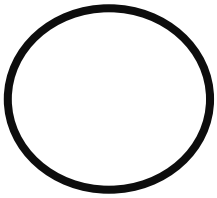
Northing	Easting	Surf Pin Elev
336435.22	597035.86	1001.40

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.40			
Top Elevation	996.05	**Pipe OD or Structure Height (inches)**	5.35	**Top Depth (FT)**
		18.79		
Bottom Elevation	994.49		6.92	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH C		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

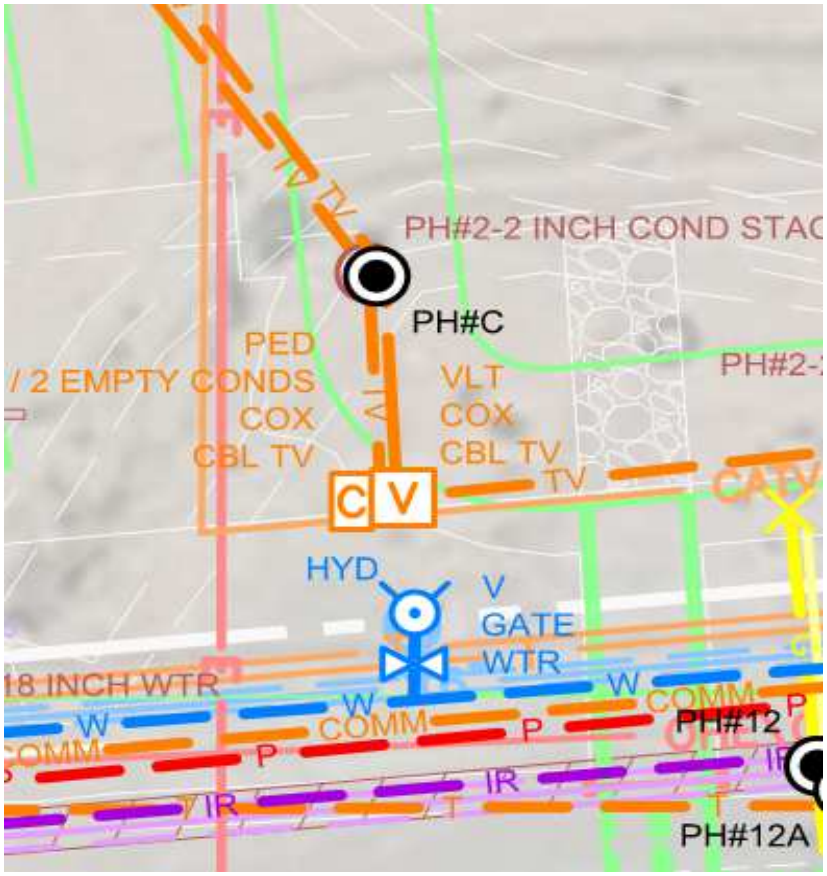
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336460.01	596972.11	1000.77

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1000.77			
Top Elevation	995.16	**Pipe OD or Structure Height (inches)**	5.61	**Top Depth (FT)**
		3.00		
Bottom Elevation	994.91		5.86	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	2	2"	PVC	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH D	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

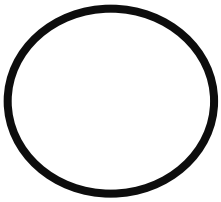
Northing	Easting	Surf Pin Elev
336503.19	596895.87	1002.10

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING Northwest

Ref Point Elevation	1002.10			
Top Elevation	996.66	**Pipe OD or Structure Height (inches)**	5.44	**Top Depth (FT)**
		18.79		
Bottom Elevation	995.09		7.01	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	SE & NW	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH D1		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336501.74	596894.86	1002.08

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1002.08			
Top Elevation	999.21	**Pipe OD or Structure Height (inches)**	2.87	**Top Depth (FT)**
		2.38		
Bottom Elevation	999.01		3.07	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	TV	1	2"	PVC	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH E		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

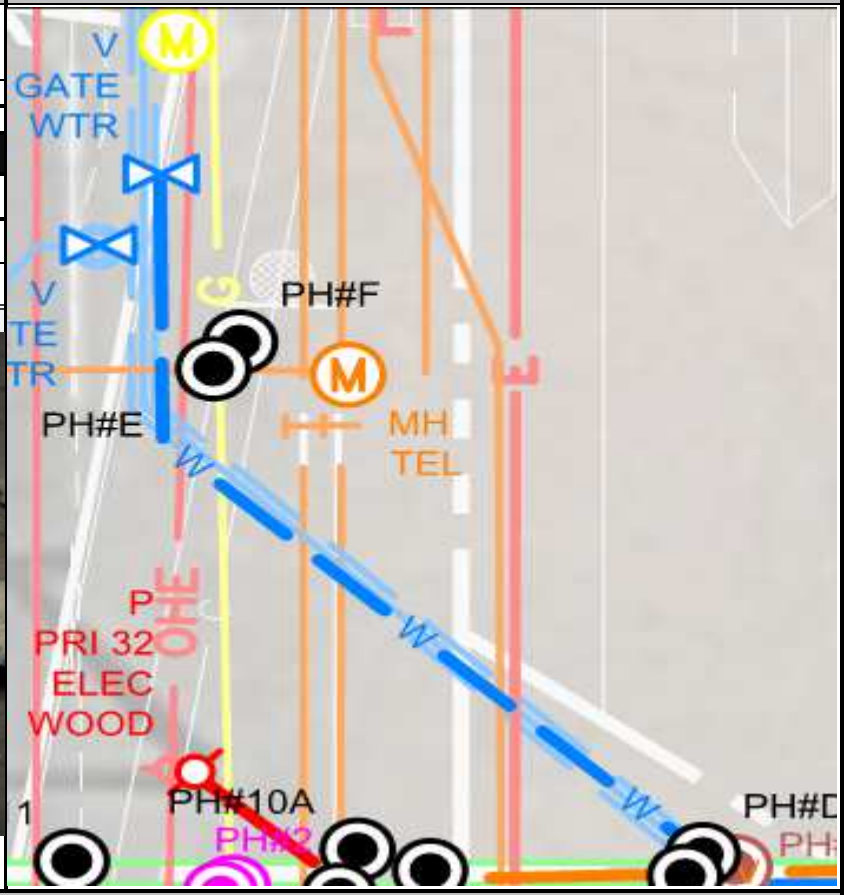
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336535.47	596868.21	1001.75

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.75			
Top Elevation	996.83	**Pipe OD or Structure Height (inches)**	4.92	**Top Depth (FT)**
		2.38		
Bottom Elevation	996.64		5.12	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	2"	HDPE	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

Out of Safe Site locate boundries. Utility info showing in the location plan above was provided by MCDOT. Pothole icon is the actual location of the utility

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH F		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

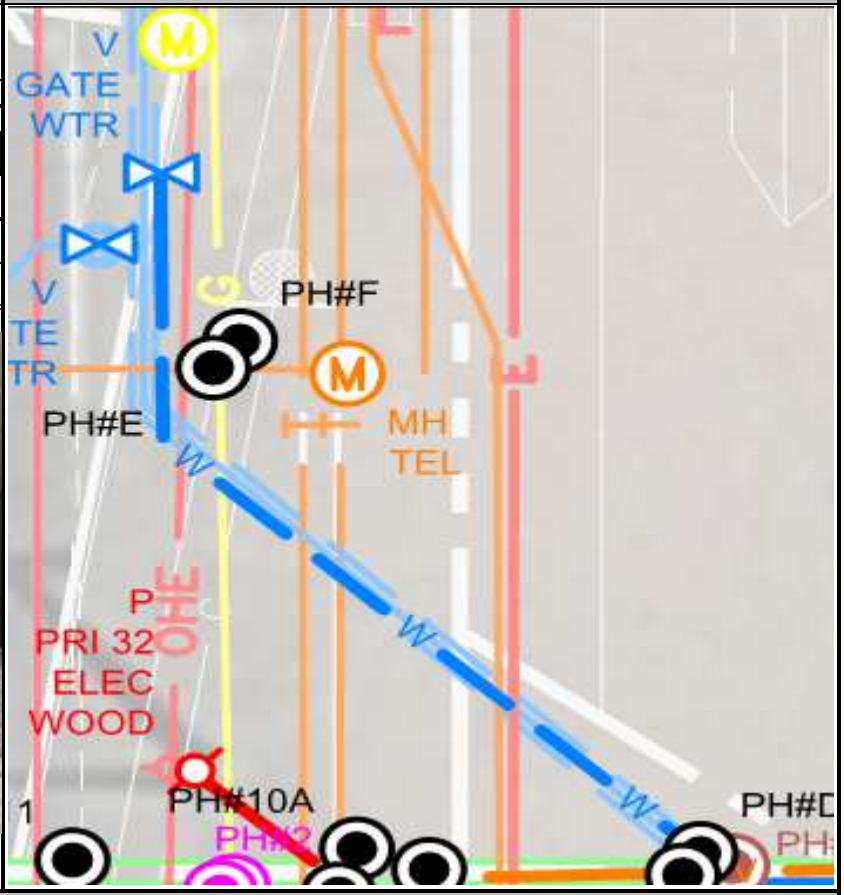
Northing	Easting	Surf Pin Elev
336537.23	596869.72	1001.74

PREPARED BY: **RLA**

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.74			
Top Elevation	996.94	**Pipe OD or Structure Height (inches)**	4.80	**Top Depth (FT)**
		4.50		
Bottom Elevation	996.57		5.18	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH G		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

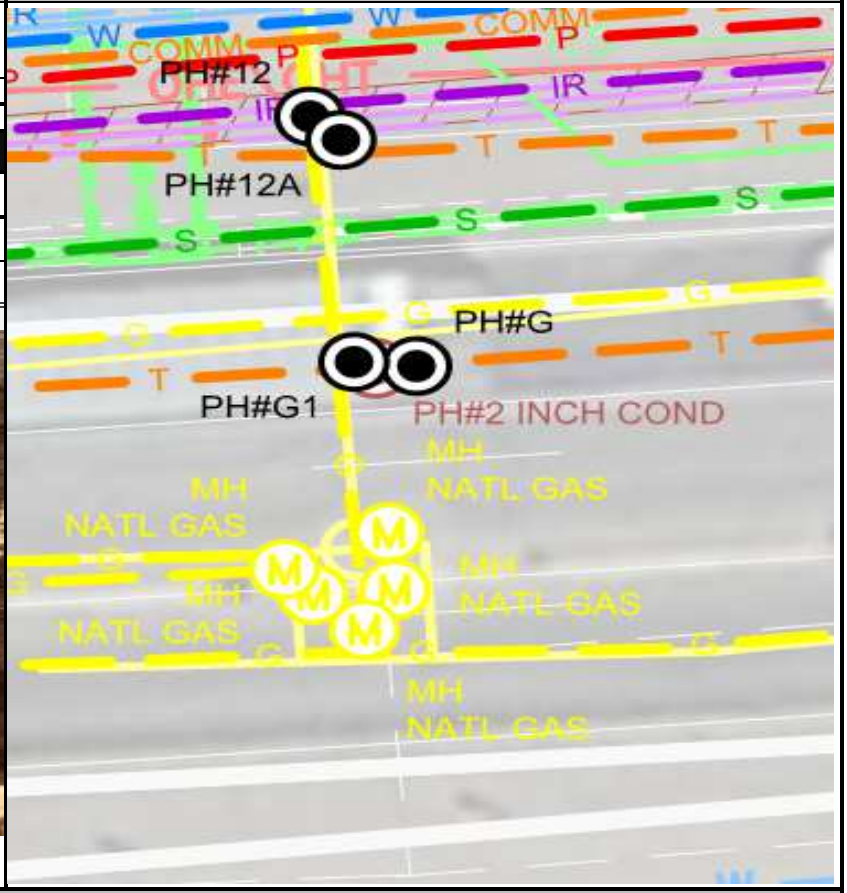
Northing	Easting	Surf Pin Elev
336406.97	597006.73	1000.16

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.16			
Top Elevation	998.76	**Pipe OD or Structure Height (inches)**	1.40	**Top Depth (FT)**
		1.90		
Bottom Elevation	998.60		1.56	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	1	1.5"	Direct Buried Cable	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH G1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

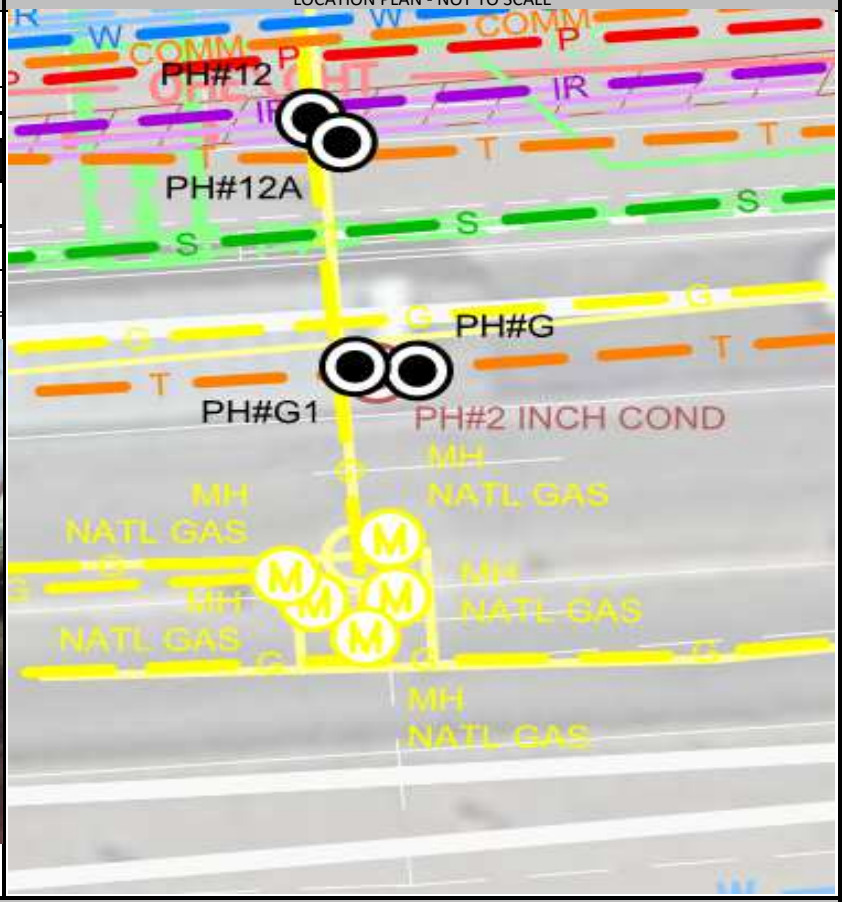
Northing	Easting	Surf Pin Elev
336407.25	597002.95	1000.40

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1000.40			
Top Elevation	993.14	**Pipe OD or Structure Height (inches)**	7.26	**Top Depth (FT)**
		4.50		
Bottom Elevation	992.77		7.64	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	Steel	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH H	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

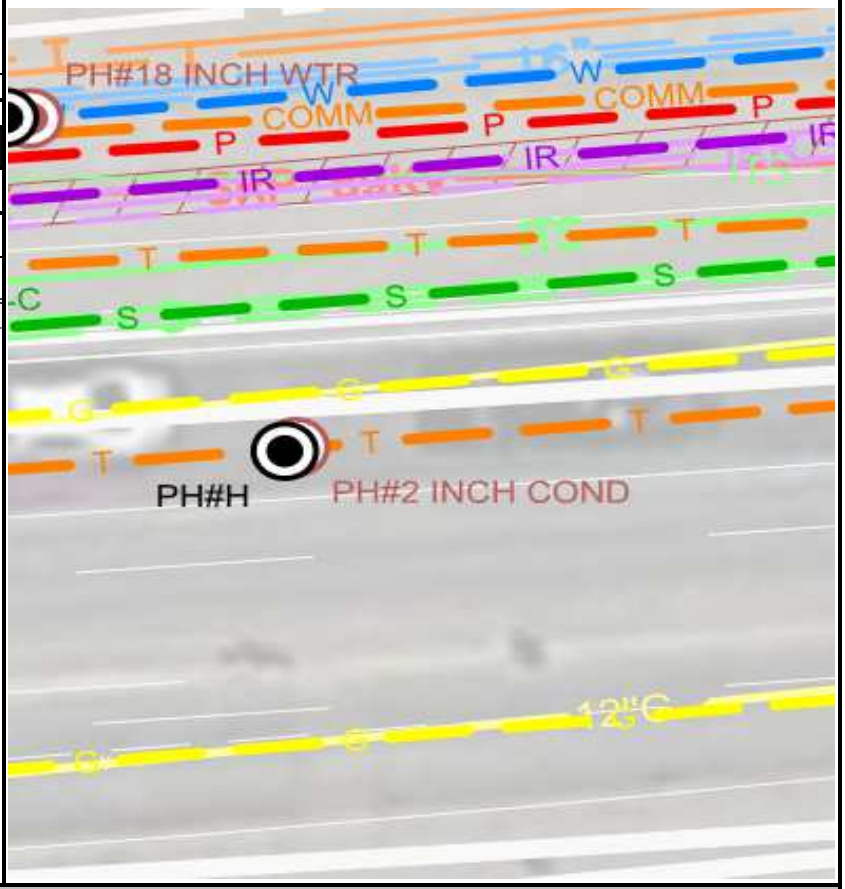
Northing	Easting	Surf Pin Elev
336410.99	597053.54	1000.05

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.05			
Top Elevation	998.93	**Pipe OD or Structure Height (inches)**	1.12	**Top Depth (FT)**
		1.90		
Bottom Elevation	998.77		1.28	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	1	1.5"	Direct Buried Cable	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH I		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/12/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

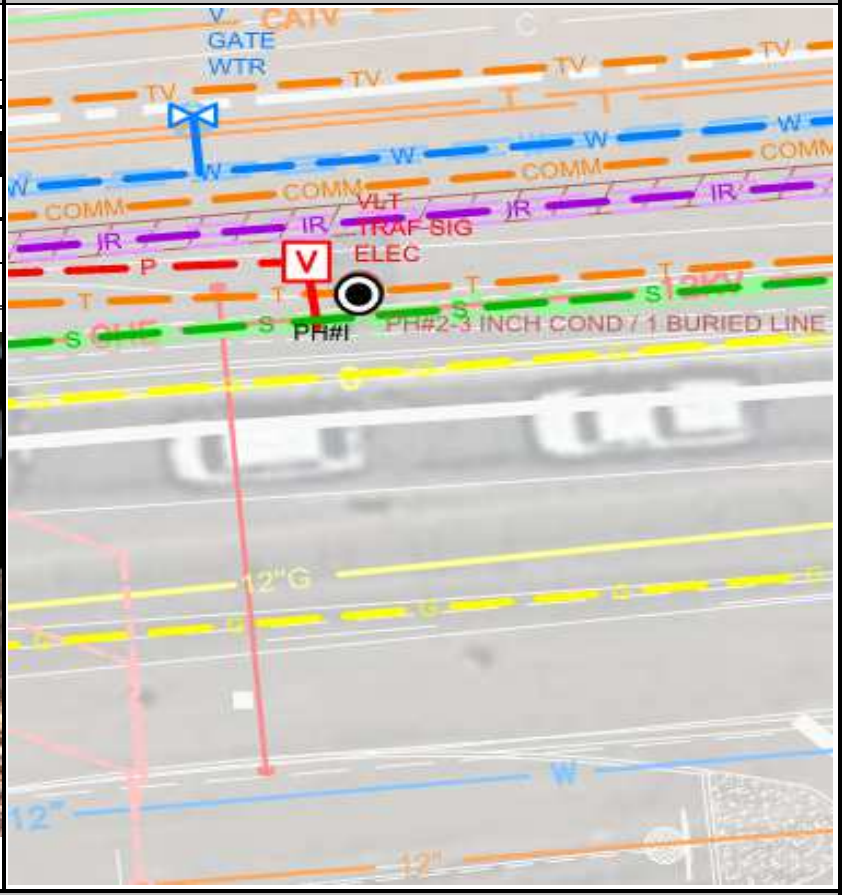
Northing	Easting	Surf Pin Elev
336445.48	597288.74	1001.81

PREPARED BY: RLA

SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.81			
Top Elevation	998.31	**Pipe OD or Structure Height (inches)**	3.50	**Top Depth (FT)**
		6.00		
Bottom Elevation	997.81		4.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
CenturyLink	Comm	3	2) 4" PVC and 1) 2" Direct Buried Cable	Duct bank	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH J		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

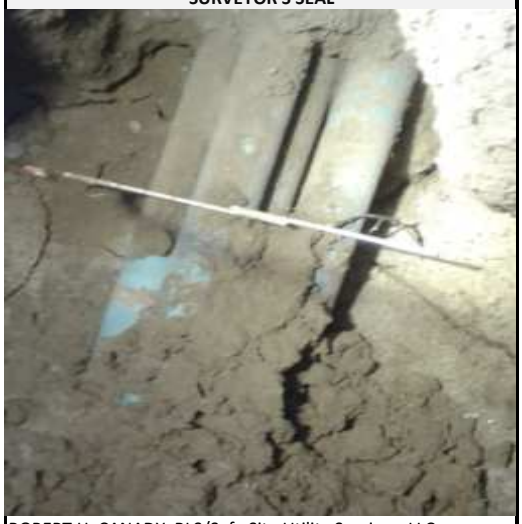
SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336610.16	598686.80	1005.62

PREPARED BY: RLA

SURVEYOR'S SEAL

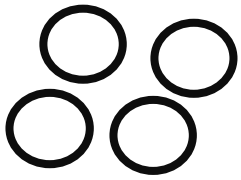


ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.62			
Top Elevation	1,002.15	**Pipe OD or Structure Height (inches)**	3.47	**Top Depth (FT)**
		6.00		
Bottom Elevation	1,001.65		3.97	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	4	2"	PVC	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH K		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336609.14	598672.80	1005.48

PREPARED BY: RLA

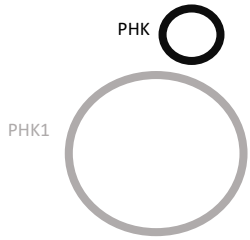
SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.48		
Top Elevation	1,003.71	**Pipe OD or Structure Height (inches)** 2.38	1.77 **Top Depth (FT)**
Bottom Elevation	1,003.51		1.97 **Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Cox	Comm	1	2"	PVC	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH K-1		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

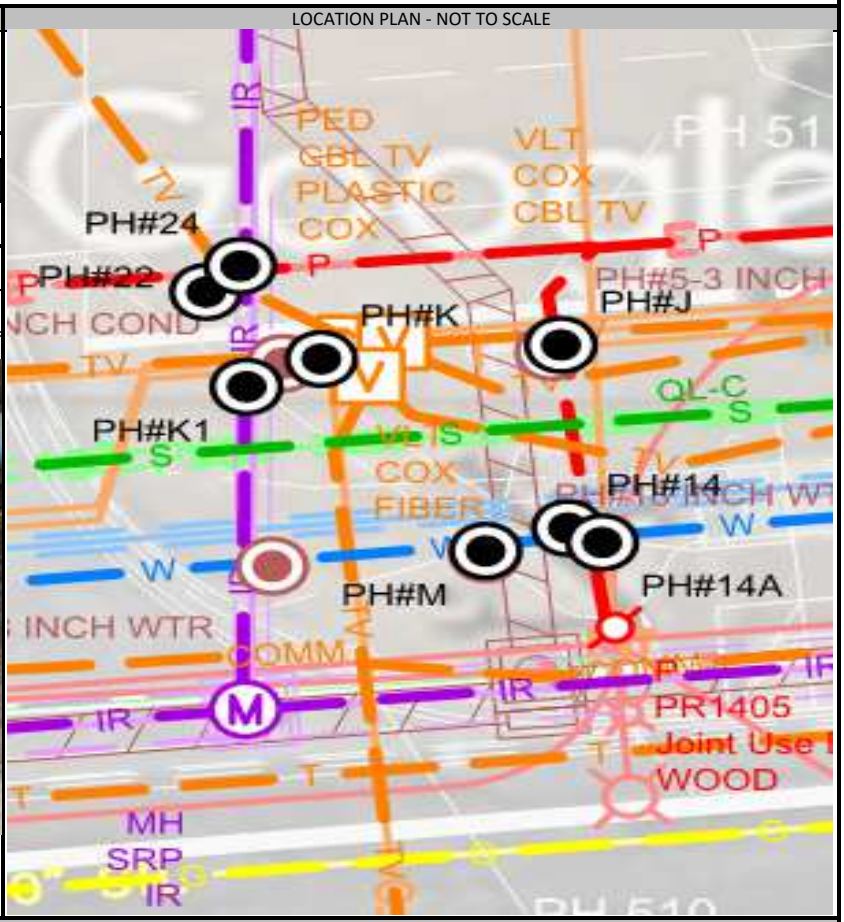
Northing	Easting	Surf Pin Elev
336607.06	598668.41	1005.47

PREPARED BY: RLA

SURVEYOR'S SEAL

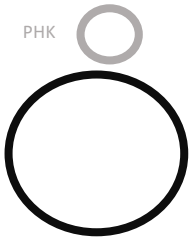
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1005.47			
Top Elevation	1,003.34	**Pipe OD or Structure Height (inches)**	2.13	**Top Depth (FT)**
		30.00		
Bottom Elevation	1,000.84		4.63	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Irrigation	1	24"	RCP	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH L		SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20		Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave		City	Phoenix
Project#	2018-061-4		County	Maricopa
Location				

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

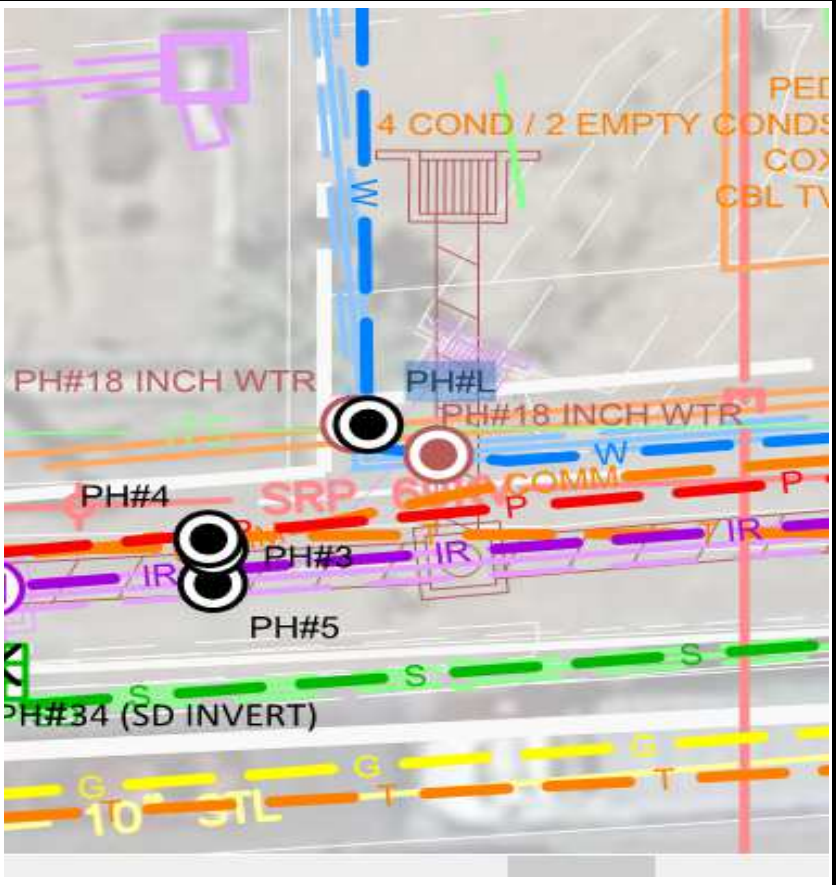
Northing	Easting	Surf Pin Elev
336430.11	596939.13	1001.19

PREPARED BY: RLA

SURVEYOR'S SEAL

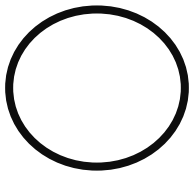
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.19			
Top Elevation	995.98	**Pipe OD or Structure Height (inches)**	5.21	**Top Depth (FT)**
		18.79		
Bottom Elevation	994.42		6.78	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Water	1	16"	ACP	NORTH & SOUTH	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

POTHOLE REPORT

Test Hole #	PH M	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336594.85	598682.39	1005.34

PREPARED BY: RLA

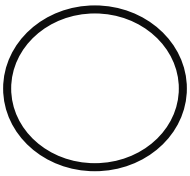
SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1005.34			
Top Elevation	999.91	**Pipe OD or Structure Height (inches)**	5.43	**Top Depth (FT)**
		18.79		
Bottom Elevation	998.35		7.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH N	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	2/13/20	Survey	Safe Site Utility Services, LLC
Project Name	TT0345 - MC 85: 75th Ave to 95th Ave	City	Phoenix
Project#	2018-061-4	County	Maricopa
Location			

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NGVD29 - Brass Cap in HandHole at 91st Ave & MC 85 Elev= 1000.90'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336598.63	598712.30	1004.77

PREPARED BY: RLA

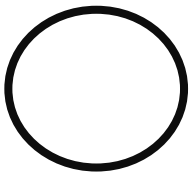
SURVEYOR'S SEAL

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1004.77			
Top Elevation	999.46	**Pipe OD or Structure Height (inches)**	5.31	**Top Depth (FT)**
		18.79		
Bottom Elevation	997.89		6.88	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Native Backfill	

MCDOT OPEN POTHOLES (Potholes dug by others) Safe Site Documentation only

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

Test Hole Summary Report

Report Prepared for: Western Underground

Address: S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353

Date of Report: 3/20/2020

Description of Project: Logic Park - 12" Water Line

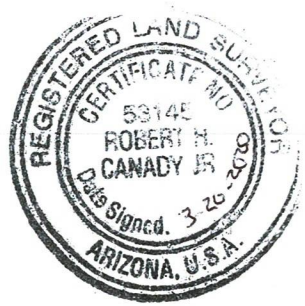
Cust Job #:

Safe Site Project #: 2002252

ADOT #	Potential Conflict / Description	Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 1	Potential Conflict / Description: 12" DIP Stub - Water Connection	City of Phoenix	Water	1	12"	DIP Concrete Encased	EAST & WEST	Native Backfill	Core & Reinstate	0+71.76	24.26LT	9975.40	9926.36	1000.68	0.90	8.80	999.78	991.88	94.80	03/16/20	Line is encased in full sack slurry - Encasement started directly below asphalt. Measured top and bottom of encasement. Stub should be located approximately 5ft west of pothole location.
PH 2	Potential Conflict / Description: Crossing - 12" Steel with FO running in it - Used to be an old gas line	Williot	Comm	1	12"	Steel	EAST & WEST	Native Backfill	Core & Reinstate	0+70.54	21.08LT	9978.60	9929.55	1000.77	5.57	6.63	995.20	994.14	12.75	03/19/20	
PH 3	Potential Conflict / Description: Crossing - Electric Duct Bank	SRP	Electric	3	(2)2" & (1) 1.5"	Duct bank	NORTH & SOUTH	Native Backfill	Core & Reinstate	1+30.61	21.95LT	9977.46	9869.46	1000.02	11.21	11.75	988.81	988.27	6.50	03/16/20	
PH 4	Potential Conflict / Description: Crossing	SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road	1+92.44	35.49LT	9963.63	9807.92	1000.58	3.41	3.81	997.17	996.77	4.80	03/17/20	
PH 5	Potential Conflict / Description: Crossing	SW Gas	Gas				NORTH & SOUTH	N/A	Core & Reinstate	5+63.92	5.05LT	9982.38	9436.11	1000.81						03/19/20	Over 10" thick asphalt then a layer over ABC backfill and then concrete at 2'. Jackhammer is maxed out and can't and could not break through concrete to expose line. (See individual teshole summary for pictures)
PH 6	Potential Conflict / Description: Crossing	MCI	Comm	2	2" stacked	PVC	NORTH & SOUTH	Native Backfill	Core & Reinstate	18+50.94	13.23LT	9978.33	8149.14	999.30	3.60	4.14	995.70	995.16	6.50	03/19/20	
PH 7	Potential Conflict / Description: Crossing	SW Gas	Gas	1	4"	PVC	NORTH & SOUTH	Native Backfill	Core & Reinstate	19+92.27	13.46LT	9977.46	8007.81	999.04	3.06	3.46	995.98	995.58	4.80	03/19/20	SWG 811 marks show 2" plastic but turned out to be a 4" PVC - Possible 4" Sleeve with 2" Insert
PH8	Potential Conflict / Description: Crossing	MCI	Comm	2	2"	PE	EAST & WEST	Native Backfill	Jackhammer & Coldpatch	23+74.46	16.47LT	9972.71	7625.64	998.71	5.26	5.80	993.45	992.90	6.50	03/17/20	Stacked
PH 9	Potential Conflict / Description: Crossing	SW Gas	Gas	1	4"	PE	EAST & WEST	Screened Backfill	Jackhammer & Coldpatch	23+72.11	22.61LT	9966.58	7628.01	998.52	3.30	3.70	995.22	994.82	4.80	03/17/20	
PH 10	Potential Conflict / Description: Crossing	Williot	Comm	1	12"		EAST & WEST	Native Backfill	None Off-Road	23+71.70	26.25LT	9962.94	7628.45	998.46	5.23	6.29	993.23	992.16	12.75	03/17/20	

Horizonal Datum: Local Datum			
Northing	Easting	Elevation	Description
10000	10000	1000.76	BCHH 91ST AVE+BUCKEYE
9987.997	7366.097		BCHH +BUCKEYE
Vertical Datum: NAVD 29			
Northing	Easting	Elevation	Description
10000.00	10000.00	1000.76	BCHH 91ST AVE+BUCKEYE

I HEREBY CERTIFY THAT THE MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY DIRECT SUPERVISION OR AS NOTED AND ARE CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.



Robert H Canady Jr

Horizontal and vertical locations of utilities obtained by actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are estimated visually and may not be exact.

Test Hole #	PH 1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/18/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

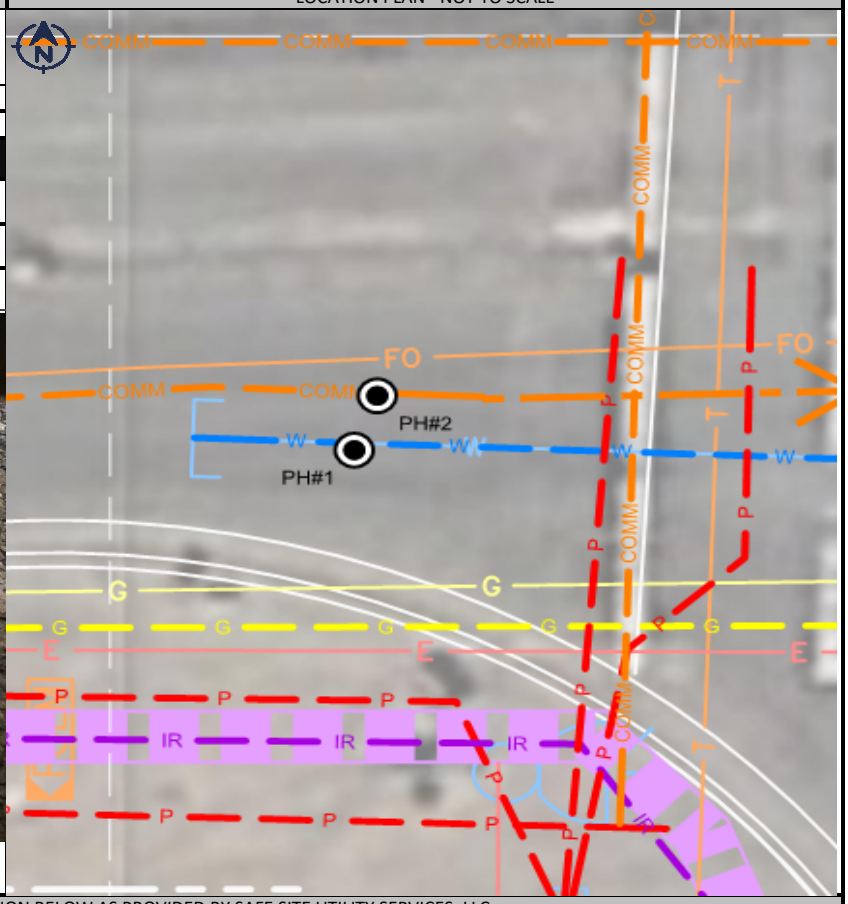
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9975.40	9928.36	1000.68

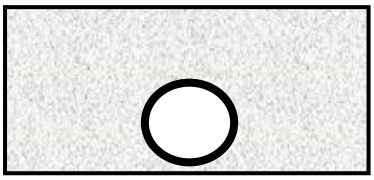
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.68			
Top Elevation	999.78	**Pipe OD or Structure Height (inches)**	0.90	**Top Depth (FT)**
		94.80		
Bottom Elevation	991.88		8.80	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
City of Phoenix	Water	1	12"	IP Concrete Encase	EAST & WEST	Native Backfill	Core & Reinstate

Potential Conflict / Description: 12" DIP Stub - Water Connection

Comments

Line is encased in full sack slurry - Encasement started directly below asphalt. Measured top and bottom of encasement. Stub should be located approximately 9ft west of pothole location.

FOR SAFE SITE UTILITY SERVICES, LLC:

PREPARED BY DA CHECKED BY RB

Test Hole #	PH 2	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/19/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

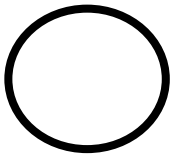
Northing	Easting	Surf Pin Elev
9978.60	9929.55	1000.77

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.77			
Top Elevation	995.20	**Pipe OD or Structure Height (inches)**	5.57	**Top Depth (FT)**
		12.75		
Bottom Elevation	994.14		6.63	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Willtel	Comm	1	12”	Steel	EAST & WEST	Native Backfill	Core & Reinstate

Potential Conflict / Description: Crossing - 12" Steel with FO running in it - Used to be an old gas line

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 3	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/18/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

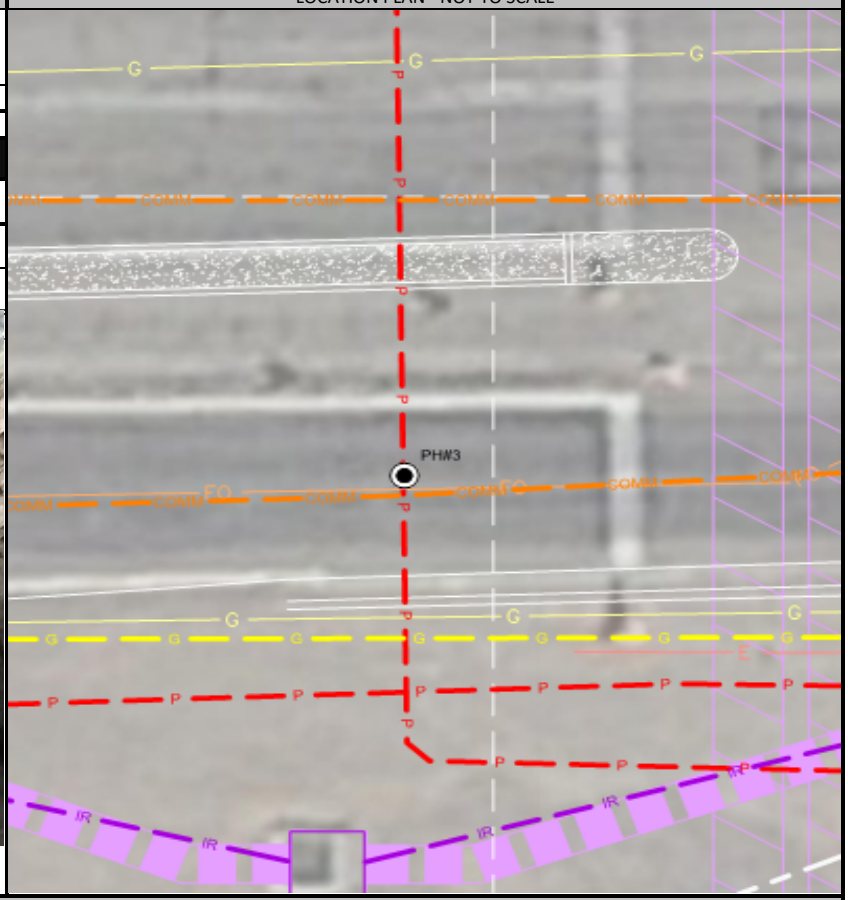
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9977.46	9869.46	1000.02

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING East

Ref Point Elevation	1000.02			
Top Elevation	988.81	**Pipe OD or Structure Height (inches)**	11.21	**Top Depth (FT)**
		6.50		
Bottom Elevation	988.27		11.75	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SRP	Electric	3	(2)2" & (1) 1.5"	Duct bank	NORTH & SOUTH	Native Backfill	Core & Reinstate

Potential Conflict / Description: Crossing - Electric Duct Bank

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 4	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/17/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

SAFE SITE UTILITY SERVICES, LLC

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

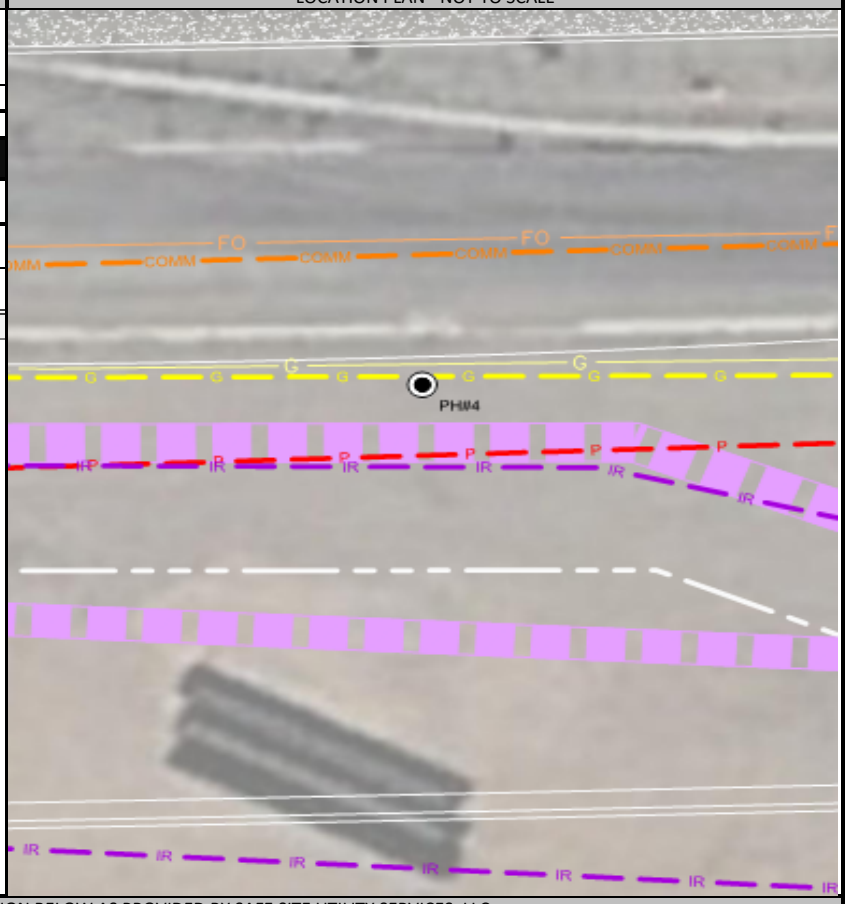
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9963.63	9807.92	1000.58

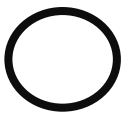
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1000.58			
Top Elevation	997.17	**Pipe OD or Structure Height (inches)**	3.41	**Top Depth (FT)**
		4.80		
Bottom Elevation	996.77		3.81	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	PE	EAST & WEST	Native Backfill	None Off-Road

Potential Conflict / Description: Crossing

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/19/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

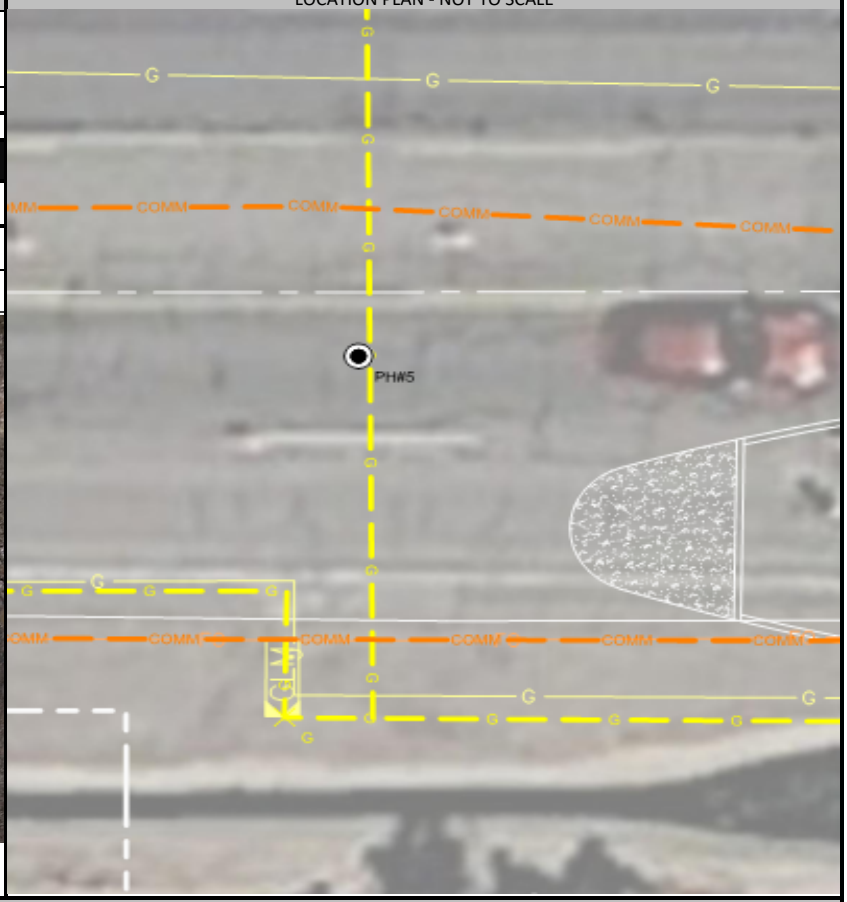
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9992.38	9436.11	1000.81

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation 1000.81

Top Elevation

Bottom Elevation

Pipe OD or Structure Height (inches)

Top Depth (FT)

Bottom Depth (FT)

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas				NORTH & SOUTH	N/A	Core & Reinstate

Potential Conflict / Description: Crossing

Comments

Over 10" thick asphalt then a layer over ABC backfill and then concrete at 2'. Jackhammer is maxed out and can't and could not break through concrete to expose line. (See individual teshole summary for pictures)

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 6	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/19/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

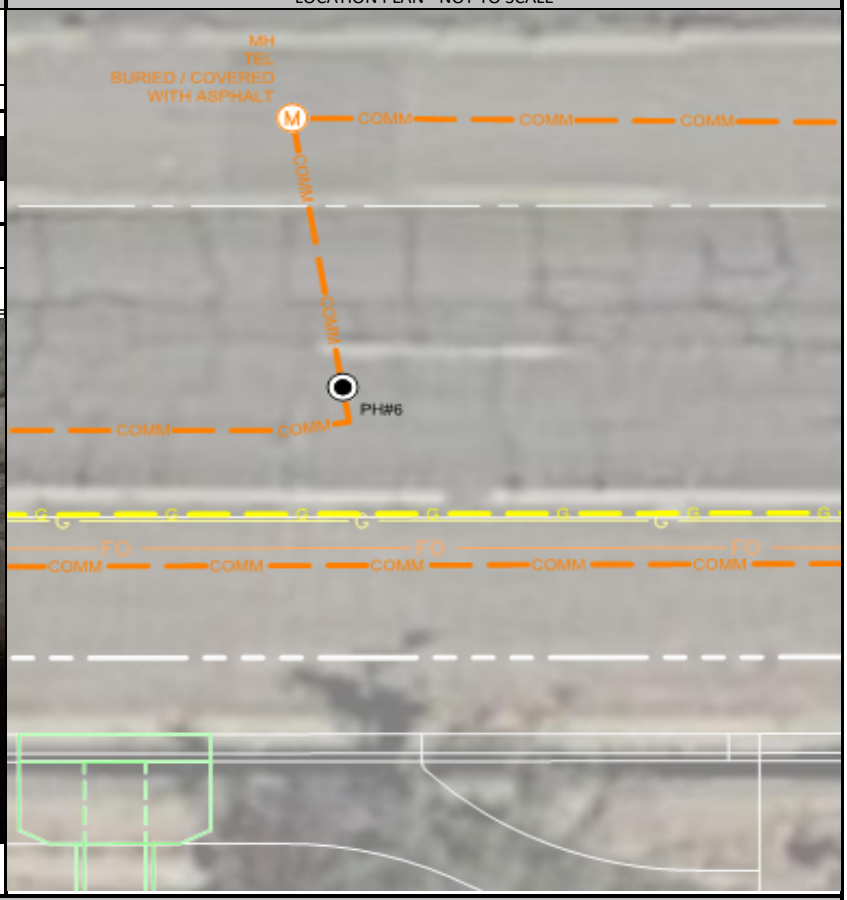
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9978.33	8149.14	999.30

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	999.30			
Top Elevation	995.70	**Pipe OD or Structure Height (inches)**	3.60	**Top Depth (FT)**
		6.50		
Bottom Elevation	995.16		4.14	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
MCI	Comm	2	2" stacked	PVC	NORTH & SOUTH	Native Backfill	Core & Reinstate

Potential Conflict / Description: Crossing

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 7	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/19/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

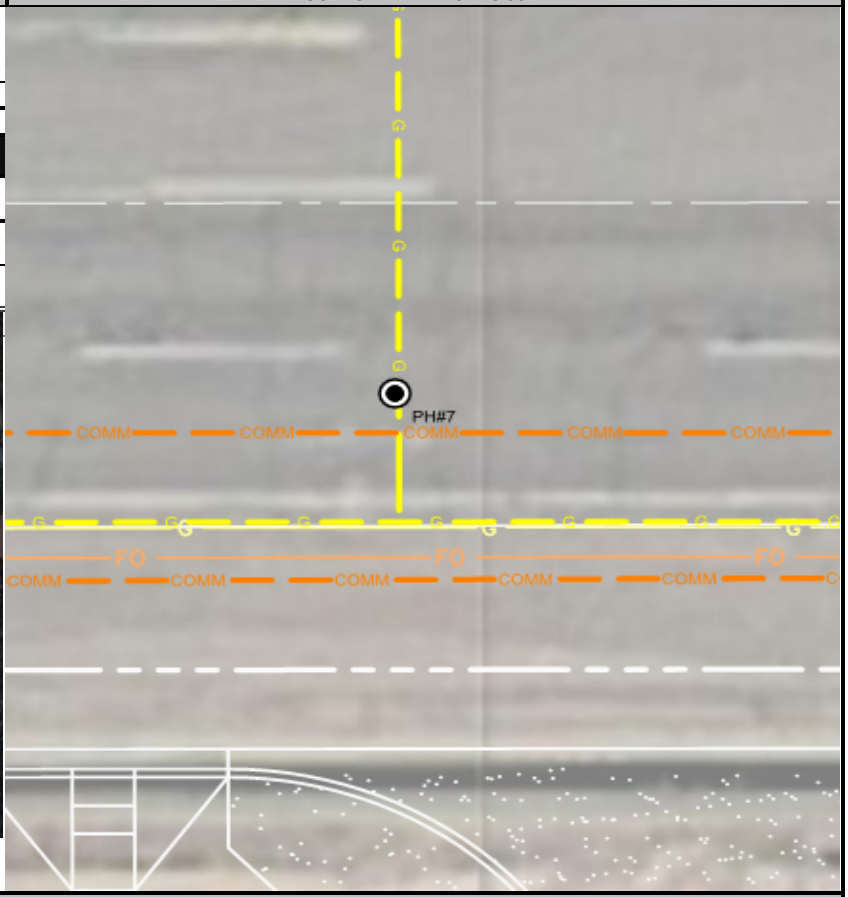
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9977.46	8007.81	999.04

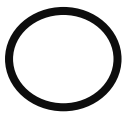
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	999.04			
Top Elevation	995.98	**Pipe OD or Structure Height (inches)**	3.06	**Top Depth (FT)**
		4.80		
Bottom Elevation	995.58		3.46	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	PVC	NORTH & SOUTH	Native Backfill	Core & Reinstate

Potential Conflict / Description: Crossing

Comments

SWG 811 marks show 2" plastic but turned out to be a 4" PVC - Possible 4" Sleeve with 2" insert

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH8	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/17/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

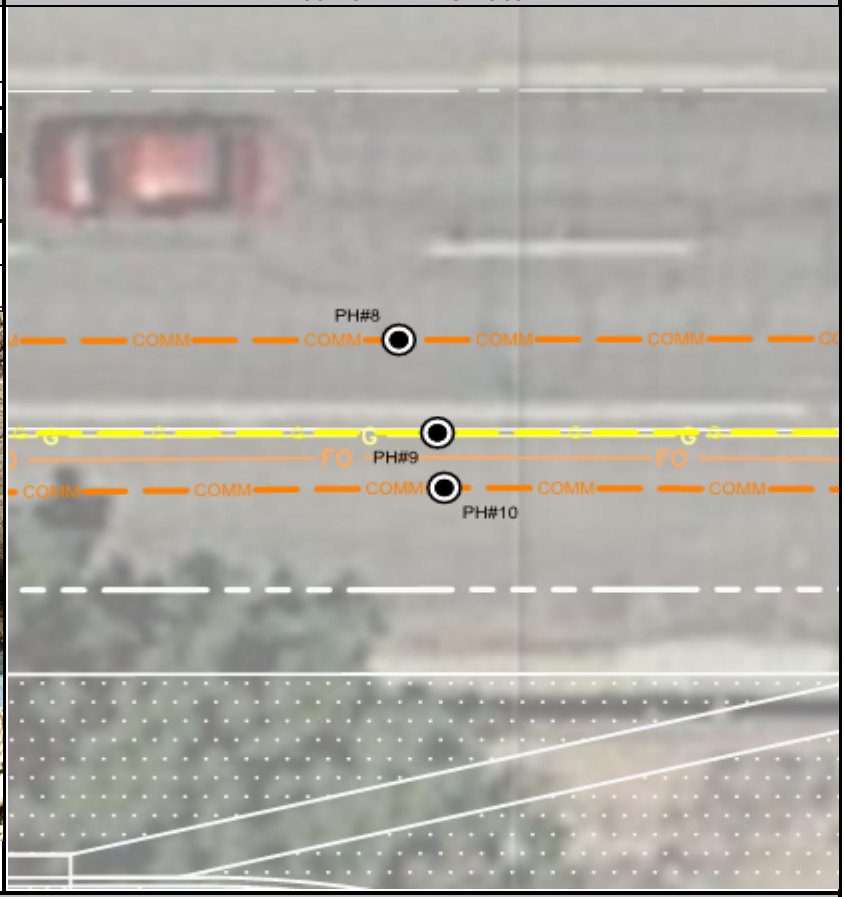
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9972.71	7625.64	998.71

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.71			
Top Elevation	993.45	**Pipe OD or Structure Height (inches)**	5.26	**Top Depth (FT)**
		6.50		
Bottom Elevation	992.90		5.80	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
MCI	Comm	2	2"	PE	EAST & WEST	Native Backfill	Jackhammer & Coldpatch

Potential Conflict / Description: Crossing

Comments

Stacked

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 9	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/17/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

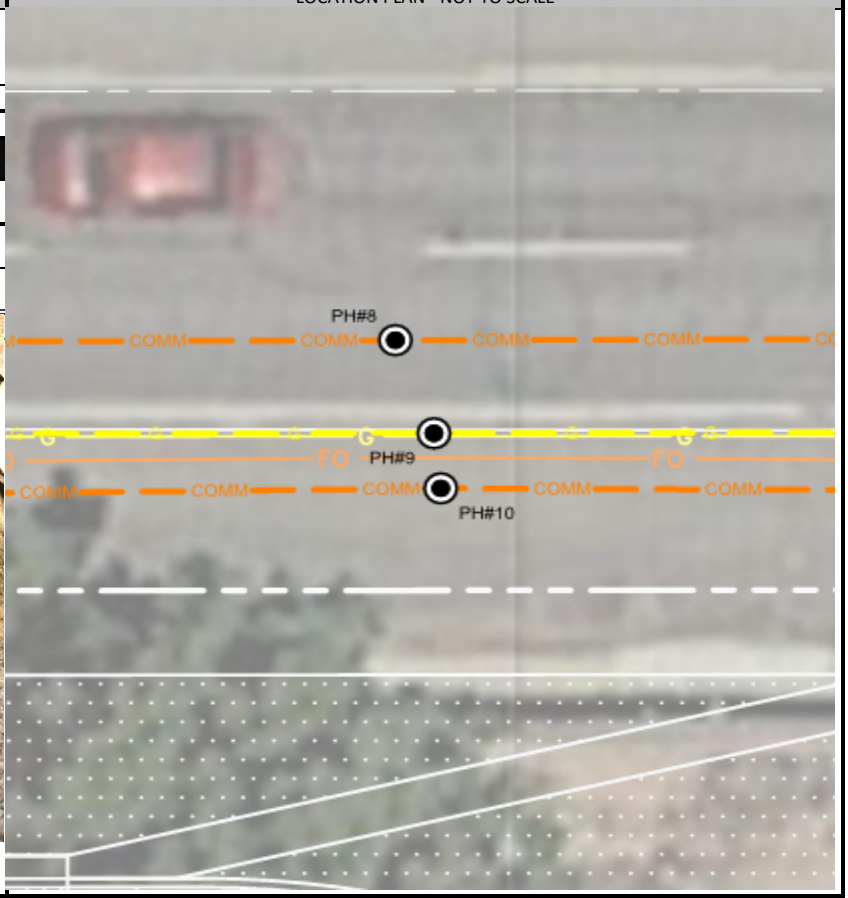
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9966.58	7628.01	998.52

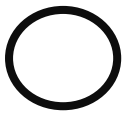
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING South East

Ref Point Elevation	998.52			
Top Elevation	995.22	**Pipe OD or Structure Height (inches)**	3.30	**Top Depth (FT)**
		4.80		
Bottom Elevation	994.82		3.70	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
SW Gas	Gas	1	4"	PE	EAST & WEST	Screened Backfill	Jackhammer & Coldpatch

Potential Conflict / Description: Crossing

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 10	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	3/17/20	Survey	Safe Site Utility Services, LLC
Project Name	Logic Park - 12" Water Line	City	Phoenix
Project#		County	Maricopa
Location	S 91st Ave & W Buckeye Rd, Estrella Village, AZ 85353		

The Professional Choice

POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

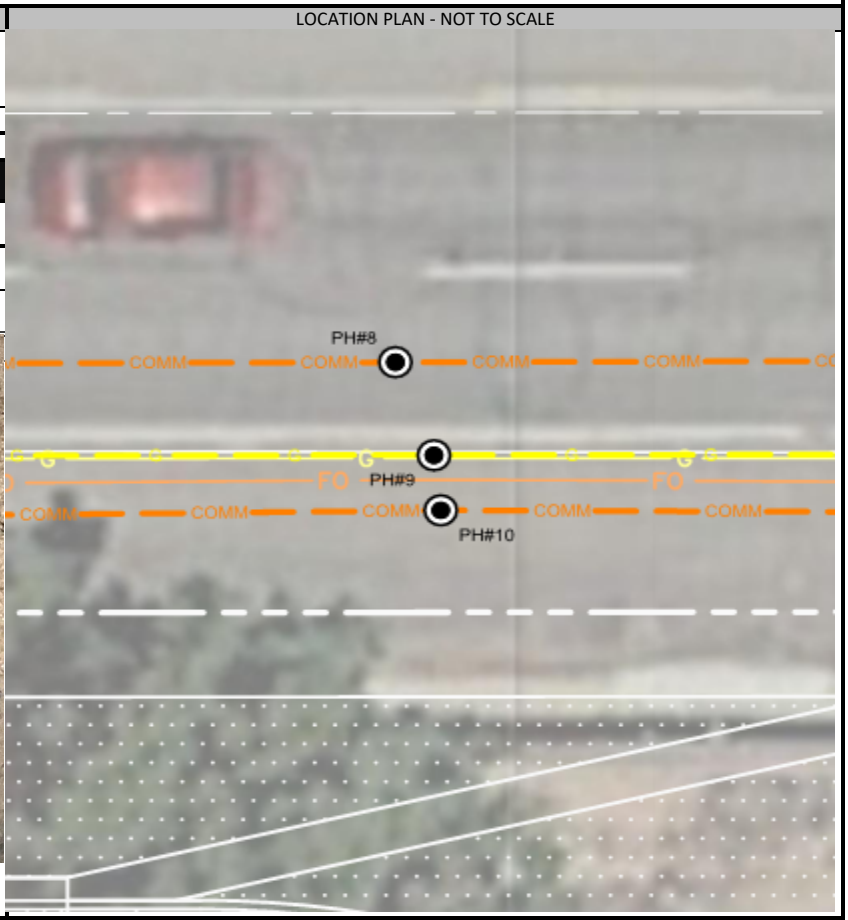
SITE BENCHMARK = NAVD 29 - Brass Cap in Handhole - 91st Ave & Buckeye Elev = 1000.8'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
9962.94	7628.45	998.46

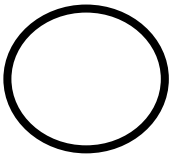
ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

LOCATION PLAN - NOT TO SCALE



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	998.46			
Top Elevation	993.23	**Pipe OD or Structure Height (inches)**	5.23	**Top Depth (FT)**
		12.75		
Bottom Elevation	992.16		6.29	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size (s)	Material / Structure	Direction	Soil Type	Surface Cut
Willtel	Comm	1	12"		EAST & WEST	Native Backfill	None Off-Road

Potential Conflict / Description: Crossing

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole Summary Report

Report Prepared for: Maricopa County Department of Transportation (MCDOT)

Address: MC 85 at 91st Ave, Tolleson, AZ 85353

Date of Report: 9/22/2020

Description of Project: TT0651-2 MC 85 at 91st Ave

Cust Job #: 2018-061-13 TT0651-2 PO# 2100000017308

Safe Site Project #: 2008287

Test Hole #	Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil Type	Surface Cut	Station & Off-Set		Northing & Easting		Ground Elevation	Depth to Top of Facility (Feet)	Depth to Bottom of Facility (Feet)	Top Elevation	Bottom Elevation	Pipe OD or Structure Height (inches)	Date Verified	Comments
PH 1	City of Tolleson	Irrigation	1	18″	RCP	NORTH & SOUTH	Screened Backfill	None Off-Road	1237+32.68	65.96 Left	336427.07	596941.01	1001.08	2.43	4.35	998.65	996.73	23.00	9/15/2020	
PH 1-1	City of Tolleson	Water	1	16″	ACP	EAST & WEST	Screened Backfill	None Off-Road	1237+79.31	65.09 Left	336426.39	596944.42	1001.25	5.43	7.00	995.82	994.25	18.79	9/15/2020	
PH 2	City of Tolleson	Irrigation	1	18″ going into a 24″	RCP	NE/SW & EAST & WEST	Screened Backfill	None Off-Road	1237+71.48	58.02 Left	336418.89	596937.07	1001.18	2.10	4.60	999.08	996.58	30.00	9/15/2020	24" IRR main with 18" Lateral Tee connection. Slurry Thrust block at the tee connections.
PH 3	City of Tolleson	Irrigation	1	24″	RCP	NORTH & SOUTH	Screened Backfill	None Off-Road	1237+49.71	61.26 Left	336420.94	596915.29	1001.43	1.23	3.73	1000.20	997.70	30.00	9/15/2020	
PH 4	City of Tolleson	Irrigation	1	24″	RCP	EAST & WEST	Rocky	None Off-Road	1210+15.04	40.78 Left	336400.09	594184.24	998.42	3.10	5.60	995.32	992.82	30.00	9/15/2020	
PH 5	City of Tolleson	Irrigation	1	24″	RCP	EAST & WEST	Rocky	None Off-Road	1210+63.15	40.97 Left	336400.34	594232.35	998.26	0.87	3.37	997.39	994.89	30.00	9/15/2020	
PH 6	City of Tolleson	Irrigation	1	24″	RCP	EAST & WEST	Screened Backfill	None Off-Road	1210+72.27	41.20 Left	336400.59	594241.47	998.32	1.11	3.61	997.21	994.71	30.00	9/15/2020	

Horizontal Control

1983 State Plane Grid Coordinates with the Northing Coordinates Truncated by subtracting -550,000 from each value.

For further details see Control Notes of MCDOT Plans for Construction of MC85 at 83rd Ave and Center turn lane expansion (MC 85 95th Ave 75th Ave) Page 2.

PT	*NORTHING*	*EASTING*	*ELEVATION*	*DESCRIPTION*
76	336675.22	600630.68		X on Side Walk
72	336300.71	596908.94		X on Side Walk
60	339054.63	596829.56		Quarter Cor. BCHH Pt#542601

Vertical Elevation Control: NGVD29

Brass Cap In HandHole at 91st Ave and MC-85 1000.90'

Horizontal and vertical locations of utilities obtained by actual exposure and subsequent measurement of subsurface utilities at a specific point. Diameters shown are estimated visually and may not be exact.

Test Hole #	PH 1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

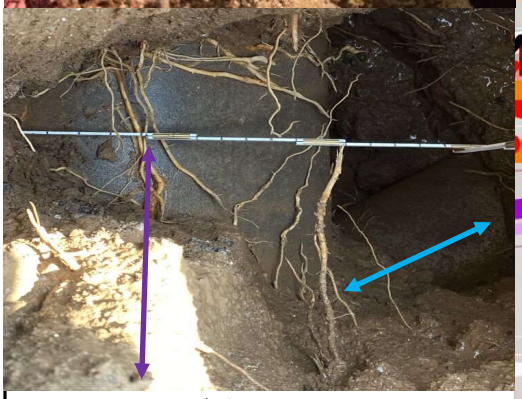
POTHOLE REPORT

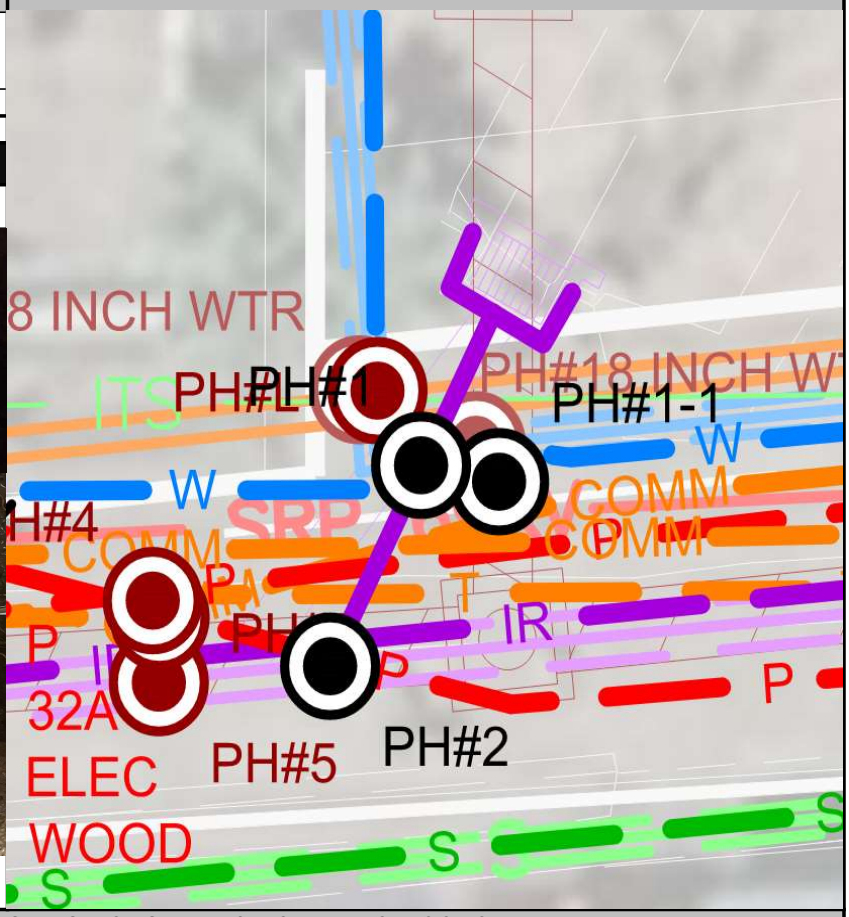
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336427.07	596941.01	1001.08

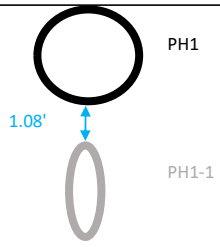




ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.08			
Top Elevation	998.65	**Pipe OD or Structure Height (inches)**	2.43	**Top Depth (FT)**
		23.00		
Bottom Elevation	996.73		4.35	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	18"	RCP	NORTH & SOUTH	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 1-1	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

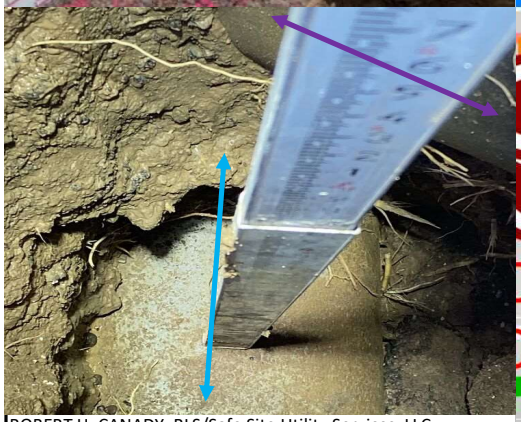
POTHOLE REPORT

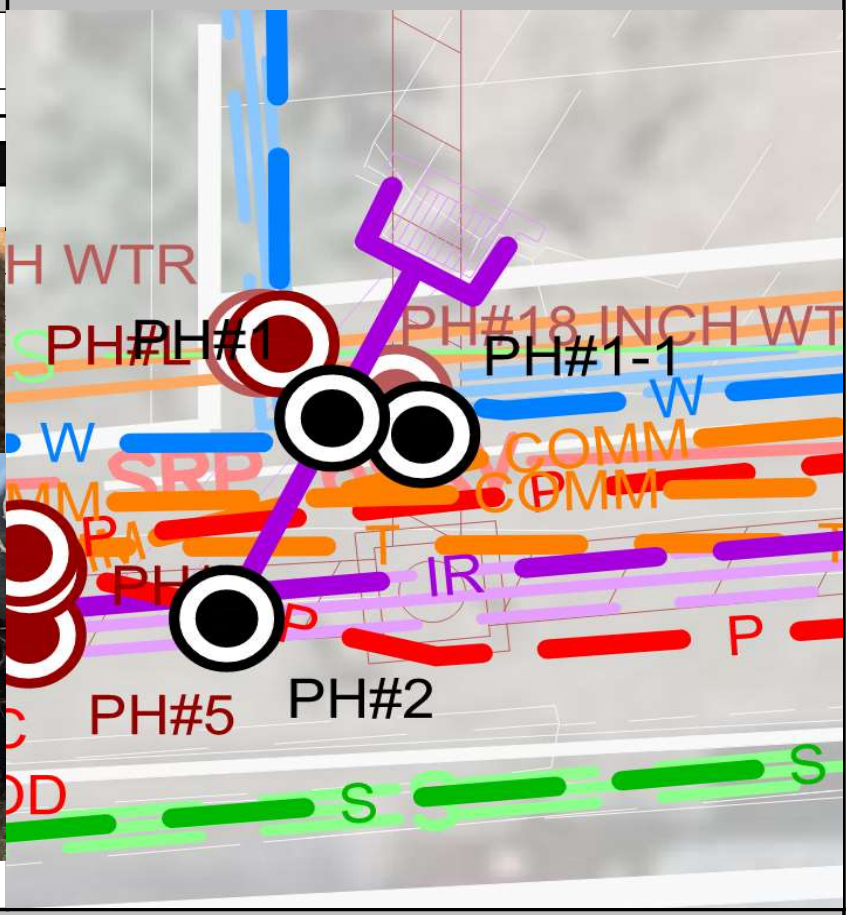
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336426.39	596944.42	1001.25

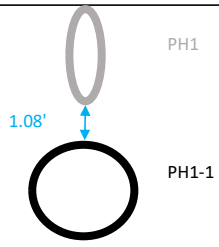




ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	1001.25			
Top Elevation	995.82	**Pipe OD or Structure Height (inches)**	5.43	**Top Depth (FT)**
		18.79		
Bottom Elevation	994.25		7.00	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Water	1	16"	ACP	EAST & WEST	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 2	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

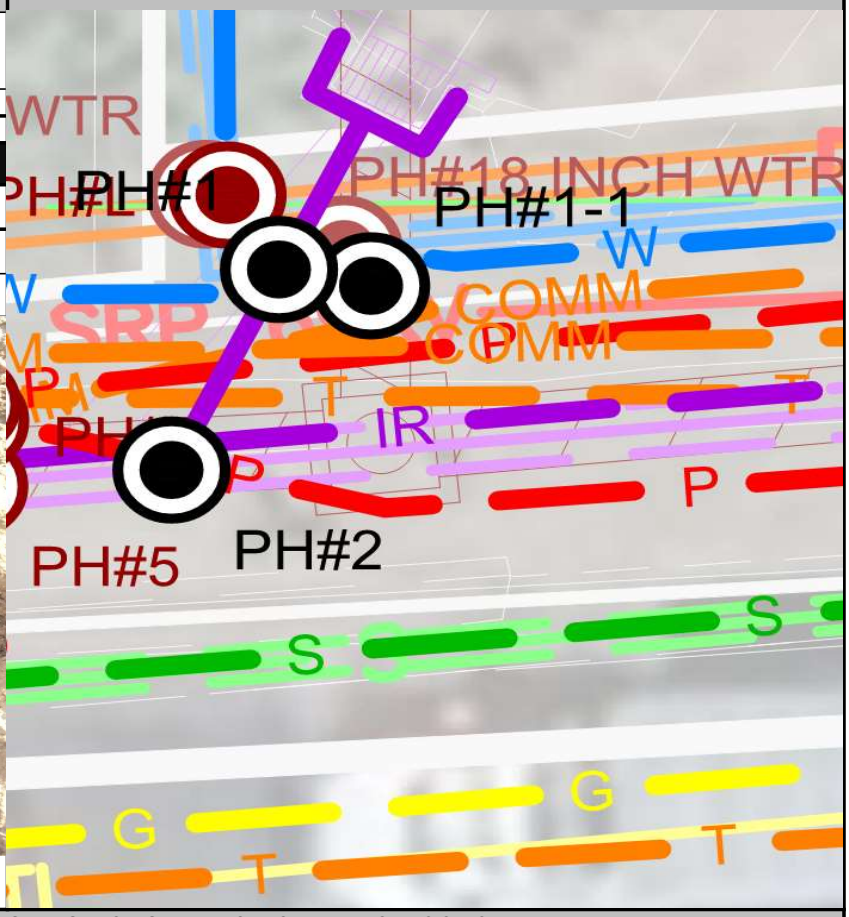
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

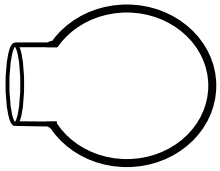
Northing	Easting	Surf Pin Elev
336418.89	596937.07	1001.18

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING _____

Ref Point Elevation	1001.18			
Top Elevation	999.08	**Pipe OD or Structure Height (inches)**	2.10	**Top Depth (FT)**
		30.00		
Bottom Elevation	996.58		4.60	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	18” going into a 24”	RCP	NE/SW & EAST & WEST	Screened Backfill	None Off-Road

Comments

24" IRR main with 18" Lateral Tee connection. Slurry Thrust block at the tee connections.

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 3	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

POTHOLE REPORT

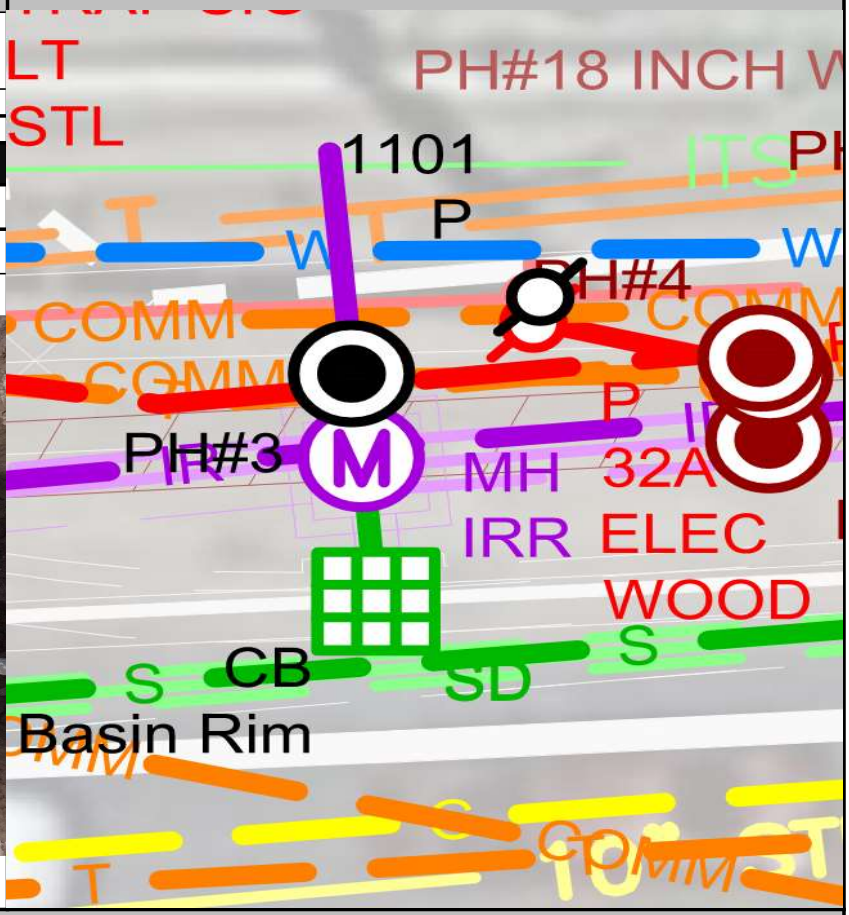
SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

Northing	Easting	Surf Pin Elev
336420.94	596915.29	1001.43

ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145



UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM

CROSS SECTION - NOT TO SCALE

FACING North

Ref Point Elevation	1001.43			
Top Elevation	1,000.20	**Pipe OD or Structure Height (inches)**	1.23	**Top Depth (FT)**
		30.00		
Bottom Elevation	997.70		3.73	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	24"	RCP	NORTH & SOUTH	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 4	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

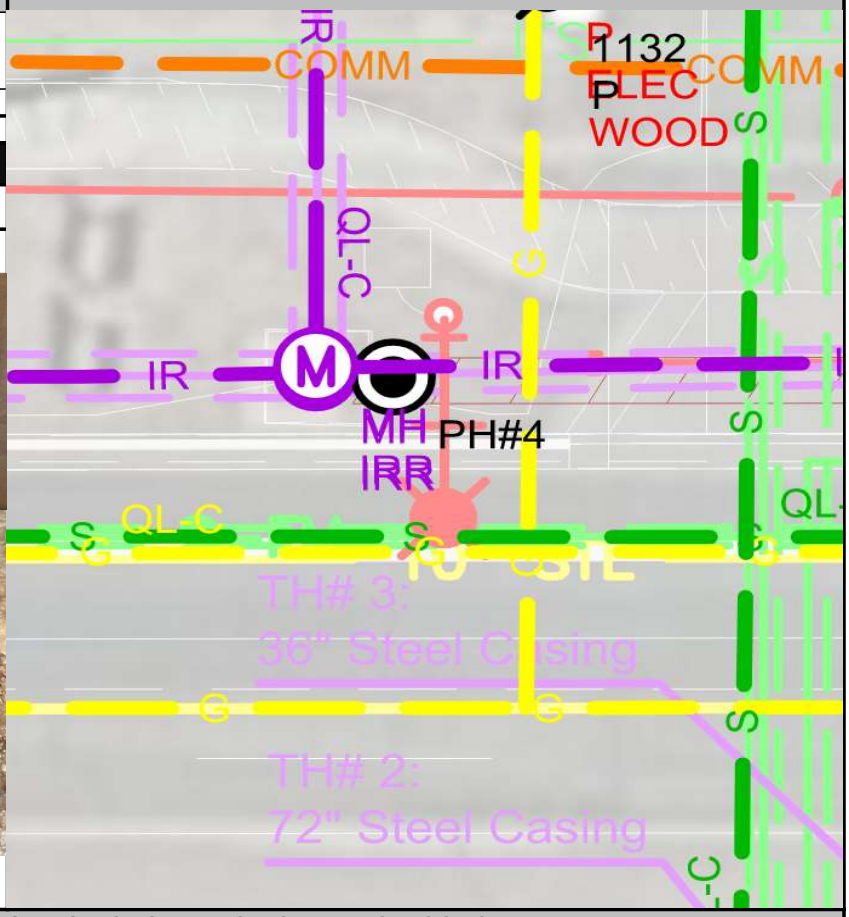
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

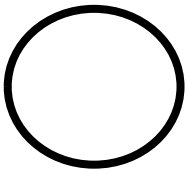
Northing	Easting	Surf Pin Elev
336400.09	594184.24	998.42



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.42			
Top Elevation	995.32	**Pipe OD or Structure Height (inches)**	3.10	**Top Depth (FT)**
		30.00		
Bottom Elevation	992.82		5.60	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	24"	RCP	EAST & WEST	Rocky	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 5	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

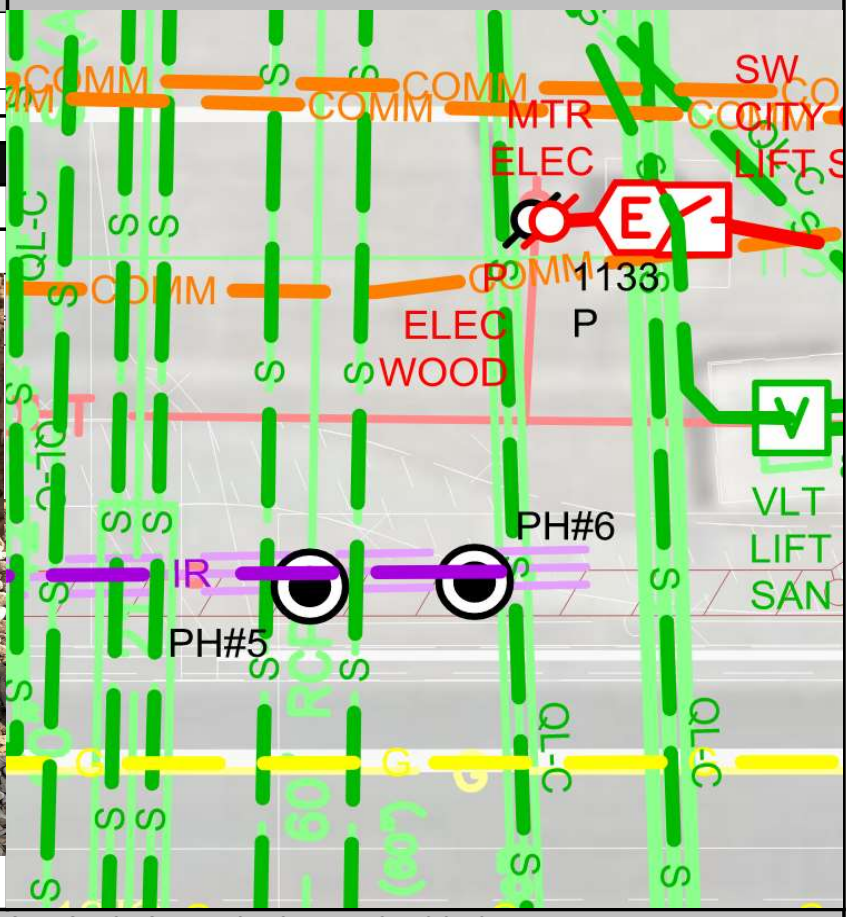
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

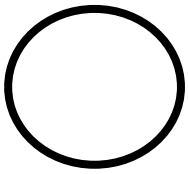
Northing	Easting	Surf Pin Elev
336400.34	594232.35	998.26



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.26			
Top Elevation	997.39	**Pipe OD or Structure Height (inches)**	0.87	**Top Depth (FT)**
		30.00		
Bottom Elevation	994.89		3.37	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	24”	RCP	EAST & WEST	Rocky	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Test Hole #	PH 6	SUE Crew	Safe Site Utility Services, LLC
Date of Excavation	9/15/2020	Survey	Safe Site Utility Services, LLC
Project Name	TT0651-2 MC 85 at 91st Ave	City	Phoenix
Project#	2018-061-13	County	Maricopa
Location	MC 85 at 91st Ave, Tolleson AZ 85353		

SAFE SITE UTILITY SERVICES, LLC
The Professional Choice

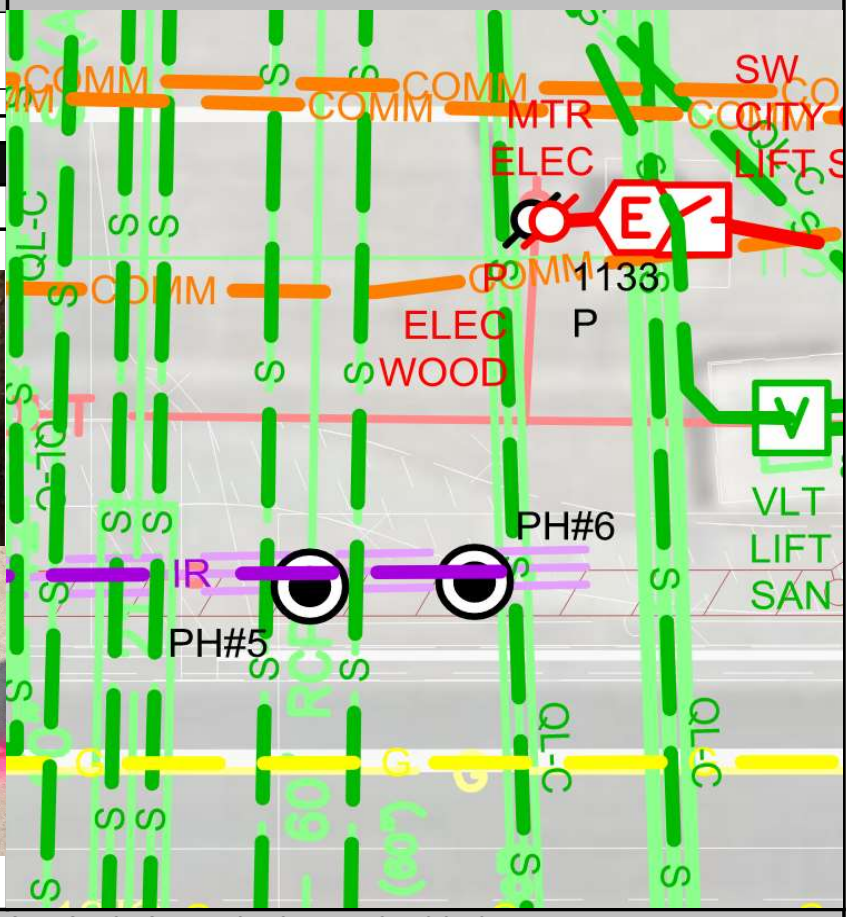
POTHOLE REPORT

SURVEY INFORMATION BY Safe Site Utility Services, LLC

SITE BENCHMARK = Control Point: X on sidewalk - Elev: 1006.54'

REFERENCE POINT

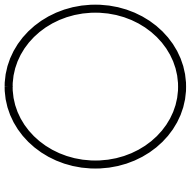
Northing	Easting	Surf Pin Elev
336400.59	594241.47	998.32



ROBERT H. CANADY, RLS/Safe Site Utility Services, LLC
AZ RLS# 53145

UTILITY INFORMATION BELOW AS PROVIDED BY SAFE SITE UTILITY SERVICES, LLC

UTILITY DIAGRAM



CROSS SECTION - NOT TO SCALE

FACING West

Ref Point Elevation	998.32			
Top Elevation	997.21	**Pipe OD or Structure Height (inches)**	1.11	**Top Depth (FT)**
		30.00		
Bottom Elevation	994.71		3.61	**Bottom Depth (FT)**

Utility Owner	Utility Type	Quantity	Pipe Size(s)	Material / Structure	Direction	Soil type	Surface Cut
City of Tolleson	Irrigation	1	24"	RCP	EAST & WEST	Screened Backfill	None Off-Road

Comments

FOR SAFE SITE UTILITY SERVICES, LLC:
PREPARED BY DA CHECKED BY RB

Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/12/12
Project Name: MC85 107th Ave to 75th Ave
Project #: TT345
Encumbrance
SSC Job #: 1143 P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

Boring • Drilling • Vacuum Excavating
Underground, We're a Cut Above

TH #	Street	Northing	Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
1	MC85 between 75th and 107th avenue	336302.29	587602.62	SRP IRR.	01/13/12	988.65	987.87	984.87	30" x 36" SRP IRRIGATION	0.78
2	MC85 between 75th and 107th avenue	336284.73	587587.94	FIBEROPTIC	01/17/12	988.46	982.57	981.49	12" Fiberoptic	5.89
3	MC85 between 75th and 107th avenue	336291.25	588441.17	FIBEROPTIC	01/17/12	990.12	985.74	984.66	12" Fiberoptic	4.38
4	MC85 between 75th and 107th avenue	336342.83	588445.13	GAS	01/13/12	990.43	985.74	984.91	10" Steel HP Gas	4.69
5	MC85 between 75th and 107th avenue	336318.29	588878.83	SRP IRR.	01/13/12	991.16	989.16	987.16	24" SRP Irrigation	2.00
6	MC85 between 75th and 107th avenue	336316.15	590365.53	FIBEROPTIC	01/17/12	991.76	986.93	985.85	12" Fiberoptic	4.83
7	MC85 between 75th and 107th avenue	336324.00	590911.82	FIBEROPTIC	01/17/12	992.90	987.75	986.67	12" Fiberoptic	5.15
8	MC85 between 75th and 107th avenue	336375.11	590917.88	GAS	01/13/12	993.31	988.27	987.44	10" Steel HP Gas	5.04
9	MC85 between 75th and 107th avenue	336346.28	591518.57	SRP IRR.	01/17/12	994.84	992.58	989.58	32" x 72" SRP Irrigation	2.26
10	MC85 between 75th and 107th avenue	336349.13	591623.03	SRP IRR.	01/17/12	0.00	0.00	0.00	30" SRP Irrigation	0.00
11	MC85 between 75th and 107th avenue	336333.97	592246.27	FIBEROPTIC	01/16/12	995.11	990.09	989.01	12" Fiberoptic	5.02
12	MC85 between 75th and 107th avenue	336385.70	592249.44	GAS	01/13/12	995.27	989.63	988.80	10" Steel HP Gas	5.64
13	MC85 between 75th and 107th avenue	336334.61	592937.82	FIBEROPTIC	01/16/12	995.66	990.50	989.42	12" Fiberoptic	5.16
14	MC85 between 75th and 107th avenue	336388.56	594418.99	GAS	01/13/12	998.45	992.51	991.68	10" Steel HP Gas	5.94
15	MC85 between 75th and 107th avenue	336389.02	594931.20	GAS	01/13/12	999.24	993.76	992.93	10" Steel HP Gas	5.48
16	MC85 between 75th and 107th avenue	336390.76	596094.30	GAS	01/13/12	1000.58	995.26	994.43	10" Steel HP Gas	5.32
17	MC85 between 75th and 107th avenue	336341.41	596092.56	FIBEROPTIC	01/13/12	1000.69	997.25	996.92	12" Fiberoptic	3.44
18	MC85 between 75th and 107th avenue	336359.56	596782.74	SRP IRR.	01/16/12	1001.52	1000.22	996.72	42" SRP Irrigation	1.30
19	MC85 between 75th and 107th avenue	336362.39	596840.77	SRP IRR.	01/16/12	1001.50	998.17	N/A	Irrigation	3.33
20	MC85 between 75th and 107th avenue	336399.02	596895.14	GAS	01/16/12	1001.26	996.92	996.09	10" Steel HP Gas	4.34

Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/12/12
Project Name: MC85 107th Ave to 75th Ave
Project #: TT345
Encumbrance
SSC Job #: 1143 P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

Boring • Drilling • Vacuum Excavating
Underground, We're a Cut Above

TH #	Street	Northing	Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
21	MC85 between 75th and 107th avenue	336351.13	596904.16	FIBEROPTIC	01/16/12	1001.46	996.57	995.49	12" Fiberoptic	4.89
22	MC85 between 75th and 107th avenue	336366.60	597089.01	FIBEROPTIC	01/13/12	1001.50	996.72	995.64	12" Fiberoptic	4.78
23	MC85 between 75th and 107th avenue	336423.28	597144.91	GAS	01/13/12	1001.68	999.71	996.04	10" Steel HP Gas	1.97
24	MC85 between 75th and 107th avenue	336475.21	597650.02	GAS	01/13/12	1003.28	997.97	997.14	10" Steel HP Gas	5.31
25	MC85 between 75th and 107th avenue	336480.24	598274.54	GAS	01/16/12	1003.51	998.58	997.50	12" Fiberoptic	4.93
26	MC85 between 75th and 107th avenue	336533.01	598273.48	GAS	01/13/12	1003.93	998.80	997.97	10" Steel HP Gas	5.13
27	MC85 between 75th and 107th avenue	336572.78	598706.22	GAS	01/13/12	1004.75	999.84	999.01	10" Steel HP Gas	4.91
28	MC85 between 75th and 107th avenue	336609.19	599083.80	GAS	01/13/12	1005.71	1000.87	1000.04	10" Steel HP Gas	4.84
29	MC85 between 75th and 107th avenue	336592.20	599422.15	FIBEROPTIC	01/10/12	1005.83	1001.11	1000.03	12" Fiberoptic	4.72
30	MC85 between 75th and 107th avenue	336643.30	599417.76	GAS	01/13/12	1006.20	1001.44	1000.61	10" Steel HP Gas	4.76
31	MC85 between 75th and 107th avenue	336699.03	600023.66	GAS	01/12/12	1006.57	1001.69	1000.86	10" Steel HP Gas	4.88
32	MC85 between 75th and 107th avenue	336721.90	600019.43	WATER	01/17/12	1006.59	1001.51	999.51	ACP Water	5.08
33	MC85 between 75th and 107th avenue	336651.09	600035.14	FIBEROPTIC	01/10/12	1006.49	1001.54	1000.46	12" Fiberoptic	4.95
34	MC85 between 75th and 107th avenue	336692.68	600526.68	FIBEROPTIC	01/10/12	1006.73	1001.12	1000.04	12" Fiberoptic	5.61
35	MC85 between 75th and 107th avenue	336743.53	600522.85	GAS	01/12/12	1006.75	1001.66	1000.83	10" Steel HP Gas	5.09
36	MC85 between 75th and 107th avenue	336741.62	601077.94	FIBEROPTIC	01/10/12	1007.08	1001.89	1000.81	12" Fiberoptic	5.19
37	MC85 between 75th and 107th avenue	336815.93	601072.81	WATER	01/17/12	1007.56	1002.34	1000.92	16" DIP Water	5.22
38	MC85 between 75th and 107th avenue	336793.54	601076.42	GAS	01/12/12	1007.71	1002.46	1001.63	10" Steel HP Gas	5.25
39	MC85 between 75th and 107th avenue	336783.77	601548.35	FIBEROPTIC	01/10/12	1007.95	1005.92	1001.70	12" Fiberoptic	2.03
40	MC85 between 75th and 107th avenue	336848.17	601676.55	GAS	01/12/12	1008.81	1003.22	1002.39	10" Steel HP Gas	5.59

Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/12/12
Project Name: MC85 107th Ave to 75th Ave
Project #: TT345
Encumbrance
SSC Job #: 1143 P

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Boring • Drilling • Vacuum Excavating
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TH #	Street	Northing	Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
41	MC85 between 75th and 107th avenue	336868.53	601918.91	GAS	01/16/12	1008.98	1003.66	1002.83	10" Steel HP Gas	5.32
42	MC85 between 75th and 107th avenue	336835.48	601947.75	SRP IRR.	01/17/12	1008.85	1006.37	1003.37	36" SRP Irrigation	2.48
43	MC85 between 75th and 107th avenue	336843.73	602017.90	SRP IRR.	01/17/12	1008.93	1005.89	1002.89	36" SRP Irrigation and Electic	3.04
44	MC85 between 75th and 107th avenue	336869.42	602070.50	GAS	01/16/12	1009.31	1004.28	1003.45	10" Steel HP Gas	5.03
45	MC85 between 75th and 107th avenue	336833.33	602096.32	FIBEROPTIC	01/17/12	0.00	0.00	0.00	12" Fiberoptic	0.00
46	MC85 between 75th and 107th avenue	336818.96	602265.91	FIBEROPTIC	01/10/12	1008.72	1004.14	1003.06	12" Fiberoptic	4.58
47	MC85 between 75th and 107th avenue	336866.15	602366.08	GAS	01/12/12	1009.81	1004.32	1003.49	10" Steel HP Gas	5.49
48	MC85 between 75th and 107th avenue	336816.53	602547.78	FIBEROPTIC	01/10/12	1009.55	1004.40	1003.32	12" Fiberoptic	5.15
49	MC85 between 75th and 107th avenue	336808.97	603017.55	FIBEROPTIC	01/6/12	1010.77	1005.53	1004.45	12" Fiberoptic	5.24
50	MC85 between 75th and 107th avenue	336859.35	603021.53	GAS	01/12/12	1011.10	1005.82	1004.99	10" Steel HP Gas	5.28
51	MC85 between 75th and 107th avenue	336853.74	603416.60	GAS	01/12/12	1011.94	1007.07	1006.24	10" Steel HP Gas	4.87
52	MC85 between 75th and 107th avenue	336801.50	603681.27	FIBEROPTIC	01/6/12	1012.19	1007.24	1006.16	12" Fiberoptic	4.95
53	MC85 between 75th and 107th avenue	336849.42	603813.68	GAS	01/12/12	1013.13	1007.31	1006.48	10" Steel HP Gas	5.82
54	MC85 between 75th and 107th avenue	336796.71	604062.63	FIBEROPTIC	01/6/12	1013.35	1008.15	1007.07	12" Fiberoptic	5.20
55	MC85 between 75th and 107th avenue	336847.42	604064.59	GAS	01/12/12	1013.79	1007.81	1006.98	10" Steel HP Gas	5.98
56	MC85 between 75th and 107th avenue	336844.92	604231.43	GAS	01/11/12	1014.27	1009.45	1008.62	10" Steel HP Gas	4.82
57	MC85 between 75th and 107th avenue	336790.36	604659.85	FIBEROPTIC	01/6/12	1015.30	1010.16	1009.08	12" Fiberoptic	5.14
58	MC85 between 75th and 107th avenue	336841.07	604660.81	GAS	01/11/12	1015.49	1010.04	1009.21	10" Steel HP Gas	5.45
59	MC85 between 75th and 107th avenue	336842.53	604660.92	WATER	01/11/12	0.00	0.00	0.00	16" DIP Water	0.00
60	MC85 between 75th and 107th avenue	336793.91	605254.83	FIBEROPTIC	01/6/12	1017.03	1012.30	1011.22	12" Fiberoptic	4.73

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/12/12
Project Name: MC85 107th Ave to 75th Ave
Project #: TT345
Encumbrance
SSC Job #: 1143 P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

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Underground, We're a Cut Above

TH #	Street	Northing	Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
61	MC85 between 75th and 107th avenue	336851.48	605256.47	WATER	01/6/12	1016.64	1011.88	1010.38	16" DIP Water	4.76
62	MC85 between 75th and 107th avenue	336844.84	605254.34	GAS	01/11/12	1017.01	1012.09	1011.26	10" Steel HP Gas	4.92
63	MC85 between 75th and 107th avenue	336798.92	605914.19	FIBEROPTIC	01/6/12	1018.93	1014.45	1013.37	12" Fiberoptic	4.48
64	MC85 between 75th and 107th avenue	336856.93	605916.39	WATER	01/6/12	1018.81	1013.37	1011.87	16" DIP Water	5.44
65	MC85 between 75th and 107th avenue	336851.39	605916.19	GAS	01/11/12	1019.01	1014.25	1013.42	10" Steel HP Gas	4.76
66	MC85 between 75th and 107th avenue	336853.64	606575.03	GAS	01/11/12	1020.91	1015.60	1014.77	10" Steel HP Gas	5.31
67	MC85 between 75th and 107th avenue	336860.76	606577.05	WATER	01/6/12	1020.49	1015.36	1013.86	16" DIP Water	5.13
68	MC85 between 75th and 107th avenue	336802.33	606577.97	FIBEROPTIC	01/6/12	1021.12	1015.25	1014.17	12" Fiberoptic	5.87
69	MC85 between 75th and 107th avenue	336367.89	590369.47	GAS	01/13/12	992.18	987.52	986.69	10" Steel HP Gas	4.66
70	MC85 between 75th and 107th avenue	336417.08	597623.39	FIBEROPTIC	01/16/12	1002.39	997.33	996.25	12" Fiberoptic	5.06
71	MC85 between 75th and 107th avenue	336558.84	599088.48	FIBEROPTIC	01/16/12	1005.39	1001.22	1000.14	12" Fiberoptic	4.17
7A	MC85 between 75th and 107th avenue	336317.58	590911.82		01/16/12	992.31	989.59	989.48	12" Fiberoptic	2.72
17A	MC85 between 75th and 107th avenue	336338.41	596094.31		01/13/12	1000.55	995.14	994.06	12" Fiberoptic	5.41
46A	MC85 between 75th and 107th avenue	336815.46	602265.91		01/10/12	1008.52	1004.67	1003.67	12" Fiberoptic	3.85
48A	MC85 between 75th and 107th avenue	336812.03	602546.78		01/10/12	1009.42	1006.46	1005.21	12" Fiberoptic	2.96
49A	MC85 between 75th and 107th avenue	336806.97	603017.55		01/6/12	1010.69	1006.88	1005.88	12" Fiberoptic	3.81
52A	MC85 between 75th and 107th avenue	336798.00	603681.27		01/6/12	1012.08	1008.10	1007.10	12" Fiberoptic	3.98
54A	MC85 between 75th and 107th avenue	336793.71	604062.63		01/6/12	1013.18	1008.76	1007.76	12" Fiberoptic	4.42

Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A01 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1120+78.32 / 39.54' Rt | Northing: 336251.03 | Easting: 585248.17 | Elevation: 991.15

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	991.15			Station / Offset:	1120+78.32 / 39.54' Rt
Rod Reading (HUB - Pothole Crew):	5.30	HUB:	5.30	T.O.U.:	6.08	Northing:	336251.03
Height of Instrument (H. I.):	996.45	G. L.:	5.50	B.O.U.:	6.92	Easting:	585248.17

H. I. :	996.45	H. I. :	996.45	H. I. :	996.45
(-) Rod Read Top Util. (T.O.U.):	6.08	(-) Rod Read Bottom Util. (B.O.U.):	6.92	(-) Rod Read Pothole (G.L.):	5.50
= Elevation Top Utility:	990.37	= Elevation Bottom Utility:	989.53	= Elevation Ground Level:	990.95

Station / Offset: 1120+78.32 / 36.54' Rt.

Northing: 336254.03

Easting: 585248.17

Actual Field Measurement: 0.58 (Existing Grade to T.O.U.)

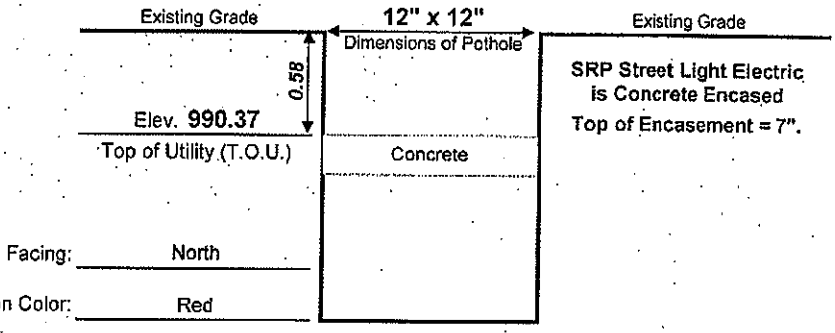
Elev. Top of Utility: 990.37

Actual Field Measurement: 1.42 (Existing Grade to B.O.U.)

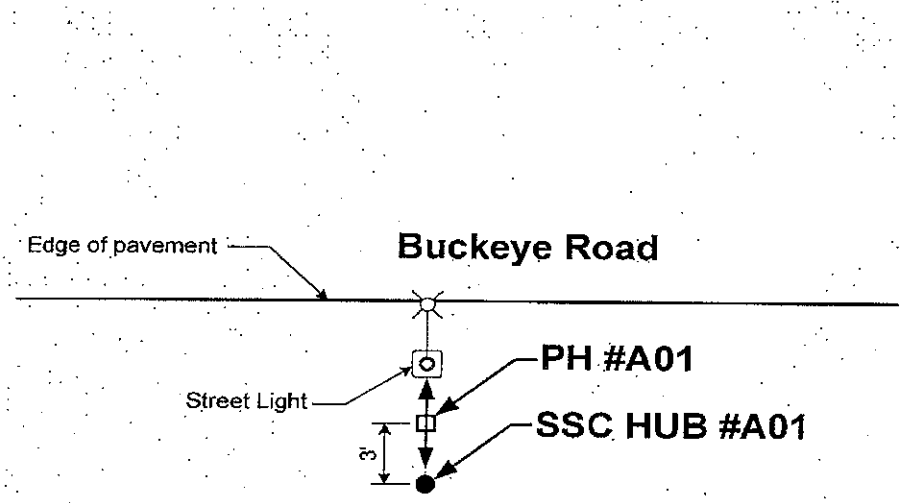
Elev. Bottom of Utility: 989.53

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

SSC
Boring • Drilling • Vacuum Excavating
Underground, We're a Cut Above

Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
T: 602-997-6164 F: 602-997-4811

Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A02 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1123+27.56 / 33.33' Rt. | Northing: 336250.57 | Easting: 585497.49 | Elevation: 992.22

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	992.22			Station / Offset:	1123+27.56 / 33.33' Rt.
Rod Reading (HUB - Pothole Crew):	5.16	HUB: 5.16	T.O.U.: 7.23	Northing:	336250.57
Height of Instrument (H. I.):	997.38	G. L.: 5.24	B.O.U.: 7.40	Easting:	585497.49

H. I. :	997.38	H. I. :	997.38	H. I. :	997.38
(-) Rod Read Top Util. (T.O.U.):	7.23	(-) Rod Read Bottom Util. (B.O.U.):	7.40	(-) Rod Read Pothole (G.L.):	5.24
= Elevation Top Utility:	990.15	= Elevation Bottom Utility:	989.98	= Elevation Ground Level:	**992.14**

Station / Offset: 1123+27.56 / 33.33' Rt.

Northing: 336250.57

Easting: 585497.49

Actual Field Measurement: (Existing Grade to T.O.U.) 1.99

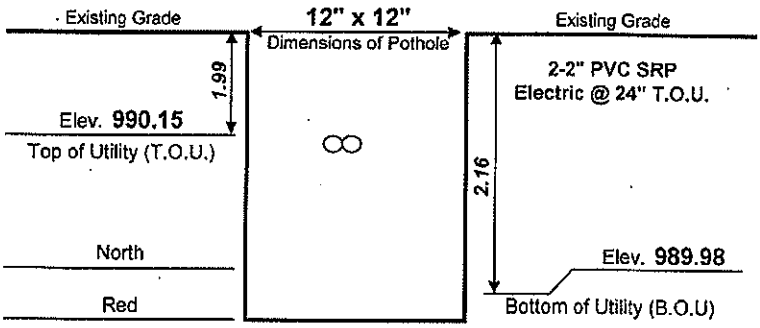
Elev. Top of Utility: 990.15

Actual Field Measurement: (Existing Grade to B.O.U.) 2.16

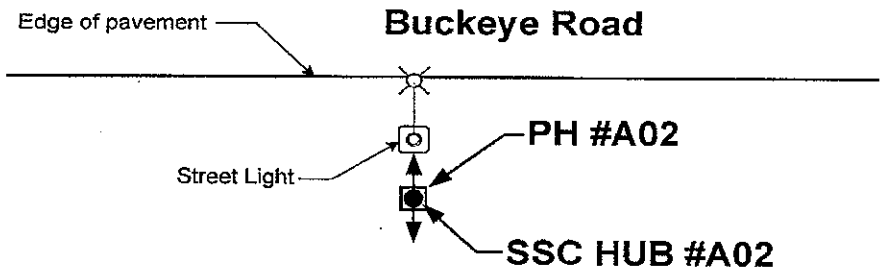
Elev. Bottom of Utility: 989.98

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A03 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Size / Type: City of Avondale Water

Anticipated Utility Information

Station / Offset: 1124+43.90 / 15.92' Rt. | Northing: 336264.87 | Easting: 585614.25 | Elevation: 992.78

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	992.78			Station / Offset:	1124+43.90 / 15.92' Rt.
Rod Reading (HUB - Pothole Crew):	5.34	HUB: 5.34	T.O.U.: 14.65	Northing:	336264.87
Height of Instrument (H. I.):	998.12	G. L.: 5.40	B.O.U.: 15.82	Easting:	585614.25

H. I. :	998.12	H. I. :	998.12	H. I. :	998.12
(-) Rod Read Top Util. (T.O.U.):	14.65	(-) Rod Read Bottom Util. (B.O.U.):	15.82	(-) Rod Read Pothole (G.L.):	5.40
= Elevation Top Utility:	983.47	= Elevation Bottom Utility:	982.30	= Elevation Ground Level:	**992.72**

Station / Offset: 1124+43.90 / 19.50' Rt.

Northing: 336261.29

Easting: 585614.25

Actual Field Measurement: 9.25
(Existing Grade to T.O.U.)

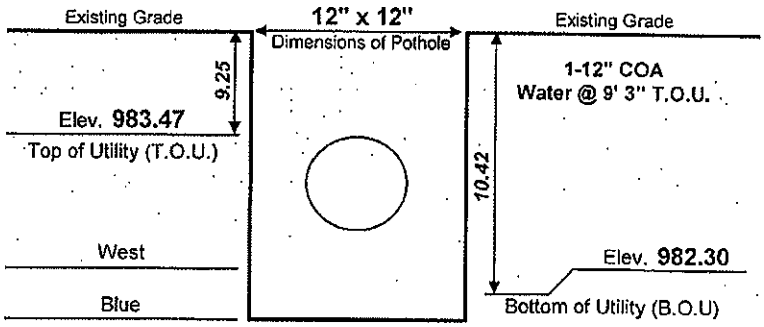
Elev. Top of Utility: 983.47

Actual Field Measurement: 10.42
(Existing Grade to B.O.U.)

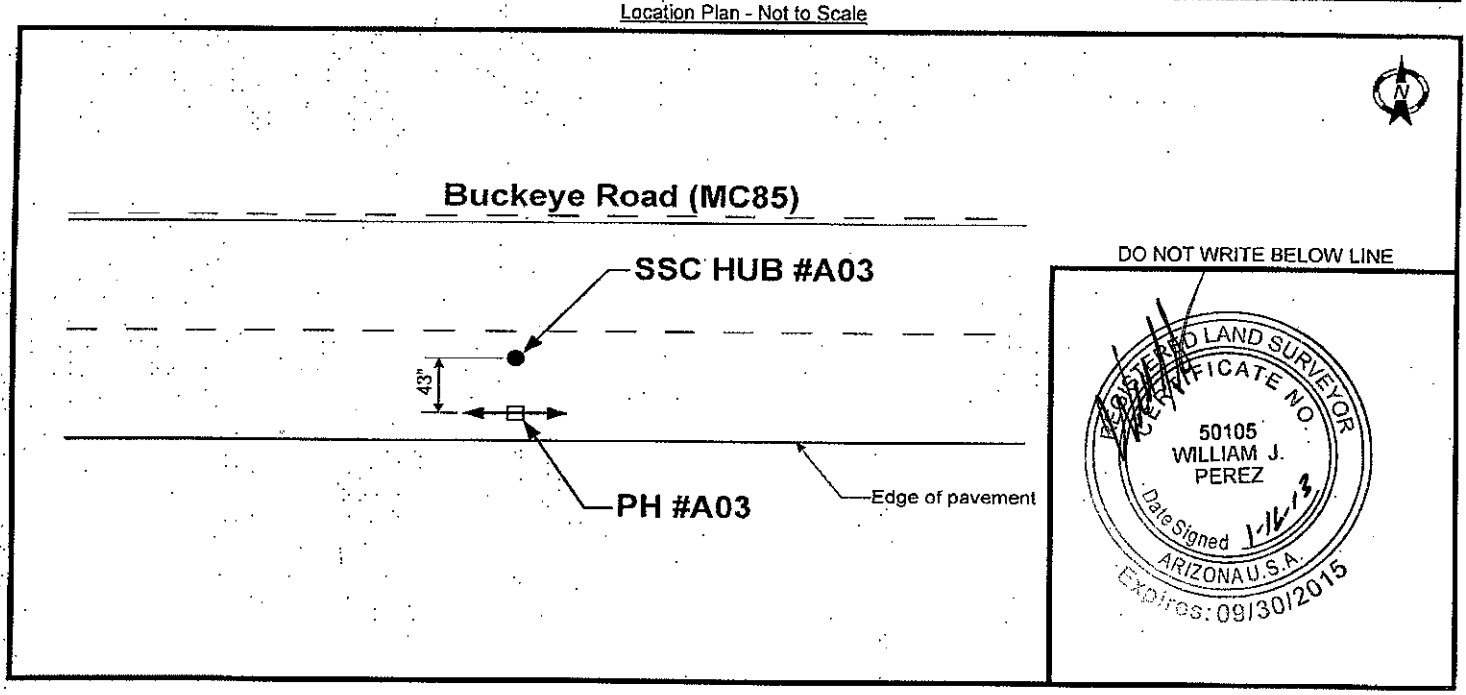
Elev. Bottom of Utility: 982.30

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A04 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1124+32.45 / 54.67' Rt. | Northing: 336226.44 | Easting: 585601.77 | Elevation: 993.14

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.14			Station / Offset:	1124+32.45 / 54.67' Rt.
Rod Reading (HUB - Pothole Crew):	5.14	HUB: 5.14	T.O.U.: 10.86	Northing:	336226.44
Height of Instrument (H. I.):	998.28	G. L.: 5.20	B.O.U.: 11.19	Easting:	585601.77

H. I. :	998.28	H. I. :	998.28	H. I. :	998.28
(-) Rod Read Top Util. (T.O.U.):	10.86	(-) Rod Read Bottom Util. (B.O.U.):	11.19	(-) Rod Read Pothole (G.L.):	5.20
= Elevation Top Utility:	987.42	= Elevation Bottom Utility:	987.09	= Elevation Ground Level:	**993.08**

Station / Offset: 1124+32.45 / 59.67' Rt.

Northing: 336221.44

Easting: 585601.77

Actual Field Measurement: (Existing Grade to T.O.U.) 5.66

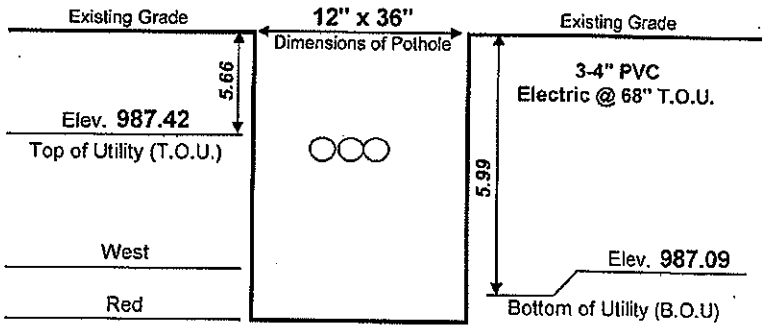
Elev. Top of Utility: 987.42

Actual Field Measurement: (Existing Grade to B.O.U.) 5.99

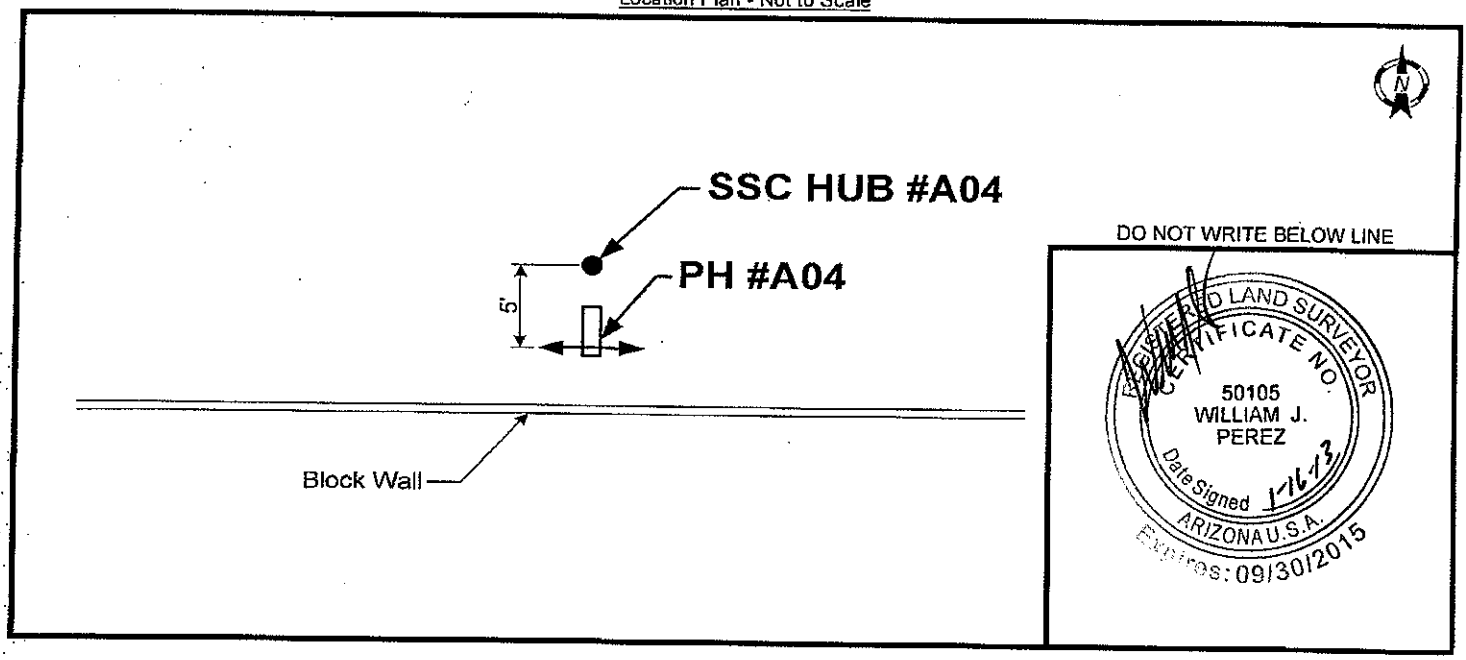
Elev. Bottom of Utility: 987.09

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A05 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1126+32.57 / 27.65' Rt. | Northing: 336248.10 | Easting: 585802.54 | Elevation: 993.40

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.40					Station / Offset:	1126+32.57 / 27.65' Rt.
Rod Reading (HUB - Pothole Crew):	5.40	HUB:	5.40	T.O.U.:	8.56	Northing:	336248.10
Height of Instrument (H. I.):	998.80	G. L.:	5.30	B.O.U.:	8.89	Easting:	585802.54

H. I. :	998.80	H. I. :	998.80	H. I. :	998.80
(-) Rod Read Top Util. (T.O.U.):	8.56	(-) Rod Read Bottom Util. (B.O.U.):	8.89	(-) Rod Read Pothole (G.L.):	5.30
= Elevation Top Utility:	990.24	= Elevation Bottom Utility:	989.91	= Elevation Ground Level:	**993.50**

Station / Offset: 1126+26.57 / 30.57' Rt.

Northing: 336245.10

Easting: 585796.54

Actual Field Measurement: (Existing Grade to T.O.U.) 3.26

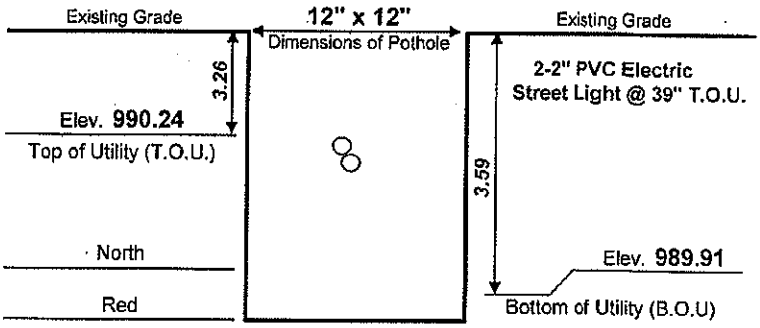
Elev. Top of Utility: 990.24

Actual Field Measurement: (Existing Grade to B.O.U.) 3.59

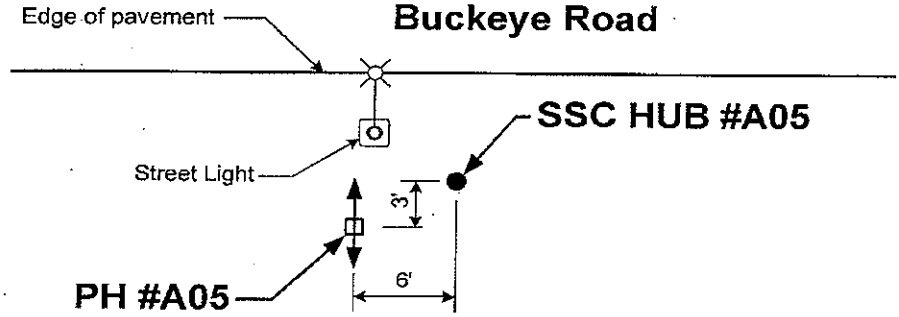
Elev. Bottom of Utility: 989.91

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A06 | Date Dug: 01/03/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communication

Station / Offset: 1126+96.15 / 23.06' Rt. | Northing: 336250.99 | Easting: 585866.22 | Elevation: 993.42

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.42			Station / Offset:	1126+96.15 / 23.06' Rt.
Rod Reading (HUB - Pothole Crew):	5.20	HUB: 5.20	T.O.U.: 8.65	Northing:	336250.99
Height of Instrument (H. I.):	998.62	G. L.: 4.84	B.O.U.: 8.82	Easting:	585866.22

H. I. :	998.62	H. I. :	998.62	H. I. :	998.62
(-) Rod Read Top Util. (T.O.U.):	8.65	(-) Rod Read Bottom Util. (B.O.U.):	8.82	(-) Rod Read Pothole (G.L.):	4.84
= Elevation Top Utility:	989.97	= Elevation Bottom Utility:	989.80	= Elevation Ground Level:	**993.78**

Station / Offset: 1126+96.15 / 58.73' Rt.

Northing: 336215.32

Easting: 585866.22

Actual Field Measurement: 3.81
(Existing Grade to T.O.U.)

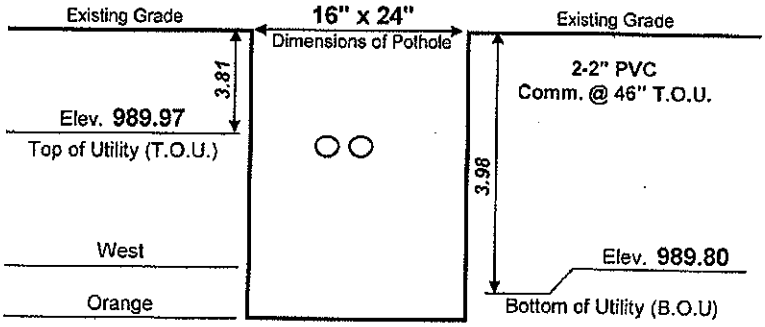
Elev. Top of Utility: 989.97

Actual Field Measurement: 3.98
(Existing Grade to B.O.U.)

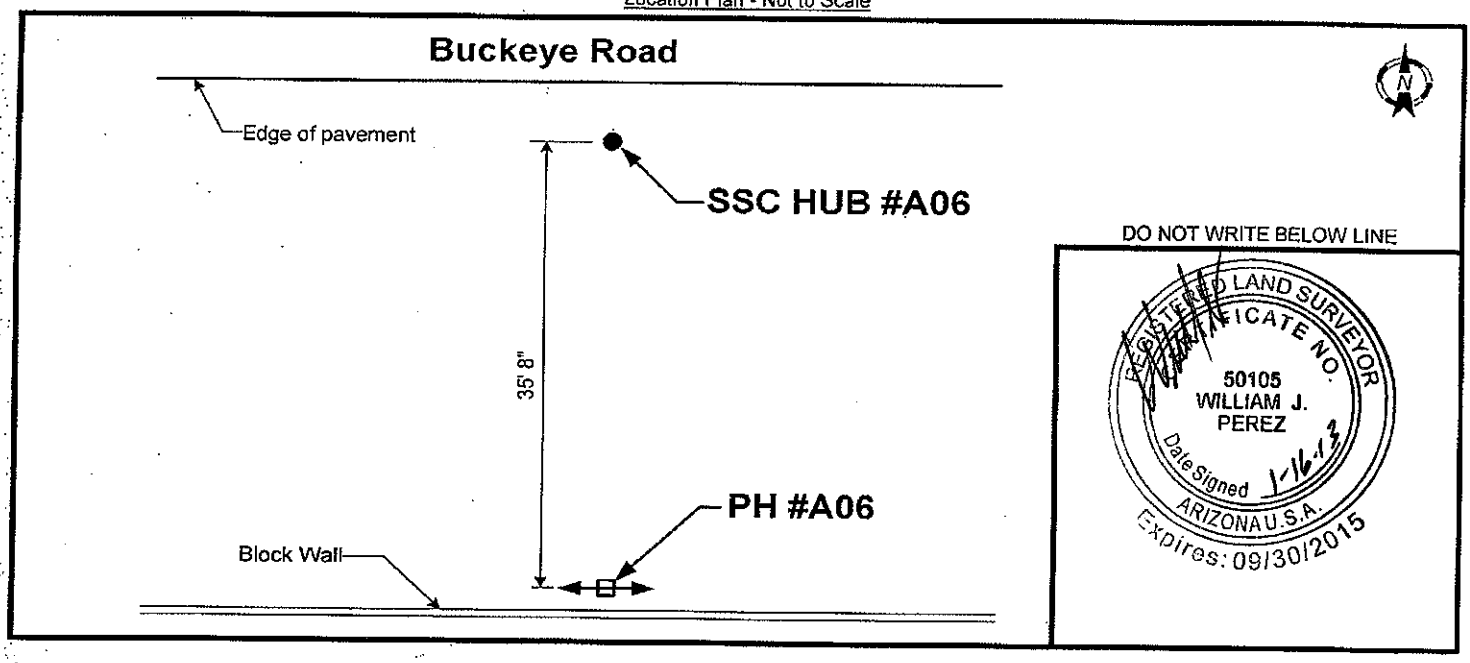
Elev. Bottom of Utility: 989.80

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub. Potholed on Cox Blue Stake

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A07 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

City of Avondale

Size / Type: Water

Anticipated Utility Information

Station / Offset: 1128+65.06 / 48.79' Rt. | Northing: 336220.75 | Easting: 586034.38 | Elevation: 993.25

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.25					Station / Offset:	1128+65.06 / 48.79' Rt.
Rod Reading (HUB - Pothole Crew):	6.18	HUB:	6.18	T.O.U.:	11.59	Northing:	336220.75
Height of Instrument (H. I.):	999.43	G. L.:	6.26	B.O.U.:	12.26	Easting:	586034.38

H. I. :	999.43	H. I. :	999.43	H. I. :	999.43
(-) Rod Read Top Util. (T.O.U.):	11.59	(-) Rod Read Bottom Util. (B.O.U.):	12.26	(-) Rod Read Pothole (G.L.):	6.26
= Elevation Top Utility:	987.84	= Elevation Bottom Utility:	987.17	= Elevation Ground Level:	993.17

Station / Offset: 1128+65.06 / 43.29 RT

Northing: 336226.25

Easting: 586034.38

Actual Field Measurement: 5.33
(Existing Grade to T.O.U.)

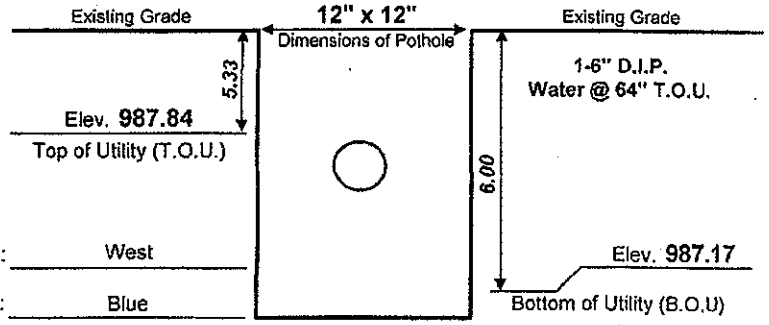
Elev. Top of Utility: 987.84

Actual Field Measurement: 6.00
(Existing Grade to B.O.U.)

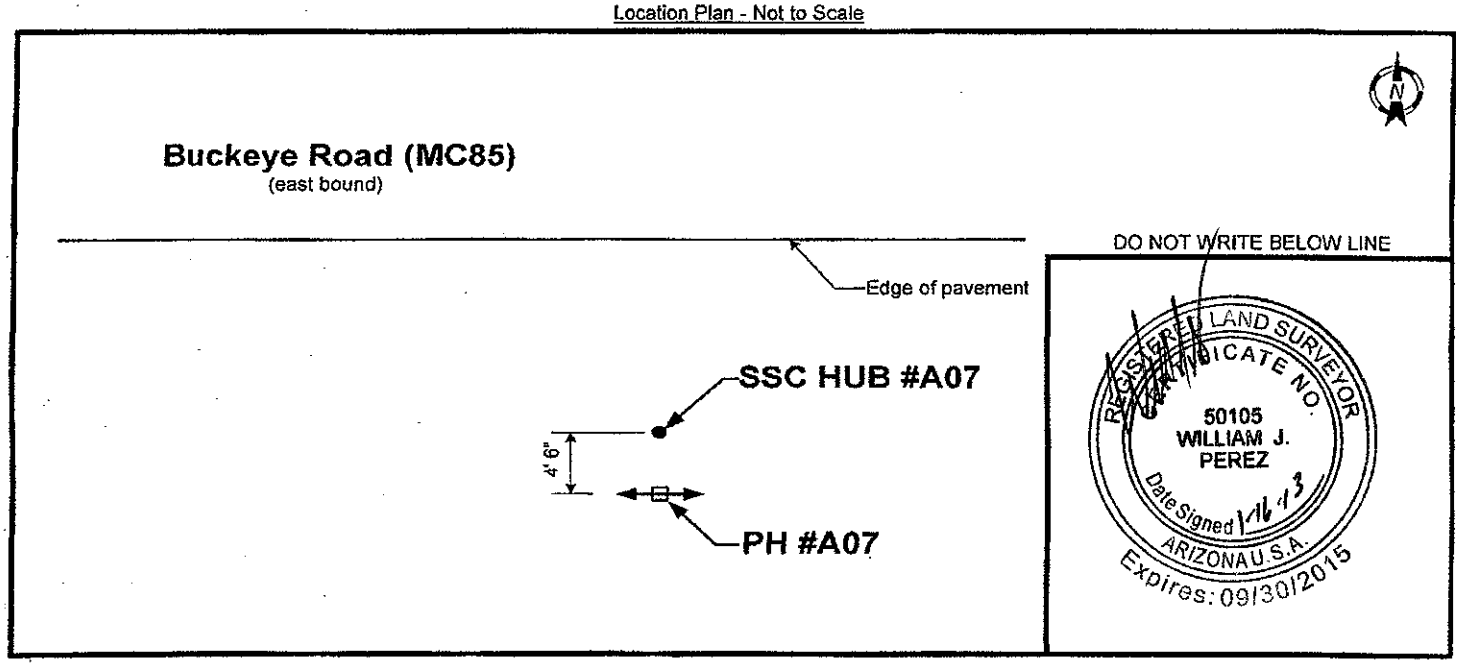
Elev. Bottom of Utility: 987.17

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A08 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1128+71.95 / 42.13' Rt. | Northing: 336227.23 | Easting: 586041.45 | Elevation: 993.36

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): | Station / Offset: 1128+71.95 / 42.13' Rt.

Rod Reading (HUB - Pothole Crew): | HUB: | T.O.U.: | Northing: 336227.23

Height of Instrument (H. I.): | G. L.: | B.O.U.: | Easting: 586041.45

H. I. :	H. I. :	H. I. :
(-) Rod Read Top Util. (T.O.U.):	(-) Rod Read Bottom Util. (B.O.U.):	(-) Rod Read Pothole (G.L.):
= Elevation Top Utility:	= Elevation Bottom Utility:	= Elevation Ground Level:

Station / Offset: 1128+71.95 / 42.13' Rt.

Northing: 336227.23

Easting: 586041.45

Actual Field Measurement: (Existing Grade to T.O.U.)

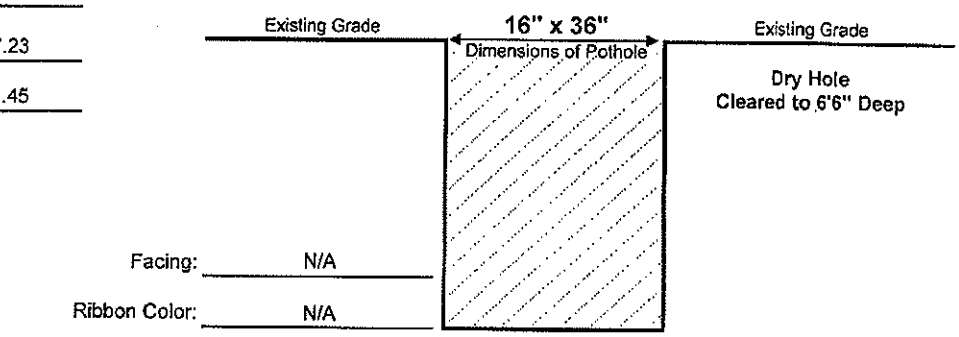
Elev. Top of Utility:

Actual Field Measurement: (Existing Grade to B.O.U.)

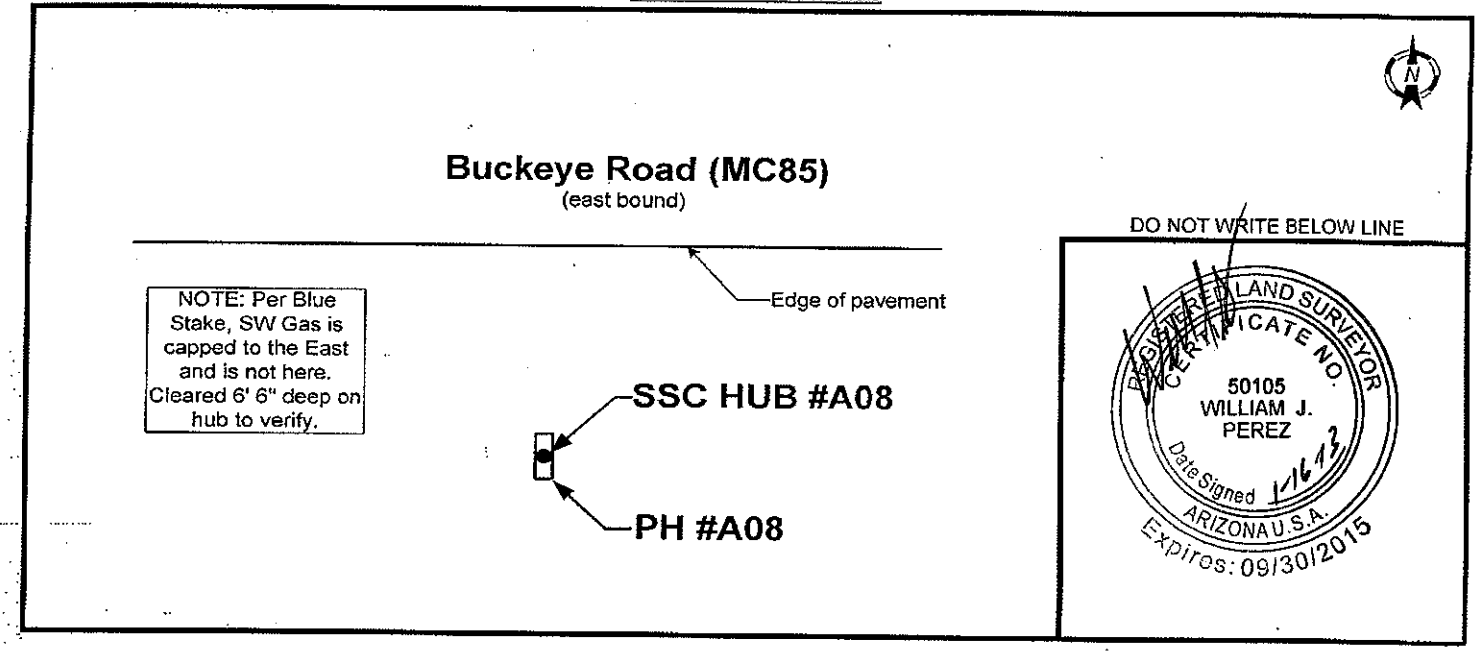
Elev. Bottom of Utility:

Facing: N/A

Ribbon Color: N/A



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub. Per SWG no Gas here

Was requested utility found? NO | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A09 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1128+75.66 / 41.65' Rt. | Northing: 336227.61 | Easting: 586045.17 | Elevation: 993.41

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.41			Station / Offset:	1128+75.66 / 41.65' Rt.
Rod Reading (HUB - Pothole Crew):	5.65	HUB: 5.65	T.O.U.: 10.12	Northing:	336227.61
Height of Instrument (H. I.):	999.06	G. L.: 5.54	B.O.U.: 10.37	Easting:	586045.17

H. I. :	999.06	H. I. :	999.06	H. I. :	999.06
(-) Rod Read Top Util. (T.O.U.):	10.12	(-) Rod Read Bottom Util. (B.O.U.):	10.37	(-) Rod Read Pothole (G.L.):	5.54
= Elevation Top Utility:	988.94	= Elevation Bottom Utility:	988.69	= Elevation Ground Level:	993.52

Station / Offset: 1128+82.66 / 47.15 RT

Northing: 336222.11

Easting: 586052.17

Actual Field Measurement: 4.58 (Existing Grade to T.O.U.)

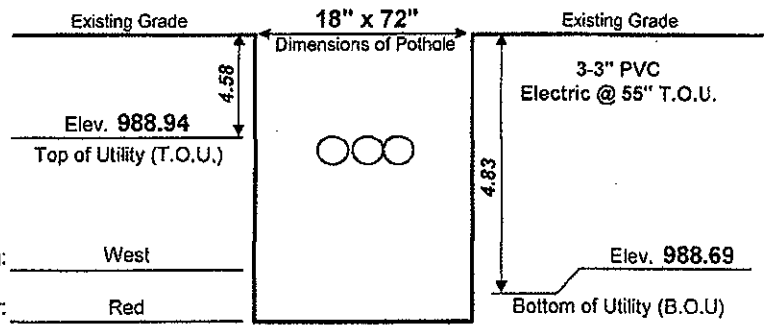
Elev. Top of Utility: 988.94

Actual Field Measurement: 4.83 (Existing Grade to B.O.U.)

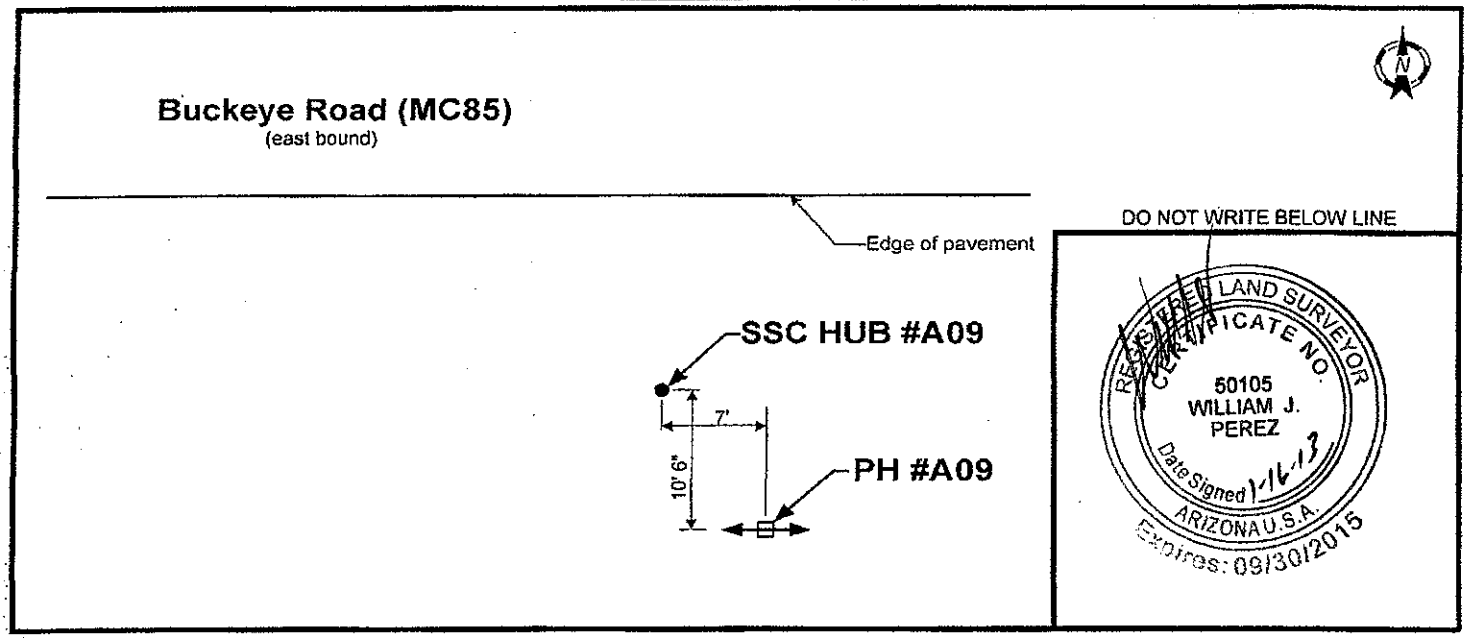
Elev. Bottom of Utility: 988.69

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A10 | Date Dug: 12/31/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1130+30.16 / 68.30' Rt. | Northing: 336197.42 | Easting: 586199.60 | Elevation: 993.76

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.76			Station / Offset:	1130+30.16 / 68.30' Rt.
Rod Reading (HUB - Pothole Crew):	5.51	HUB: 5.51	T.O.U.: 9.46	Northing:	336197.42
Height of Instrument (H. I.):	999.27	G. L.: 5.09	B.O.U.: 9.71	Easting:	586199.60

H. I. :	999.27	H. I. :	999.27	H. I. :	999.27
(-) Rod Read Top Util. (T.O.U.):	9.46	(-) Rod Read Bottom Util. (B.O.U.):	9.71	(-) Rod Read Pothole (G.L.):	5.09
= Elevation Top Utility:	989.81	= Elevation Bottom Utility:	989.56	= Elevation Ground Level:	994.18

Station / Offset: 1130+30.16 / 43.30' Rt.

Northing: 336222.42

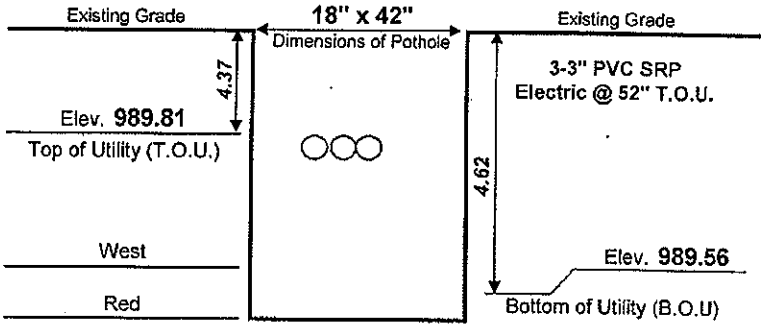
Easting: 586199.60

Actual Field Measurement: (Existing Grade to T.O.U.) 4.37

Elev. Top of Utility: 989.81

Actual Field Measurement: (Existing Grade to B.O.U.) 4.62

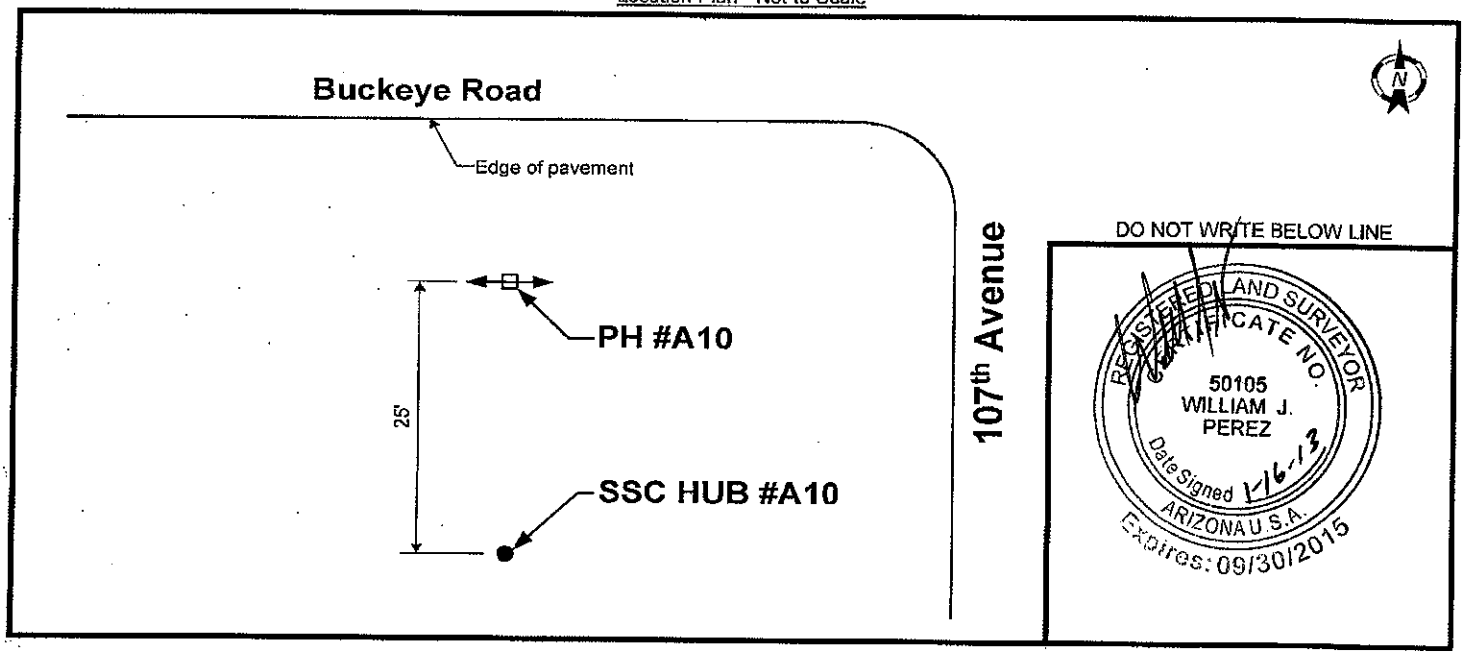
Elev. Bottom of Utility: 989.56



Facing: West

Ribbon Color: Red

Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub. Potholed on Blue Stake

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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T: 602-997-6164 F: 602-997-4811

Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A11 | Date Dug: 12/31/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1130+46.84 / 76.48' Rt. | Northing: 336188.98 | Easting: 586216.25 | Elevation: 993.34

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.34					Station / Offset:	1130+46.84 / 76.48' Rt.
Rod Reading (HUB - Pothole Crew):	5.33	HUB:	5.33	T.O.U.:	10.81	Northing:	336188.98
Height of Instrument (H. I.):	998.67	G. L.:	5.12	B.O.U.:	11.06	Easting:	586216.25

H. I. :	998.67	H. I. :	998.67	H. I. :	998.67
(-) Rod Read Top Util. (T.O.U.):	10.81	(-) Rod Read Bottom Util. (B.O.U.):	11.06	(-) Rod Read Pothole (G.L.):	5.12
= Elevation Top Utility:	987.86	= Elevation Bottom Utility:	987.61	= Elevation Ground Level:	**993.55**

Station / Offset: 1130+37.09 / 76.48' Rt.

Northing: 336188.98

Easting: 586206.50

Actual Field Measurement: 5.69
(Existing Grade to T.O.U.)

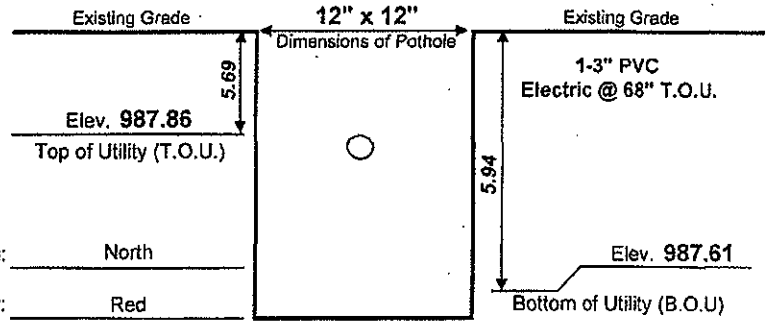
Elev. Top of Utility: 987.86

Actual Field Measurement: 5.94
(Existing Grade to B.O.U.)

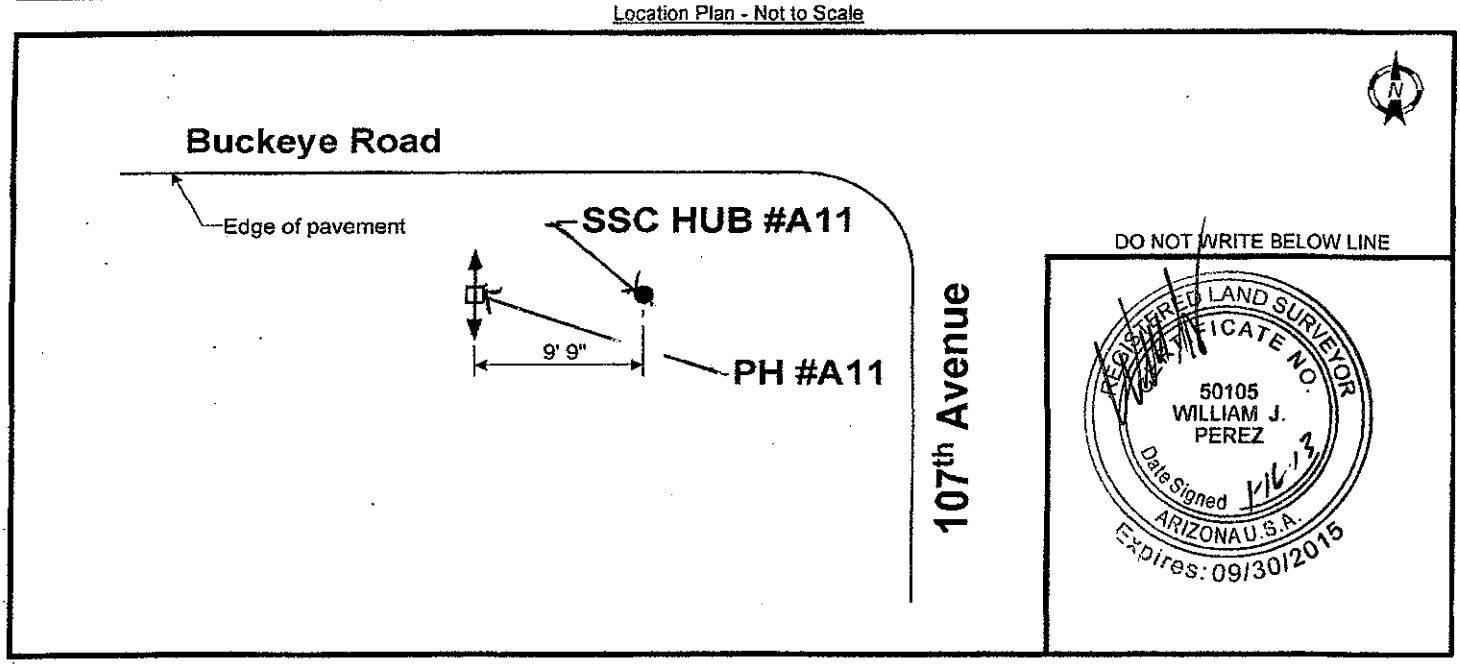
Elev. Bottom of Utility: 987.61

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A12 | Date Dug: 01/14/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1130+67.08 / 78.39' Rt. | Northing: 336186.77 | Easting: 586236.59 | Elevation: 993.24

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.24			Station / Offset:	1130+67.08 / 78.39' Rt.
Rod Reading (HUB - Pothole Crew):	5.56	HUB: 5.56	T.O.U.: 11.16	Northing:	336186.77
Height of Instrument (H. I.):	998.80	G. L.: 5.77	B.O.U.: 11.49	Easting:	586236.59

H. I. :	998.80	H. I. :	998.80	H. I. :	998.80
(-) Rod Read Top Util. (T.O.U.):	11.16	(-) Rod Read Bottom Util. (B.O.U.):	11.49	(-) Rod Read Pothole (G.L.):	5.77
= Elevation Top Utility:	987.64	= Elevation Bottom Utility:	987.31	= Elevation Ground Level:	**993.03**

Station / Offset: 1130+68.25 / 87.89' Rt.

Northing: 336177.27

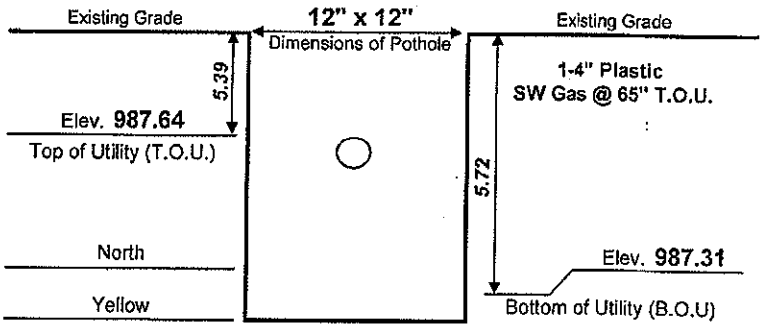
Easting: 586237.76

Actual Field Measurement: 5.39
(Existing Grade to T.O.U.)

Elev. Top of Utility: 987.64

Actual Field Measurement: 5.72
(Existing Grade to B.O.U.)

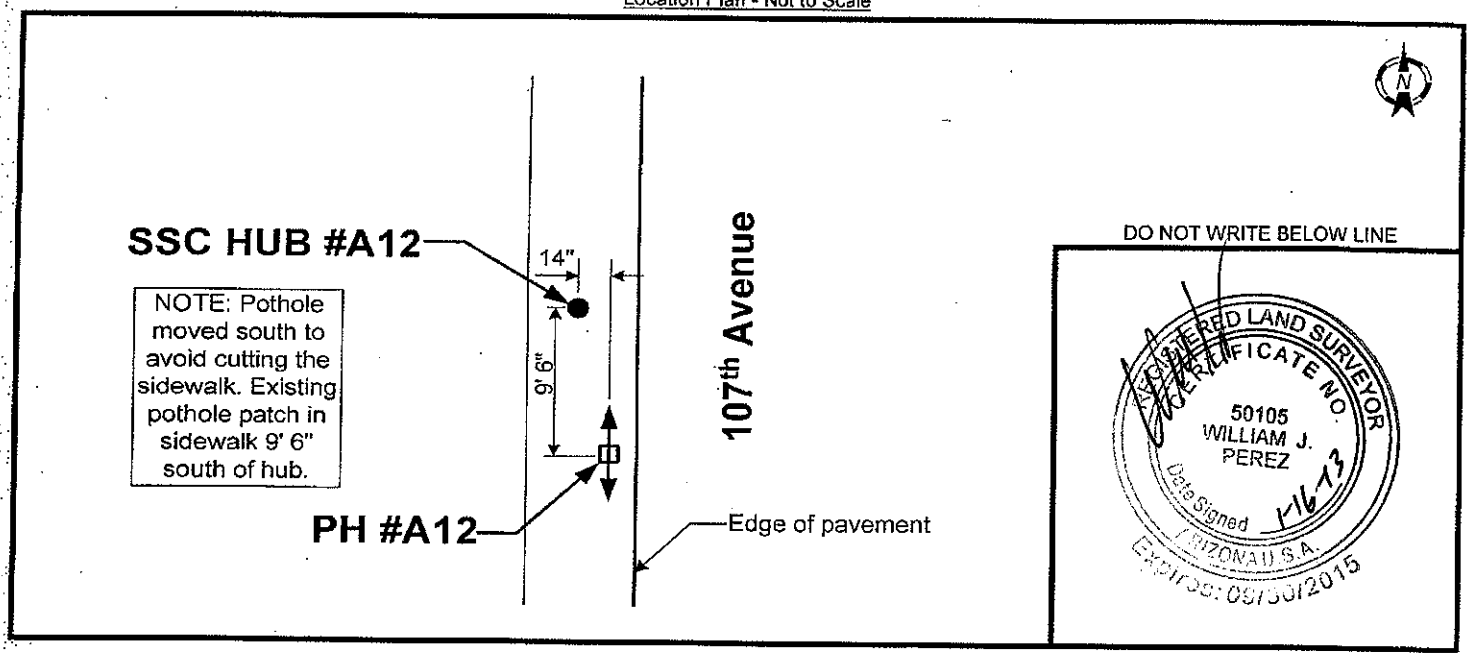
Elev. Bottom of Utility: 987.31



Facing: North

Ribbon Color: Yellow

Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A13 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1130+76.14 / 76.05' Rt. | Northing: 336188.99 | Easting: 586245.74 | Elevation: 993.02

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.02					Station / Offset:	1130+76.14 / 76.05' Rt.
Rod Reading (HUB - Pothole Crew):	5.41	HUB:	5.41	T.O.U.:	8.92	Northing:	336188.99
Height of Instrument (H. I.):	998.43	G. L.:	5.41	B.O.U.:	9.42	Easting:	586245.74

H. I. :	998.43	H. I. :	998.43	H. I. :	998.43
(-) Rod Read Top Util. (T.O.U.):	8.92	(-) Rod Read Bottom Util. (B.O.U.):	9.42	(-) Rod Read Pothole (G.L.):	5.41
= Elevation Top Utility:	989.51	= Elevation Bottom Utility:	989.01	= Elevation Ground Level:	**993.02**

Station / Offset: 1130+77.14 / 76.05' Rt.

Northing: 336188.99

Easting: 586246.74

Actual Field Measurement: (Existing Grade to T.O.U.) 3.51

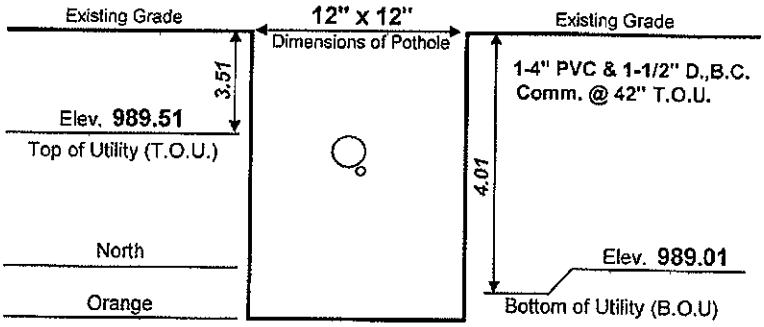
Elev. Top of Utility: 989.51

Actual Field Measurement: (Existing Grade to B.O.U.) 4.01

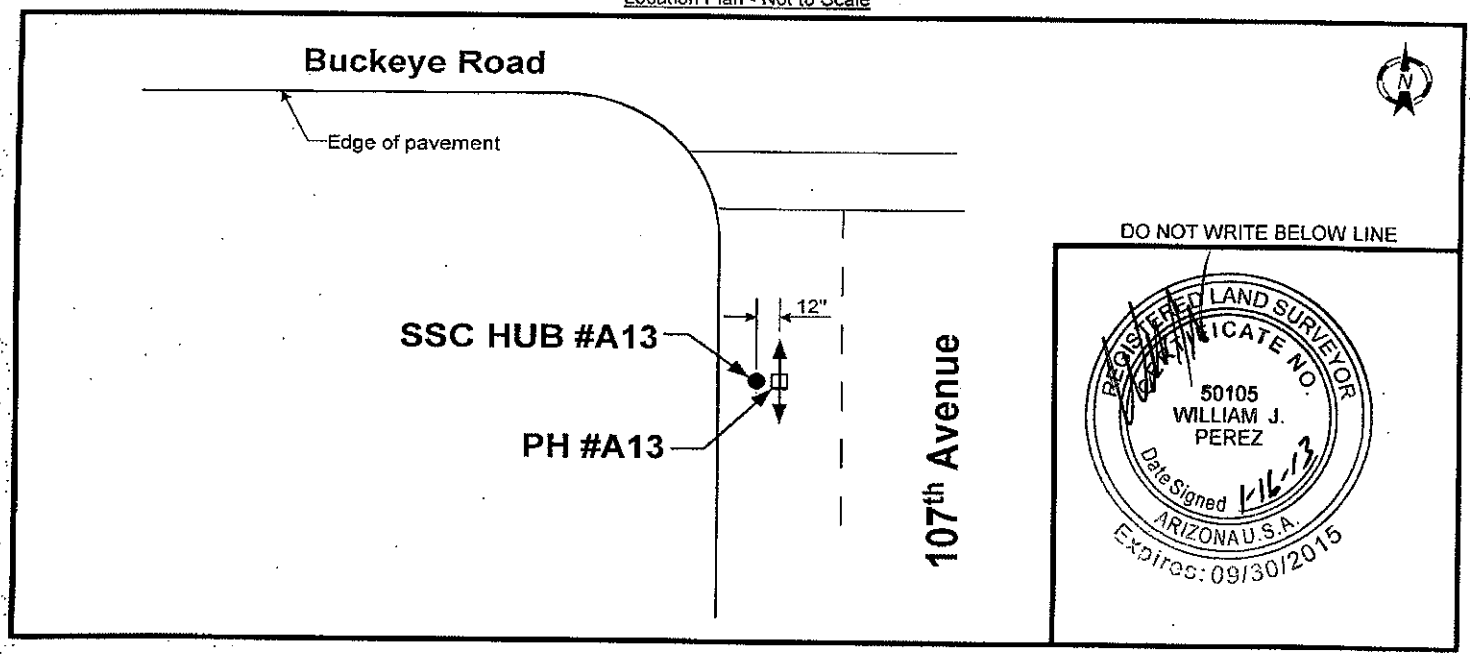
Elev. Bottom of Utility: 989.01

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A14 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Avondale Water

Station / Offset: 1131+18.40 / 75.30' Rt. | Northing: 336189.27 | Easting: 586288.27 | Elevation: 993.24

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.24			Station / Offset:	1131+18.40 / 75.30' Rt.
Rod Reading (HUB - Pothole Crew):	5.41	HUB: 5.41	T.O.U.: 11.78	Northing:	336189.27
Height of Instrument (H. I.):	998.65	G. L.: 5.41	B.O.U.: 13.45	Easting:	586288.27

H. I. :	998.65	H. I. :	998.65	H. I. :	998.65
(-) Rod Read Top Util. (T.O.U.):	11.78	(-) Rod Read Bottom Util. (B.O.U.):	13.45	(-) Rod Read Pothole (G.L.):	5.41
= Elevation Top Utility:	986.87	= Elevation Bottom Utility:	985.20	= Elevation Ground Level:	**993.24**

Station / Offset: 1131+19.48 / 75.30' Rt.

Northing: 336189.27

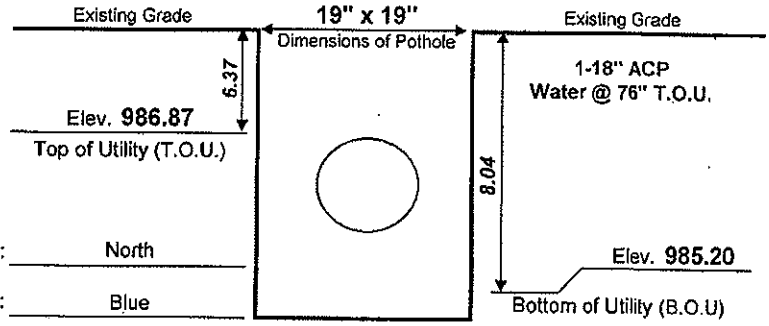
Easting: 586289.35

Actual Field Measurement: 6.37
(Existing Grade to T.O.U.)
Elev. Top of Utility: 986.87

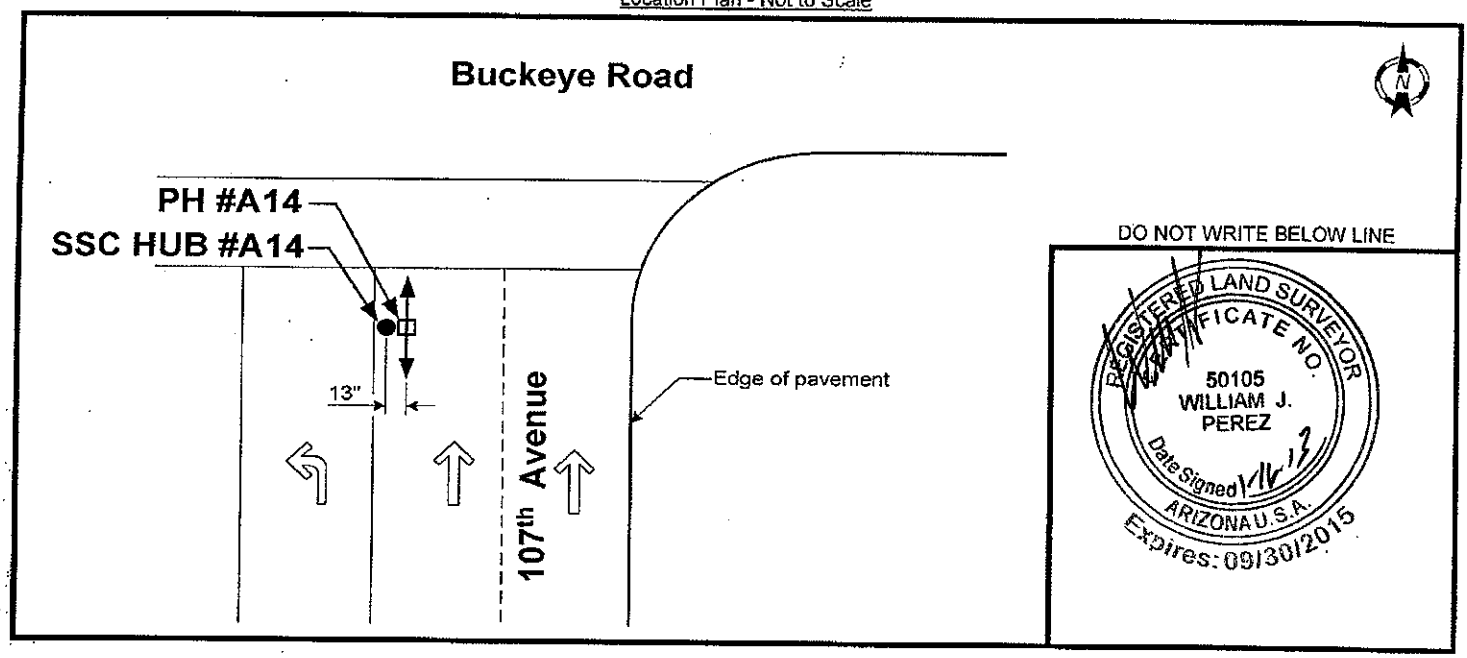
Actual Field Measurement: 8.04
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 985.20

Facing: North

Ribbon Color: Blue



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 5" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A15 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1131+23.35 / 75.25' Rt. | Northing: 336189.27 | Easting: 586293.25 | Elevation: 993.18

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.18			Station / Offset:	1131+23.35 / 75.25' Rt.
Rod Reading (HUB - Pothole Crew):	5.58	HUB: 5.58	T.O.U.: 12.27	Northing:	336189.27
Height of Instrument (H. I.):	998.76	G. L.: 5.58	B.O.U.: 12.33	Easting:	586293.25

H. I. :	998.76	H. I. :	998.76	H. I. :	998.76
(-) Rod Read Top Util. (T.O.U.):	12.27	(-) Rod Read Bottom Util. (B.O.U.):	12.33	(-) Rod Read Pothole (G.L.):	5.58
= Elevation Top Utility:	986.49	= Elevation Bottom Utility:	986.43	= Elevation Ground Level:	**993.18**

Station / Offset: 1131+23.35 / 74.25' Rt.

Northing: 336190.27

Easting: 586293.25

Actual Field Measurement: 6.69 (Existing Grade to T.O.U.)

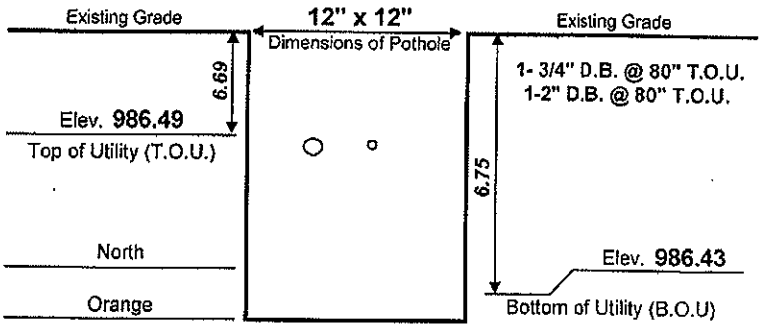
Elev. Top of Utility: 986.49

Actual Field Measurement: 6.75 (Existing Grade to B.O.U.)

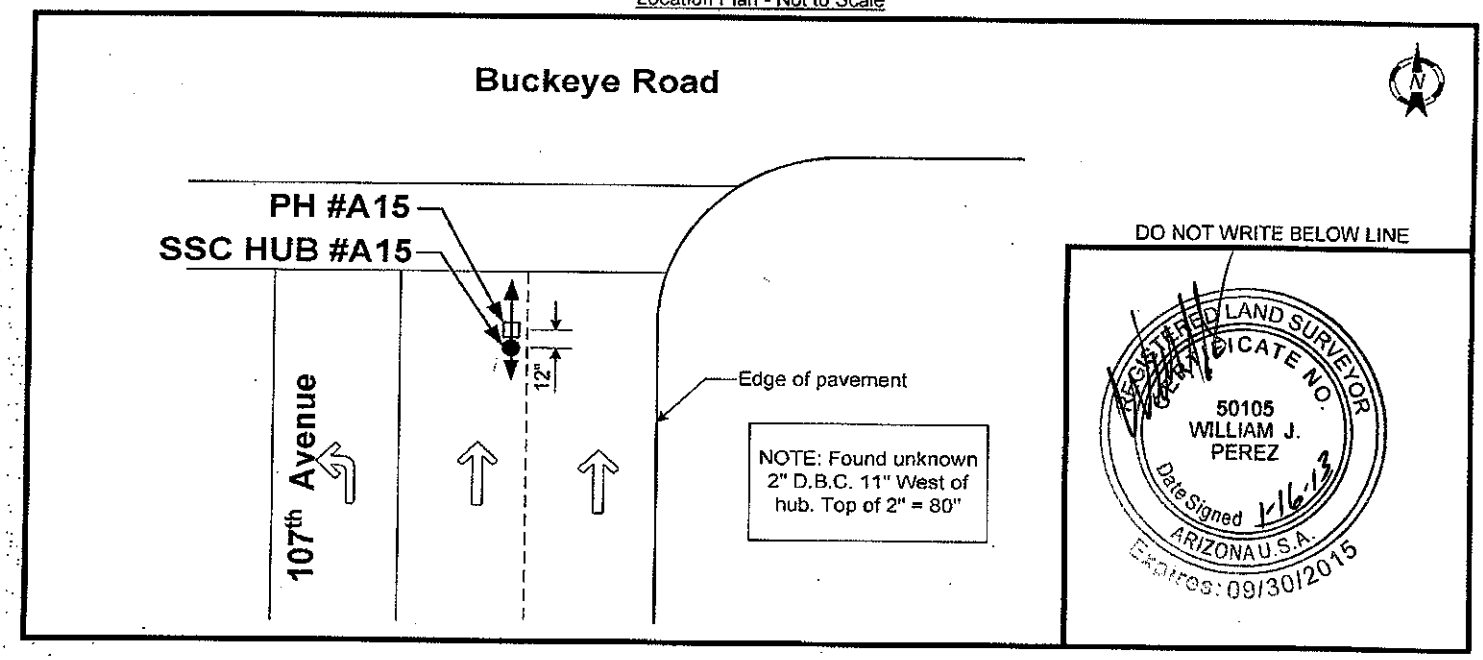
Elev. Bottom of Utility: 986.43

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub. Found Unknown 2" D.B.C.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 5" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A16 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1131+25.30 / 8.98' Lt. | Northing: 336273.48 | Easting: 586295.95 | Elevation: 993.91

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.91					Station / Offset:	1131+25.30 / 8.98' Lt.
Rod Reading (HUB - Pothole Crew):	4.78	HUB:	4.78	T.O.U.:	8.32	Northing:	336273.48
Height of Instrument (H. I.):	998.69	G. L.:	4.78	B.O.U.:	11.34	Easting:	586295.95

H. I. :	998.69	H. I. :	998.69	H. I. :	998.69
(-) Rod Read Top Util. (T.O.U.):	8.32	(-) Rod Read Bottom Util. (B.O.U.):	11.34	(-) Rod Read Pothole (G.L.):	4.78
= Elevation Top Utility:	990.37	= Elevation Bottom Utility:	987.35	= Elevation Ground Level:	**993.91**

Station / Offset: 1131+25.30 / 9.98' Lt.

Northing: 336274.48

Easting: 586295.95

Actual Field Measurement: (Existing Grade to T.O.U.) 3.54

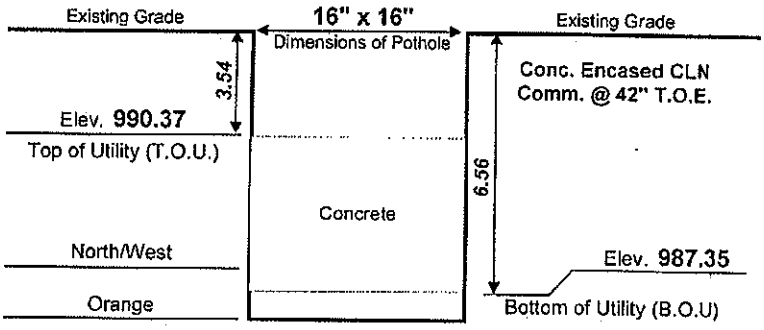
Elev. Top of Utility: 990.37

Actual Field Measurement: (Existing Grade to B.O.U.) 6.56

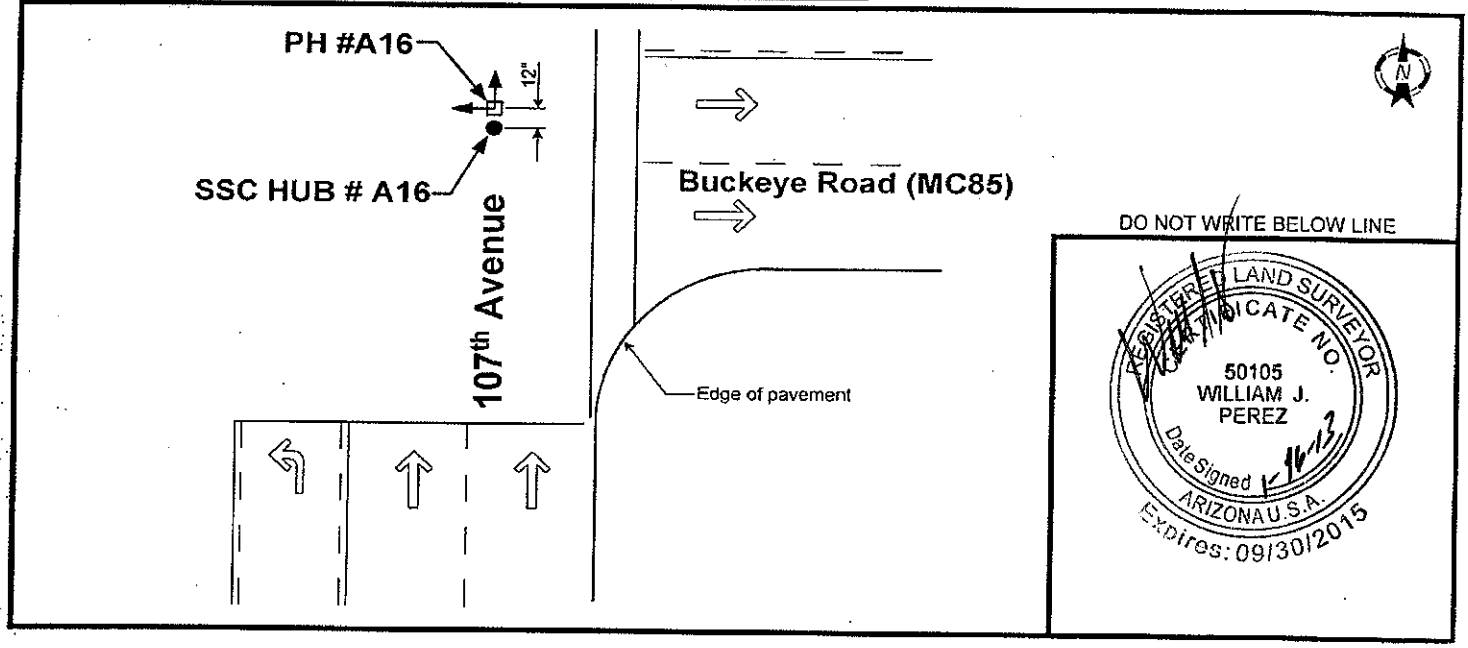
Elev. Bottom of Utility: 987.35

Facing: North/West

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A17 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1131+38.89 / 51.80' Lt. | Northing: 336316.19 | Easting: 586309.86 | Elevation: 994.01

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.01					Station / Offset:	1131+38.89 / 51.80' Lt.
Rod Reading (HUB - Pothole Crew):	5.02	HUB:	5.02	T.O.U.:	11.05	Northing:	336316.19
Height of Instrument (H. I.):	999.03	G. L.:	5.03	B.O.U.:	11.88	Easting:	586309.86

H. I. :	999.03	H. I. :	999.03	H. I. :	999.03
(-) Rod Read Top Util. (T.O.U.):	11.05	(-) Rod Read Bottom Util. (B.O.U.):	11.88	(-) Rod Read Pothole (G.L.):	5.03
= Elevation Top Utility:	987.98	= Elevation Bottom Utility:	987.15	= Elevation Ground Level:	994.00

Station / Offset: 1131+38.89 / 44.22' Lt.

Northing: 336308.61

Easting: 586309.86

Actual Field Measurement: 6.02 (Existing Grade to T.O.U.)

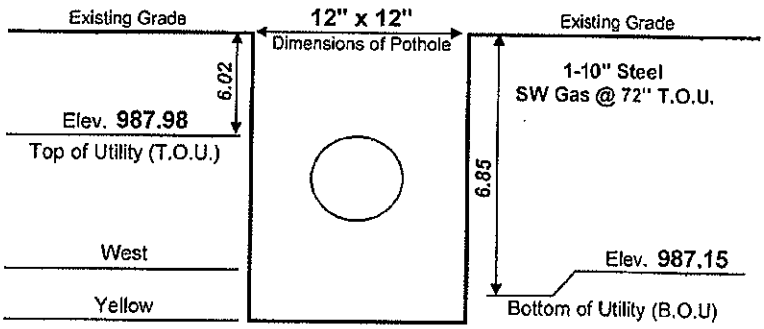
Elev. Top of Utility: 987.98

Actual Field Measurement: 6.85 (Existing Grade to B.O.U.)

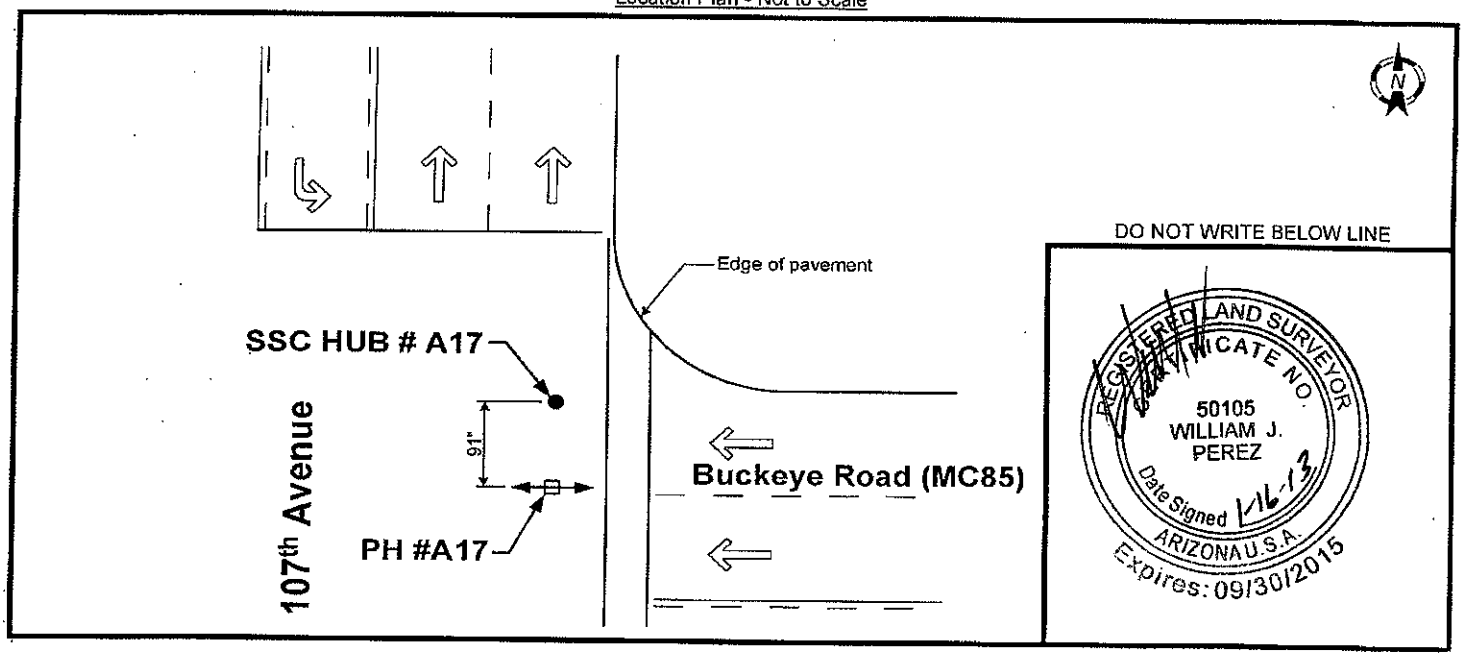
Elev. Bottom of Utility: 987.15

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 14" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A18 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1131+34.21 / 1.88' Lt. | Northing: 336266.30 | Easting: 586304.80 | Elevation: 993.68

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.68			Station / Offset:	1131+34.21 / 1.88' Lt.
Rod Reading (HUB - Pothole Crew):	5.24	HUB: 5.24	T.O.U.: 10.26	Northing:	336266.30
Height of Instrument (H. I.):	998.92	G. L.: 5.29	B.O.U.: 10.43	Easting:	586304.80

H. I. :	998.92	H. I. :	998.92	H. I. :	998.92
(-) Rod Read Top Util. (T.O.U.):	10.26	(-) Rod Read Bottom Util. (B.O.U.):	10.43	(-) Rod Read Pothole (G.L.):	5.29
= Elevation Top Utility:	988.66	= Elevation Bottom Utility:	988.49	= Elevation Ground Level:	**993.63**

Station / Offset: 1131+34.21 / 4.70' Rt.

Northing: 336259.72

Easting: 586304.80

Actual Field Measurement: (Existing Grade to T.O.U.) 4.97

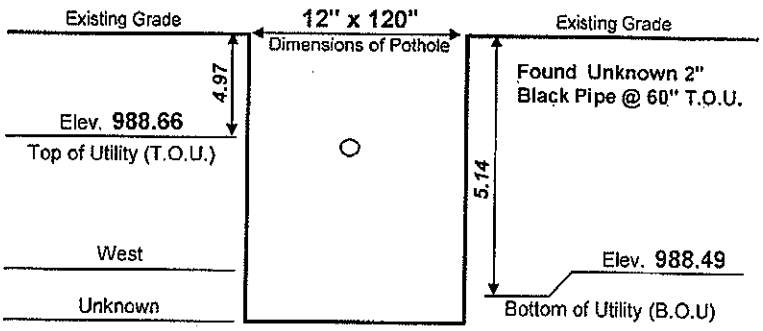
Elev. Top of Utility: 988.66

Actual Field Measurement: (Existing Grade to B.O.U.) 5.14

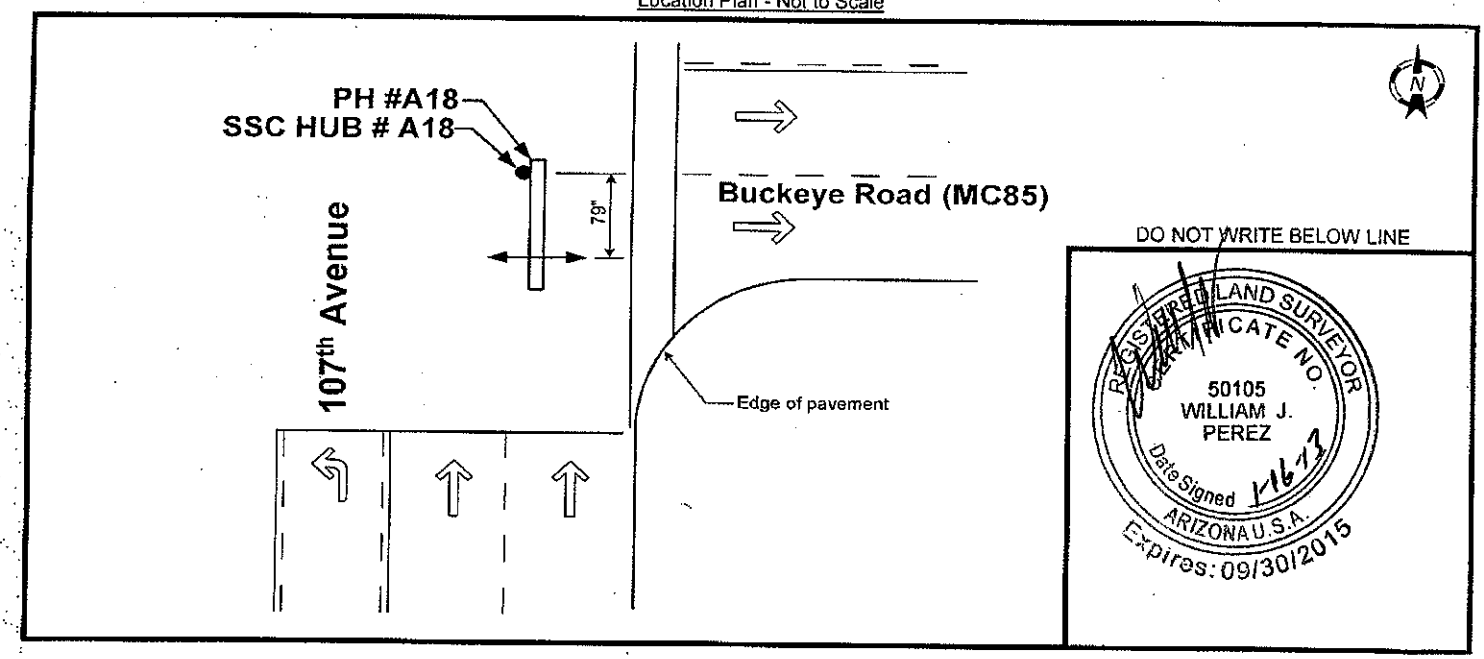
Elev. Bottom of Utility: 988.49

Facing: West

Ribbon Color: Unknown



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J. PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub. LVL3 was NOT located. Trenched 10' and cleared to 6'6" deep.

Was requested utility found? NO | Soil Type: "B" | Paving Thickness & Type: Remove 13" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A19 | Date Dug: 1/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Southwest
Size / Type: Gas

Station / Offset: 1131+34.82 / 10.16' Rt. | Northing: 336254.26 | Easting: 586305.31 | Elevation: 993.56

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.56			Station / Offset:	1131+34.82 / 10.16' Rt.
Rod Reading (HUB - Pothole Crew):	5.32	HUB: 5.32	T.O.U.: 9.18	Northing:	336254.26
Height of Instrument (H. I.):	998.88	G. L.: 5.51	B.O.U.: 9.35	Easting:	586305.31

H. I. :	998.88	H. I. :	998.88	H. I. :	998.88
(-) Rod Read Top Util. (T.O.U.):	9.18	(-) Rod Read Bottom Util. (B.O.U.):	9.35	(-) Rod Read Pothole (G.L.):	5.51
= Elevation Top Utility:	989.70	= Elevation Bottom Utility:	989.53	= Elevation Ground Level:	993.37

Station / Offset: 1131+40.65 / 13.41' Rt.

Northing: 336251.01

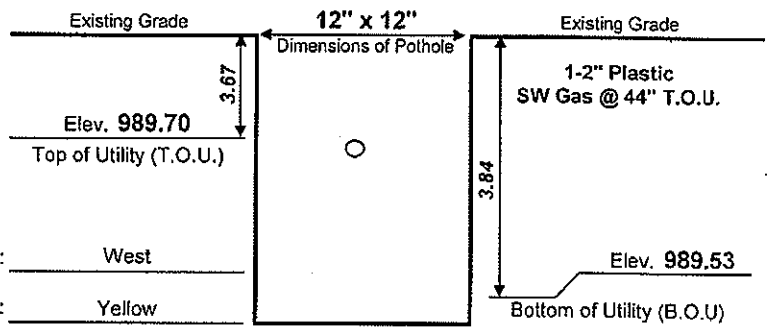
Easting: 586311.14

Actual Field Measurement: 3.67
(Existing Grade to T.O.U.)
Elev. Top of Utility: 989.70

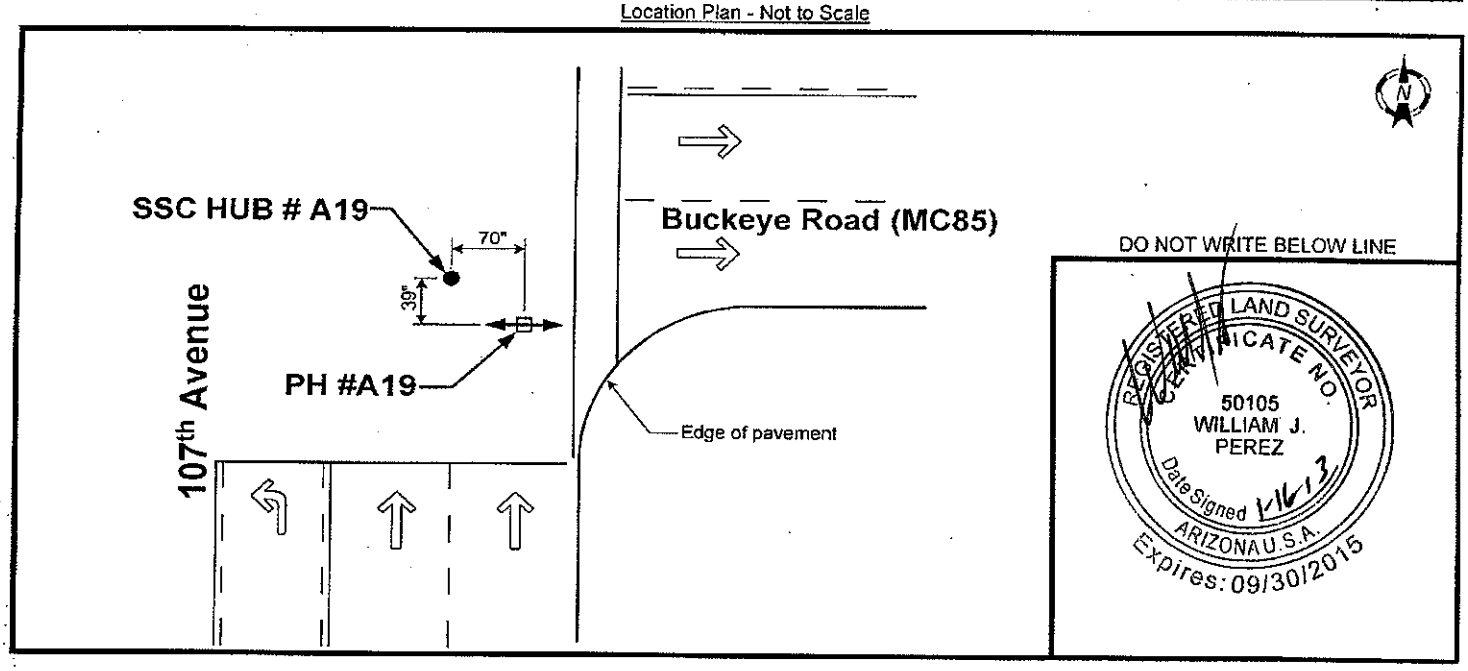
Actual Field Measurement: 3.84
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 989.53

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A20 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1131+34.86 / 15.20' Rt. | Northing: 336249.22 | Easting: 586305.31 | Elevation: 993.49

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): | Station / Offset: 1131+34.86 / 15.20' Rt.

Rod Reading (HUB - Pothole Crew): | HUB: | T.O.U.: | Northing: 336249.22

Height of Instrument (H. I.): | G. L.: | B.O.U.: | Easting: 586305.31

H. I. :	H. I. :	H. I. :
(-) Rod Read Top Util. (T.O.U.):	(-) Rod Read Bottom Util. (B.O.U.):	(-) Rod Read Pothole (G.L.):
= Elevation Top Utility:	= Elevation Bottom Utility:	= Elevation Ground Level:

Station / Offset: 1131+34.86 / 15.20' Rt.

Northing: 336249.22

Easting: 586305.31

Actual Field Measurement: (Existing Grade to T.O.U.)

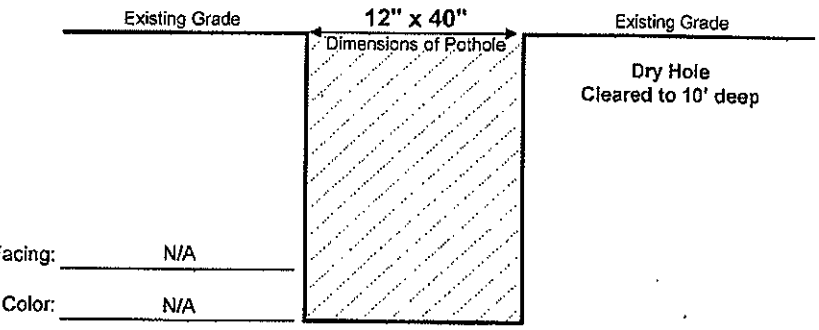
Elev. Top of Utility:

Actual Field Measurement: (Existing Grade to B.O.U.)

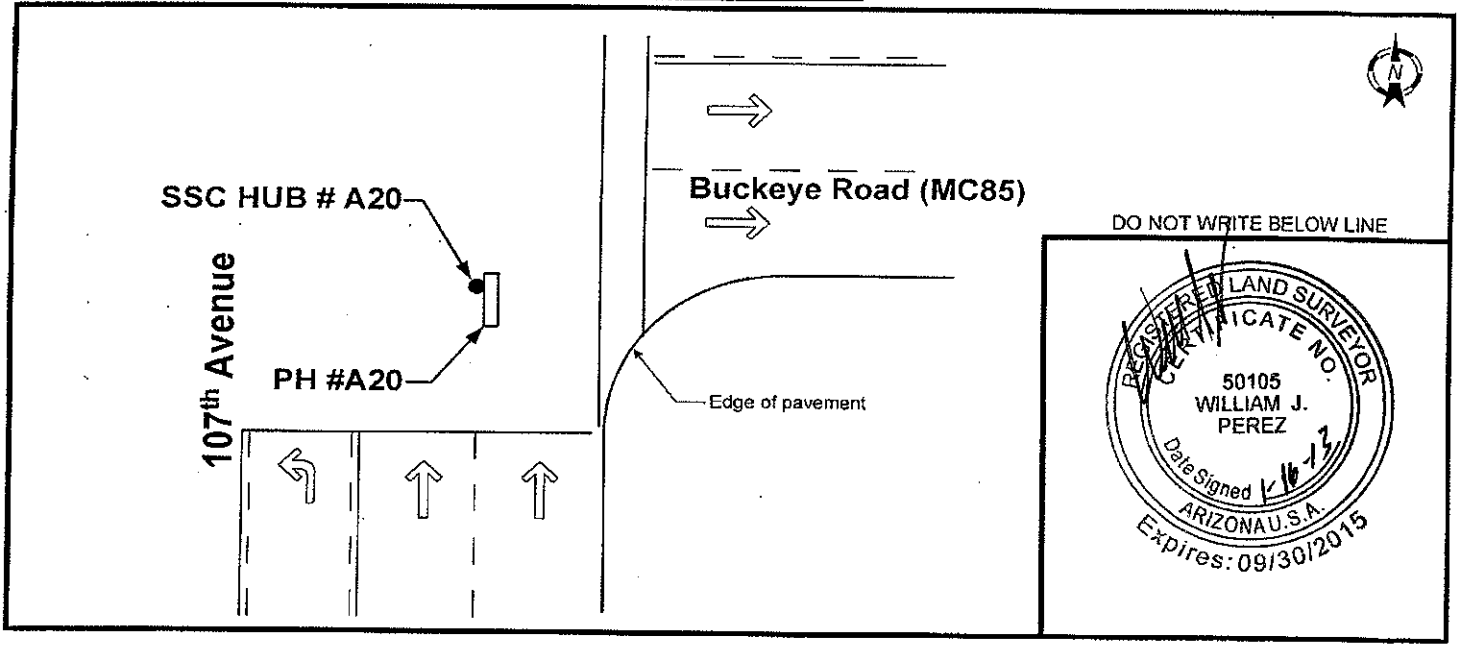
Elev. Bottom of Utility:

Facing: N/A

Ribbon Color: N/A



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: Remove 13" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A21 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1131+34.21 / 17.77' Rt. | Northing: 336246.66 | Easting: 586304.64 | Elevation: 993.45

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.45			Station / Offset:	1131+34.21 / 17.77' Rt.
Rod Reading (HUB - Pothole Crew):	5.48	HUB: 5.48	T.O.U.: 7.76	Northing:	336246.66
Height of Instrument (H. I.):	998.93	G. L.: 5.46	B.O.U.: 7.93	Easting:	586304.64

H. I. :	998.93	H. I. :	998.93	H. I. :	998.93
(-) Rod Read Top Util. (T.O.U.):	7.76	(-) Rod Read Bottom Util. (B.O.U.):	7.93	(-) Rod Read Pothole (G.L.):	5.46
= Elevation Top Utility:	991.17	= Elevation Bottom Utility:	991.00	= Elevation Ground Level:	**993.47**

Station / Offset: 1131+34.21 / 14.10' Rt.

Northing: 336250.33

Easting: 586304.64

Actual Field Measurement: 2.30
(Existing Grade to T.O.U.)

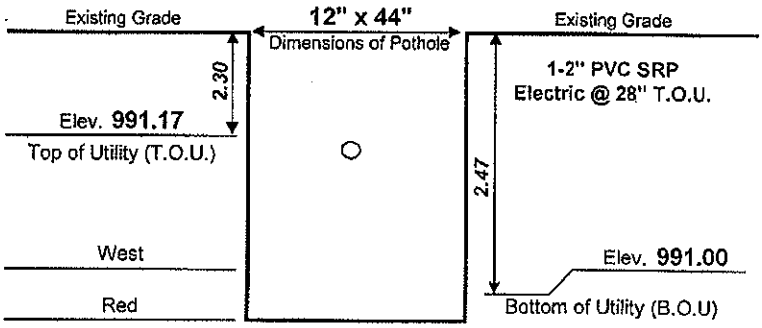
Elev. Top of Utility: 991.17

Actual Field Measurement: 2.47
(Existing Grade to B.O.U.)

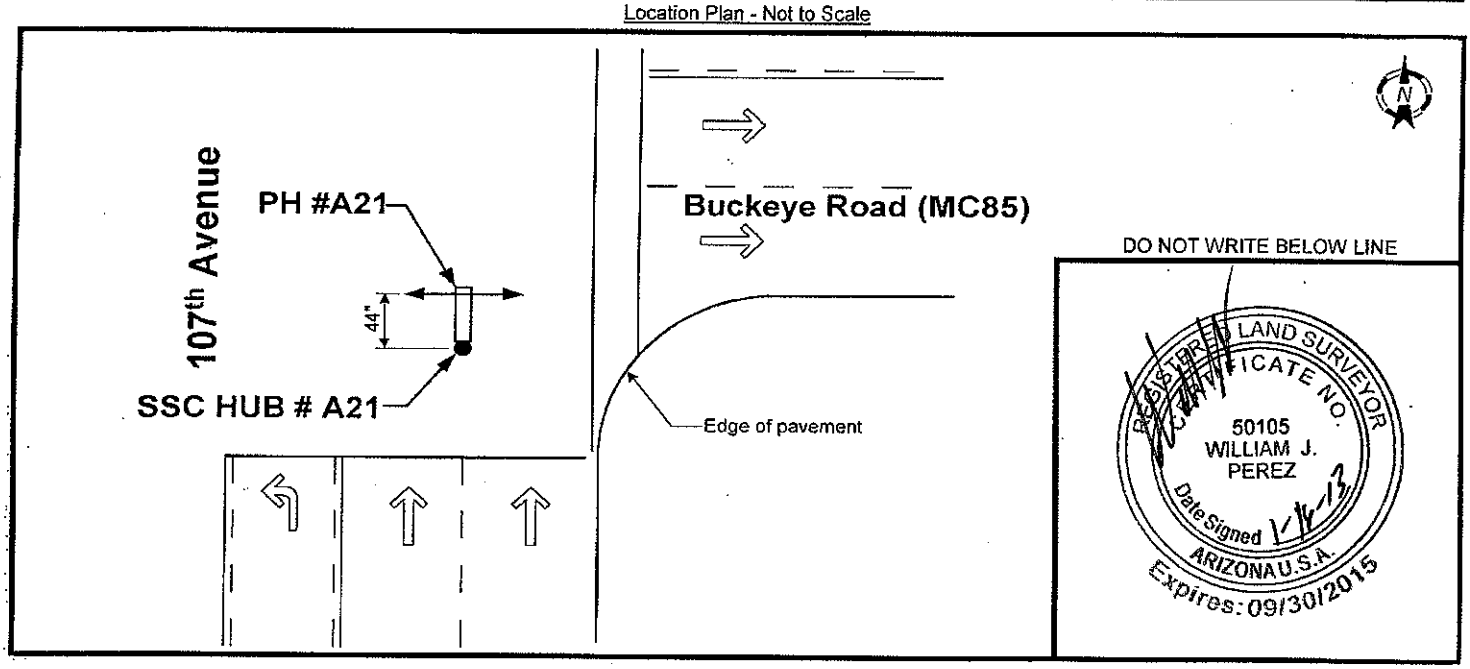
Elev. Bottom of Utility: 991.00

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 7" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A22 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1131+34.31 / 23.74' Rt. | Northing: 336240.68 | Easting: 586304.69 | Elevation: 993.40

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): _____ | Station / Offset: 1131+34.31 / 23.74' Rt.

Rod Reading (HUB - Pothole Crew): _____ | HUB: _____ | T.O.U.: _____ | Northing: 336240.68

Height of Instrument (H. I.): _____ | G. L.: _____ | B.O.U.: _____ | Easting: 586304.69

H. I. : _____	H. I. : _____	H. I. : _____
(-) Rod Read Top Util. (T.O.U.): _____	(-) Rod Read Bottom Util. (B.O.U.): _____	(-) Rod Read Pothole (G.L.): _____
= Elevation Top Utility: _____	= Elevation Bottom Utility: _____	= Elevation Ground Level: _____

Station / Offset: 1131+34.31 / 23.74' Rt.

Northing: 336240.68

Easting: 586304.69

Actual Field Measurement: (Existing Grade to T.O.U.) _____

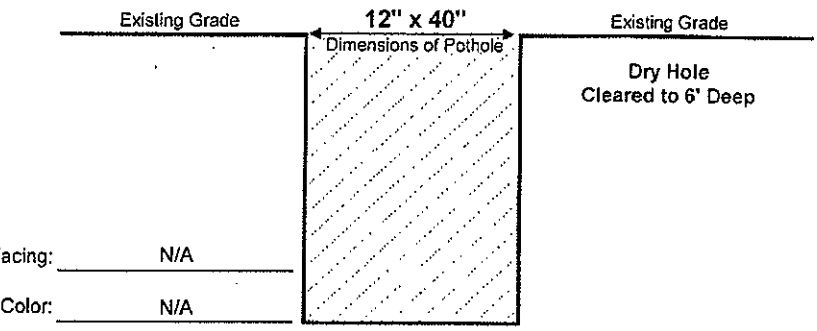
Elev. Top of Utility: _____

Actual Field Measurement: (Existing Grade to B.O.U.) _____

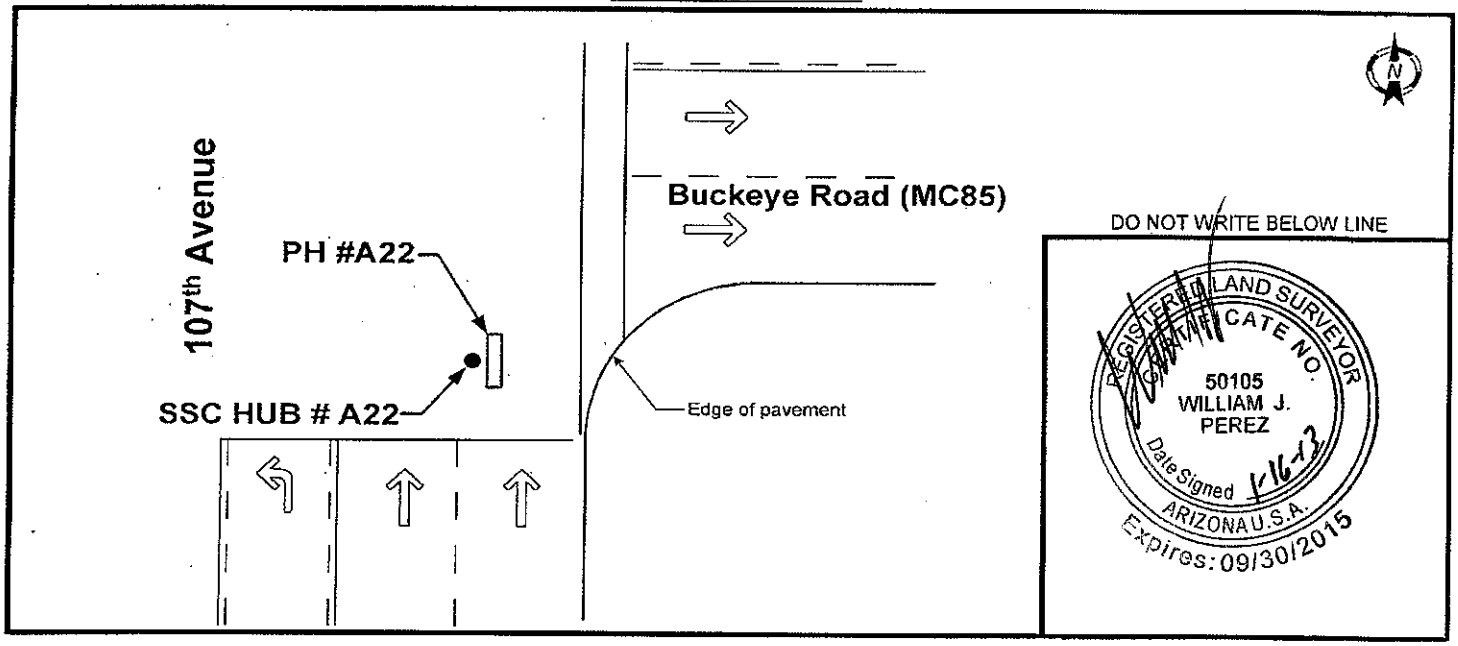
Elev. Bottom of Utility: _____

Facing: N/A

Ribbon Color: N/A



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. A24 | Date Dug: 01/09/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1131+32.66 / 74.09' Rt. | Northing: 336190.35 | Easting: 586302.63 | Elevation: 992.98

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	992.98			Station / Offset:	1131+32.66 / 74.09' Rt.
Rod Reading (HUB - Pothole Crew):	5.26	HUB: 5.26	T.O.U.: 9.87	Northing:	336190.35
Height of Instrument (H. I.):	998.24	G. L.: 5.32	B.O.U.: 10.20	Easting:	586302.63

H. I. :	998.24	H. I. :	998.24	H. I. :	998.24
(-) Rod Read Top Util. (T.O.U.):	9.87	(-) Rod Read Bottom Util. (B.O.U.):	10.20	(-) Rod Read Pothole (G.L.):	5.32
= Elevation Top Utility:	988.37	= Elevation Bottom Utility:	988.04	= Elevation Ground Level:	**992.92**

Station / Offset: 1131+33.83 / 74.09' Rt.

Northing: 336190.35

Easting: 586303.80

Actual Field Measurement: 4.55
(Existing Grade to T.O.U.)

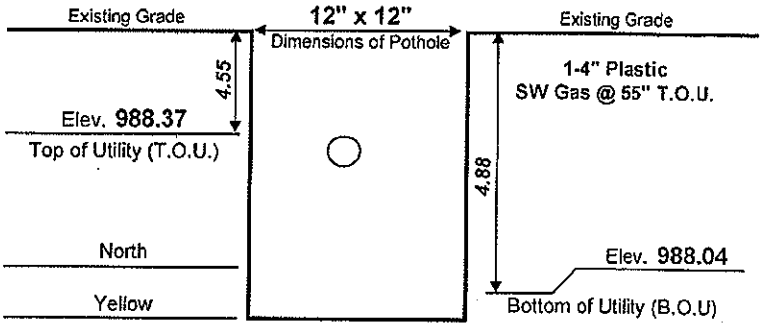
Elev. Top of Utility: 988.37

Actual Field Measurement: 4.88
(Existing Grade to B.O.U.)

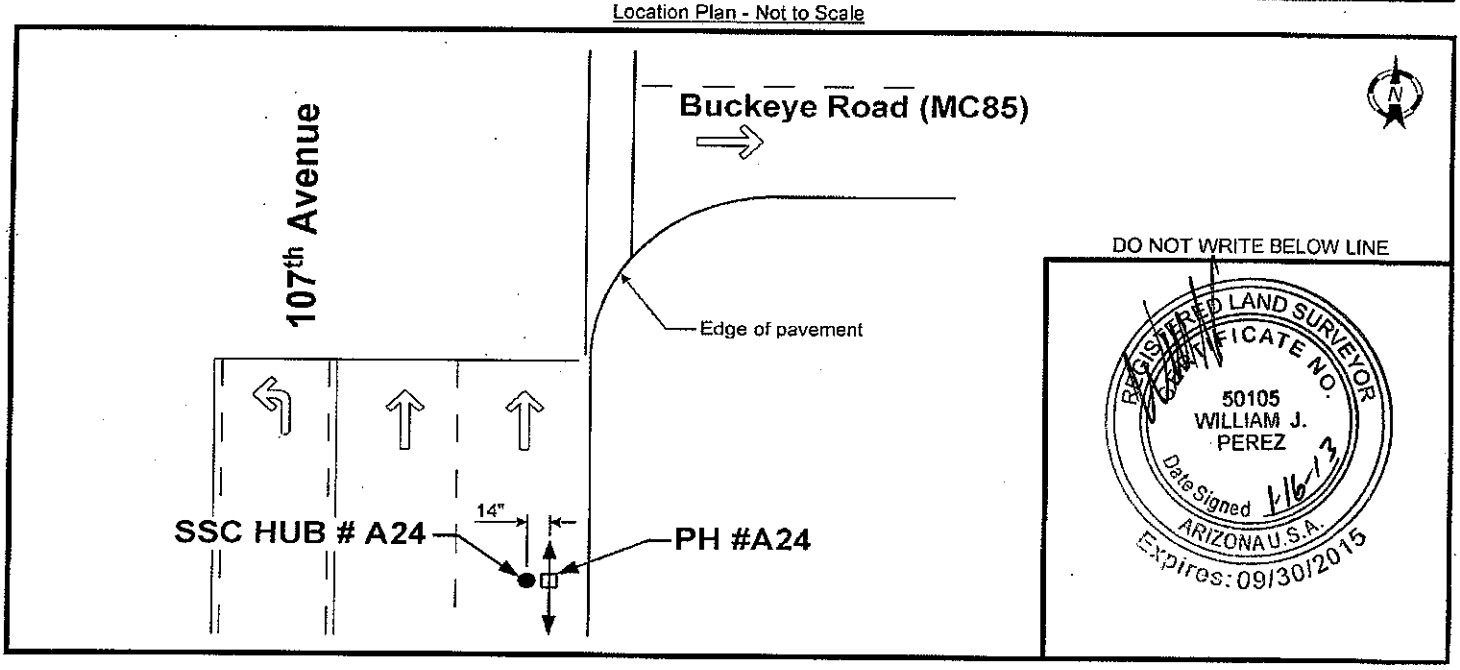
Elev. Bottom of Utility: 988.04

Facing: North

Ribbon Color: Yellow



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B01 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1144+37.14 / 20.33' Rt. | Northing: 336285.22 | Easting: 587607.69 | Elevation: 988.57

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	988.57			Station / Offset:	1144+37.14 / 20.33' Rt.
Rod Reading (HUB - Pothole Crew):	5.40	HUB: 5.40	T.O.U.: 11.43	Northing:	336285.22
Height of Instrument (H. I.):	993.97	G. L.: 5.40	B.O.U.: 12.60	Easting:	587607.69

H. I. :	993.97	H. I. :	993.97	H. I. :	993.97
(-) Rod Read Top Util. (T.O.U.):	11.43	(-) Rod Read Bottom Util. (B.O.U.):	12.60	(-) Rod Read Pothole (G.L.):	5.40
= Elevation Top Utility:	982.54	= Elevation Bottom Utility:	981.37	= Elevation Ground Level:	988.57

Station / Offset: 1144+37.14 / 20.33' Rt.

Northing: 336285.22

Easting: 587607.69

Actual Field Measurement: 6.03
(Existing Grade to T.O.U.)

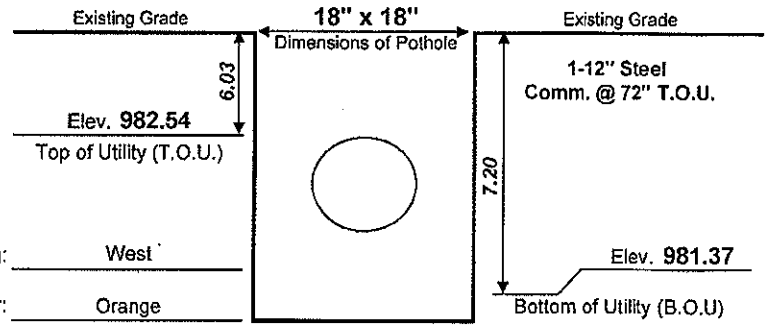
Elev. Top of Utility: 982.54

Actual Field Measurement: 7.20
(Existing Grade to B.O.U.)

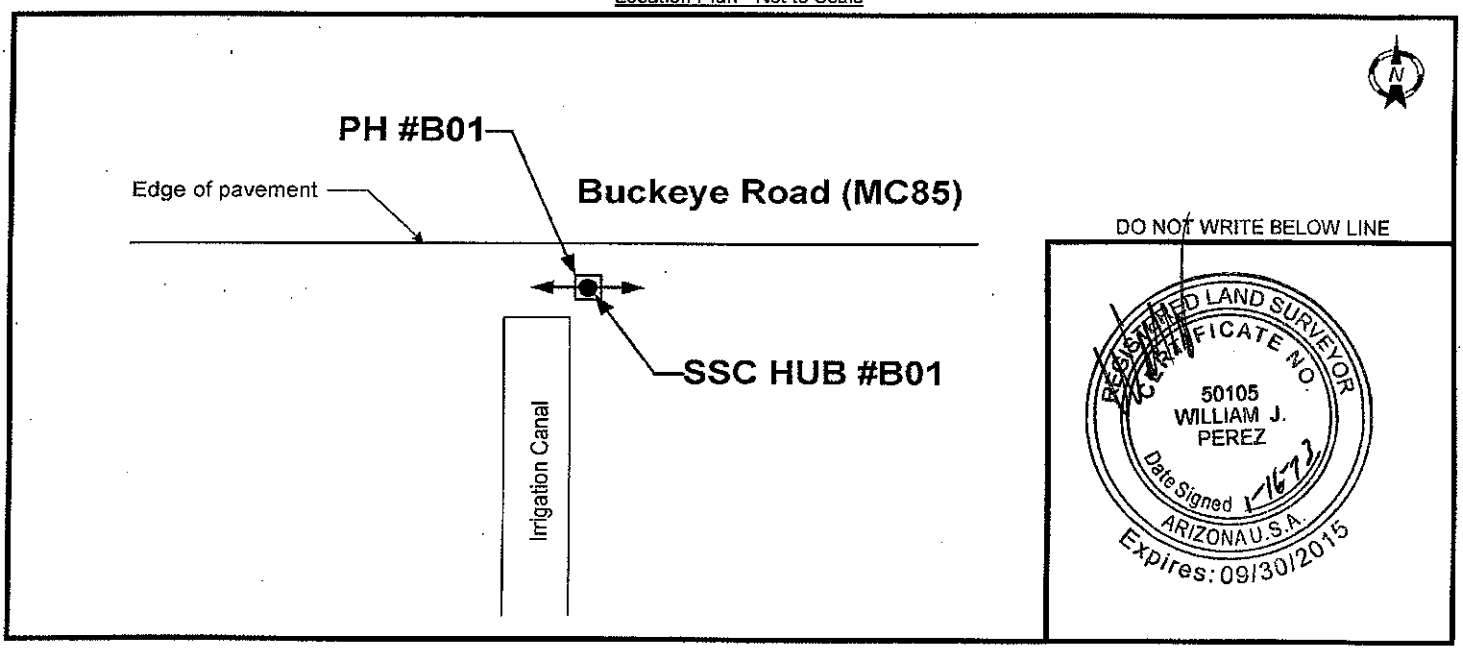
Elev. Bottom of Utility: 981.37

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B02 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1144+36.97 / 24.52' Rt. | Northing: 336281.03 | Easting: 587607.69 | Elevation: 988.12

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): _____

Rod Reading (HUB - Pothole Crew): _____ | HUB: _____ | T.O.U.: _____

Height of Instrument (H. I.): _____ | G. L.: _____ | B.O.U.: _____

Station / Offset: 1144+36.97 / 24.52' Rt.

Northing: 336281.03

Easting: 587607.69

H. I. : _____	H. I. : _____	H. I. : _____
(-) Rod Read Top Util. (T.O.U.): _____	(-) Rod Read Bottom Util. (B.O.U.): _____	(-) Rod Read Pothole (G.L.): _____
= Elevation Top Utility: _____	= Elevation Bottom Utility: _____	= Elevation Ground Level: _____

Station / Offset: 1144+36.97 / 24.52' Rt.

Northing: 336281.03

Easting: 587607.69

Actual Field Measurement: (Existing Grade to T.O.U.) _____

Elev. Top of Utility: _____

Actual Field Measurement: (Existing Grade to B.O.U.) _____

Elev. Bottom of Utility: _____

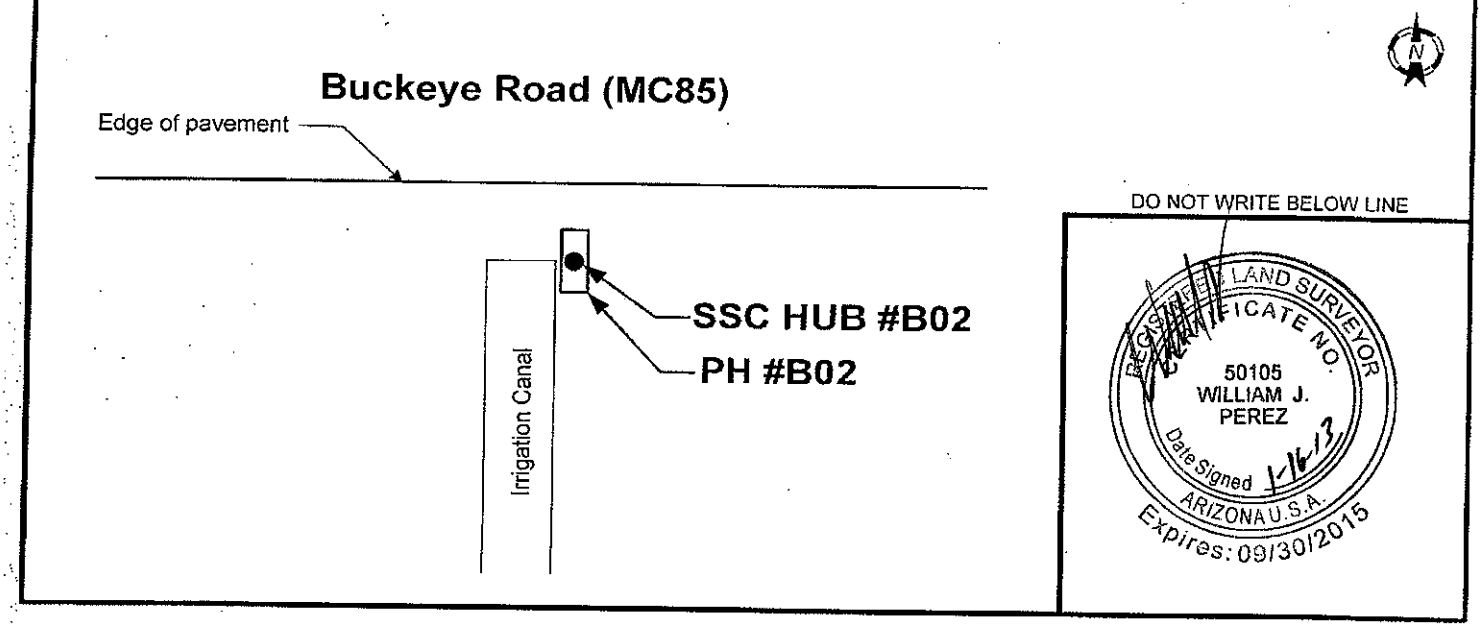
Facing: N/A

Ribbon Color: N/A

Existing Grade | 12" x 72" Dimensions of Pothole | Existing Grade

Dry Hole
Cleared to 8' deep

Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

CERTIFICATE NO. 50105 WILLIAM J. PEREZ
REGISTERED LAND SURVEYOR
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub. Per Blue Stake, No CLN at this location. Runs north across Buckeye 1 pole east of this location.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B03 | Date Dug: 12/31/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1145+99.89 / 40.65' Lt. | Northing: 336351.77 | Easting: 587768.35 | Elevation: 988.74

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	988.74			Station / Offset:	1145+99.89 / 40.65' Lt.
Rod Reading (HUB - Pothole Crew):	5.32	HUB: 5.32	T.O.U.: 11.50	Northing:	336351.77
Height of Instrument (H. I.):	994.06	G. L.: 5.24	B.O.U.: 13.10	Easting:	587768.35

H. I. :	994.06	H. I. :	994.06	H. I. :	994.06
(-) Rod Read Top Util. (T.O.U.):	11.50	(-) Rod Read Bottom Util. (B.O.U.):	13.10	(-) Rod Read Pothole (G.L.):	5.24
= Elevation Top Utility:	982.56	= Elevation Bottom Utility:	980.96	= Elevation Ground Level:	**988.82**

Station / Offset: 1145+99.89 / 49.15' Lt.

Northing: 336360.27

Easting: 587768.35

Actual Field Measurement: 6.26
(Existing Grade to T.O.U.)

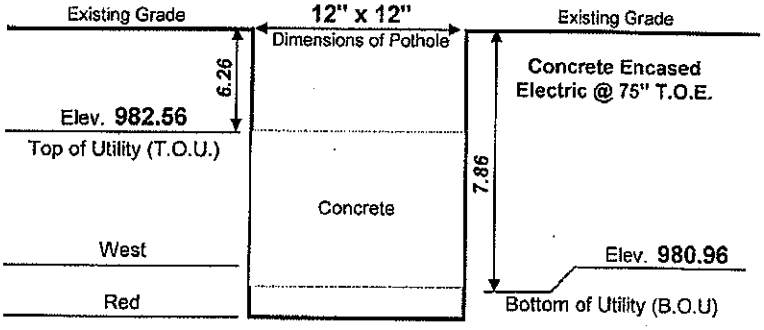
Elev. Top of Utility: 982.56

Actual Field Measurement: 7.86
(Existing Grade to B.O.U.)

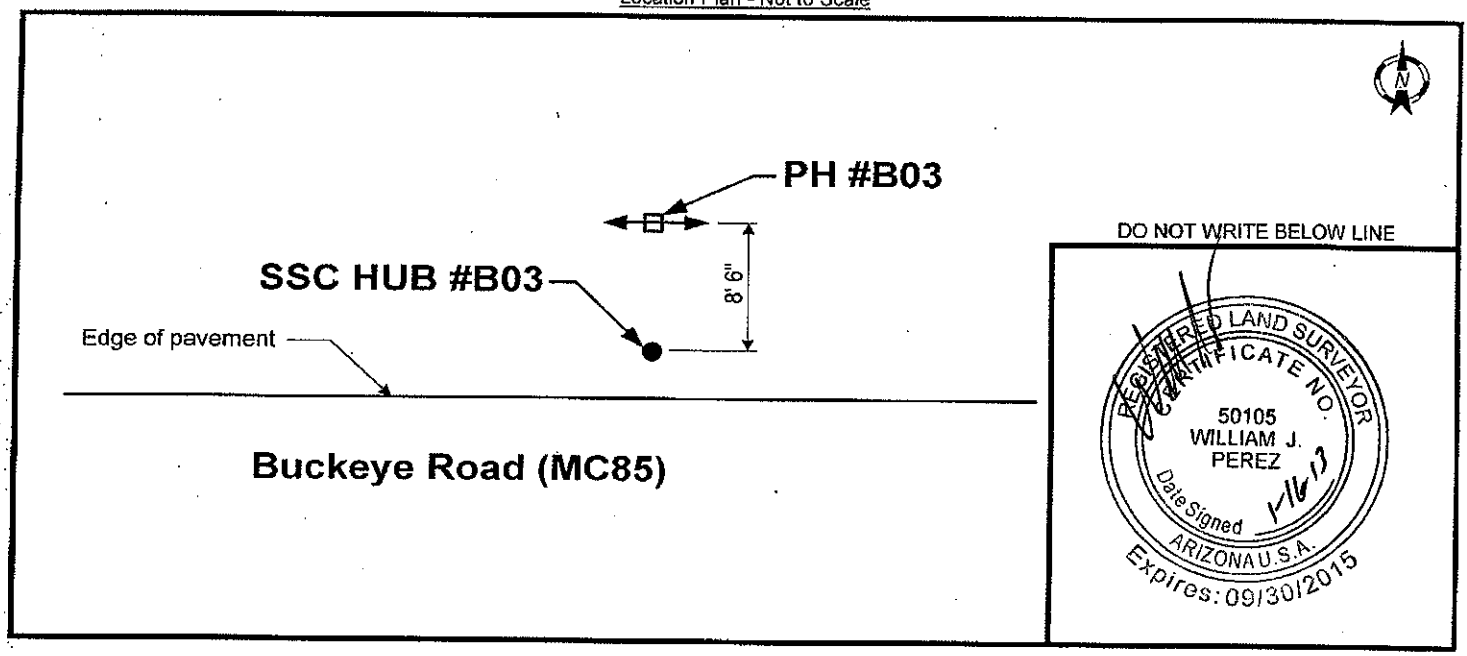
Elev. Bottom of Utility: 980.96

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B04 | Date Dug: 12/31/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1146+46.24 / 44.84' Lt. | Northing: 336357.24 | Easting: 587814.70 | Elevation: 989.04

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	989.04			Station / Offset:	1146+46.24 / 44.84' Lt.
Rod Reading (HUB - Pothole Crew):	5.18	HUB: 5.18	T.O.U.: 8.32	Northing:	336357.24
Height of Instrument (H. I.):	994.22	G. L.: 5.06	B.O.U.: 8.65	Easting:	587814.70

H. I. :	994.22	H. I. :	994.22	H. I. :	994.22
(-) Rod Read Top Util. (T.O.U.):	8.32	(-) Rod Read Bottom Util. (B.O.U.):	8.65	(-) Rod Read Pothole (G.L.):	5.06
= Elevation Top Utility:	985.90	= Elevation Bottom Utility:	985.57	= Elevation Ground Level:	**989.16**

Station / Offset: 1146+46.24 / 48.17' Lt.

Northing: 336360.57

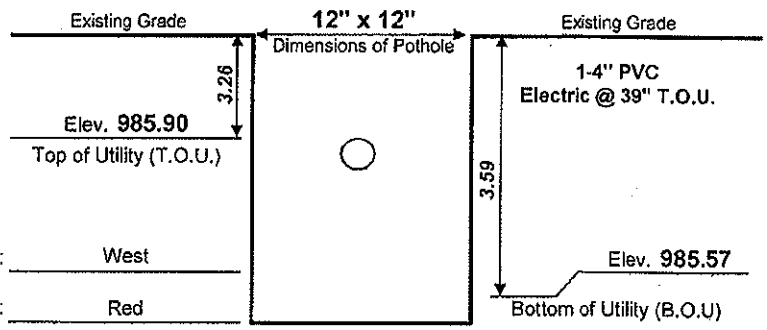
Easting: 587814.70

Actual Field Measurement: 3.26
(Existing Grade to T.O.U.)
Elev. Top of Utility: 985.90

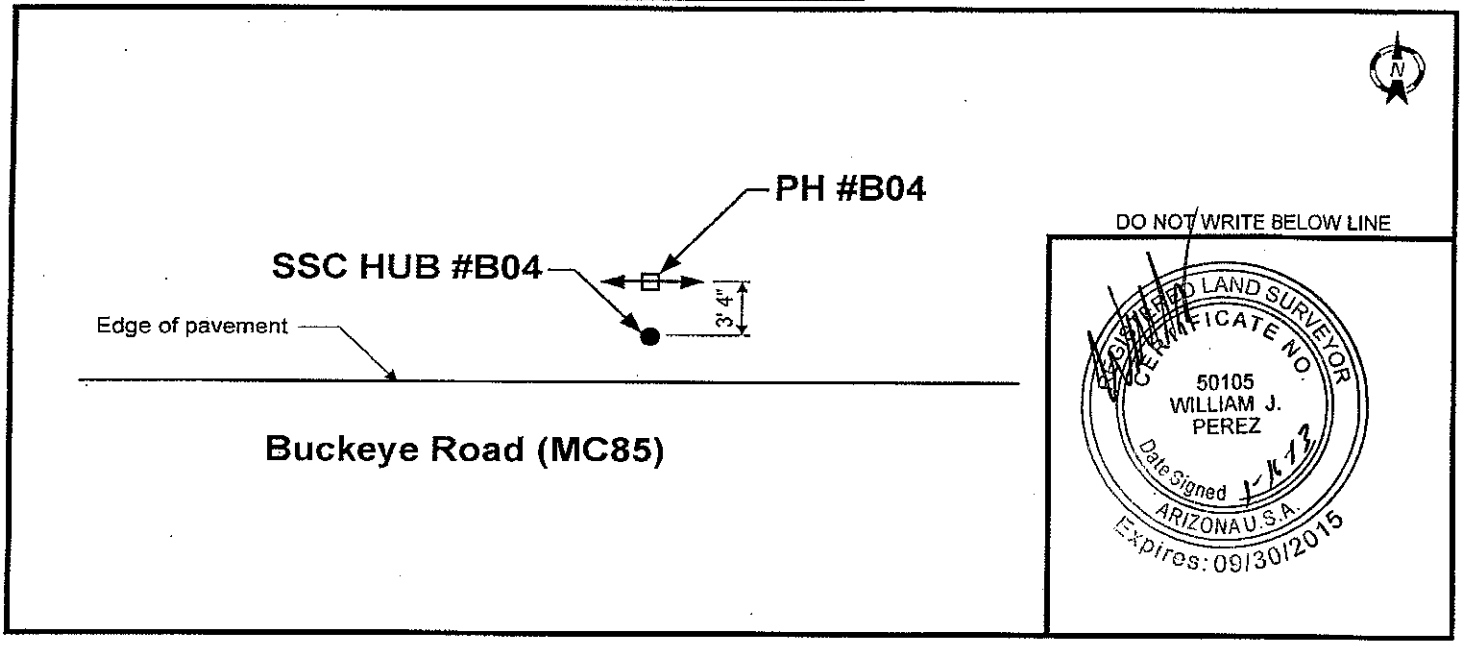
Actual Field Measurement: 3.59
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 985.57

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B05 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1157+11.94 / 26.59' Rt. | Northing: 336296.72 | Easting: 588881.71 | Elevation: 991.05

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	991.05					Station / Offset:	1157+11.94 / 26.59' Rt.
Rod Reading (HUB - Pothole Crew):	5.38	HUB:	5.38	T.O.U.:	10.78	Northing:	336296.72
Height of Instrument (H. I.):	996.43	G. L.:	5.43	B.O.U.:	11.95	Easting:	588881.71

H. I. :	996.43	H. I. :	996.43	H. I. :	996.43
(-) Rod Read Top Util. (T.O.U.):	10.78	(-) Rod Read Bottom Util. (B.O.U.):	11.95	(-) Rod Read Pothole (G.L.):	5.43
= Elevation Top Utility:	985.65	= Elevation Bottom Utility:	984.48	= Elevation Ground Level:	**991.00**

Station / Offset: 1157+14.19 / 27.84' Rt.

Northing: 336295.47

Easting: 588883.96

Actual Field Measurement: 5.35
(Existing Grade to T.O.U.)

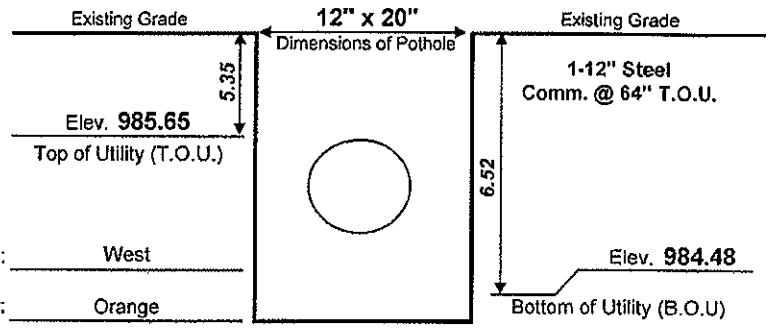
Elev. Top of Utility: 985.65

Actual Field Measurement: 6.52
(Existing Grade to B.O.U.)

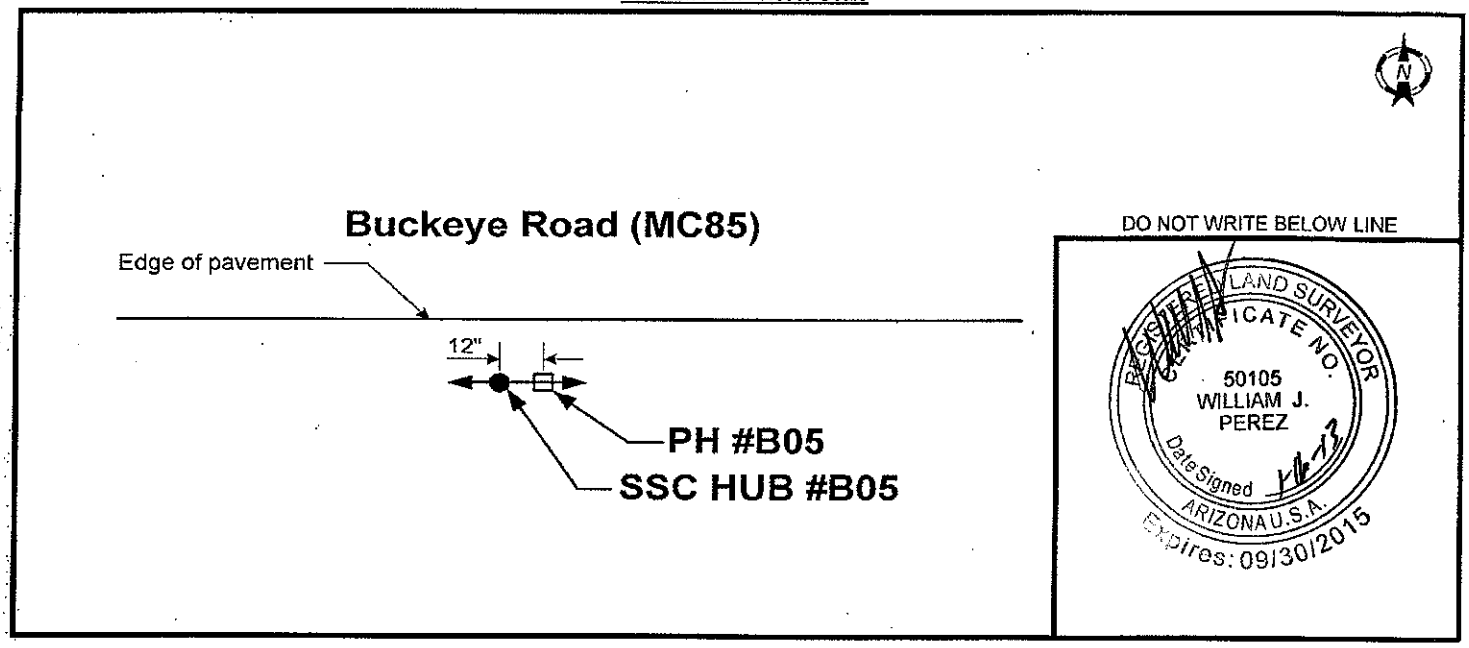
Elev. Bottom of Utility: 984.48

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B06 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1187+72.23 / 7.06' Rt. | Northing: 336334.28 | Easting: 591941.64 | Elevation: 995.15

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	995.15			Station / Offset:	1187+72.23 / 7.06' Rt.
Rod Reading (HUB - Pothole Crew):	5.12	HUB: 5.12	T.O.U.: 10.76	Northing:	336334.28
Height of Instrument (H. I.):	1000.27	G. L.: 5.12	B.O.U.: 11.93	Easting:	591941.64

H. I. :	1000.27	H. I. :	1000.27	H. I. :	1000.27
(-) Rod Read Top Util. (T.O.U.):	10.76	(-) Rod Read Bottom Util. (B.O.U.):	11.93	(-) Rod Read Pothole (G.L.):	5.12
= Elevation Top Utility:	989.51	= Elevation Bottom Utility:	988.34	= Elevation Ground Level:	995.15

Station / Offset: 1187+72.23 / 9.06' Rt.

Northing: 336332.28

Easting: 591941.64

Actual Field Measurement: 5.64 (Existing Grade to T.O.U.)

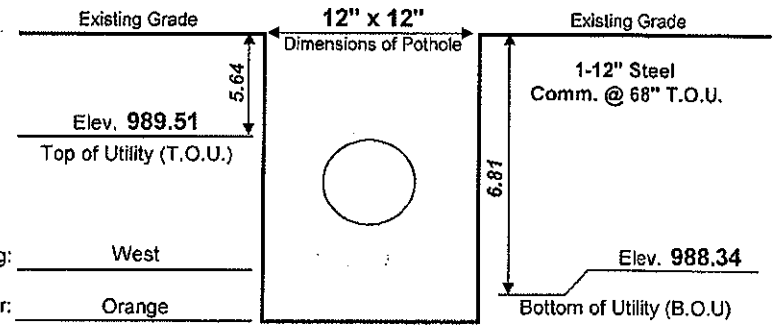
Elev. Top of Utility: 989.51

Actual Field Measurement: 6.81 (Existing Grade to B.O.U.)

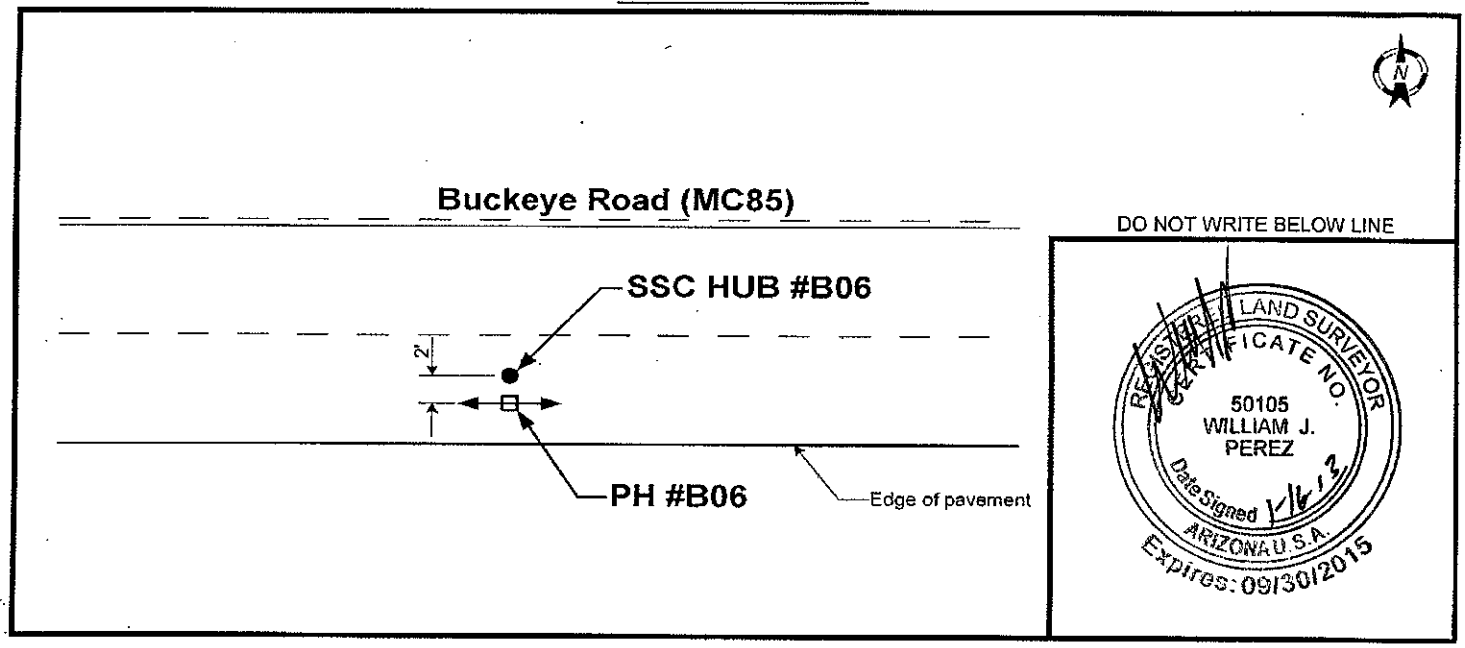
Elev. Bottom of Utility: 988.34

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B07 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas.

Station / Offset: 1182+71.56 / 17.06' Rt. | Northing: 336322.11 | Easting: 591441.21 | Elevation: 994.48

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.48					Station / Offset:	1182+71.56 / 17.06' Rt.
Rod Reading (HUB - Pothole Crew):	4.50	HUB:	4.50	T.O.U.:	8.25	Northing:	336322.11
Height of Instrument (H. I.):	998.98	G. L.:	4.50	B.O.U.:	8.75	Easting:	591441.21

H. I. :	998.98	H. I. :	998.98	H. I. :	998.98
(-) Rod Read Top Util. (T.O.U.):	8.25	(-) Rod Read Bottom Util. (B.O.U.):	8.75	(-) Rod Read Pothole (G.L.):	4.50
= Elevation Top Utility:	990.73	= Elevation Bottom Utility:	990.23	= Elevation Ground Level:	994.48

Station / Offset: 1182+71.56 / 19.23' Rt.

Northing: 336319.94

Easting: 591441.21

Actual Field Measurement: 3.75
(Existing Grade to T.O.U.)

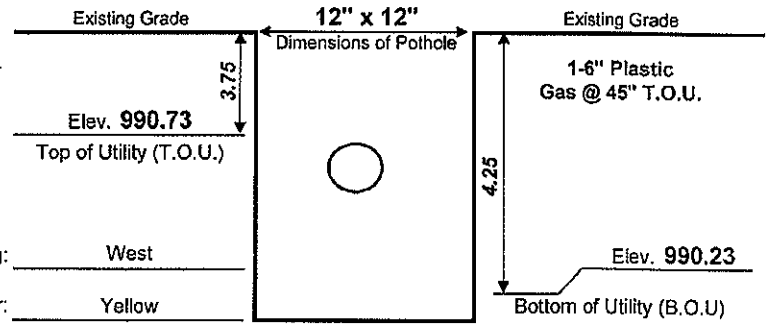
Elev. Top of Utility: 990.73

Actual Field Measurement: 4.25
(Existing Grade to B.O.U.)

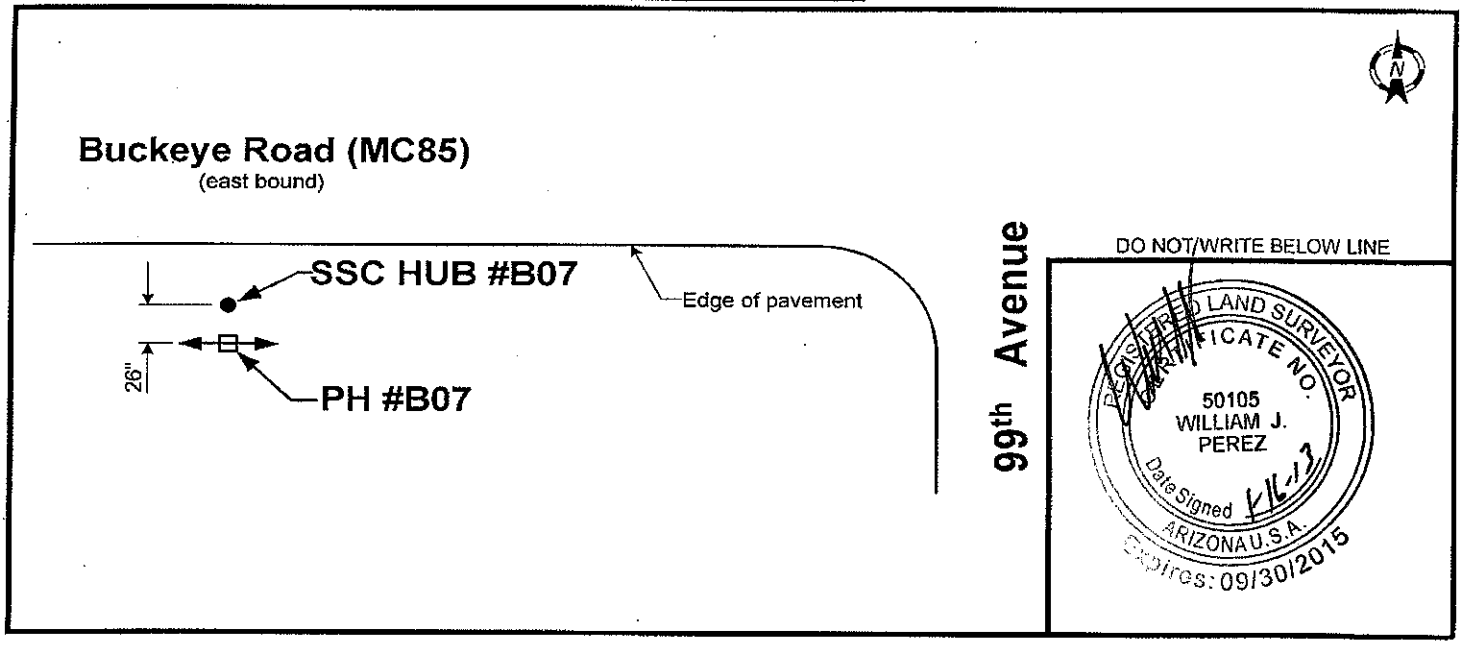
Elev. Bottom of Utility: 990.23

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B08 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1182+71.88 / 25.90' Rt. | Northing: 336313.28 | Easting: 591441.66 | Elevation: 994.11

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): | Station / Offset: 1182+71.88 / 25.90' Rt.

Rod Reading (HUB - Pothole Crew): | HUB: | T.O.U.: | Northing: 336313.28

Height of Instrument (H. I.): | G. L.: | B.O.U.: | Easting: 591441.66

H. I. :	H. I. :	H. I. :
(-) Rod Read Top Util. (T.O.U.):	(-) Rod Read Bottom Util. (B.O.U.):	(-) Rod Read Pothole (G.L.):
= Elevation Top Utility:	= Elevation Bottom Utility:	= Elevation Ground Level:

Station / Offset: 1182+71.88 / 25.90' Rt.

Northing: 336313.28

Easting: 591441.66

Actual Field Measurement: (Existing Grade to T.O.U.)

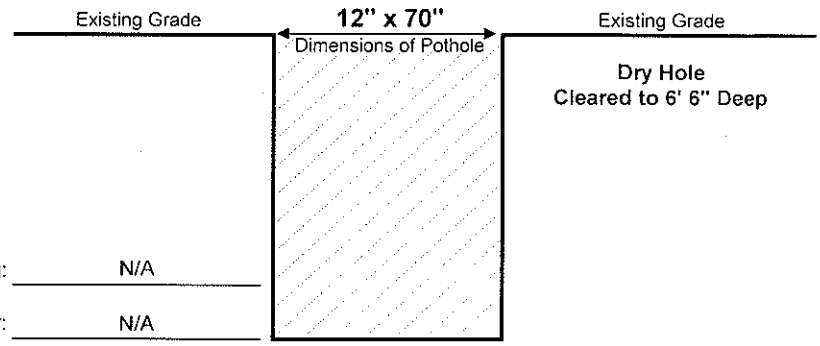
Elev. Top of Utility:

Actual Field Measurement: (Existing Grade to B.O.U.)

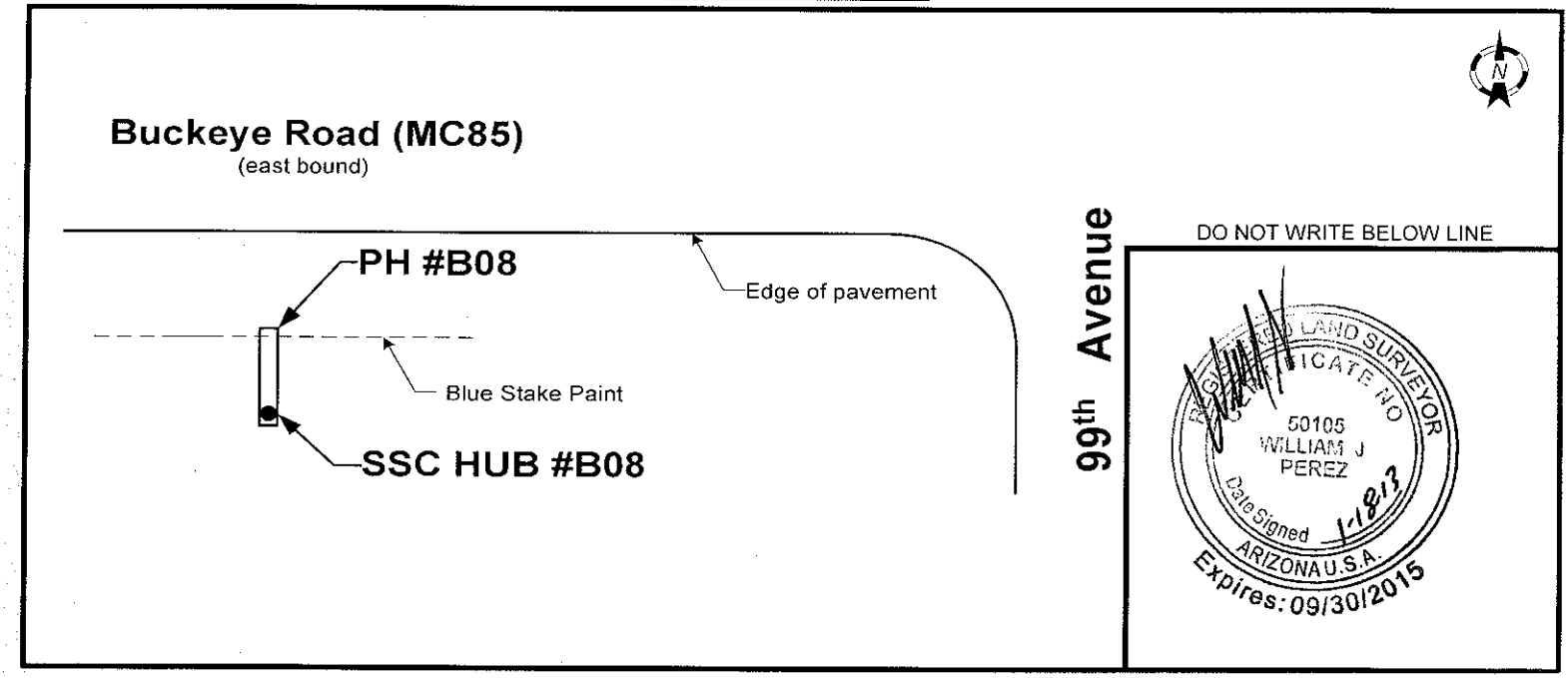
Elev. Bottom of Utility:

Facing: N/A

Ribbon Color: N/A



Location Plan - Not to Scale



Remarks: Trenched from hub north 62" and south for 8". Cleared hole to 6' 6" deep and nothing found. Blue Stake shows utility to be 58" north of hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B08-A | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1182+71.88 / 25.90' Rt. | Northing: 336313.28 | Easting: 591441.66 | Elevation: 994.11

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.11					Station / Offset:	1182+71.88 / 25.90' Rt.
Rod Reading (HUB - Pothole Crew):	4.77	HUB:	4.77	T.O.U.:	8.11	Northing:	336313.28
Height of Instrument (H. I.):	998.88	G. L.:	4.82	B.O.U.:	8.19	Easting:	591441.66

H. I. :	998.88	H. I. :	998.88	H. I. :	998.88
(-) Rod Read Top Util. (T.O.U.):	8.11	(-) Rod Read Bottom Util. (B.O.U.):	8.19	(-) Rod Read Pothole (G.L.):	4.82
= Elevation Top Utility:	990.77	= Elevation Bottom Utility:	990.69	= Elevation Ground Level:	**994.06**

Station / Offset: 1182+71.88 / 27.65' Rt.

Northing: 336311.53

Easting: 591441.66

Actual Field Measurement: 3.29
(Existing Grade to T.O.U.)

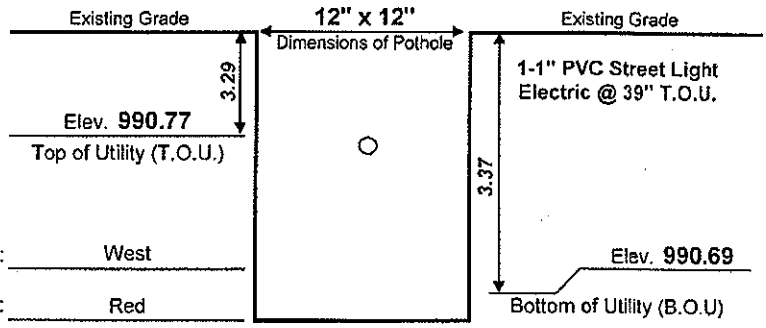
Elev. Top of Utility: 990.77

Actual Field Measurement: 3.37
(Existing Grade to B.O.U.)

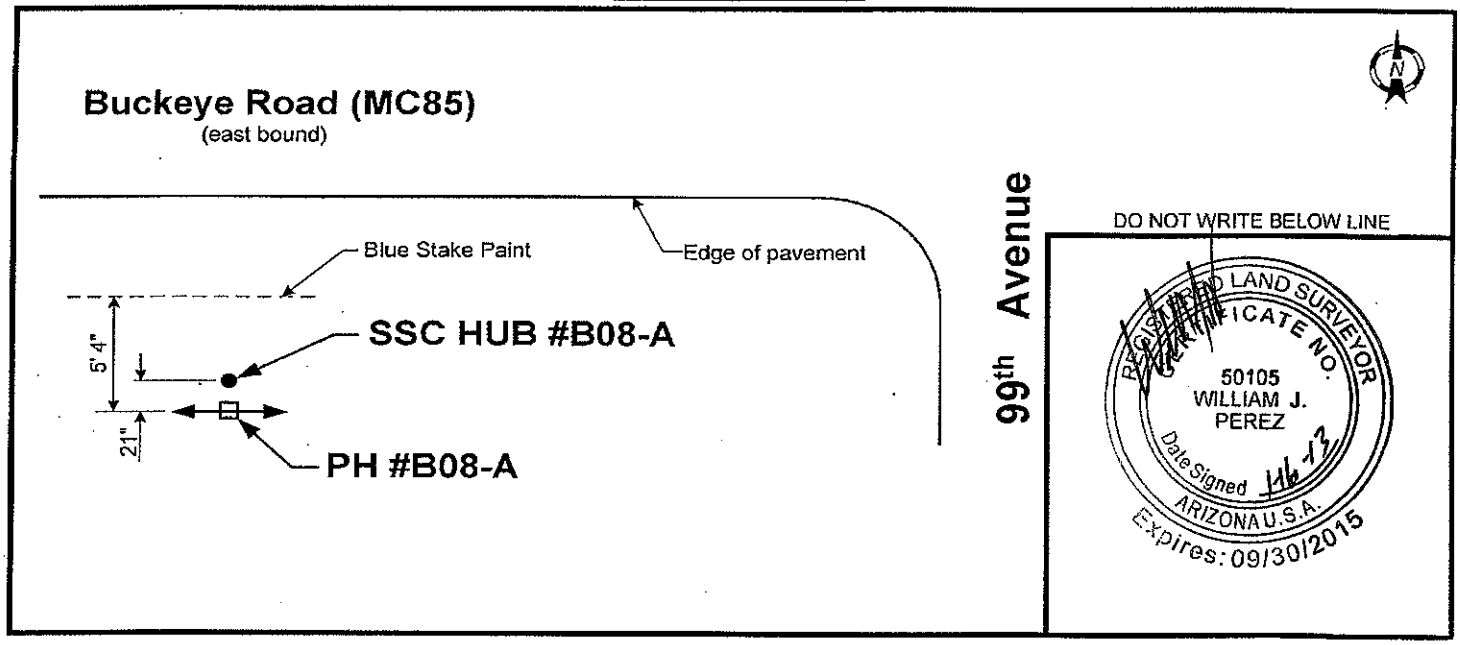
Elev. Bottom of Utility: 990.69

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B09 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1182+72.03 / 42.92' Lt. | Northing: 336382.09 | Easting: 591440.84 | Elevation: 994.48

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.48			Station / Offset:	1182+72.03 / 42.92' Lt.
Rod Reading (HUB - Pothole Crew):	5.00	HUB:	5.00	T.O.U.: 11.50	Northing: 336382.09
Height of Instrument (H. I.):	999.48	G. L.:	5.00	B.O.U.: 12.50	Easting: 591440.84

H. I. :	999.48	H. I. :	999.48	H. I. :	999.48
(-) Rod Read Top Util. (T.O.U.):	11.50	(-) Rod Read Bottom Util. (B.O.U.):	12.50	(-) Rod Read Pothole (G.L.):	5.00
= Elevation Top Utility:	987.98	= Elevation Bottom Utility:	986.98	= Elevation Ground Level:	994.48

Station / Offset: 1182+73.03 / 42.92' Lt.

Northing: 336382.09

Easting: 591441.84

Actual Field Measurement: 6.50
(Existing Grade to T.O.U.)

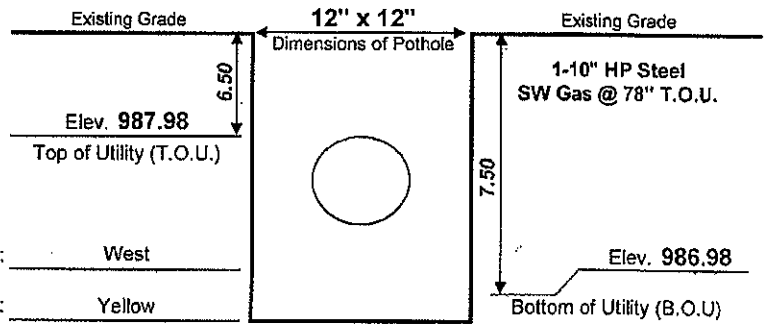
Elev. Top of Utility: 987.98

Actual Field Measurement: 7.50
(Existing Grade to B.O.U.)

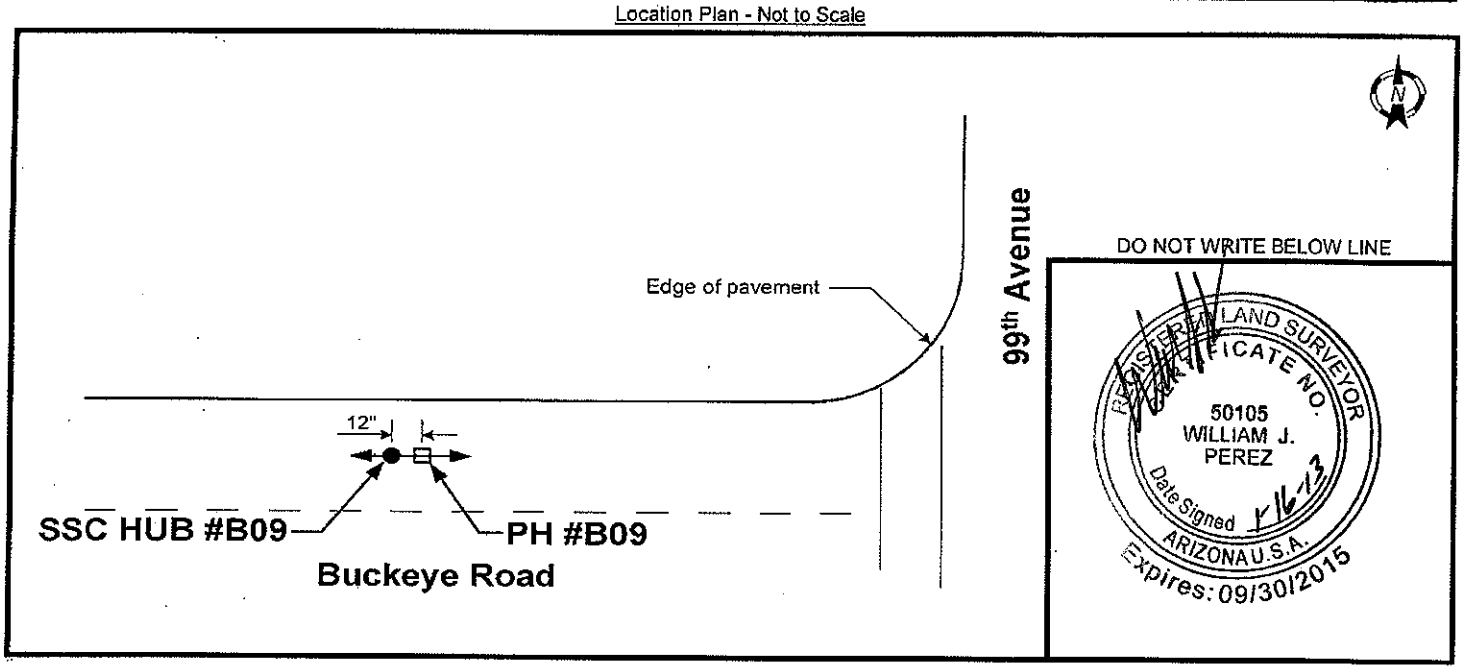
Elev. Bottom of Utility: 986.98

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B11 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1182+73.64 / 105.27' Lt. | Northing: 336444.46 | Easting: 591441.57 | Elevation: 993.09

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.09					Station / Offset:	1182+73.64 / 105.27' Lt.
Rod Reading (HUB - Pothole Crew):	5.67	HUB:	5.67	T.O.U.:	25.66	Northing:	336444.46
Height of Instrument (H. I.):	998.76	G. L.:	5.45	B.O.U.:	26.83	Easting:	591441.57

H. I. :	998.76	H. I. :	998.76	H. I. :	998.76
(-) Rod Read Top Util. (T.O.U.):	25.66	(-) Rod Read Bottom Util. (B.O.U.):	26.83	(-) Rod Read Pothole (G.L.):	5.45
= Elevation Top Utility:	973.10	= Elevation Bottom Utility:	971.93	= Elevation Ground Level:	**993.31**

Station / Offset: 1182+73.64 / 113.94' Lt.

Northing: 336453.13

Easting: 591441.57

Actual Field Measurement: (Existing Grade to T.O.U.) 20.21

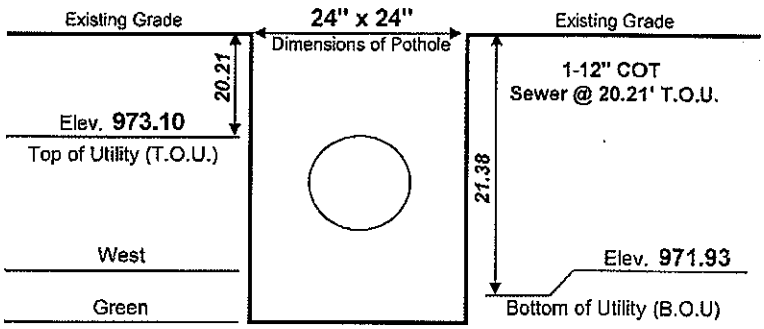
Elev. Top of Utility: 973.10

Actual Field Measurement: (Existing Grade to B.O.U.) 21.38

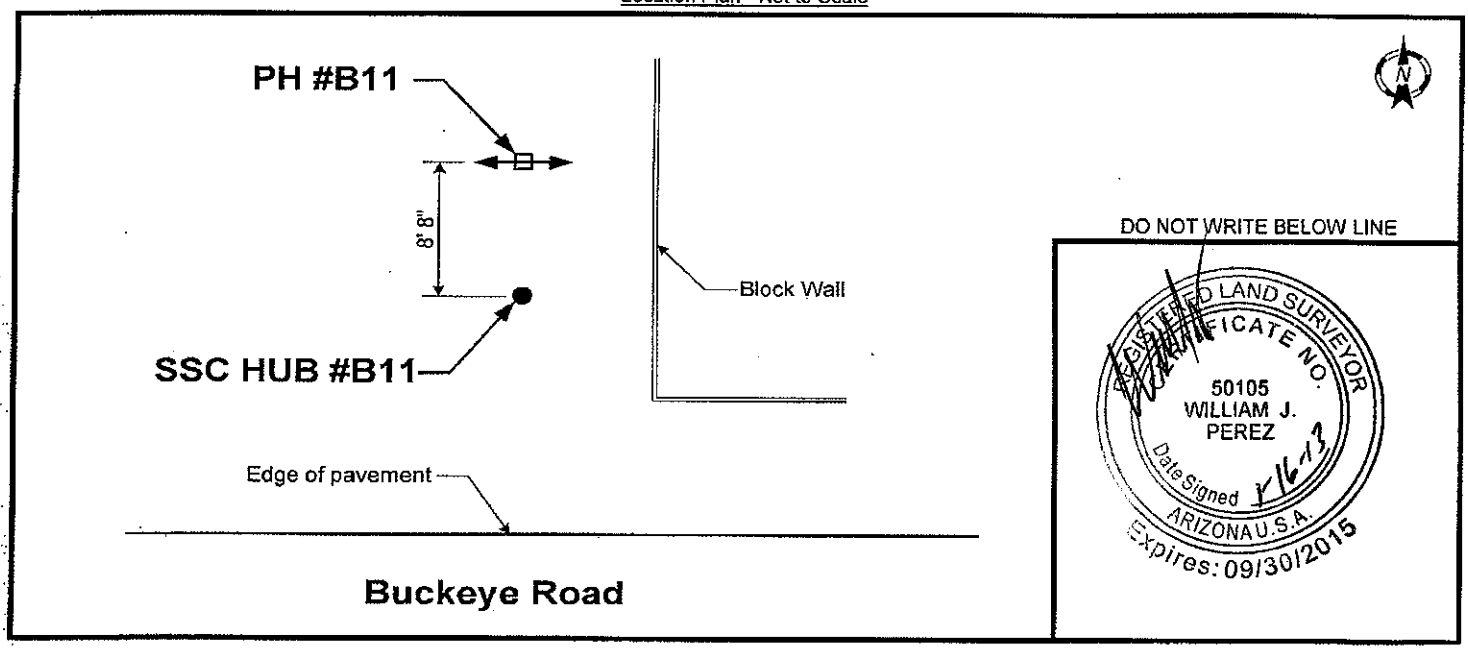
Elev. Bottom of Utility: 971.93

Facing: West

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B13 | Date Dug: 01/02/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Water

Station / Offset: 222+57.89 / 46.21' Lt. | Northing: 336616.58 | Easting: 591520.96 | Elevation: 993.66

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.66					Station / Offset:	222+57.89 / 46.21' Lt.
Rod Reading (HUB - Pothole Crew):	4.98	HUB:	4.98	T.O.U.:	9.04	Northing:	336616.58
Height of Instrument (H. I.):	998.64	G. L.:	4.86	B.O.U.:	10.62	Easting:	591520.96

H. I. :	998.64	H. I. :	998.64	H. I. :	998.64
(-) Rod Read Top Util. (T.O.U.):	9.04	(-) Rod Read Bottom Util. (B.O.U.):	10.62	(-) Rod Read Pothole (G.L.):	4.86
= Elevation Top Utility:	989.60	= Elevation Bottom Utility:	988.02	= Elevation Ground Level:	993.78

Station / Offset: 222+57.89 / 36.71' Lt.

Northing: 336616.58

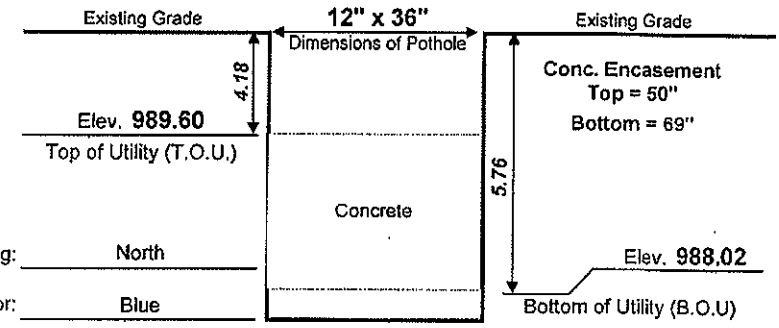
Easting: 591530.46

Actual Field Measurement: 4.18
(Existing Grade to T.O.U.)
Elev. Top of Utility: 989.60

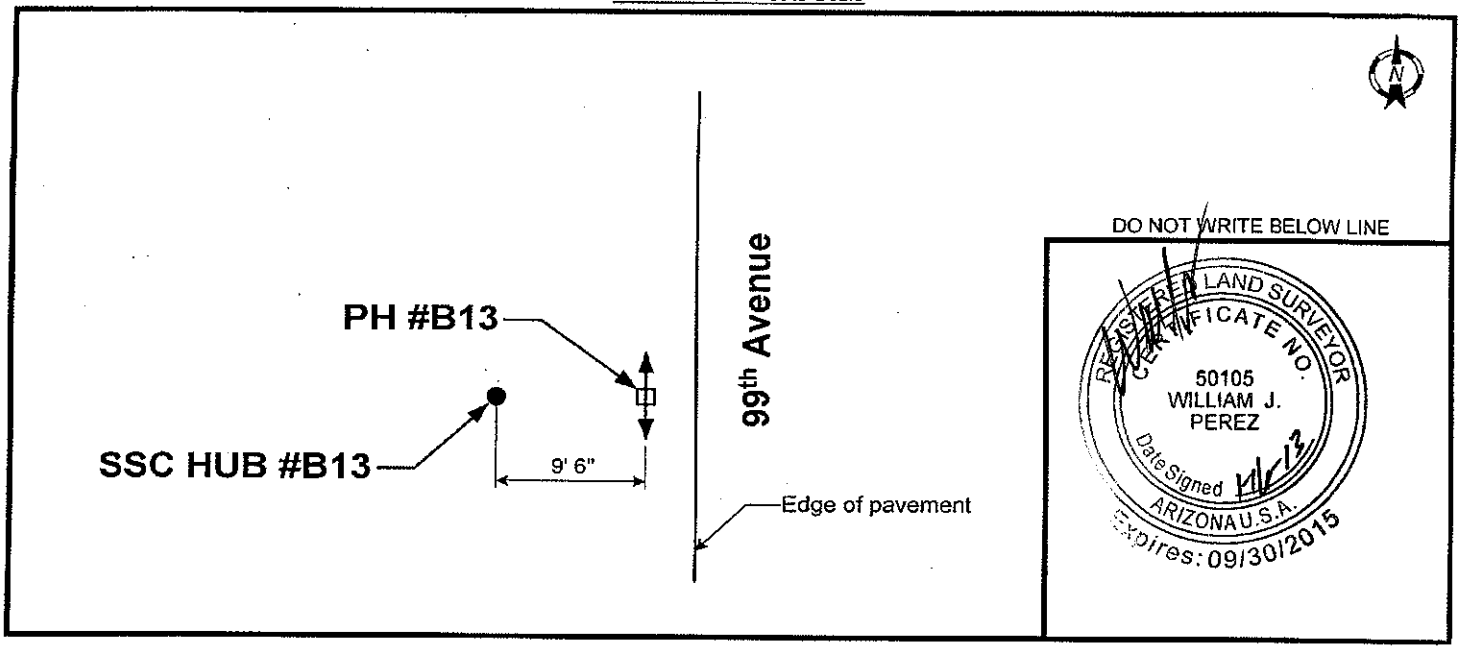
Actual Field Measurement: 5.76
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 988.02

Facing: North

Ribbon Color: Blue



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. B14 | Date Dug: 01/02/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 222+57.88 / 40.37' Lt. | Northing: 336616.59 | Easting: 591526.80 | Elevation: 993.79

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	993.79					Station / Offset:	222+57.88 / 40.37' Lt.
Rod Reading (HUB - Pothole Crew):	4.92	HUB:	4.92	T.O.U.:	8.13	Northing:	336616.59
Height of Instrument (H. I.):	998.71	G. L.:	4.87	B.O.U.:	8.21	Easting:	591526.80

H. I. :	998.71	H. I. :	998.71	H. I. :	998.71
(-) Rod Read Top Util. (T.O.U.):	8.13	(-) Rod Read Bottom Util. (B.O.U.):	8.21	(-) Rod Read Pothole (G.L.):	4.87
= Elevation Top Utility:	990.58	= Elevation Bottom Utility:	990.50	= Elevation Ground Level:	**993.84**

Station / Offset: 222+57.88 / 39.37' Lt.

Northing: 336616.59

Easting: 591527.80

Actual Field Measurement: 3.26
(Existing Grade to T.O.U.)

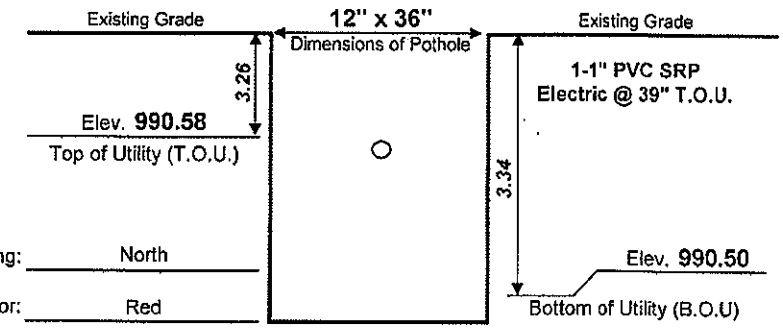
Elev. Top of Utility: 990.58

Actual Field Measurement: 3.34
(Existing Grade to B.O.U.)

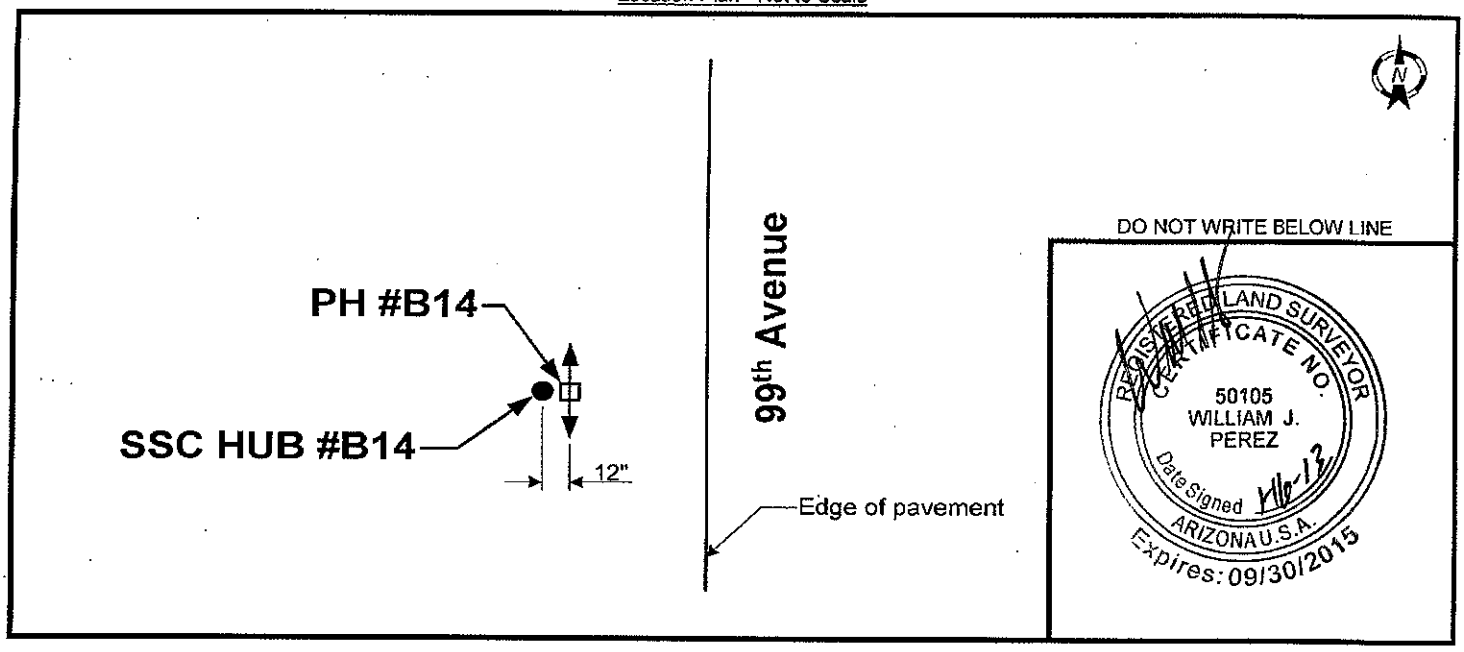
Elev. Bottom of Utility: 990.50

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C01 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1184+84.49 / 17.29' Rt. | Northing: 336323.67 | Easting: 591653.92 | Elevation: 994.67

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.67					Station / Offset:	1184+84.49 / 17.29' Rt.
Rod Reading (HUB - Pothole Crew):	4.80	HUB:	4.80	T.O.U.:	8.49	Northing:	336323.67
Height of Instrument (H. I.):	999.47	G. L.:	4.93	B.O.U.:	9.23	Easting:	591653.92

H. I. :	999.47	H. I. :	999.47	H. I. :	999.47
(-) Rod Read Top Util. (T.O.U.):	8.49	(-) Rod Read Bottom Util. (B.O.U.):	9.23	(-) Rod Read Pothole (G.L.):	4.93
= Elevation Top Utility:	990.98	= Elevation Bottom Utility:	990.24	= Elevation Ground Level:	**994.54**

Station / Offset: 1184+86.49 / 17.29' Rt.

Northing: 336323.67

Easting: 591655.92

Actual Field Measurement: (Existing Grade to T.O.U.) 3.56

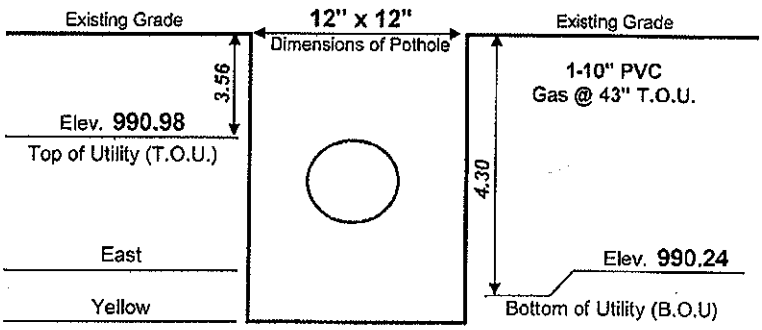
Elev. Top of Utility: 990.98

Actual Field Measurement: (Existing Grade to B.O.U.) 4.30

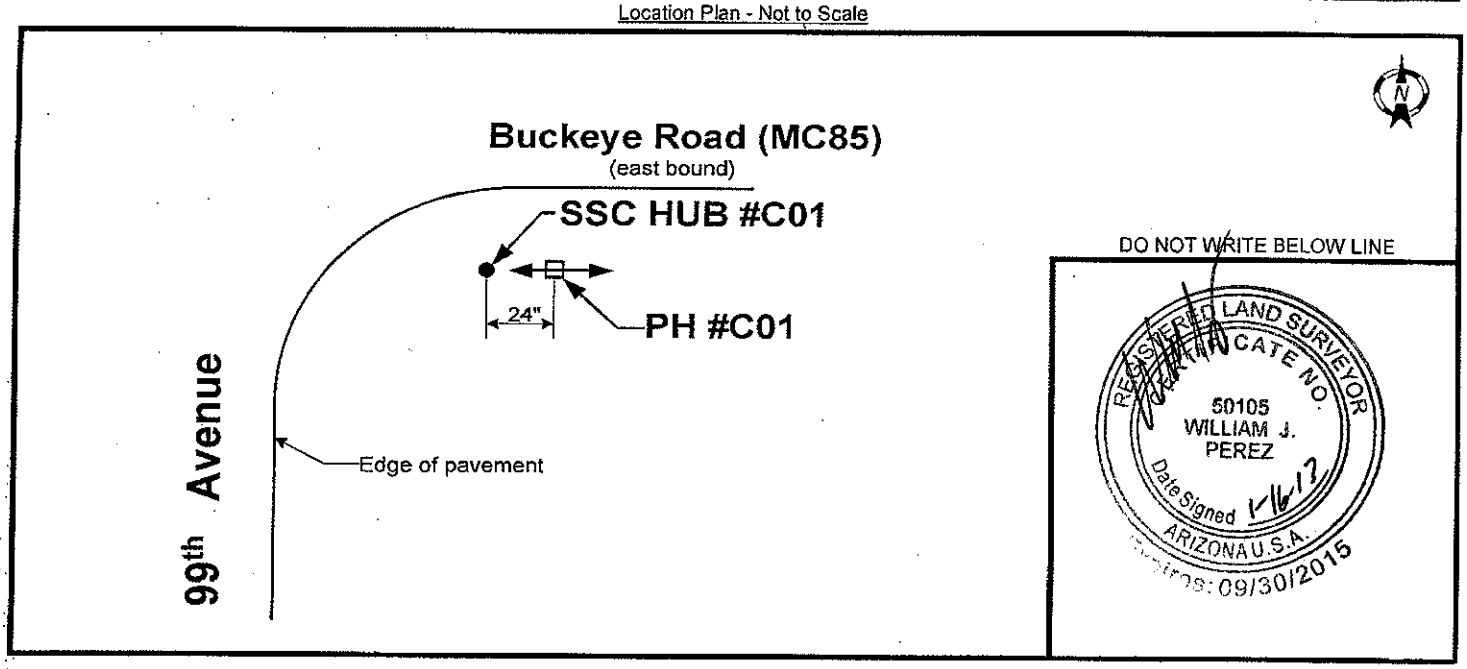
Elev. Bottom of Utility: 990.24

Facing: East

Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No.	2180P	Cust. Job No.	TT345	Test Hole No.	C02	Date Dug:	01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis — Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th — General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1184+84.50 / 8.70' Rt. — Northing: 336332.26 — Easting: 591653.91 — Elevation: 994.65

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.65					Station / Offset:	1184+84.50 / 8.70' Rt.
Rod Reading (HUB - Pothole Crew):	5.25	HUB:	5.25	T.O.U.:	11.60	Northing:	336332.26
Height of Instrument (H. I.):	999.90	G. L.:	5.25	B.O.U.:	12.77	Easting:	591653.91

H. I. :	999.90	H. I. :	999.90	H. I. :	999.90
(-) Rod Read Top Util. (T.O.U.):	11.60	(-) Rod Read Bottom Util. (B.O.U.):	12.77	(-) Rod Read Pothole (G.L.):	5.25
= Elevation Top Utility:	988.30	= Elevation Bottom Utility:	987.13	= Elevation Ground Level:	**994.65**

Station / Offset: 1184+84.50 / 8.70' Rt.

Northing: 336332.26

Easting: 591653.91

Actual Field Measurement: 6.35 (Existing Grade to T.O.U.)

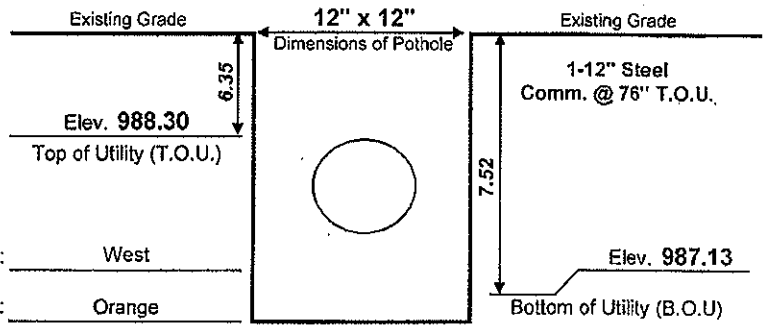
Elev. Top of Utility: 988.30

Actual Field Measurement: 7.52 (Existing Grade to B.O.U.)

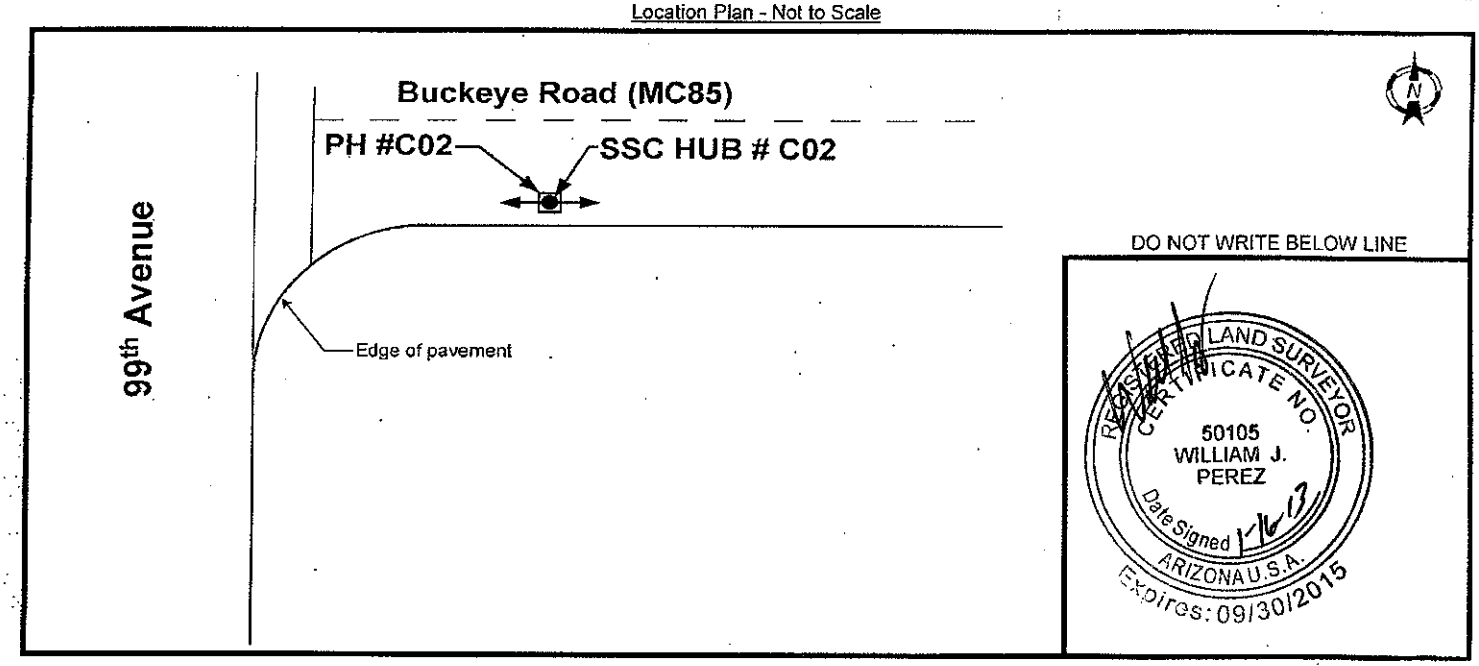
Elev. Bottom of Utility: 987.13

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes — Soil Type: " B " — Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C03 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1184+84.57 / 42.71' Lt. | Northing: 336383.67 | Easting: 591653.92 | Elevation: 994.80

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 994.80 | Station / Offset: 1184+84.57 / 42.71' Lt.

Rod Reading (HUB - Pothole Crew): 5.18 | HUB: 5.18 | T.O.U.: 10.69 | Northing: 336383.67

Height of Instrument (H. I.): 999.98 | G. L.: 5.18 | B.O.U.: 11.69 | Easting: 591653.92

H. I.: 999.98	H. I.: 999.98	H. I.: 999.98
(-) Rod Read Top Util. (T.O.U.): 10.69	(-) Rod Read Bottom Util. (B.O.U.): 11.69	(-) Rod Read Pothole (G.L.): 5.18
= Elevation Top Utility: 989.29	= Elevation Bottom Utility: 988.29	= Elevation Ground Level: 994.80

Station / Offset: 1184+84.57 / 42.71' Lt.

Northing: 336383.67

Easting: 591653.92

Actual Field Measurement: 5.51 (Existing Grade to T.O.U.)

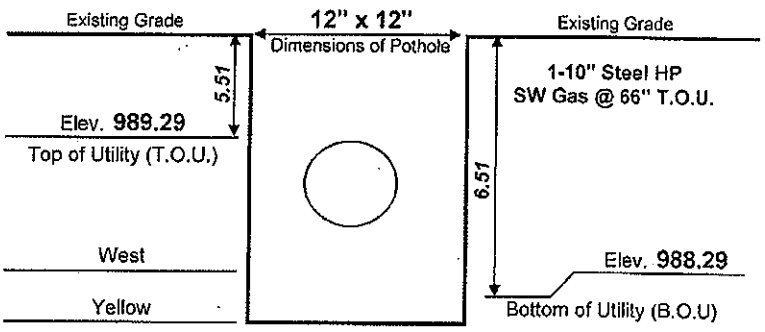
Elev. Top of Utility: 989.29

Actual Field Measurement: 6.51 (Existing Grade to B.O.U.)

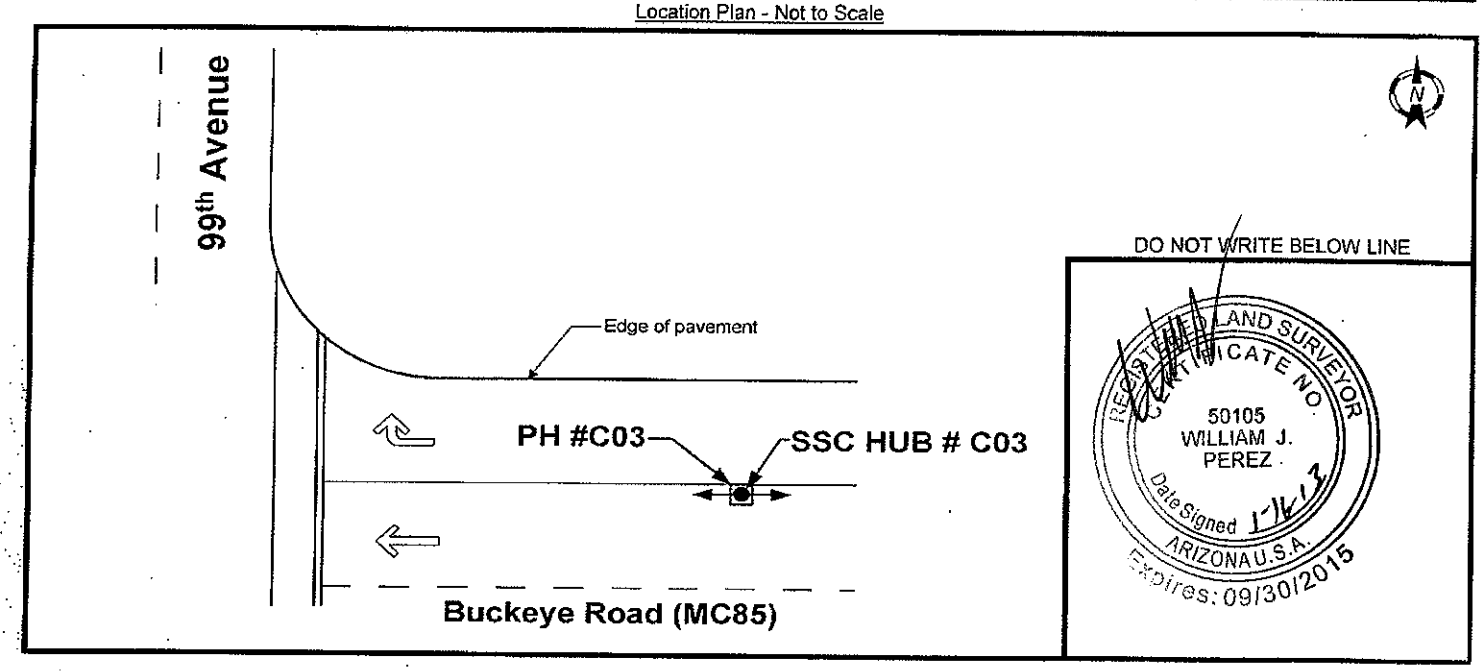
Elev. Bottom of Utility: 988.29

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C04 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1184+84.57 / 46.77' Lt. | Northing: 336387.73 | Easting: 591653.91 | Elevation: 994.79

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.79			Station / Offset:	1184+84.57 / 46.77' Lt.
Rod Reading (HUB - Pothole Crew):	5.22	HUB: 5.22	T.O.U.: 9.81	Northing:	336387.73
Height of Instrument (H. I.):	1000.01	G. L.: 5.22	B.O.U.: 10.98	Easting:	591653.91

H. I. :	1000.01	H. I. :	1000.01	H. I. :	1000.01
(-) Rod Read Top Util. (T.O.U.):	9.81	(-) Rod Read Bottom Util. (B.O.U.):	10.98	(-) Rod Read Pothole (G.L.):	5.22
= Elevation Top Utility:	990.20	= Elevation Bottom Utility:	989.03	= Elevation Ground Level:	**994.79**

Station / Offset: 1184+84.57 / 47.77' Lt.

Northing: 336388.73

Easting: 591653.91

Actual Field Measurement: 4.59 (Existing Grade to T.O.U.)

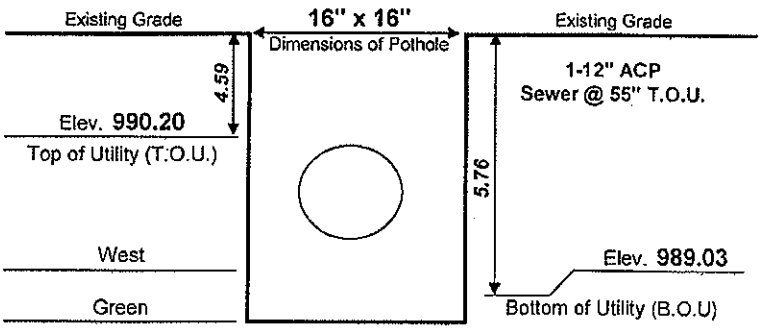
Elev. Top of Utility: 990.20

Actual Field Measurement: 5.76 (Existing Grade to B.O.U.)

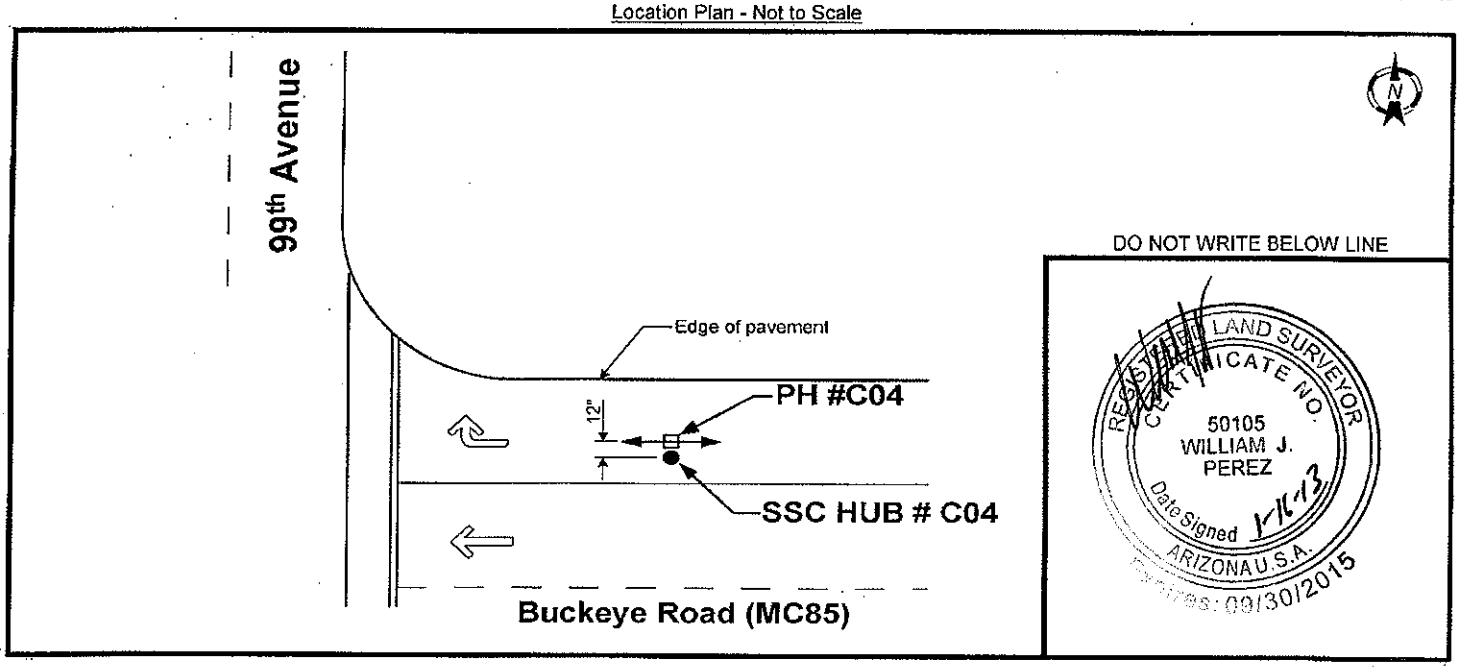
Elev. Bottom of Utility: 989.03

Facing: West

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C05 | Date Dug: 01/04/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1184+84.60 / 68.07' Lt. | Northing: 336409.03 | Easting: 591653.91 | Elevation: 994.06

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	994.06			Station / Offset:	1184+84.60 / 68.07' Lt.
Rod Reading (HUB - Pothole Crew):	5.95	HUB: 5.95	T.O.U.: 11.30	Northing:	336409.03
Height of Instrument (H. I.):	1000.01	G. L.: 5.95	B.O.U.: 11.47	Easting:	591653.91

H. I. :	1000.01	H. I. :	1000.01	H. I. :	1000.01
(-) Rod Read Top Util. (T.O.U.):	11.30	(-) Rod Read Bottom Util. (B.O.U.):	11.47	(-) Rod Read Pothole (G.L.):	5.95
= Elevation Top Utility:	988.71	= Elevation Bottom Utility:	988.54	= Elevation Ground Level:	994.06

Station / Offset: 1184+84.60 / 68.07' Lt.

Northing: 336409.03

Easting: 591653.91

Actual Field Measurement: 5.35 (Existing Grade to T.O.U.)

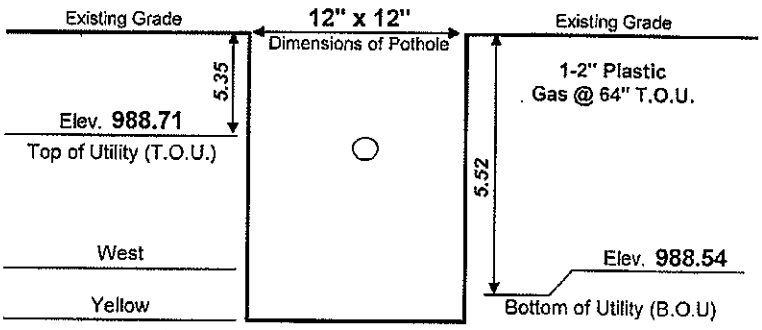
Elev. Top of Utility: 988.71

Actual Field Measurement: 5.52 (Existing Grade to B.O.U.)

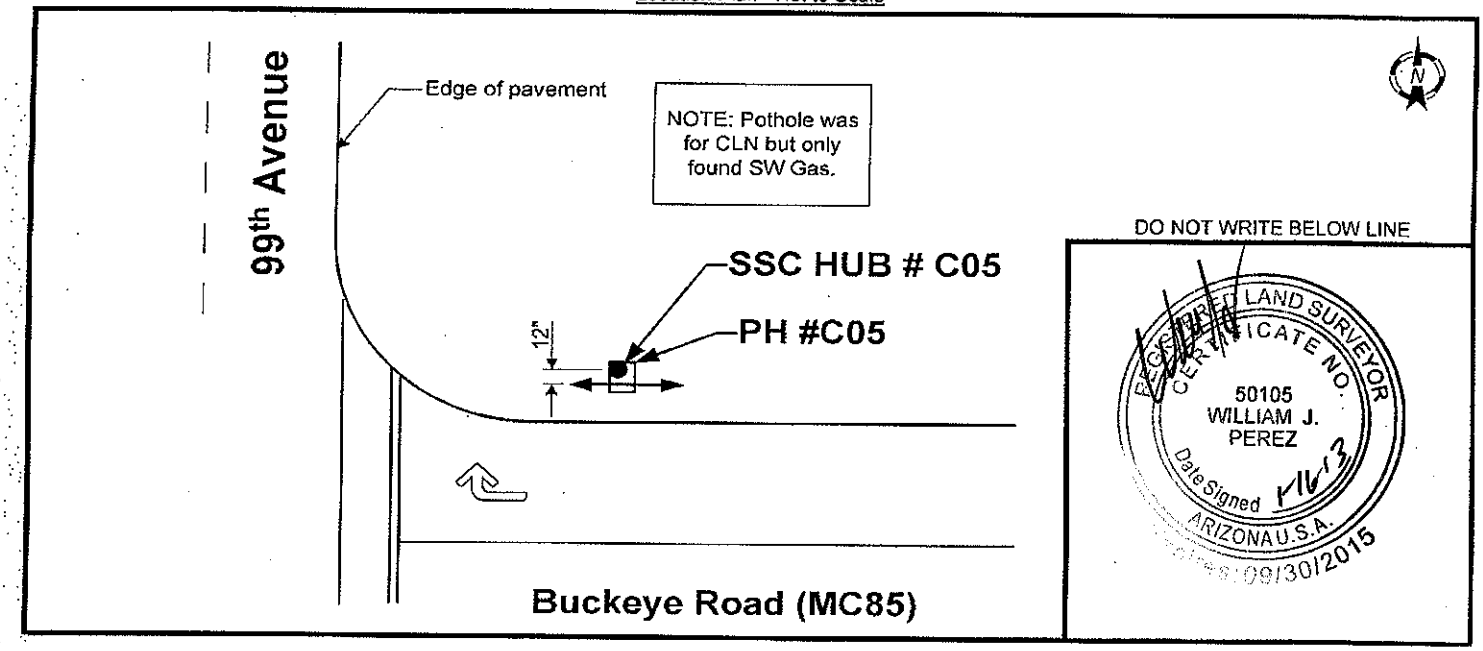
Elev. Bottom of Utility: 988.54

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C06 | Date Dug: 01/02/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1184+97.32 / 80.21' Lt. | Northing: 336421.19 | Easting: 591666.62 | Elevation: 992.95

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	992.95			Station / Offset:	1184+97.32 / 80.21' Lt.
Rod Reading (HUB - Pothole Crew):	6.30	HUB: 6.30	T.O.U.: 13.60	Northing:	336421.19
Height of Instrument (H. I.):	999.25	G. L.: 6.73	B.O.U.: 15.27	Easting:	591666.62

H. I. :	999.25	H. I. :	999.25	H. I. :	999.25
(-) Rod Read Top Util. (T.O.U.):	13.60	(-) Rod Read Bottom Util. (B.O.U.):	15.27	(-) Rod Read Pothole (G.L.):	6.73
= Elevation Top Utility:	985.65	= Elevation Bottom Utility:	983.98	= Elevation Ground Level:	**992.52**

Station / Offset: 1184+96.32 / 83.21' Lt.

Northing: 336424.19

Easting: 591665.62

Actual Field Measurement: 6.87
(Existing Grade to T.O.U.)

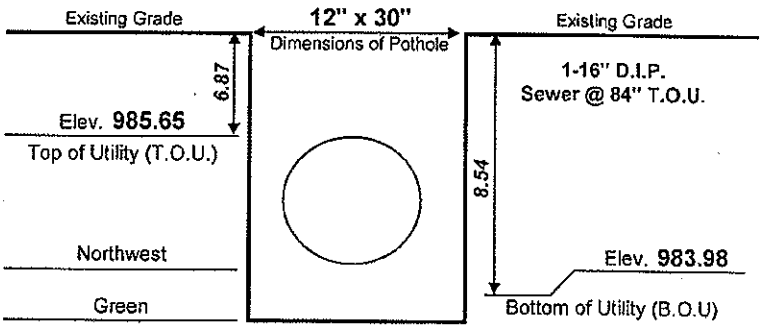
Elev. Top of Utility: 985.65

Actual Field Measurement: 8.54
(Existing Grade to B.O.U.)

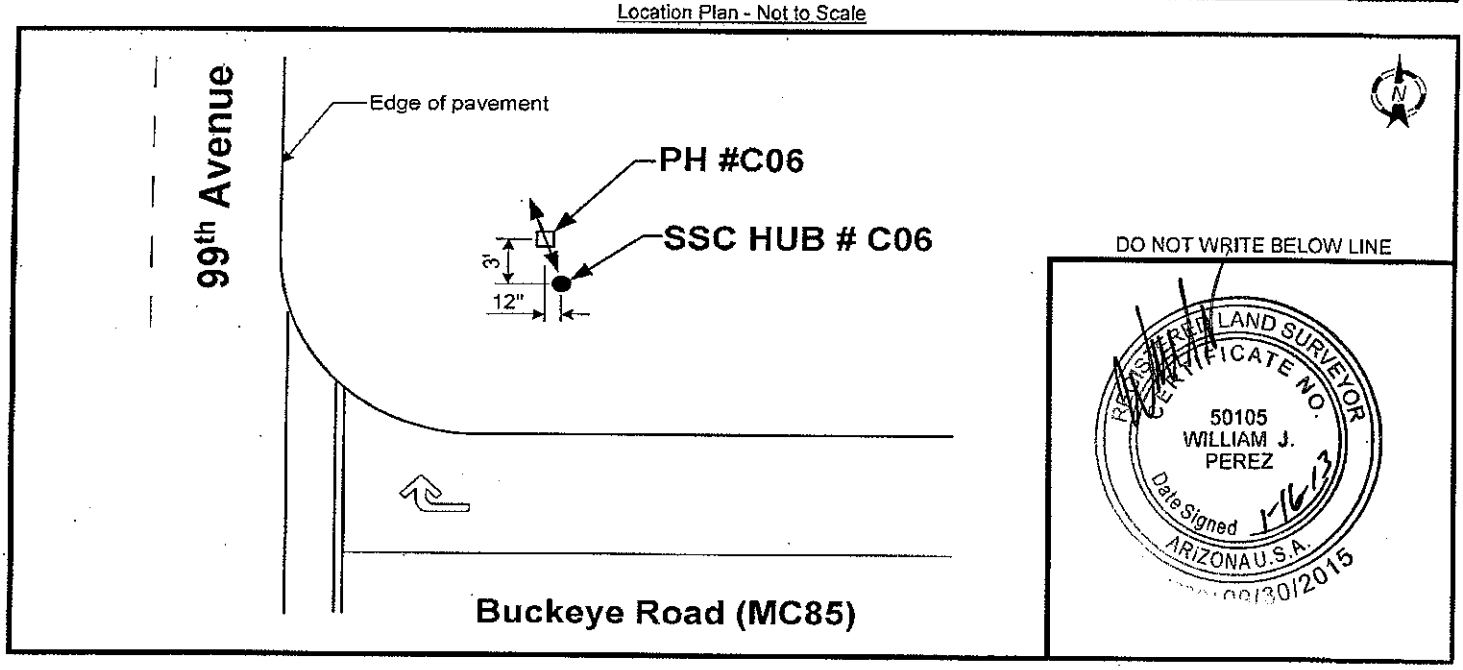
Elev. Bottom of Utility: 983.98

Facing: Northwest

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C07 | Date Dug: 01/02/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1184+88.28 / 92.94' Lt. | Northing: 336433.91 | Easting: 591657.56 | Elevation: 992.88

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	992.88			Station / Offset:	1184+88.28 / 92.94' Lt.
Rod Reading (HUB - Pothole Crew):	6.52	HUB: 6.52	T.O.U.: 11.62	Northing:	336433.91
Height of Instrument (H. I.):	999.40	G. L.: 6.52	B.O.U.: 12.62	Easting:	591657.56

H. I. :	999.40	H. I. :	999.40	H. I. :	999.40
(-) Rod Read Top Util. (T.O.U.):	11.62	(-) Rod Read Bottom Util. (B.O.U.):	12.62	(-) Rod Read Pothole (G.L.):	6.52
= Elevation Top Utility:	987.78	= Elevation Bottom Utility:	986.78	= Elevation Ground Level:	992.88

Station / Offset: 1184+88.28 / 92.94' Lt.

Northing: 336433.91

Easting: 591657.56

Actual Field Measurement: 5.10 (Existing Grade to T.O.U.)

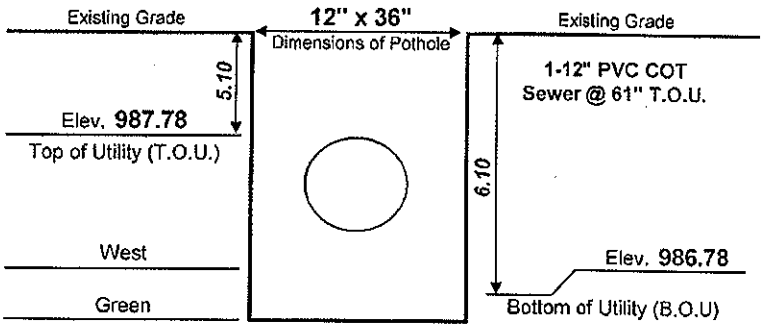
Elev. Top of Utility: 987.78

Actual Field Measurement: 6.10 (Existing Grade to B.O.U.)

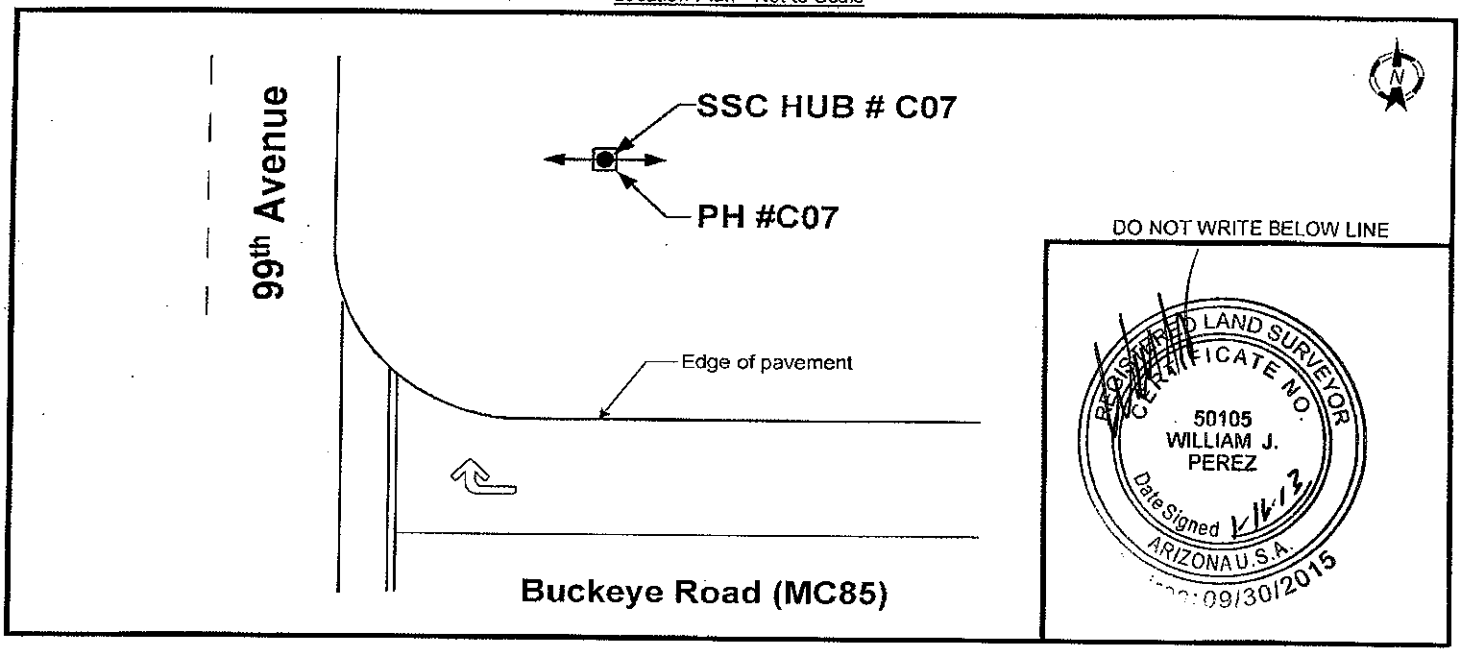
Elev. Bottom of Utility: 986.78

Facing: West

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/14/13
ARIZONA U.S.A.
09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C09 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Sterling

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1210+33.88 / 40.35' Lt. | Northing: 336399.68 | Easting: 594203.08 | Elevation: 998.06

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.06			Station / Offset:	1210+33.88 / 40.35' Lt.
Rod Reading (HUB - Pothole Crew):	5.50	HUB: 5.50	T.O.U.: 9.26	Northing:	336399.68
Height of Instrument (H. I.):	1003.56	G. L.: 5.01	B.O.U.: 10.43	Easting:	594203.08

H. I. :	1003.56	H. I. :	1003.56	H. I. :	1003.56
(-) Rod Read Top Util. (T.O.U.):	9.26	(-) Rod Read Bottom Util. (B.O.U.):	10.43	(-) Rod Read Pothole (G.L.):	5.01
= Elevation Top Utility:	994.30	= Elevation Bottom Utility:	993.13	= Elevation Ground Level:	998.55

Station / Offset: 1210+37.55 / 51.02' Lt.

Northing: 336410.35

Easting: 594206.75

Actual Field Measurement: 4.25
(Existing Grade to T.O.U.)

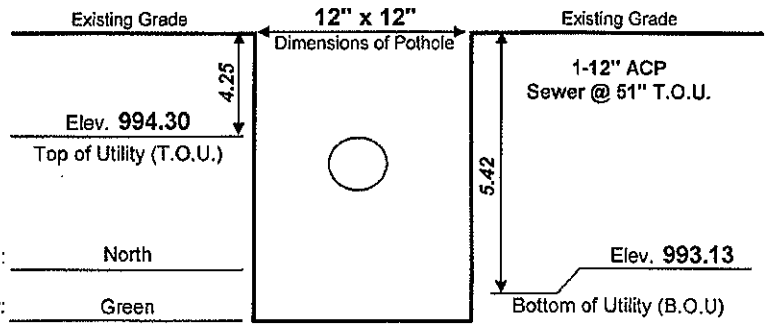
Elev. Top of Utility: 994.30

Actual Field Measurement: 5.42
(Existing Grade to B.O.U.)

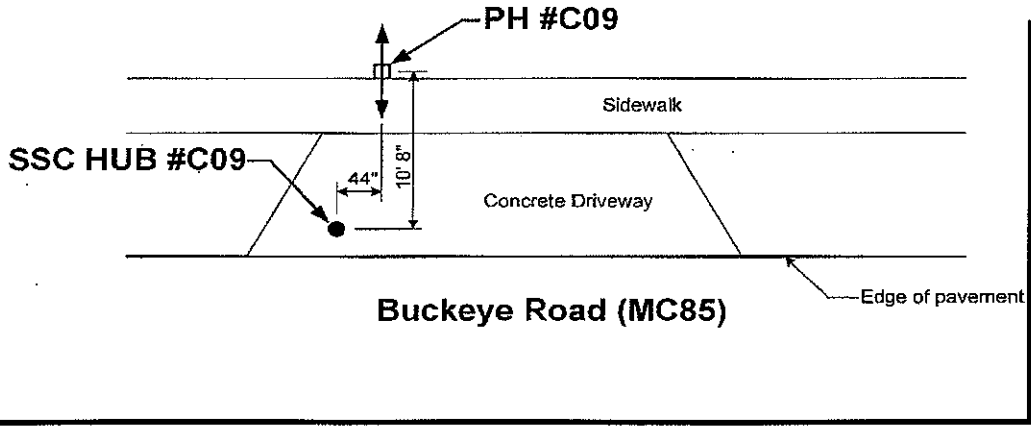
Elev. Bottom of Utility: 993.13

Facing: North

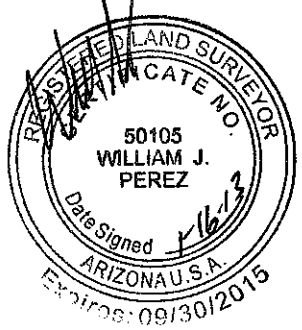
Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Phoenix, AZ 85021
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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C10 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Tolleson

Size / Type: Sewer

Station / Offset: 1210+38.88 / 40.35' Lt. | Northing: 336399.69 | Easting: 594208.08 | Elevation: 998.10

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 998.10

Rod Reading (HUB - Pothole Crew): 5.80

Height of Instrument (H. I.): 1003.90

HUB: 5.80 | T.O.U.: 13.29

G. L.: 5.26 | B.O.U.: 19.29

Station / Offset: 1210+38.88 / 40.35' Lt.

Northing: 336399.69

Easting: 594208.08

H. I. : 1003.90	H. I. : 1003.90	H. I. : 1003.90
(-) Rod Read Top Util. (T.O.U.): 13.29	(-) Rod Read Bottom Util. (B.O.U.): 19.29	(-) Rod Read Pothole (G.L.): 5.26
= Elevation Top Utility: 990.61	= Elevation Bottom Utility: 984.61	= Elevation Ground Level: **998.64**

Station / Offset: 1210+40.38 / 50.93' Lt.

Northing: 336410.27

Easting: 594209.58

Actual Field Measurement: 8.03
(Existing Grade to T.O.U.)

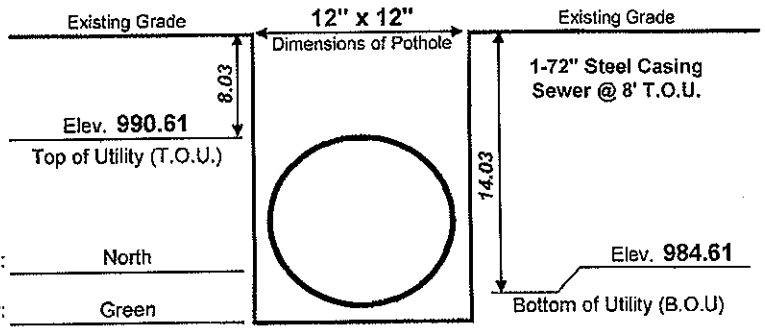
Elev. Top of Utility: 990.61

Actual Field Measurement: 14.03
(Existing Grade to B.O.U.)

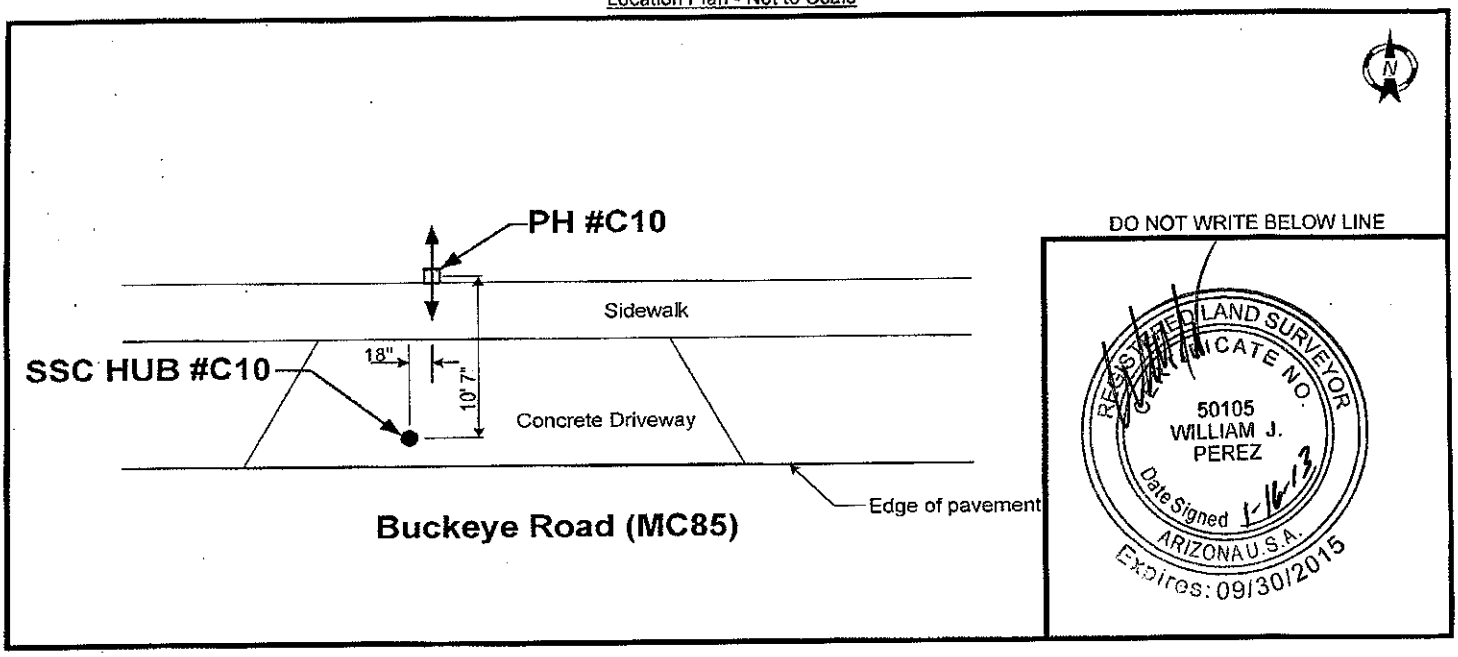
Elev. Bottom of Utility: 984.61

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C11 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1210+46.88 / 40.83' Lt. | Northing: 336400.18 | Easting: 594216.08 | Elevation: 998.12

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.12					Station / Offset:	1210+46.88 / 40.83' Lt.
Rod Reading (HUB - Pothole Crew):	5.66	HUB:	5.66	T.O.U.:	12.19	Northing:	336400.18
Height of Instrument (H. I.):	1003.78	G. L.:	5.15	B.O.U.:	13.86	Easting:	594216.08

H. I. :	1003.78	H. I. :	1003.78	H. I. :	1003.78
(-) Rod Read Top Util. (T.O.U.):	12.19	(-) Rod Read Bottom Util. (B.O.U.):	13.86	(-) Rod Read Pothole (G.L.):	5.15
= Elevation Top Utility:	991.59	= Elevation Bottom Utility:	989.92	= Elevation Ground Level:	**998.63**

Station / Offset: 1210+48.46 / 51.33' Lt.

Northing: 336410.68

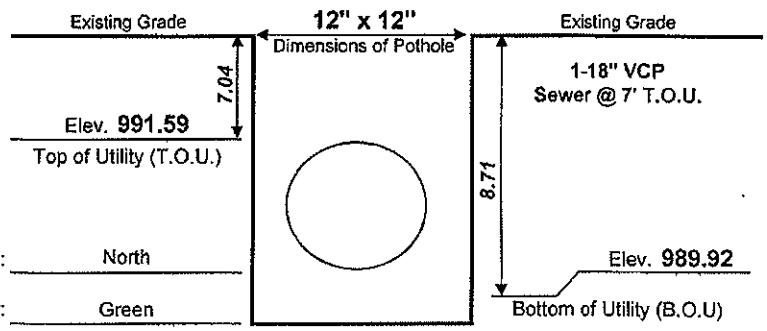
Easting: 594217.66

Actual Field Measurement: 7.04
(Existing Grade to T.O.U.)
Elev. Top of Utility: 991.59

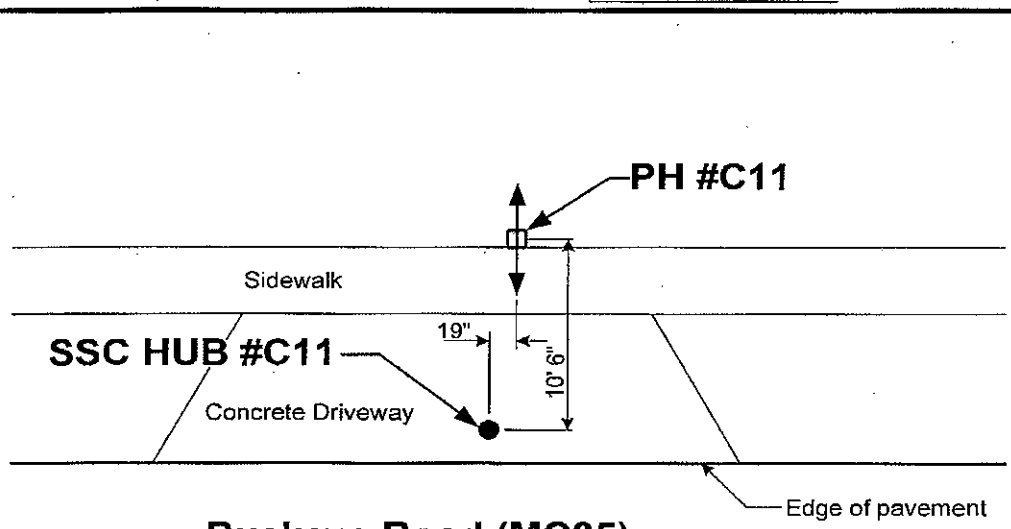
Actual Field Measurement: 8.71
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 989.92

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C12 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

City of Avondale

Size / Type: Sewer

Anticipated Utility Information

Station / Offset: 1210+53.72 / 40.87' Lt. | Northing: 336400.23 | Easting: 594222.92 | Elevation: 998.30

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.30			Station / Offset:	1210+53.72 / 40.87' Lt.
Rod Reading (HUB - Pothole Crew):	5.66	HUB: 5.66	T.O.U.: 12.52	Northing:	336400.23
Height of Instrument (H. I.):	1003.96	G. L.: 5.50	B.O.U.: 14.27	Easting:	594222.92

H. I. :	1003.96	H. I. :	1003.96	H. I. :	1003.96
(-) Rod Read Top Util. (T.O.U.):	12.52	(-) Rod Read Bottom Util. (B.O.U.):	14.27	(-) Rod Read Pothole (G.L.):	5.50
= Elevation Top Utility:	991.44	= Elevation Bottom Utility:	989.69	= Elevation Ground Level:	**998.46**

Station / Offset: 1210+56.14 / 51.87' Lt.

Northing: 336411.23

Easting: 594224.34

Actual Field Measurement: 7.02
(Existing Grade to T.O.U.)

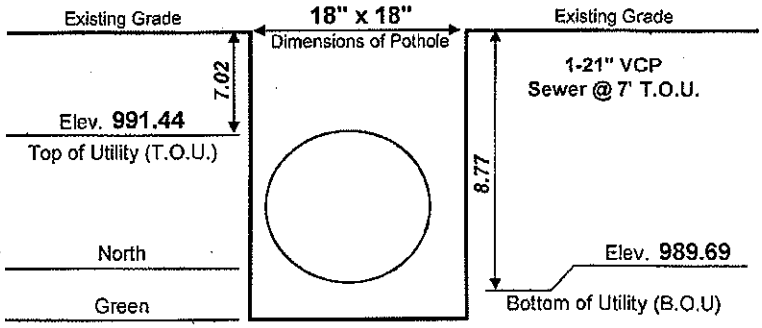
Elev. Top of Utility: 991.44

Actual Field Measurement: 8.77
(Existing Grade to B.O.U.)

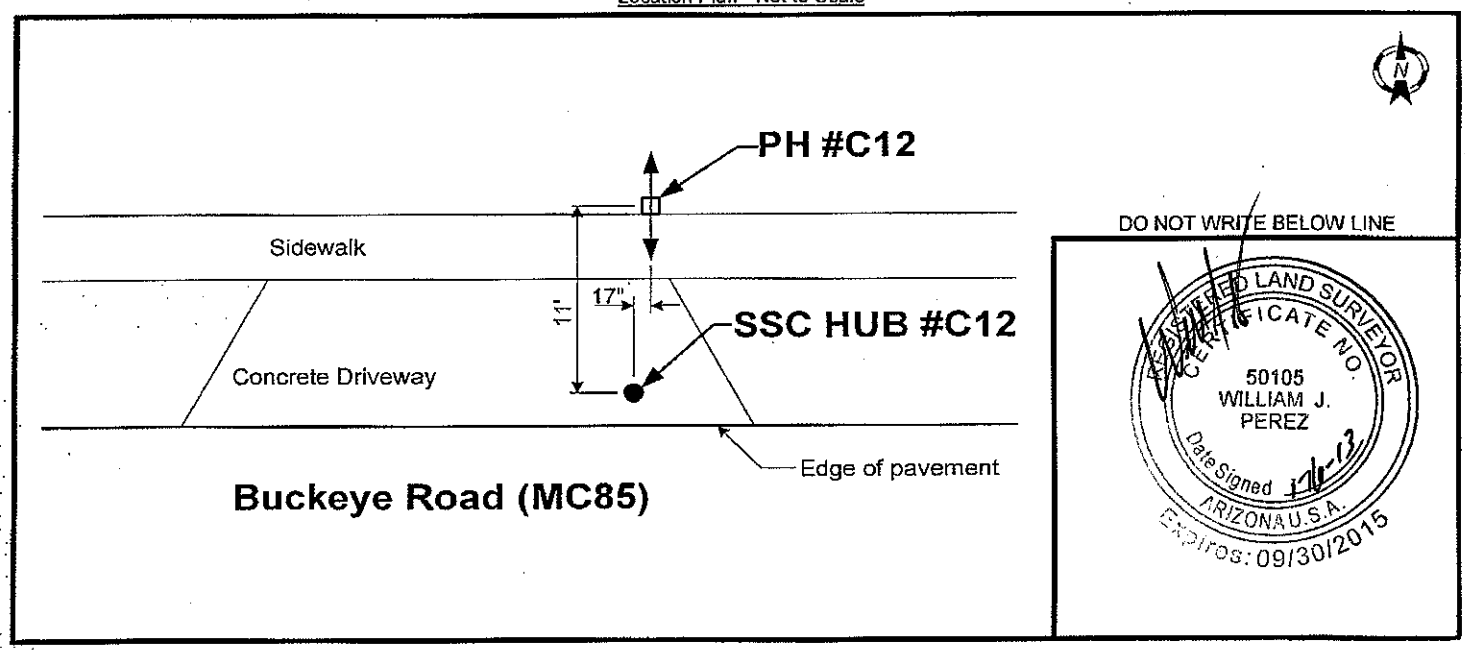
Elev. Bottom of Utility: 989.69

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 12-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C13 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Sewer

Station / Offset: 1210+63.20 / 40.56' Lt. | Northing: 336399.93 | Easting: 594232.40 | Elevation: 998.29

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.29			Station / Offset:	1210+63.20 / 40.56' Lt.
Rod Reading (HUB - Pothole Crew):	5.66	HUB:	5.66	Northing:	336399.93
Height of Instrument (H. I.):	1003.95	G. L.:	5.66	Easting:	594232.40

H. I. :	1003.95	H. I. :	1003.95	H. I. :	1003.95
(-) Rod Read Top Util. (T.O.U.):	13.71	(-) Rod Read Bottom Util. (B.O.U.):	19.04	(-) Rod Read Pothole (G.L.):	5.66
= Elevation Top Utility:	990.24	= Elevation Bottom Utility:	984.91	= Elevation Ground Level:	**998.29**

Station / Offset: 1210+66.20 / 43.89' Lt.

Northing: 336403.26

Easting: 594235.40

Actual Field Measurement: 8.05
(Existing Grade to T.O.U.)

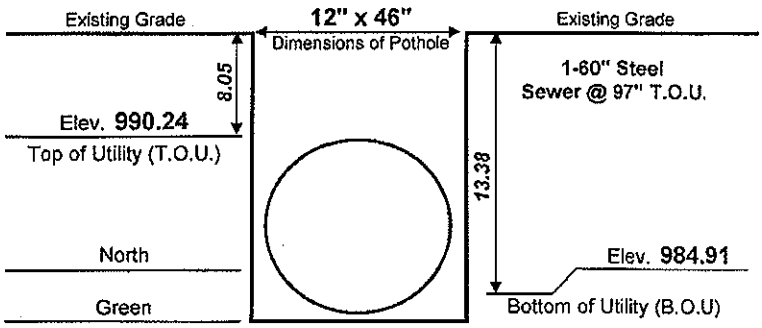
Elev. Top of Utility: 990.24

Actual Field Measurement: 13.38
(Existing Grade to B.O.U.)

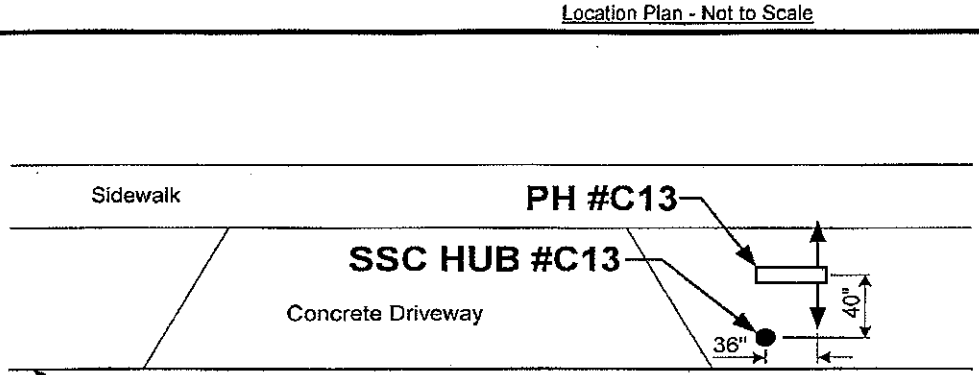
Elev. Bottom of Utility: 984.91

Facing: North

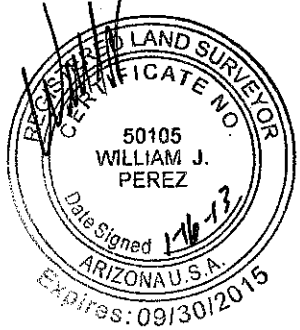
Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C14 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Tolleson

Size / Type: Sewer

Station / Offset: 1210+77.20 / 40.54' Lt. | Northing: 336399.93 | Easting: 594246.40 | Elevation: 998.47

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.47			Station / Offset:	1210+77.20 / 40.54' Lt.
Rod Reading (HUB - Pothole Crew):	5.50	HUB: 5.50	T.O.U.: 11.92	Northing:	336399.93
Height of Instrument (H. I.):	1003.97	G. L.: 5.46	B.O.U.: 13.42	Easting:	594246.40

H. I. :	1003.97	H. I. :	1003.97	H. I. :	1003.97
(-) Rod Read Top Util. (T.O.U.):	11.92	(-) Rod Read Bottom Util. (B.O.U.):	13.42	(-) Rod Read Pothole (G.L.):	5.46
= Elevation Top Utility:	992.05	= Elevation Bottom Utility:	990.55	= Elevation Ground Level:	**998.51**

Station / Offset: 1210+73.45 / 48.29' Lt

Northing: 336407.68

Easting: 594242.65

Actual Field Measurement: 6.46
(Existing Grade to T.O.U.)

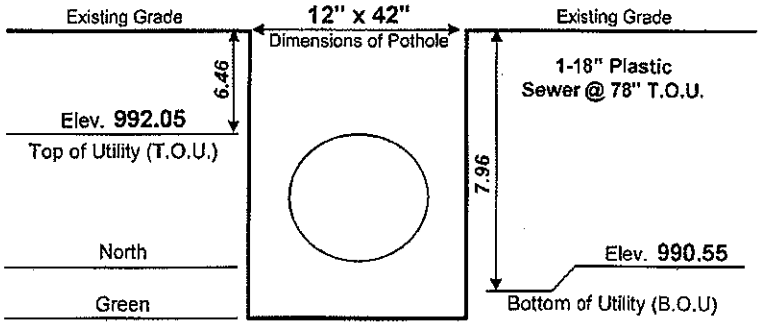
Elev. Top of Utility: 992.05

Actual Field Measurement: 7.96
(Existing Grade to B.O.U.)

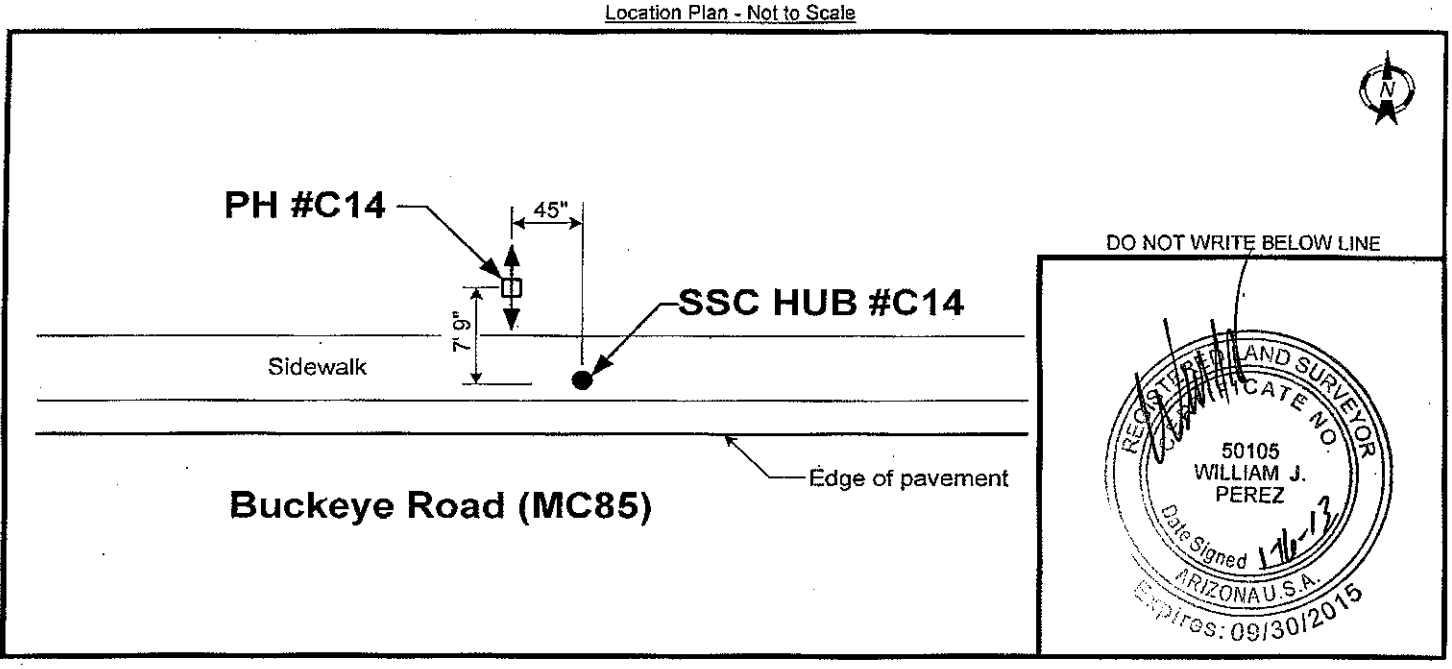
Elev. Bottom of Utility: 990.55

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C15 | Date Dug: 12/20/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Tolleson

Size / Type: Sewer

Station / Offset: 1210+82.24 / 40.35' Lt. | Northing: 336399.74 | Easting: 594251.44 | Elevation: 998.48

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.48					Station / Offset:	1210+82.24 / 40.35' Lt.
Rod Reading (HUB - Pothole Crew):	5.67	HUB:	5.67	T.O.U.:	12.02	Northing:	336399.74
Height of Instrument (H. I.):	1004.15	G. L.:	5.73	B.O.U.:	14.19	Easting:	594251.44

H. I. :	1004.15	H. I. :	1004.15	H. I. :	1004.15
(-) Rod Read Top Util. (T.O.U.):	12.02	(-) Rod Read Bottom Util. (B.O.U.):	14.19	(-) Rod Read Pothole (G.L.):	5.73
= Elevation Top Utility:	992.13	= Elevation Bottom Utility:	989.96	= Elevation Ground Level:	**998.42**

Station / Offset: 1210+83.82 / 39.10' Lt.

Northing: 336398.49

Easting: 594253.02

Actual Field Measurement: 6.29
(Existing Grade to T.O.U.)

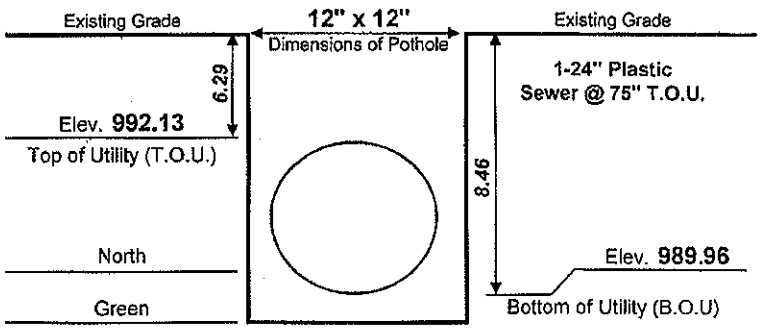
Elev. Top of Utility: 992.13

Actual Field Measurement: 8.46
(Existing Grade to B.O.U.)

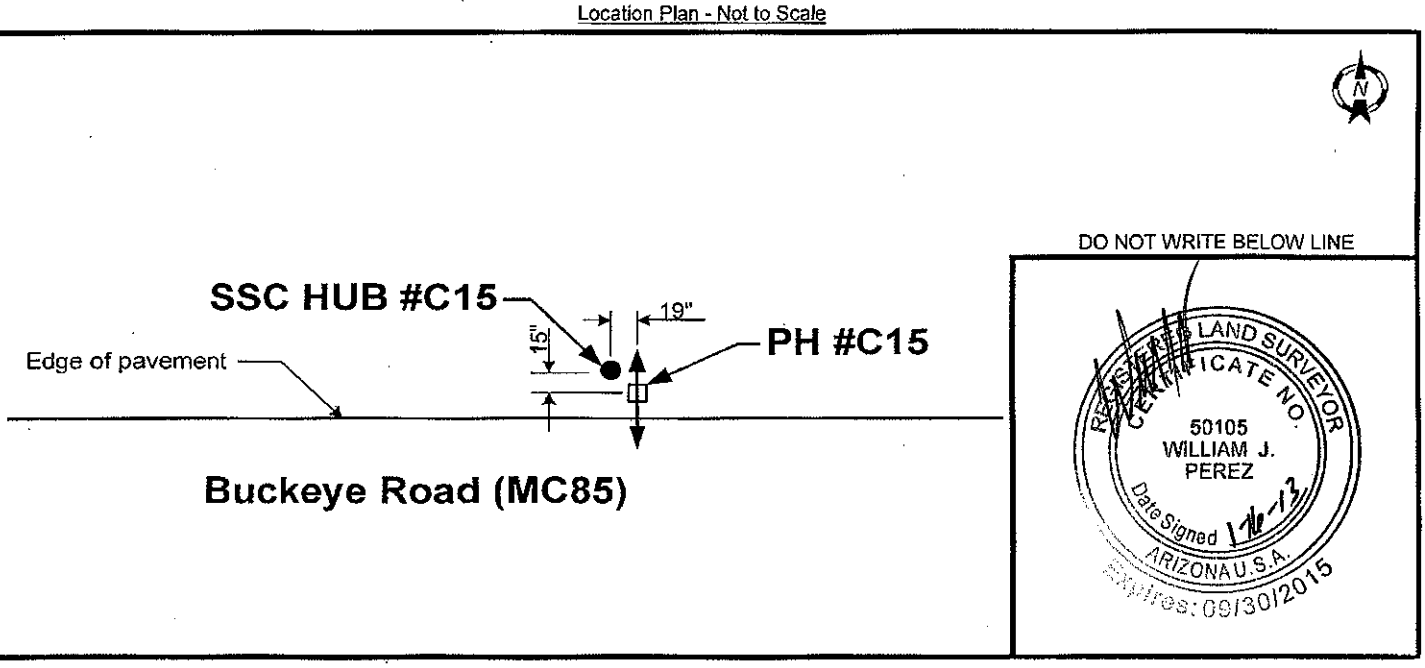
Elev. Bottom of Utility: 989.96

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C17 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1210+32.69 / 73.38' Rt. | Northing: 336285.95 | Easting: 594202.04 | Elevation: 997.39

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	997.39					Station / Offset:	1210+32.69 / 73.38' Rt.
Rod Reading (HUB - Pothole Crew):	6.28	HUB:	6.28	T.O.U.:	14.29	Northing:	336285.95
Height of Instrument (H. I.):	1003.67	G. L.:	6.28	B.O.U.:	16.12	Easting:	594202.04

H. I. :	1003.67	H. I. :	1003.67	H. I. :	1003.67
(-) Rod Read Top Util. (T.O.U.):	14.29	(-) Rod Read Bottom Util. (B.O.U.):	16.12	(-) Rod Read Pothole (G.L.):	6.28
= Elevation Top Utility:	989.38	= Elevation Bottom Utility:	987.55	= Elevation Ground Level:	**997.39**

Station / Offset: 1210+32.69 / 73.38' Rt.

Northing: 336285.95

Easting: 594202.04

Actual Field Measurement: 8.01
(Existing Grade to T.O.U.)

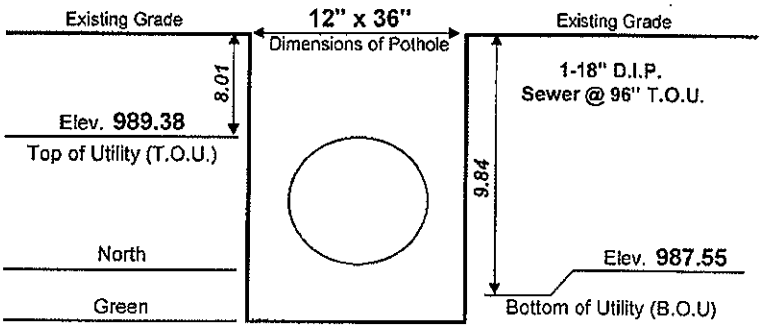
Elev. Top of Utility: 989.38

Actual Field Measurement: 9.84
(Existing Grade to B.O.U.)

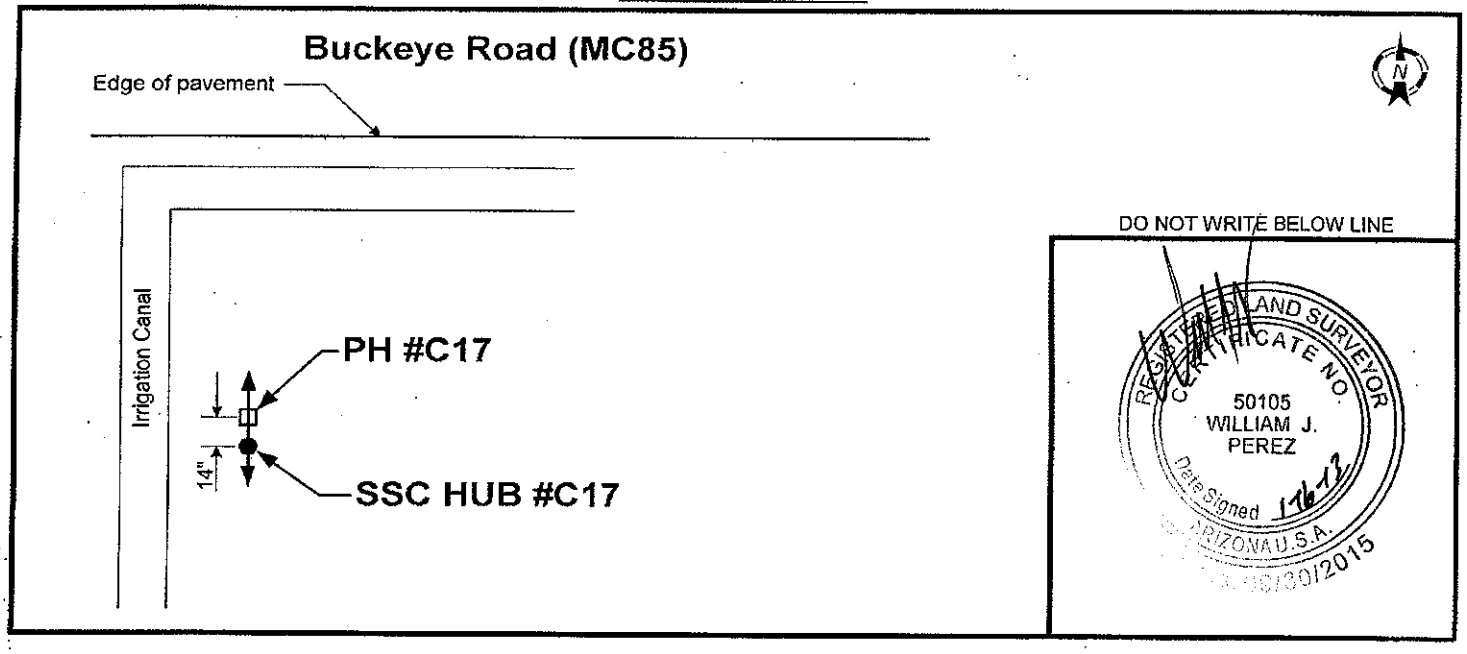
Elev. Bottom of Utility: 987.55

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C18 | Date Dug: 12/27/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Tolleson

Size / Type: Sewer

Station / Offset: 1210+37.62 / 73.91' Rt. | Northing: 336285.43 | Easting: 594206.97 | Elevation: 998.42

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.42			Station / Offset:	1210+37.62 / 73.91' Rt.
Rod Reading (HUB - Pothole Crew):	5.26	HUB: 5.26	T.O.U.: 14.14	Northing:	336285.43
Height of Instrument (H. I.):	1003.68	G. L.: 5.04	B.O.U.: 17.64	Easting:	594206.97

H. I. :	1003.68	H. I. :	1003.68	H. I. :	1003.68
(-) Rod Read Top Util. (T.O.U.):	14.14	(-) Rod Read Bottom Util. (B.O.U.):	17.64	(-) Rod Read Pothole (G.L.):	5.04
= Elevation Top Utility:	989.54	= Elevation Bottom Utility:	986.04	= Elevation Ground Level:	**998.64**

Station / Offset: 1210+38.95 / 71.74' Rt.

Northing: 336287.60

Easting: 594208.30

Actual Field Measurement: 9.10
(Existing Grade to T.O.U.)

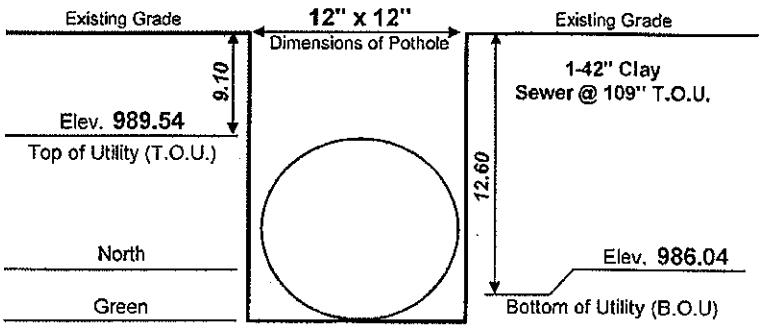
Elev. Top of Utility: 989.54

Actual Field Measurement: 12.60
(Existing Grade to B.O.U.)

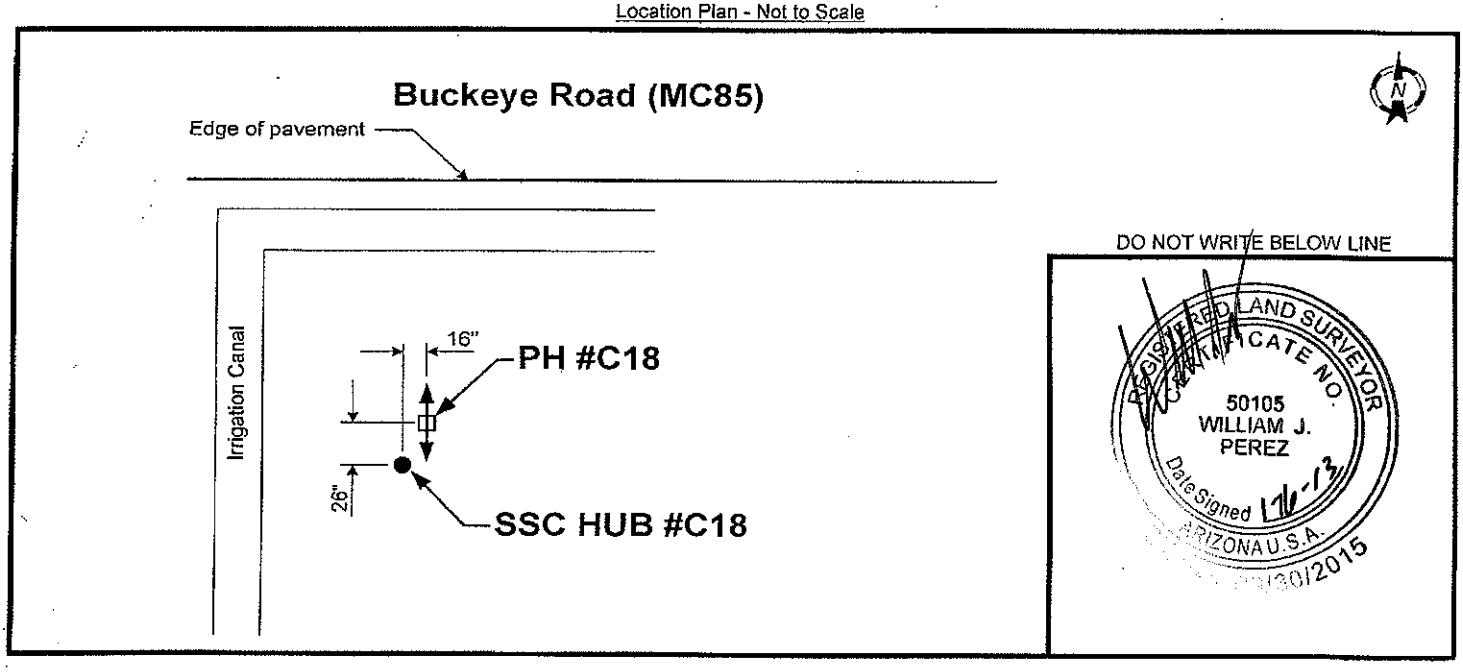
Elev. Bottom of Utility: 986.04

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C19 | Date Dug: 12/13/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Eric/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Avondale Sewer

Station / Offset: 1210+50.75 / 78.89' Rt. | Northing: 336280.46 | Easting: 594220.10 | Elevation: 998.36

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.36					Station / Offset:	1210+50.75 / 78.89' Rt.
Rod Reading (HUB - Pothole Crew):	5.68	HUB:	5.68	T.O.U.:	11.04	Northing:	0.00
Height of Instrument (H. I.):	1004.04	G. L.:	5.72	B.O.U.:	13.12	Easting:	594220.10

H. I. :	1004.04	H. I. :	1004.04	H. I. :	1004.04
(-) Rod Read Top Util. (T.O.U.):	11.04	(-) Rod Read Bottom Util. (B.O.U.):	13.12	(-) Rod Read Pothole (G.L.):	5.72
= Elevation Top Utility:	993.00	= Elevation Bottom Utility:	990.92	= Elevation Ground Level:	**998.32**

Station / Offset: 1210+50.75 / 80.39' Rt.

Northing: 336281.96

Easting: 594220.10

Actual Field Measurement: 5.32 (Existing Grade to T.O.U.)

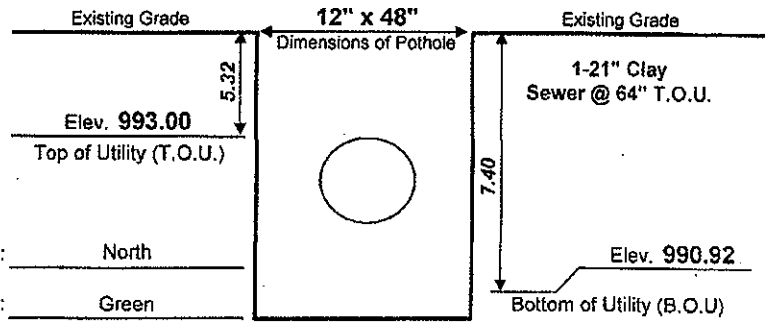
Elev. Top of Utility: 993.00

Actual Field Measurement: 7.40 (Existing Grade to B.O.U.)

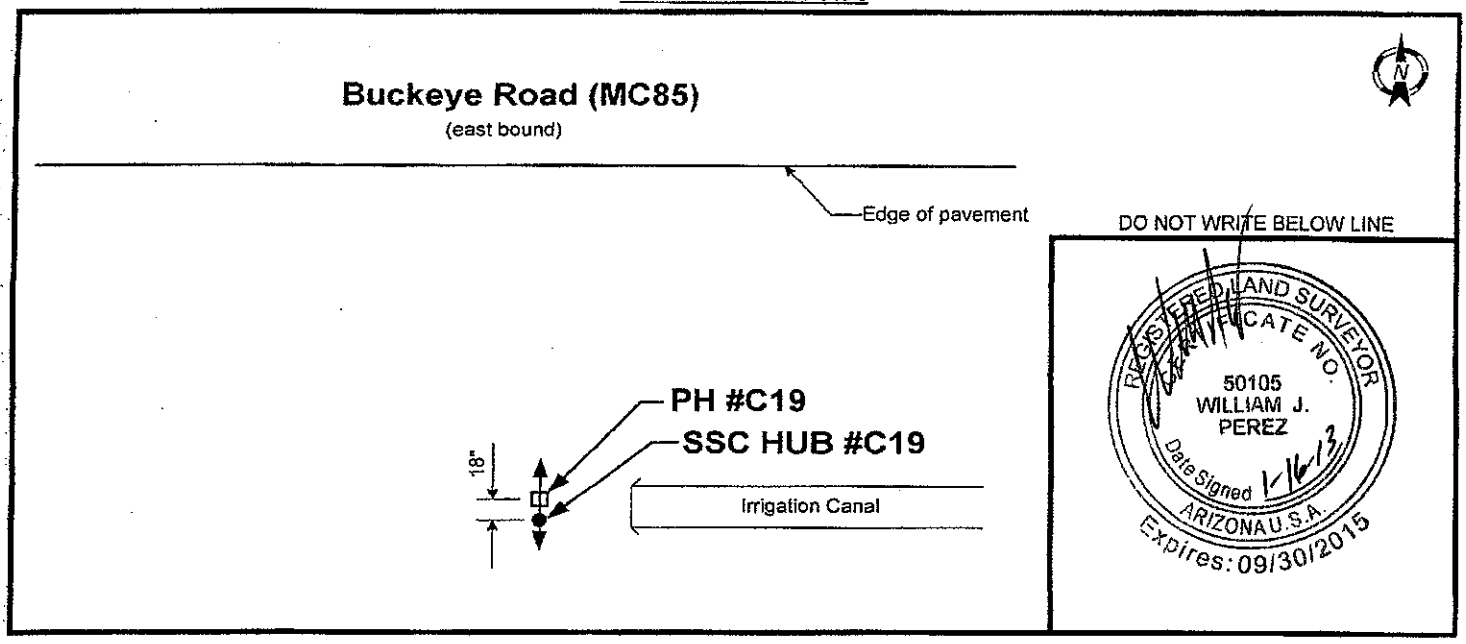
Elev. Bottom of Utility: 990.92

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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T: 602-997-6164 F: 602-997-4811

Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C20 | Date Dug: 12/13/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Sewer

Station / Offset: 1210+83.12 / 74.71' Rt. | Northing: 336284.69 | Easting: 594252.47 | Elevation: 998.45

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.45			Station / Offset:	1210+83.12 / 74.71' Rt.
Rod Reading (HUB - Pothole Crew):	4.72	HUB: 4.72	T.O.U.: 9.50	Northing:	336284.69
Height of Instrument (H. I.):	1003.17	G. L.: 5.16	B.O.U.: 14.17	Easting:	594252.47

H. I. :	1003.17	H. I. :	1003.17	H. I. :	1003.17
(-) Rod Read Top Util. (T.O.U.):	9.50	(-) Rod Read Bottom Util. (B.O.U.):	14.17	(-) Rod Read Pothole (G.L.):	5.16
= Elevation Top Utility:	993.67	= Elevation Bottom Utility:	989.00	= Elevation Ground Level:	998.01

Station / Offset: 1210+83.12 / 76.86 Rt.

Northing: 336282.52

Easting: 594252.47

Actual Field Measurement: 4.34
(Existing Grade to T.O.U.)

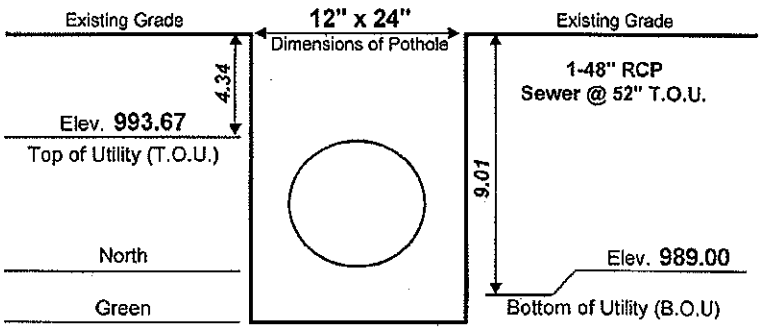
Elev. Top of Utility: 993.67

Actual Field Measurement: 9.01
(Existing Grade to B.O.U.)

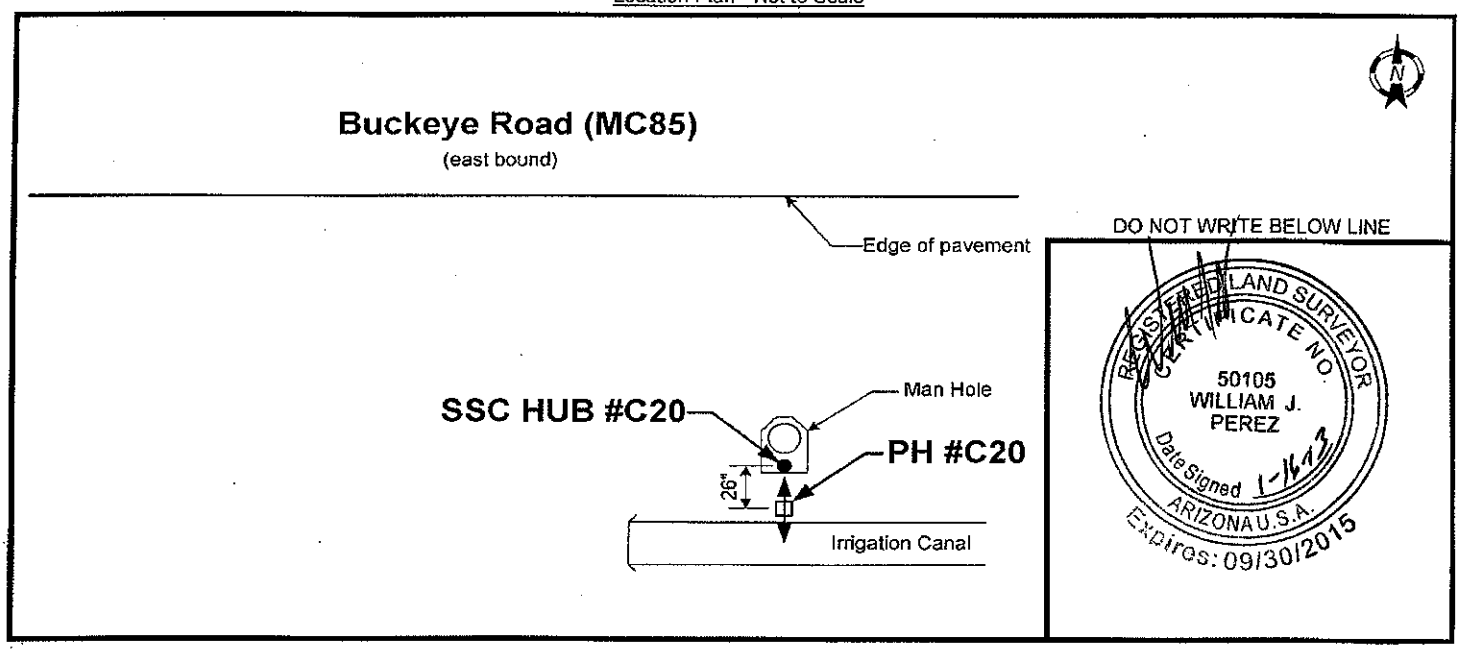
Elev. Bottom of Utility: 989.00

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C21 | Date Dug: 12/13/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Eric/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Sewer

Station / Offset: 1210+61.29 / 74.71' Rt. | Northing: 336284.66 | Easting: 594230.64 | Elevation: 998.15

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.15			Station / Offset:	1210+61.29 / 74.71' Rt.
Rod Reading (HUB - Pothole Crew):	5.62	HUB:	5.62	T.O.U.: 14.30	Northing: 336284.66
Height of Instrument (H. I.):	1003.77	G. L.:	5.58	B.O.U.: 19.97	Easting: 594230.64

H. I. :	1003.77	H. I. :	1003.77	H. I. :	1003.77
(-) Rod Read Top Util. (T.O.U.):	14.30	(-) Rod Read Bottom Util. (B.O.U.):	19.97	(-) Rod Read Pothole (G.L.):	5.58
= Elevation Top Utility:	989.47	= Elevation Bottom Utility:	983.80	= Elevation Ground Level:	998.19

Station / Offset: 1210+64.46 / 62.71 RT

Northing: 336296.66

Easting: 594233.81

Actual Field Measurement: 8.72 (Existing Grade to T.O.U.)

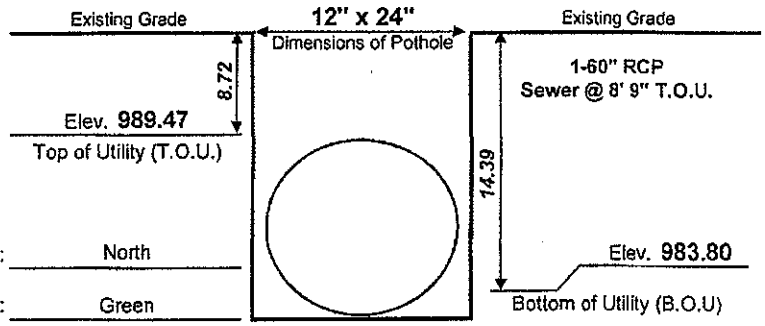
Elev. Top of Utility: 989.47

Actual Field Measurement: 14.39 (Existing Grade to B.O.U.)

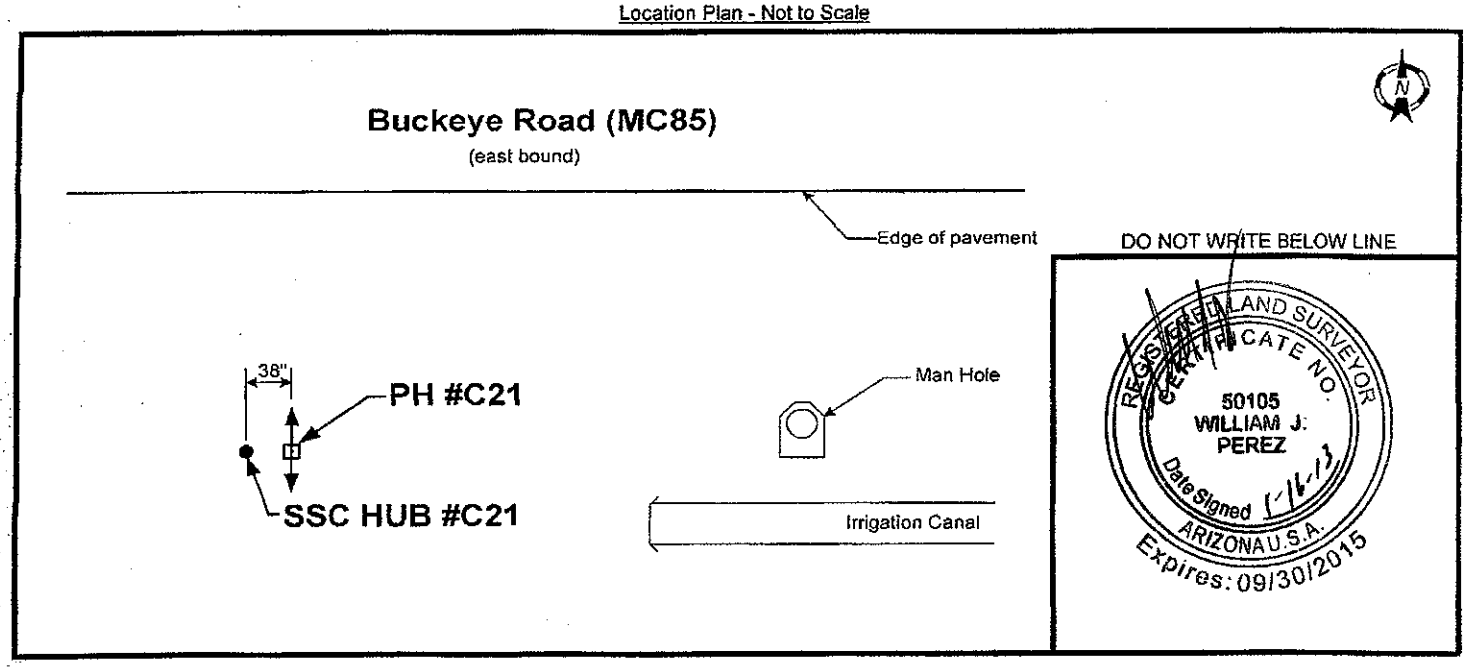
Elev. Bottom of Utility: 983.80

Facing: North

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C22 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Phoenix

Size / Type: Sewer

Station / Offset: 303+49.33 / 66.06' Lt. | Northing: 334716.69 | Easting: 596708.92 | Elevation: 998.83

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	998.83					Station / Offset:	303+49.33 / 66.06' Lt.
Rod Reading (HUB - Pothole Crew):	5.34	HUB:	5.34	T.O.U.:	17.97	Northing:	334716.69
Height of Instrument (H. I.):	1004.17	G. L.:	5.34	B.O.U.:	23.64	Easting:	596708.92

H. I. :	1004.17	H. I. :	1004.17	H. I. :	1004.17
(-) Rod Read Top Util. (T.O.U.):	17.97	(-) Rod Read Bottom Util. (B.O.U.):	23.64	(-) Rod Read Pothole (G.L.):	5.34
= Elevation Top Utility:	986.20	= Elevation Bottom Utility:	980.53	= Elevation Ground Level:	**998.83**

Station / Offset: 303+50.66 / 66.06' Lt.

Northing: 334718.02

Easting: 596708.92

Actual Field Measurement: 12.63
(Existing Grade to T.O.U.)

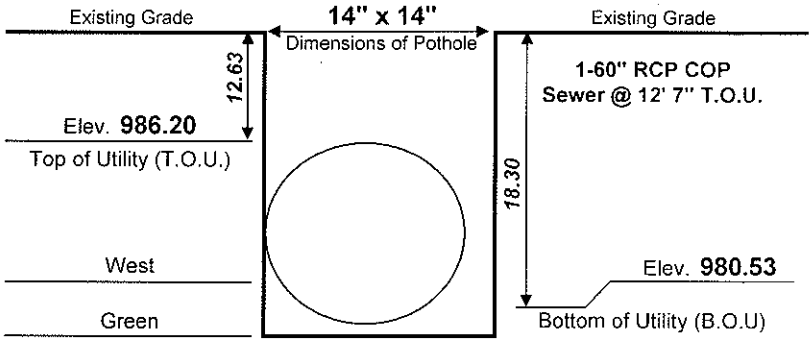
Elev. Top of Utility: 986.20

Actual Field Measurement: 18.30
(Existing Grade to B.O.U.)

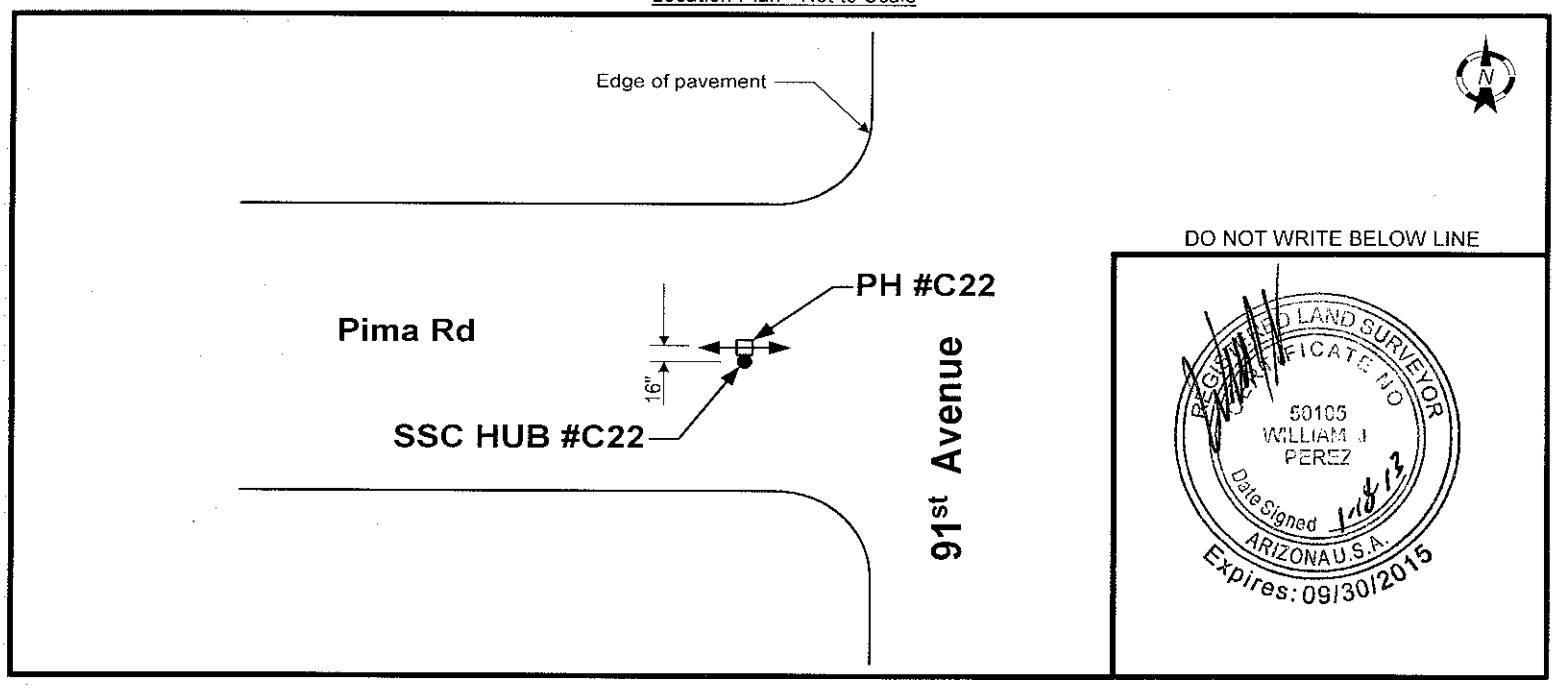
Elev. Bottom of Utility: 980.53

Facing: West

Ribbon Color: Green



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C23 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Sterling

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Water

Station / Offset: 303+81.62 / 65.81' Lt. | Northing: 334748.98 | Easting: 596709.63 | Elevation: 999.19

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.19					Station / Offset:	303+81.62 / 65.81' Lt.
Rod Reading (HUB - Pothole Crew):	5.15	HUB:	5.15	T.O.U.:	12.14	Northing:	334748.98
Height of Instrument (H. I.):	1004.34	G. L.:	5.14	B.O.U.:	13.14	Easting:	596709.63

H. I. :	1004.34	H. I. :	1004.34	H. I. :	1004.34
(-) Rod Read Top Util. (T.O.U.):	12.14	(-) Rod Read Bottom Util. (B.O.U.):	13.14	(-) Rod Read Pothole (G.L.):	5.14
= Elevation Top Utility:	992.20	= Elevation Bottom Utility:	991.20	= Elevation Ground Level:	**999.20**

Station / Offset: 303+81.62 / 62.56' Lt.

Northing: 334745.73

Easting: 596709.63

Actual Field Measurement: (Existing Grade to T.O.U.) 7.00

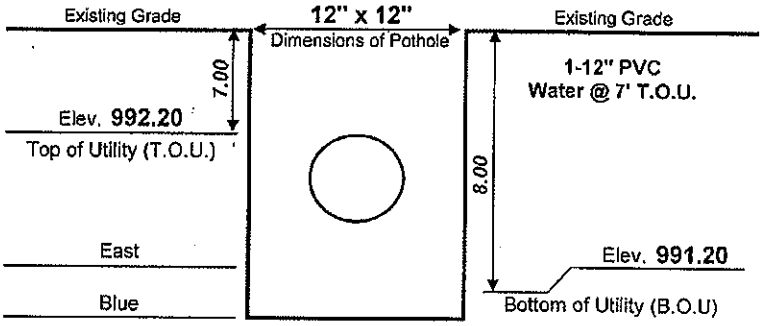
Elev. Top of Utility: 992.20

Actual Field Measurement: (Existing Grade to B.O.U.) 8.00

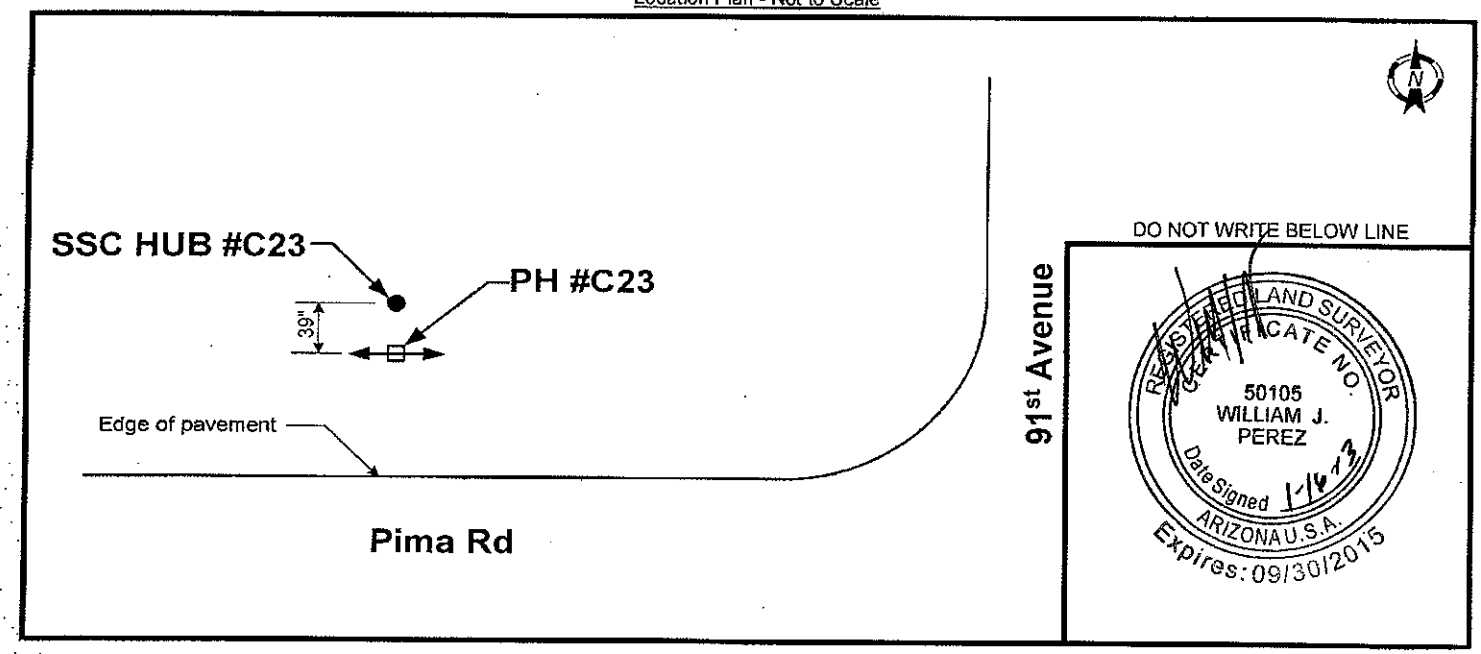
Elev. Bottom of Utility: 991.20

Facing: East

Ribbon Color: Blue



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C24 | Date Dug: 12/16/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Sterling

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SWG

Station / Offset: 303+64.09 / 66.36' Lt. | Northing: 334731.46 | Easting: 596708.83 | Elevation: 998.78

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 998.78 | Station / Offset: 303+64.09 / 66.36' Lt.

Rod Reading (HUB - Pothole Crew): 5.57 | HUB: 5.57 | T.O.U.: 8.36 | Northing: 334731.46

Height of Instrument (H. I.): 1004.35 | G. L.: 5.20 | B.O.U.: 8.53 | Easting: 596708.83

H. I. : 1004.35	H. I. : 1004.35	H. I. : 1004.35
(-) Rod Read Top Util. (T.O.U.): 8.36	(-) Rod Read Bottom Util. (B.O.U.): 8.53	(-) Rod Read Pothole (G.L.): 5.20
= Elevation Top Utility: 995.99	= Elevation Bottom Utility: 995.82	= Elevation Ground Level: **999.15**

Station / Offset: 303+75.76 / 66.36' Lt.

Northing: 334743.13

Easting: 596708.83

Actual Field Measurement: 3.16
(Existing Grade to T.O.U.)

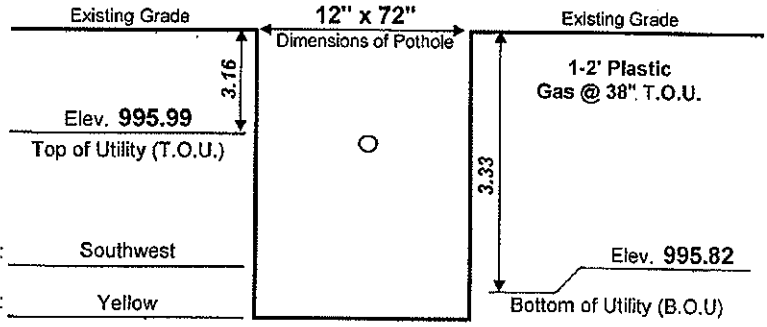
Elev. Top of Utility: 995.99

Actual Field Measurement: 3.33
(Existing Grade to B.O.U.)

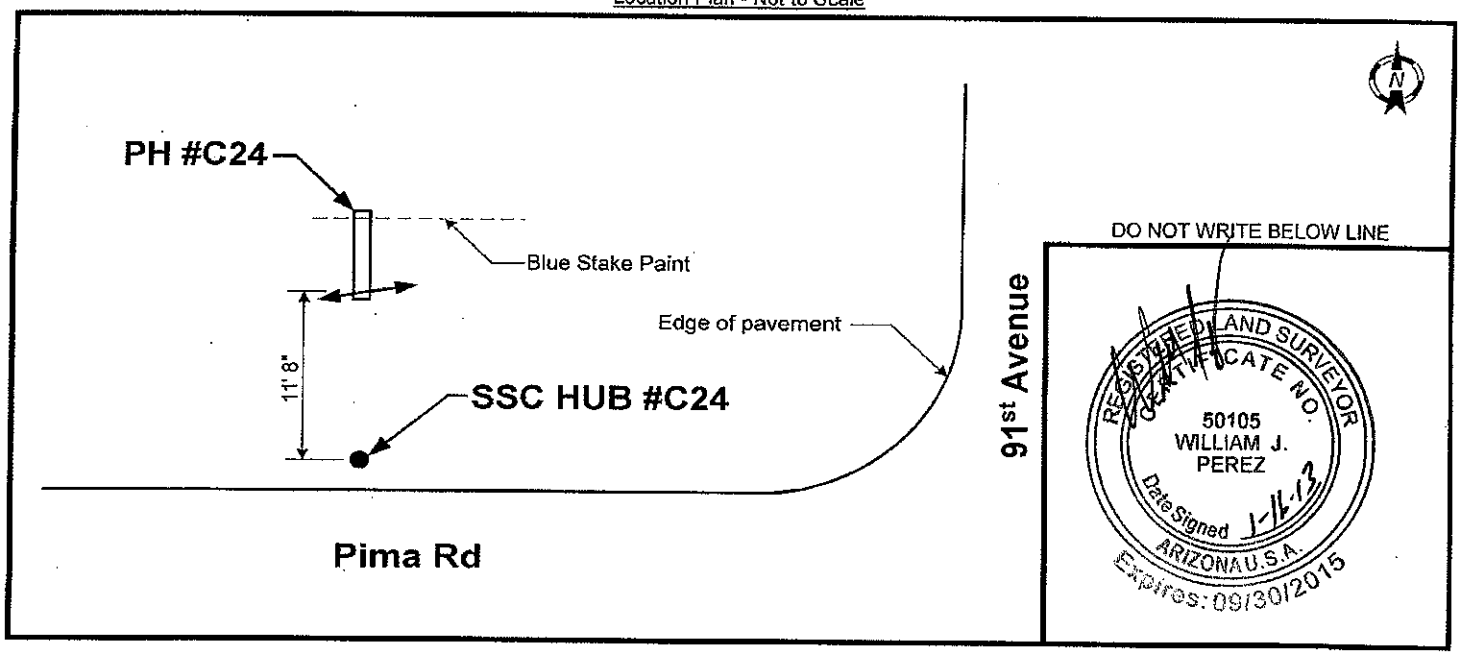
Elev. Bottom of Utility: 995.82

Facing: Southwest

Ribbon Color: Yellow



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C25 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Sterling

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1235+53.57 / 22.61 RT. | Northing: 336328.55 | Easting: 596723.34 | Elevation: 1001.37

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.37					Station / Offset:	1235+53.57 / 22.61' Rt.
Rod Reading (HUB - Pothole Crew):	5.30	HUB:	5.30	T.O.U.:	12.41	Northing:	336328.55
Height of Instrument (H. I.):	1006.67	G. L.:	5.35	B.O.U.:	12.74	Easting:	596723.34

H. I. :	1006.67	H. I. :	1006.67	H. I. :	1006.67
(-) Rod Read Top Util. (T.O.U.):	12.41	(-) Rod Read Bottom Util. (B.O.U.):	12.74	(-) Rod Read Pothole (G.L.):	5.35
= Elevation Top Utility:	994.26	= Elevation Bottom Utility:	993.93	= Elevation Ground Level:	**1001.32**

Station / Offset: 1235+53.57 / 27.61' RT.

Northing: 336323.55

Easting: 596723.34

Actual Field Measurement: (Existing Grade to T.O.U.) 7.06

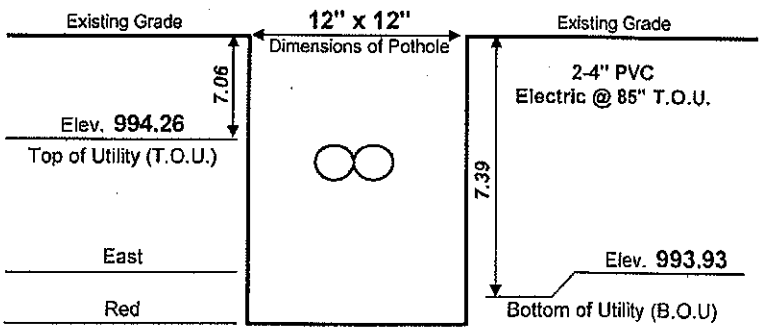
Elev. Top of Utility: 994.26

Actual Field Measurement: (Existing Grade to B.O.U.) 7.39

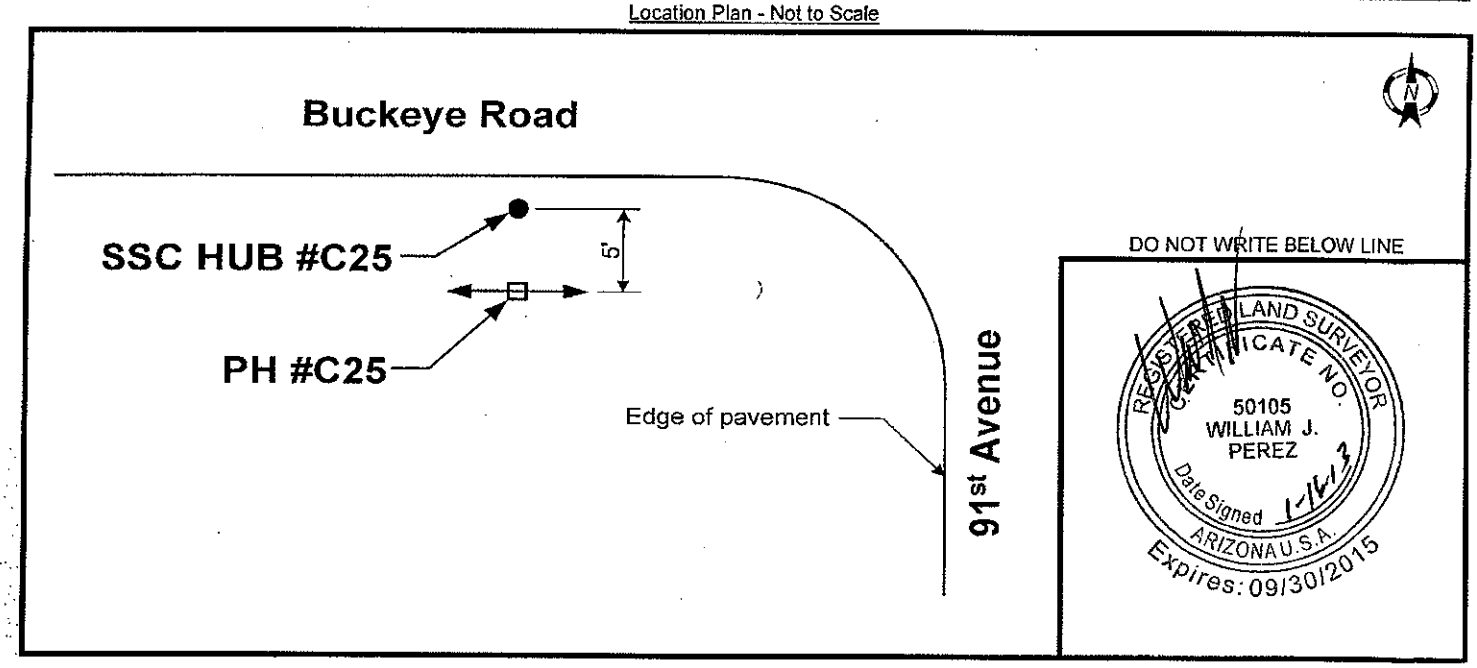
Elev. Bottom of Utility: 993.93

Facing: East

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C26 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Eric/Arturo

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Level3 Communications

Station / Offset: 1235+54.14 / 6.08' Rt. | Northing: 336345.09 | Easting: 596723.35 | Elevation: 1001.03

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.03					Station / Offset:	1235+54.14 / 6.08' Rt.
Rod Reading (HUB - Pothole Crew):	5.06	HUB:	5.06	T.O.U.:	10.51	Northing:	336345.09
Height of Instrument (H. I.):	1006.09	G. L.:	5.06	B.O.U.:	11.51	Easting:	596723.35

H. I. :	1006.09	H. I. :	1006.09	H. I. :	1006.09
(-) Rod Read Top Util. (T.O.U.):	10.51	(-) Rod Read Bottom Util. (B.O.U.):	11.51	(-) Rod Read Pothole (G.L.):	5.06
= Elevation Top Utility:	995.58	= Elevation Bottom Utility:	994.58	= Elevation Ground Level:	1001.03

Station / Offset: 1235+54.14 / 8.08' Rt.

Northing: 336343.09

Easting: 596723.35

Actual Field Measurement: 5.45 (Existing Grade to T.O.U.)

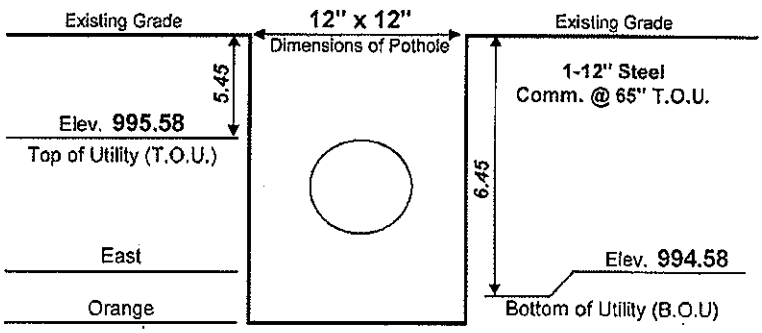
Elev. Top of Utility: 995.58

Actual Field Measurement: 6.45 (Existing Grade to B.O.U.)

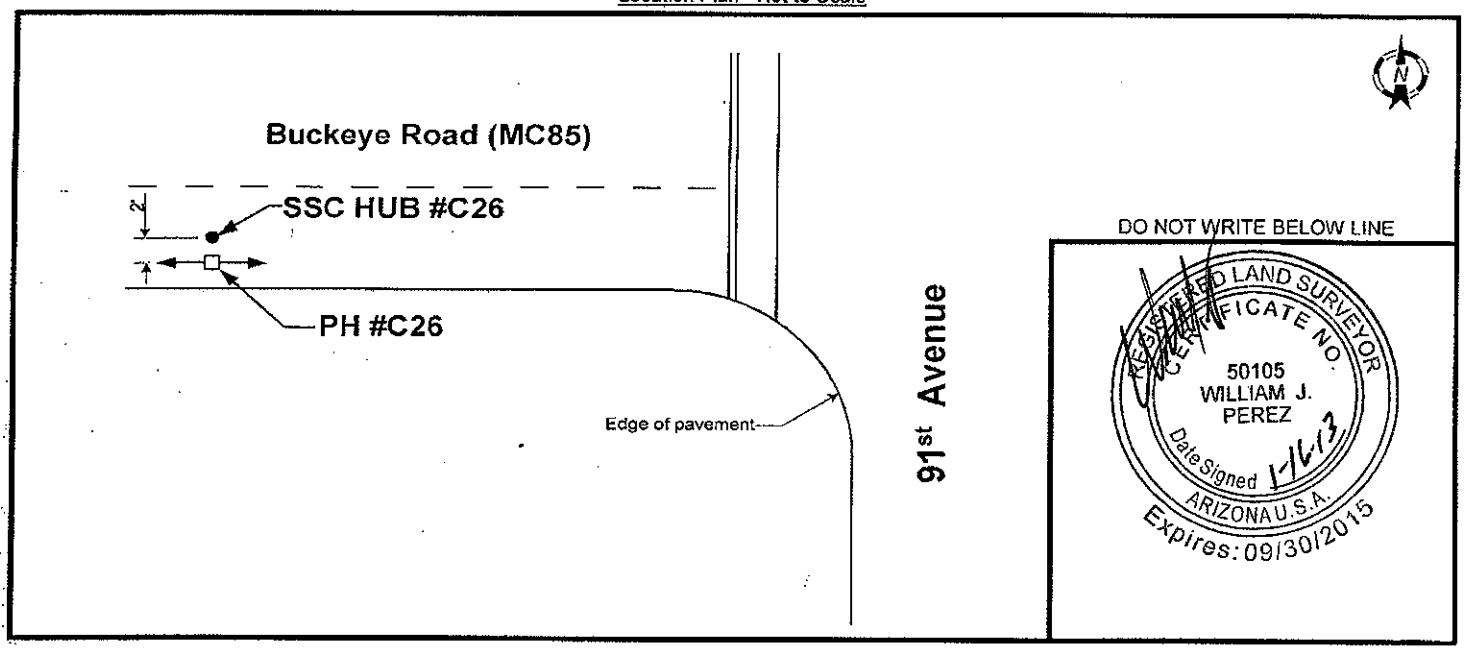
Elev. Bottom of Utility: 994.58

Facing: East

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 13" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C27 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1235+56.12 / 38.54' Lt. | Northing: 336389.75 | Easting: 596723.81 | Elevation: 1001.03

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.03			Station / Offset:	1235+56.12 / 38.54' Lt.
Rod Reading (HUB - Pothole Crew):	5.20	HUB: 5.20	T.O.U.: 10.34	Northing:	336389.75
Height of Instrument (H. I.):	1006.23	G. L.: 5.16	B.O.U.: 11.34	Easting:	596723.81

H. I. :	1006.23	H. I. :	1006.23	H. I. :	1006.23
(-) Rod Read Top Util. (T.O.U.):	10.34	(-) Rod Read Bottom Util. (B.O.U.):	11.34	(-) Rod Read Pothole (G.L.):	5.16
= Elevation Top Utility:	995.89	= Elevation Bottom Utility:	994.89	= Elevation Ground Level:	1001.07

Station / Offset: 1235+56.12 / 40.04' Lt.

Northing: 336391.25

Easting: 596723.81

Actual Field Measurement: 5.18
(Existing Grade to T.O.U.)

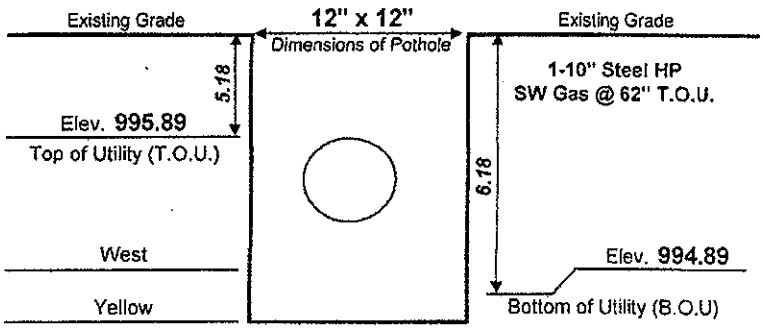
Elev. Top of Utility: 995.89

Actual Field Measurement: 6.18
(Existing Grade to B.O.U.)

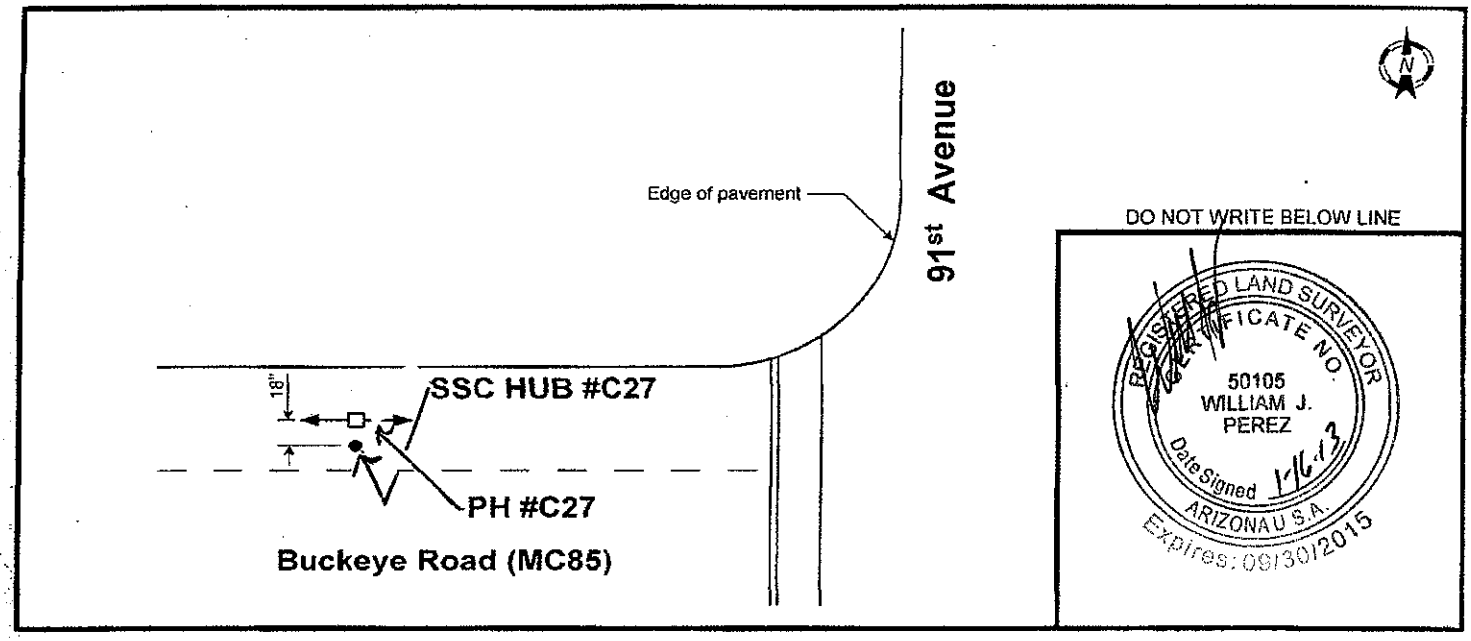
Elev. Bottom of Utility: 994.89

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C29 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1235+53.47 / 63.81' Lt. | Northing: 336414.92 | Easting: 596720.31 | Elevation: 1001.54

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.54					Station / Offset:	1235+53.47 / 63.81' Lt.
Rod Reading (HUB - Pothole Crew):	5.31	HUB:	5.31	T.O.U.:	8.50	Northing:	336414.92
Height of Instrument (H. I.):	1006.85	G. L.:	5.31	B.O.U.:	8.67	Easting:	596720.31

H. I. :	1006.85	H. I. :	1006.85	H. I. :	1006.85
(-) Rod Read Top Util. (T.O.U.):	8.50	(-) Rod Read Bottom Util. (B.O.U.):	8.67	(-) Rod Read Pothole (G.L.):	5.31
= Elevation Top Utility:	998.35	= Elevation Bottom Utility:	998.18	= Elevation Ground Level:	**1001.54**

Station / Offset: 1235+53.47 / 71.06' Lt.

Northing: 336422.17

Easting: 596720.31

Actual Field Measurement: 3.19 (Existing Grade to T.O.U.)

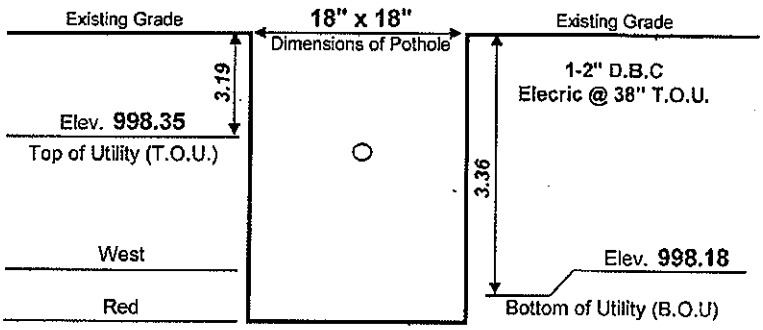
Elev. Top of Utility: 998.35

Actual Field Measurement: 3.36 (Existing Grade to B.O.U.)

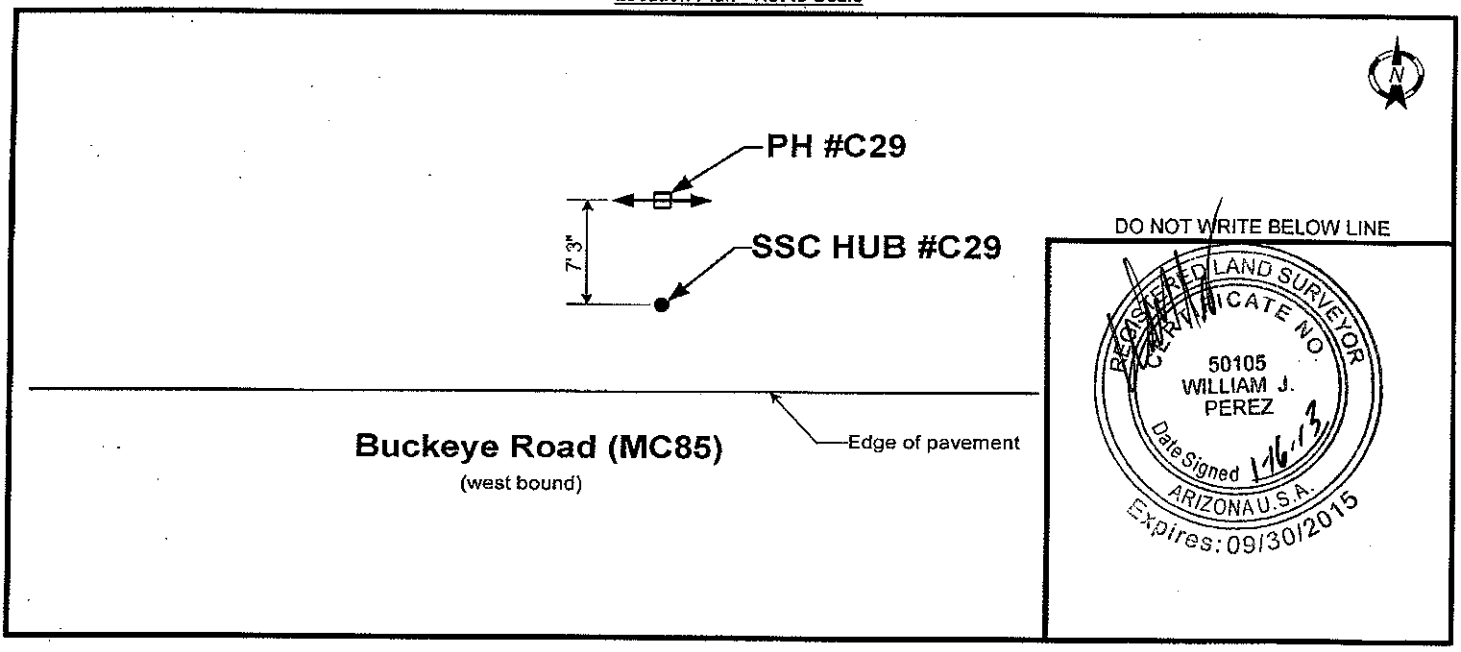
Elev. Bottom of Utility: 998.18

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C30 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1235+53.60 / 67.62' Lt. | Northing: 336418.73 | Easting: 596720.31 | Elevation: 1001.51

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.51					Station / Offset:	1235+53.60 / 67.62' Lt.
Rod Reading (HUB - Pothole Crew):	5.44	HUB:	5.44	T.O.U.:	10.06	Northing:	336418.73
Height of Instrument (H. I.):	1006.95	G. L.:	5.44	B.O.U.:	10.39	Easting:	596720.31

H. I. :	1006.95	H. I. :	1006.95	H. I. :	1006.95
(-) Rod Read Top Util. (T.O.U.):	10.06	(-) Rod Read Bottom Util. (B.O.U.):	10.39	(-) Rod Read Pothole (G.L.):	5.44
= Elevation Top Utility:	996.89	= Elevation Bottom Utility:	996.56	= Elevation Ground Level:	1001.51

Station / Offset: 1235+55.02 / 66.45 Lt.

Northing: 336417.56

Easting: 596721.73

Actual Field Measurement: 4.62 (Existing Grade to T.O.U.)

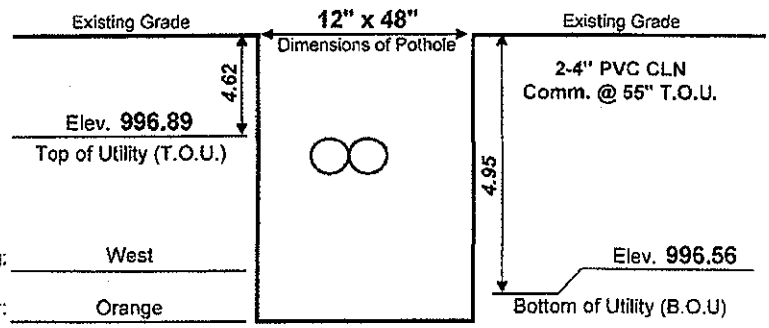
Elev. Top of Utility: 996.89

Actual Field Measurement: 4.95 (Existing Grade to B.O.U.)

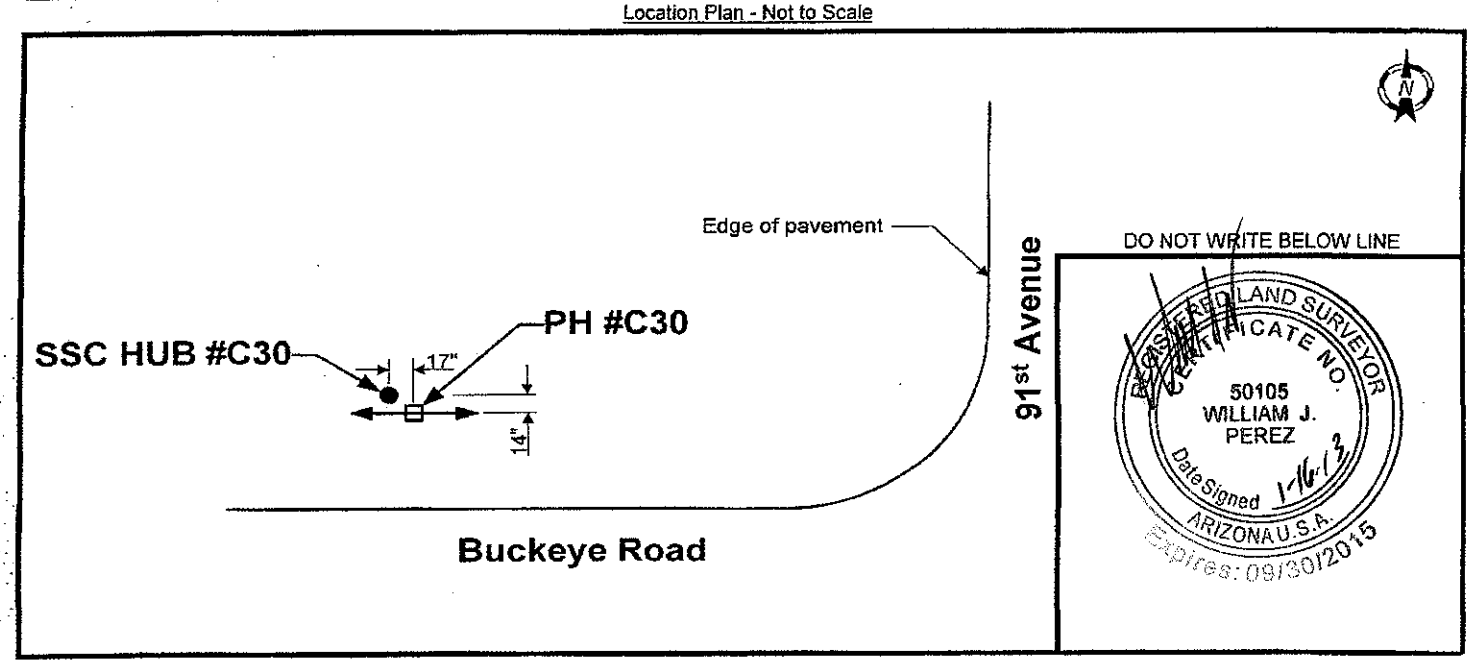
Elev. Bottom of Utility: 996.56

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C31 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1236+11.98 / 93.29' Lt. | Northing: 336446.52 | Easting: 596777.22 | Elevation: 1002.80

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1002.80			Station / Offset:	1236+11.98 / 93.29' Lt.
Rod Reading (HUB - Pothole Crew):	5.22	HUB:	5.22	T.O.U.:	8.92	Northing:	336446.52
Height of Instrument (H. I.):	1008.02	G. L.:	5.22	B.O.U.:	9.08	Easting:	596777.22

H. I. :	1008.02	H. I. :	1008.02	H. I. :	1008.02
(-) Rod Read Top Util. (T.O.U.):	8.92	(-) Rod Read Bottom Util. (B.O.U.):	9.08	(-) Rod Read Pothole (G.L.):	5.22
= Elevation Top Utility:	999.10	= Elevation Bottom Utility:	998.94	= Elevation Ground Level:	1002.80

Station / Offset: 1236+06.31 / 91.46' Lt.

Northing: 336444.69

Easting: 596771.55

Actual Field Measurement: 3.70
(Existing Grade to T.O.U.)

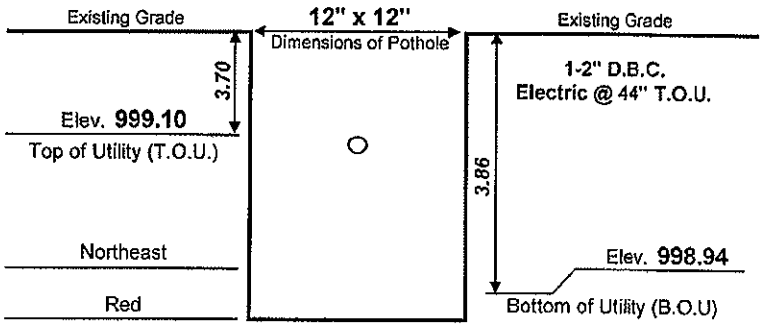
Elev. Top of Utility: 999.10

Actual Field Measurement: 3.86
(Existing Grade to B.O.U.)

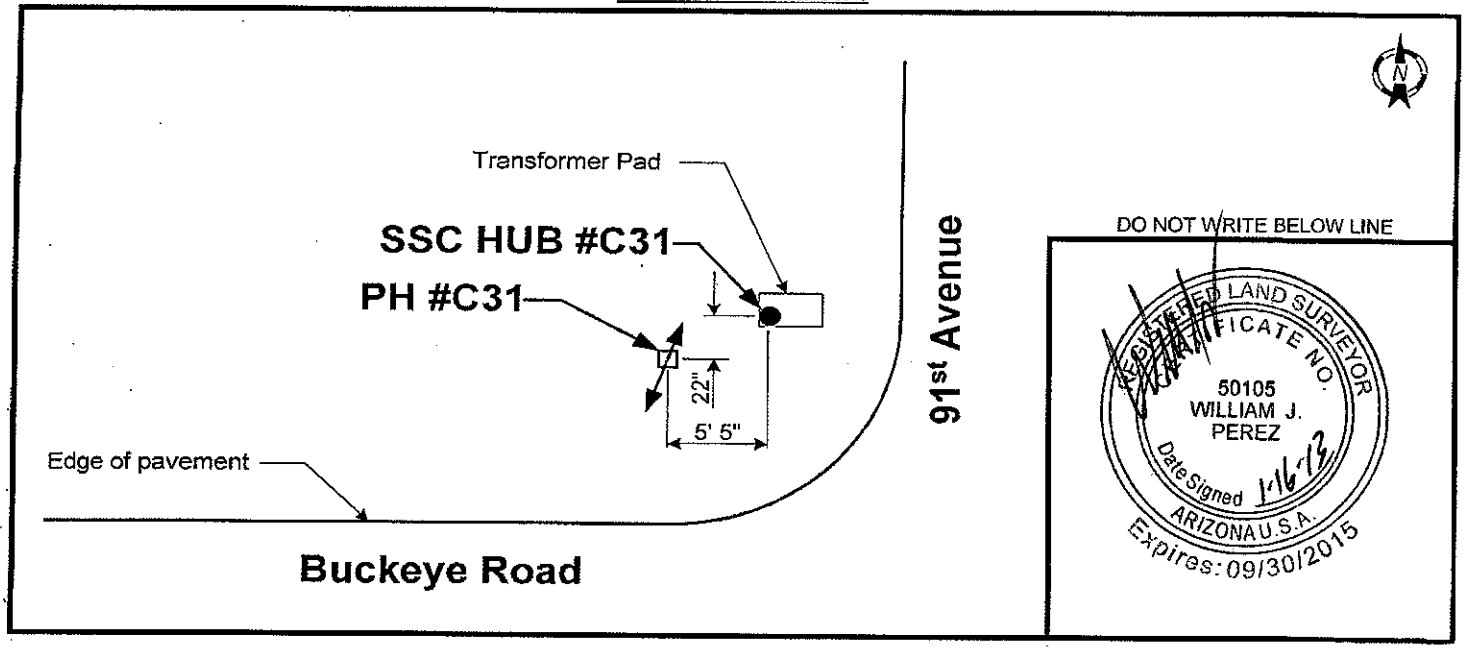
Elev. Bottom of Utility: 998.94

Facing: Northeast

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C32 | Date Dug: 01/14/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 327+06.57 / 50.18' Lt. | Northing: 337073.49 | Easting: 596767.01 | Elevation: 1003.97

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1003.97					Station / Offset:	327+06.57 / 50.18' Lt.
Rod Reading (HUB - Pothole Crew):	4.43	HUB:	4.43	T.O.U.:	6.56	Northing:	337073.49
Height of Instrument (H. I.):	1008.40	G. L.:	4.64	B.O.U.:	6.64	Easting:	596767.01

H. I. :	1008.40	H. I. :	1008.40	H. I. :	1008.40
(-) Rod Read Top Util. (T.O.U.):	6.56	(-) Rod Read Bottom Util. (B.O.U.):	6.64	(-) Rod Read Pothole (G.L.):	4.64
= Elevation Top Utility:	1001.84	= Elevation Bottom Utility:	1001.76	= Elevation Ground Level:	1003.76

Station / Offset: 327+06.57 / 31.18 LT

Northing: 337073.49

Easting: 596786.01

Actual Field Measurement: 1.92 (Existing Grade to T.O.U.)

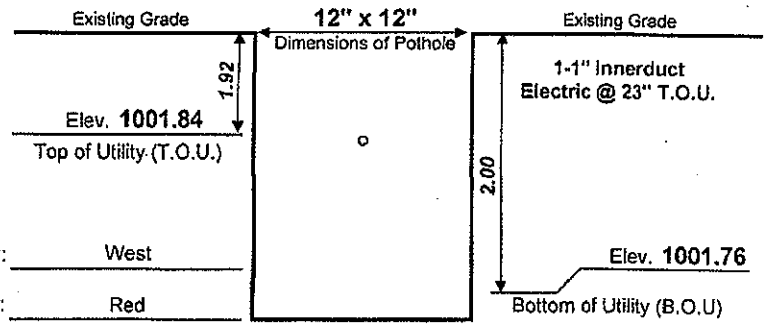
Elev. Top of Utility: 1001.84

Actual Field Measurement: 2.00 (Existing Grade to B.O.U.)

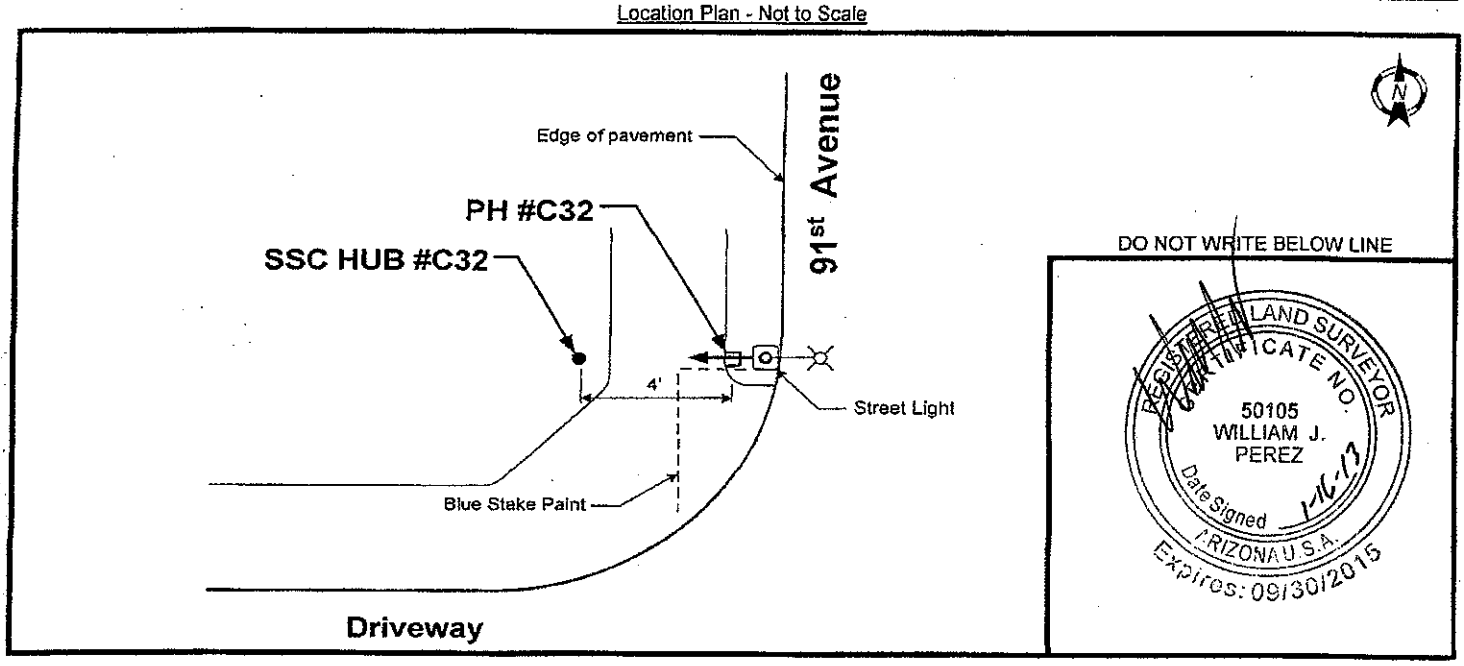
Elev. Bottom of Utility: 1001.76

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C33 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 329+79.24 / 54.72' Lt. | Northing: 337346.20 | Easting: 596767.47 | Elevation: 1004.55

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1004.55			Station / Offset:	329+79.24 / 54.72' Lt.
Rod Reading (HUB - Pothole Crew):	5.56	HUB:	5.56	T.O.U.:	9.71	Northing:	337346.20
Height of Instrument (H. I.):	1010.11	G. L.:	5.56	B.O.U.:	9.88	Easting:	596767.47

H. I. :	1010.11	H. I. :	1010.11	H. I. :	1010.11
(-) Rod Read Top Util. (T.O.U.):	9.71	(-) Rod Read Bottom Util. (B.O.U.):	9.88	(-) Rod Read Pothole (G.L.):	5.56
= Elevation Top Utility:	1000.40	= Elevation Bottom Utility:	1000.23	= Elevation Ground Level:	**1004.55**

Station / Offset: 329+79.24 / 54.72' Lt.

Northing: 337346.20

Easting: 596767.47

Actual Field Measurement: 4.15
(Existing Grade to T.O.U.)

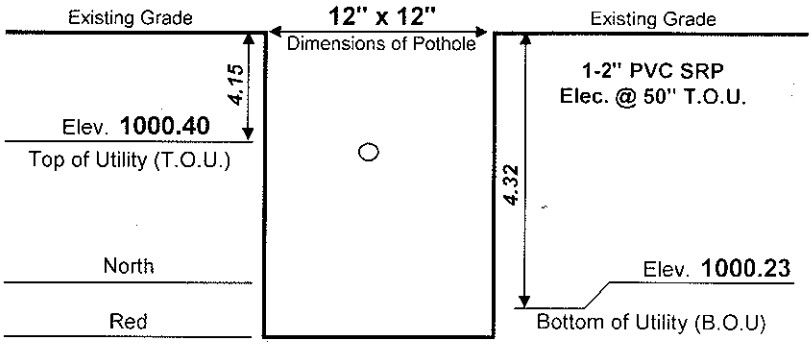
Elev. Top of Utility: 1000.40

Actual Field Measurement: 4.32
(Existing Grade to B.O.U.)

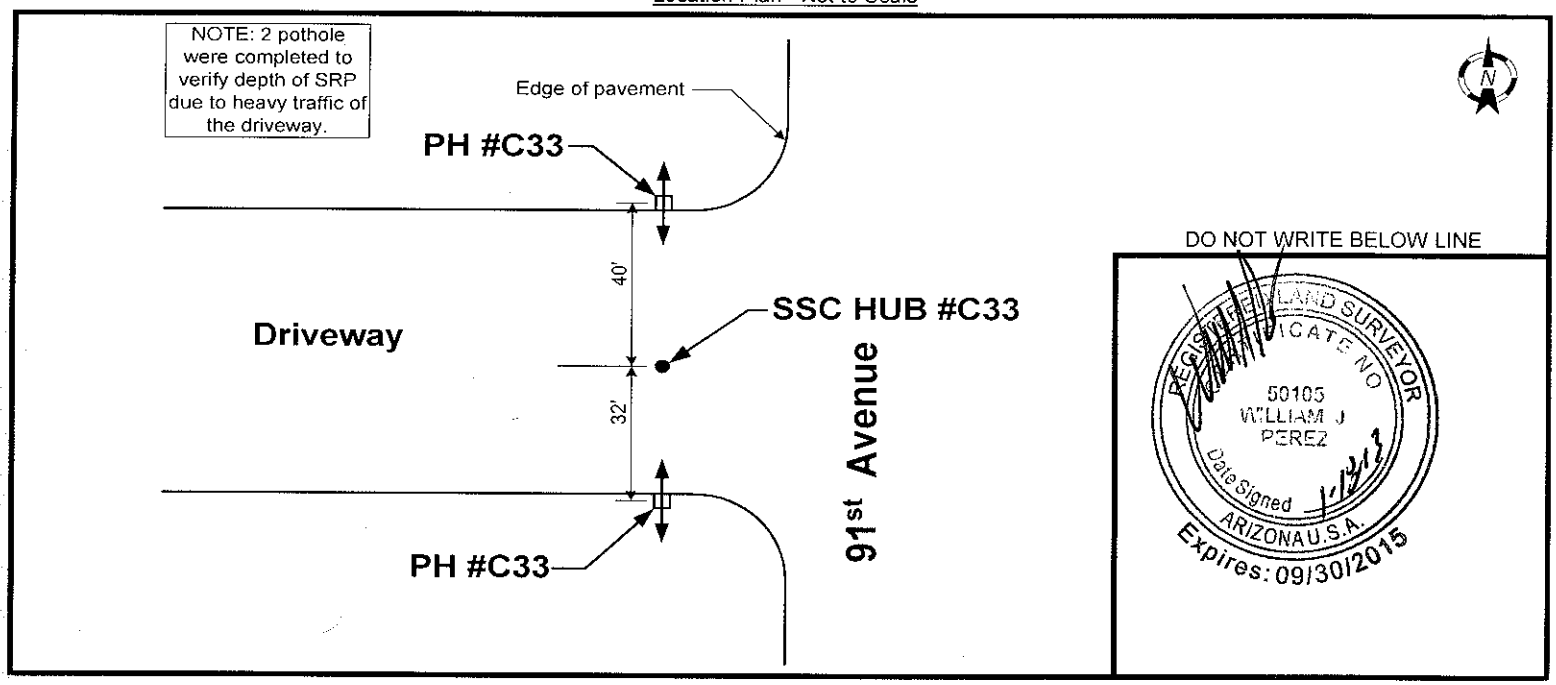
Elev. Bottom of Utility: 1000.23

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C34 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1235+98.91 / 56.01' Lt. | Northing: 336408.68 | Easting: 596763.74 | Elevation: 1001.53

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.53			Station / Offset:	1235+98.91 / 56.01' Lt.
Rod Reading (HUB - Pothole Crew):	5.62	HUB: 5.62	T.O.U.: 7.77	Northing:	336408.68
Height of Instrument (H. I.):	1007.15	G. L.: 5.64	B.O.U.: 7.94	Easting:	596763.74

H. I. :	1007.15	H. I. :	1007.15	H. I. :	1007.15
(-) Rod Read Top Util. (T.O.U.):	7.77	(-) Rod Read Bottom Util. (B.O.U.):	7.94	(-) Rod Read Pothole (G.L.):	5.64
= Elevation Top Utility:	999.38	= Elevation Bottom Utility:	999.21	= Elevation Ground Level:	**1001.51**

Station / Offset: 1235+98.91 / 61.01' Lt.

Northing: 336413.68

Easting: 596763.74

Actual Field Measurement: 2.13
(Existing Grade to T.O.U.)

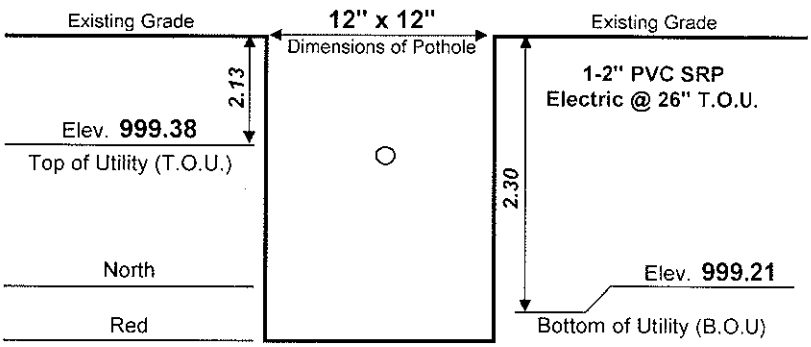
Elev. Top of Utility: 999.38

Actual Field Measurement: 2.30
(Existing Grade to B.O.U.)

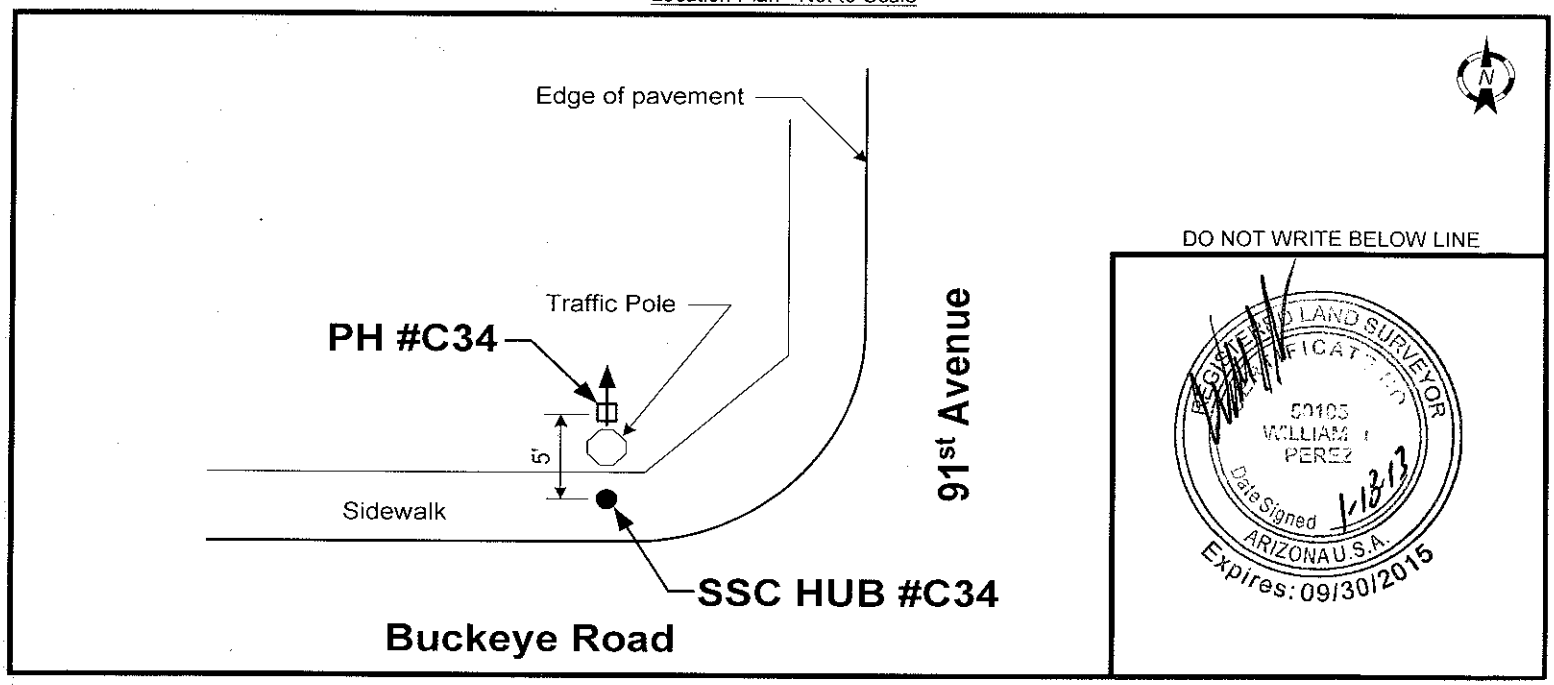
Elev. Bottom of Utility: 999.21

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C35 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1236+06.73 / 56.04' Lt. | Northing: 336409.09 | Easting: 596773.49 | Elevation: 1002.01

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1002.01					Station / Offset:	1236+06.73 / 56.04' Lt.
Rod Reading (HUB - Pothole Crew):	5.27	HUB:	5.27	T.O.U.:	7.80	Northing:	336409.09
Height of Instrument (H. I.):	1007.28	G. L.:	5.24	B.O.U.:	8.05	Easting:	596773.49

H. I. :	1007.28	H. I. :	1007.28	H. I. :	1007.28
(-) Rod Read Top Util. (T.O.U.):	7.80	(-) Rod Read Bottom Util. (B.O.U.):	8.05	(-) Rod Read Pothole (G.L.):	5.24
= Elevation Top Utility:	999.48	= Elevation Bottom Utility:	999.23	= Elevation Ground Level:	1002.04

Station / Offset: 1236+04.48 / 54.04LT

Northing: 336407.09

Easting: 596771.24

Actual Field Measurement: 2.56 (Existing Grade to T.O.U.)

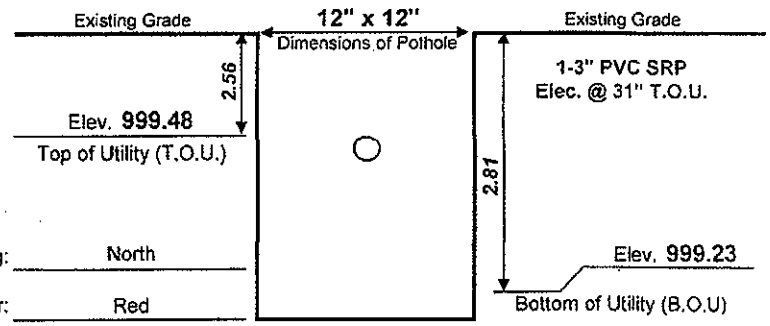
Elev. Top of Utility: 999.48

Actual Field Measurement: 2.81 (Existing Grade to B.O.U.)

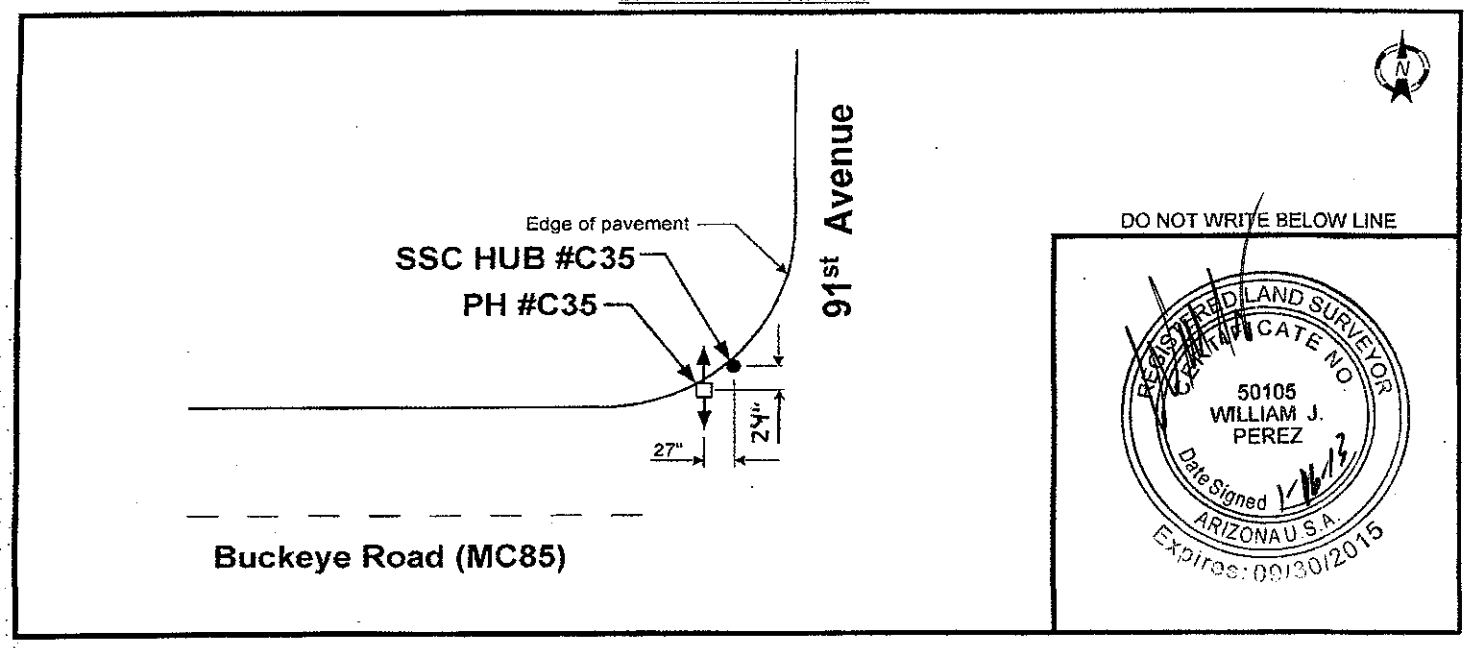
Elev. Bottom of Utility: 999.23

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No.	2180P	Cust. Job No.	TT345	Test Hole No.	C36	Date Dug:	01/08/13
Project Name:	MC85 Buckeye Road Center Turn Lane Exp.						
Checked by:	Curtis			Crew Members:	Arturo/Eric		
General Location:	Buckeye Road 107th-75th			General:	MCDOT		

Anticipated Utility Information

Size / Type: City of Tolleson Water

Station / Offset: 1236+74.39 / 56.75' Lt. Northing: 336412.68 Easting: 596840.67 Elevation: 1001.28

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.28					Station / Offset:	1236+74.39 / 56.75' Lt.
Rod Reading (HUB - Pothole Crew):	5.25	HUB:	5.25	T.O.U.:	13.29	Northing:	336412.68
Height of Instrument (H. I.):	1006.53	G. L.:	5.25	B.O.U.:	14.62	Easting:	596840.67

H. I. :	1006.53	H. I. :	1006.53	H. I. :	1006.53
(-) Rod Read Top Util. (T.O.U.):	13.29	(-) Rod Read Bottom Util. (B.O.U.):	14.62	(-) Rod Read Pothole (G.L.):	5.25
= Elevation Top Utility:	993.24	= Elevation Bottom Utility:	991.91	= Elevation Ground Level:	**1001.28**

Station / Offset: 1236+73.89 / 56.75' Lt.

Northing: 336412.68

Easting: 596840.17

Actual Field Measurement: 8.04
(Existing Grade to T.O.U.)

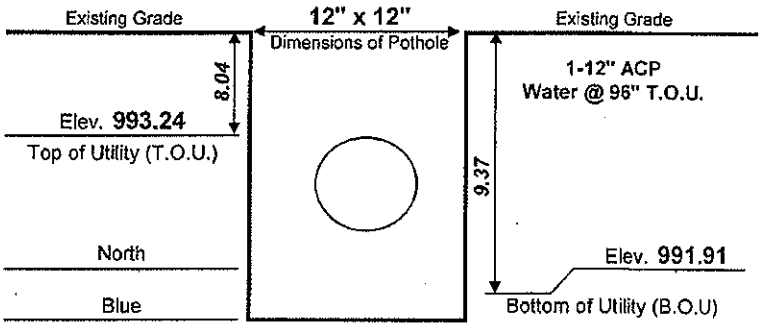
Elev. Top of Utility: 993.24

Actual Field Measurement: 9.37
(Existing Grade to B.O.U.)

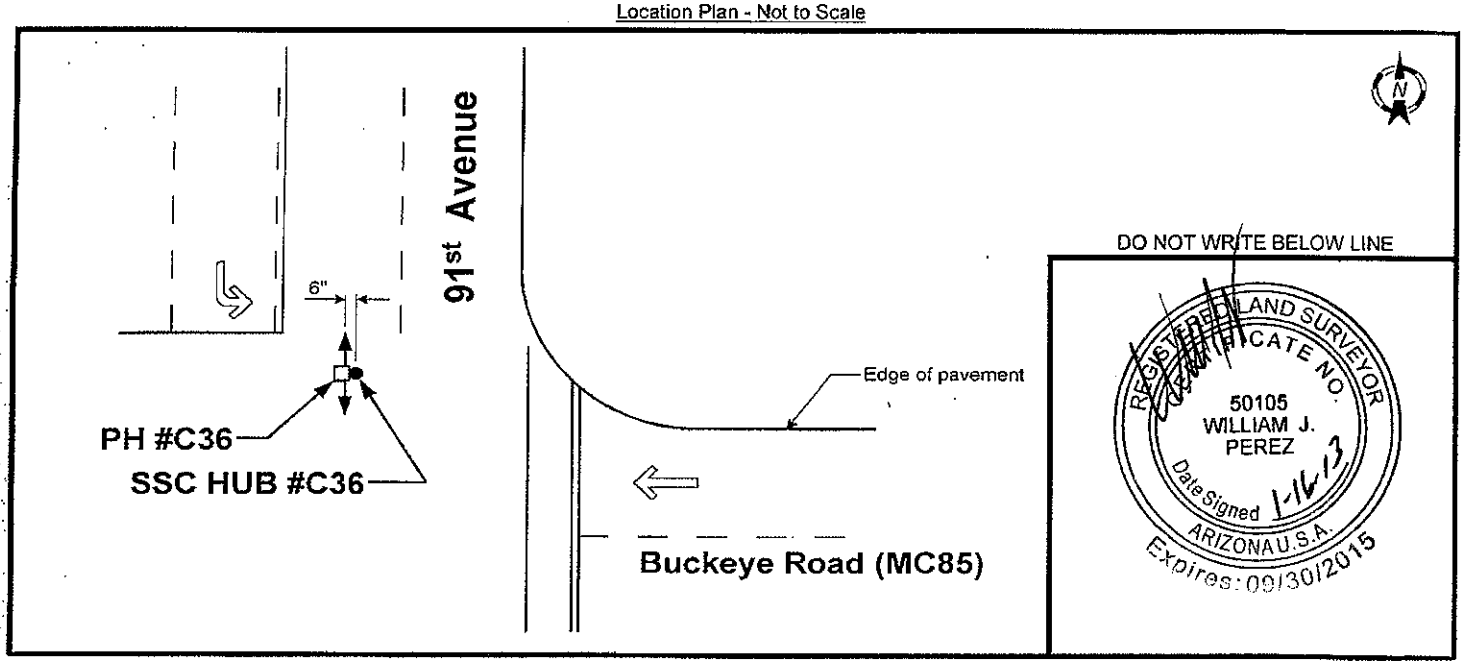
Elev. Bottom of Utility: 991.91

Facing: North

Ribbon Color: Blue



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes Soil Type: " B " Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C37 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1236+86.13 / 57.58' Lt. | Northing: 336414.05 | Easting: 596852.29 | Elevation: 1001.27

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.27					Station / Offset:	1236+86.13 / 57.58' Lt.
Rod Reading (HUB - Pothole Crew):	5.42	HUB:	5.42	T.O.U.:	12.56	Northing:	336414.05
Height of Instrument (H. I.):	1006.69	G. L.:	5.42	B.O.U.:	12.98	Easting:	596852.29

H. I. :	1006.69	H. I. :	1006.69	H. I. :	1006.69
(-) Rod Read Top Util. (T.O.U.):	12.56	(-) Rod Read Bottom Util. (B.O.U.):	12.98	(-) Rod Read Pothole (G.L.):	5.42
= Elevation Top Utility:	994.13	= Elevation Bottom Utility:	993.71	= Elevation Ground Level:	1001.27

Station / Offset: 1236+86.13 / 57.58' Lt.

Northing: 336414.05

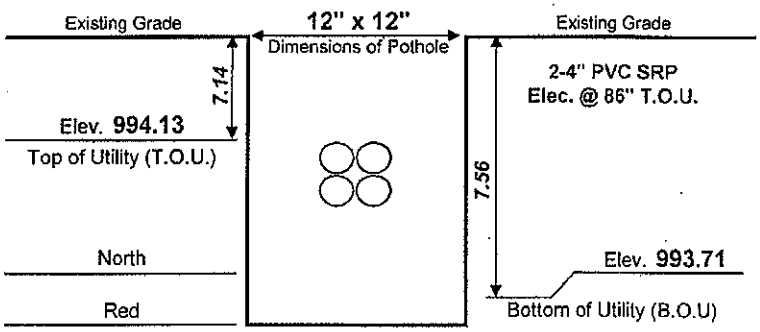
Easting: 596852.29

Actual Field Measurement: 7.14
(Existing Grade to T.O.U.)

Elev. Top of Utility: 994.13

Actual Field Measurement: 7.56
(Existing Grade to B.O.U.)

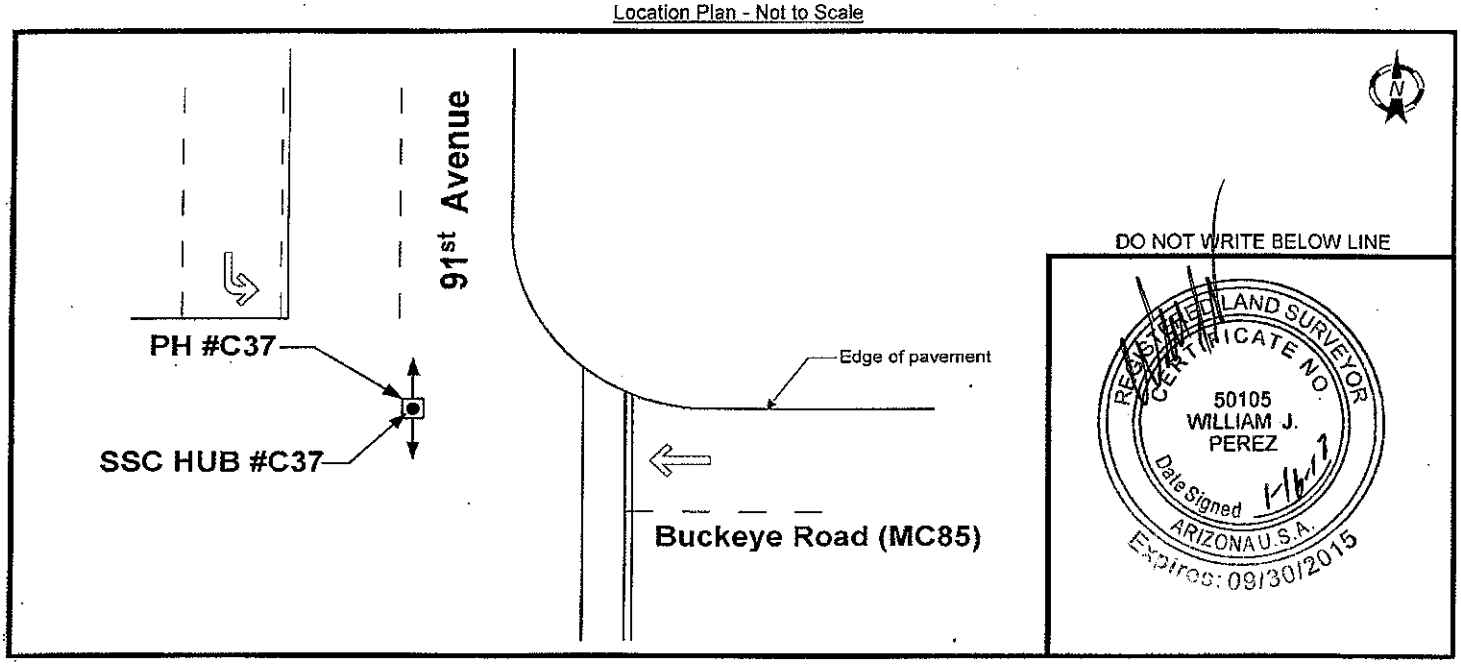
Elev. Bottom of Utility: 993.71



Facing: North

Ribbon Color: Red

Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 14" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C38 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/ Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1236+91.44 / 56.77' Lt. | Northing: 336413.49 | Easting: 596857.60 | Elevation: 1001.24

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 1001.24 | Station / Offset: 1236+91.44 / 56.77' Lt.

Rod Reading (HUB - Pothole Crew): 5.42 | HUB: 5.42 | T.O.U.: 12.37 | Northing: 336413.49

Height of Instrument (H. I.): 1006.66 | G. L.: 5.49 | B.O.U.: 12.79 | Easting: 596857.60

H. I. : 1006.66	H. I. : 1006.66	H. I. : 1006.66
(-) Rod Read Top Util. (T.O.U.): 12.37	(-) Rod Read Bottom Util. (B.O.U.): 12.79	(-) Rod Read Pothole (G.L.): 5.49
= Elevation Top Utility: 994.29	= Elevation Bottom Utility: 993.87	= Elevation Ground Level: 1001.17

Station / Offset: 1236196.92 T 56.77' Lt.

Northing: 336413.49

Easting: 596862.18

Actual Field Measurement: 6.88 (Existing Grade to T.O.U.)

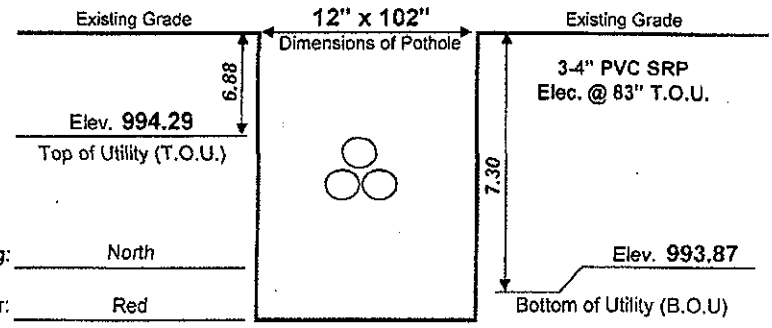
Elev. Top of Utility: 994.29

Actual Field Measurement: 7.30 (Existing Grade to B.O.U.)

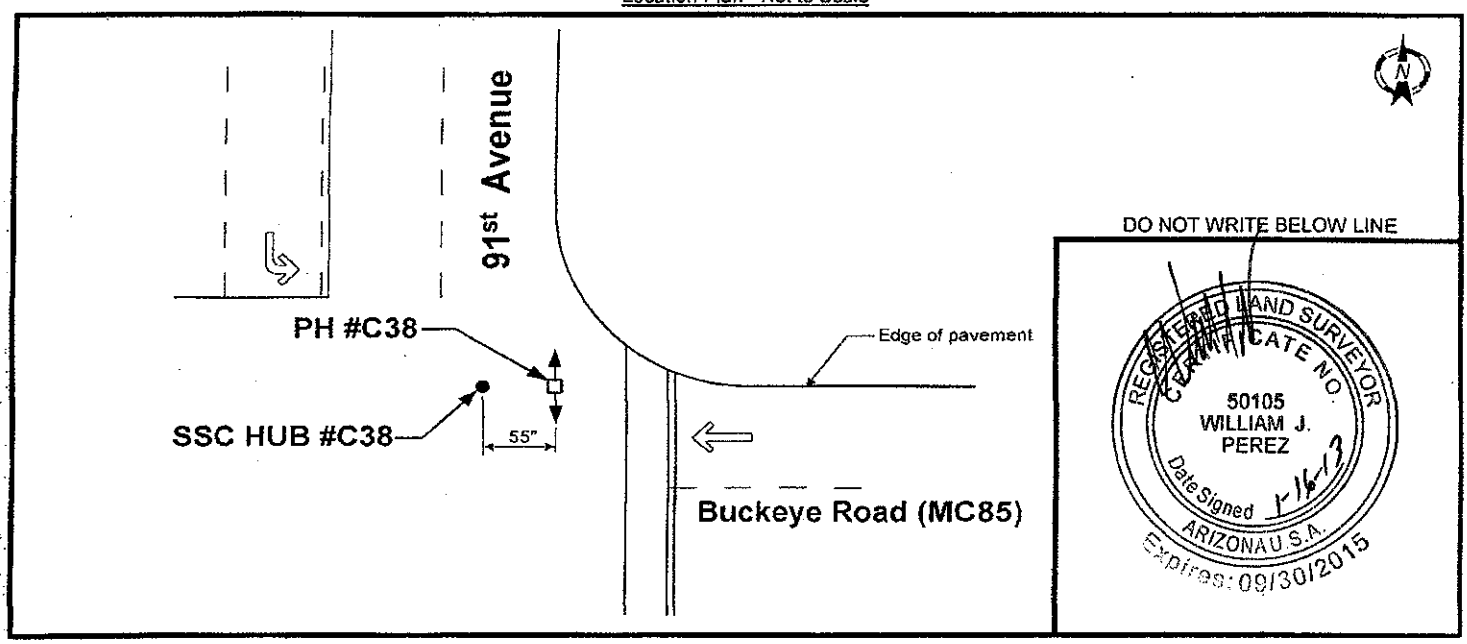
Elev. Bottom of Utility: 993.87

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 14" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C40 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1237+03.13 / 57.68' Lt. | Northing: 336414.97 | Easting: 596869.17 | Elevation: 1001.25

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.25			Station / Offset:	1237+03.13 / 57.68' Lt.
Rod Reading (HUB - Pothole Crew):	5.52	HUB: 5.52	T.O.U.: 12.20	Northing:	336414.97
Height of Instrument (H. I.):	1006.77	G. L.: 5.52	B.O.U.: 12.45	Easting:	596869.17

H. I. :	1006.77	H. I. :	1006.77	H. I. :	1006.77
(-) Rod Read Top Util. (T.O.U.):	12.20	(-) Rod Read Bottom Util. (B.O.U.):	12.45	(-) Rod Read Pothole (G.L.):	5.52
= Elevation Top Utility:	994.57	= Elevation Bottom Utility:	994.32	= Elevation Ground Level:	1001.25

Station / Offset: 1237+03.13 / 57.68' Lt.

Northing: 336414.97

Easting: 596869.17

Actual Field Measurement: 6.68 (Existing Grade to T.O.U.)

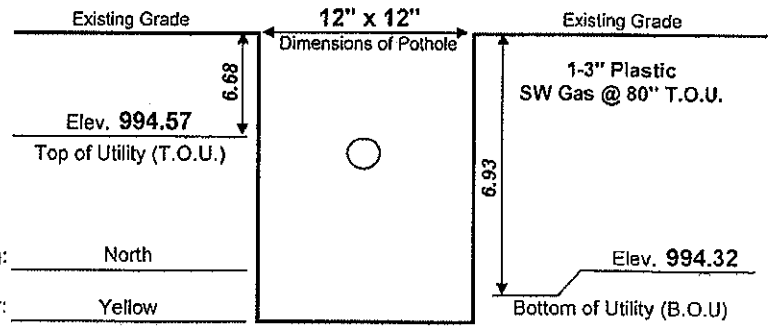
Elev. Top of Utility: 994.57

Actual Field Measurement: 6.93 (Existing Grade to B.O.U.)

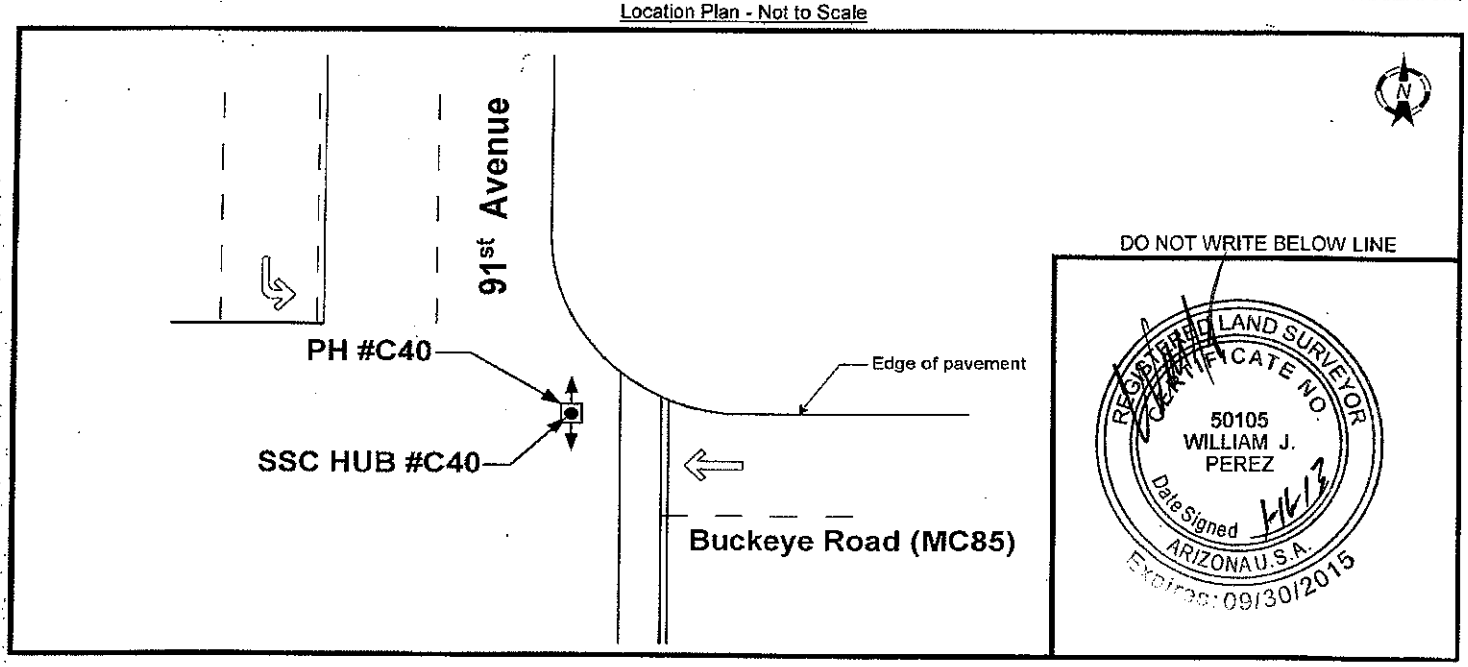
Elev. Bottom of Utility: 994.32

Facing: North

Ribbon Color: Yellow



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR CERTIFICATE NO. 50105 WILLIAM J. PEREZ Date Signed 1/6/13 ARIZONA U.S.A. Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 14" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C41 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1237+07.24 / 57.42' Lt. | Northing: 336414.91 | Easting: 596873.26 | Elevation: 1001.21

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.21					Station / Offset:	1237+07.24 / 57.42' Lt.
Rod Reading (HUB - Pothole Crew):	5.22	HUB:	5.22	T.O.U.:	7.05	Northing:	336414.91
Height of Instrument (H. I.):	1006.43	G. L.:	5.22	B.O.U.:	N/A	Easting:	596873.26

H. I. :	1006.43	H. I. :	1006.43	H. I. :	1006.43
(-) Rod Read Top Util. (T.O.U.):	7.05	(-) Rod Read Bottom Util. (B.O.U.):	N/A	(-) Rod Read Pothole (G.L.):	5.22
= Elevation Top Utility:	999.38	= Elevation Bottom Utility:	N/A	= Elevation Ground Level:	**1001.21**

Station / Offset: 1237+07.24 / 57.42' Lt.

Northing: 336414.91

Easting: 596873.26

Actual Field Measurement: 1.83
(Existing Grade to T.O.U.)

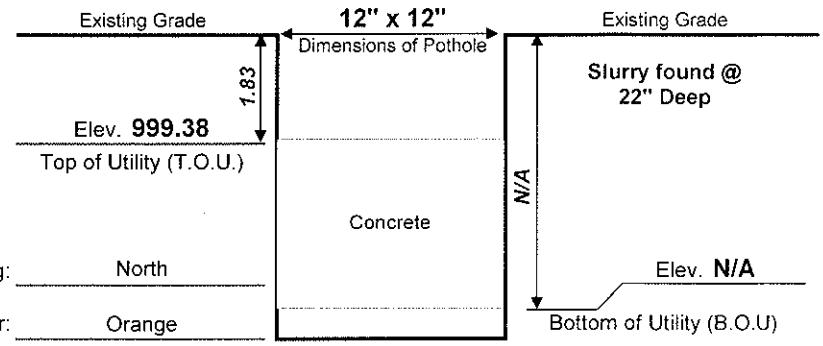
Elev. Top of Utility: 999.38

Actual Field Measurement: N/A
(Existing Grade to B.O.U.)

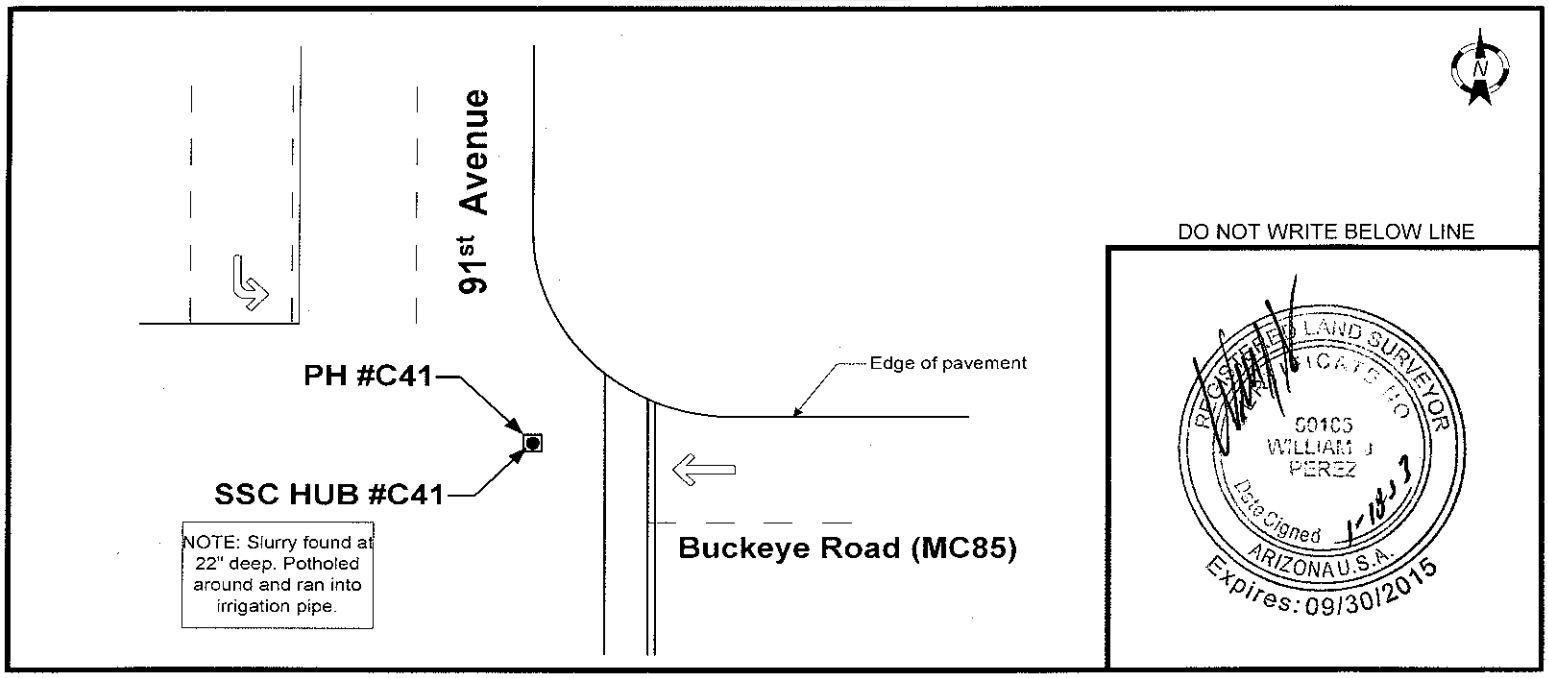
Elev. Bottom of Utility: N/A

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: Remove 14" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C42 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1237+09.07 / 57.33' Lt. | Northing: 336414.91 | Easting: 596875.08 | Elevation: 1001.19

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.19			Station / Offset:	1237+09.07 / 57.33' Lt.
Rod Reading (HUB - Pothole Crew):	5.54	HUB: 5.54	T.O.U.: 10.44	Northing:	336414.91
Height of Instrument (H. I.):	1006.73	G. L.: 5.28	B.O.U.: 10.77	Easting:	596875.08

H. I. :	1006.73	H. I. :	1006.73	H. I. :	1006.73
(-) Rod Read Top Util. (T.O.U.):	10.44	(-) Rod Read Bottom Util. (B.O.U.):	10.77	(-) Rod Read Pothole (G.L.):	5.28
= Elevation Top Utility:	996.29	= Elevation Bottom Utility:	995.96	= Elevation Ground Level:	**1001.45**

Station / Offset: 1237+08.57 / 74.83' Lt.

Northing: 336432.41

Easting: 596874.58

Actual Field Measurement: (Existing Grade to T.O.U.) 5.16

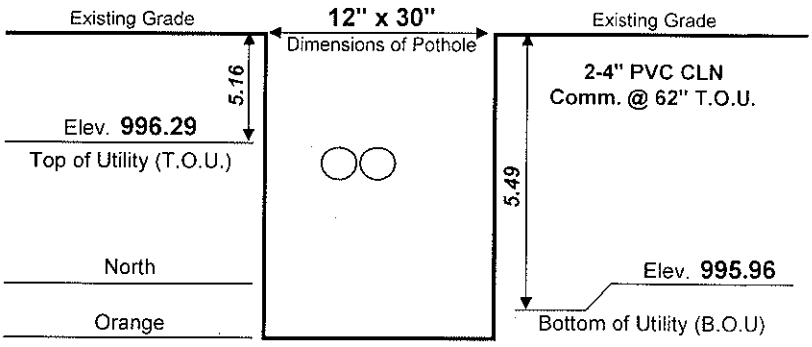
Elev. Top of Utility: 996.29

Actual Field Measurement: (Existing Grade to B.O.U.) 5.49

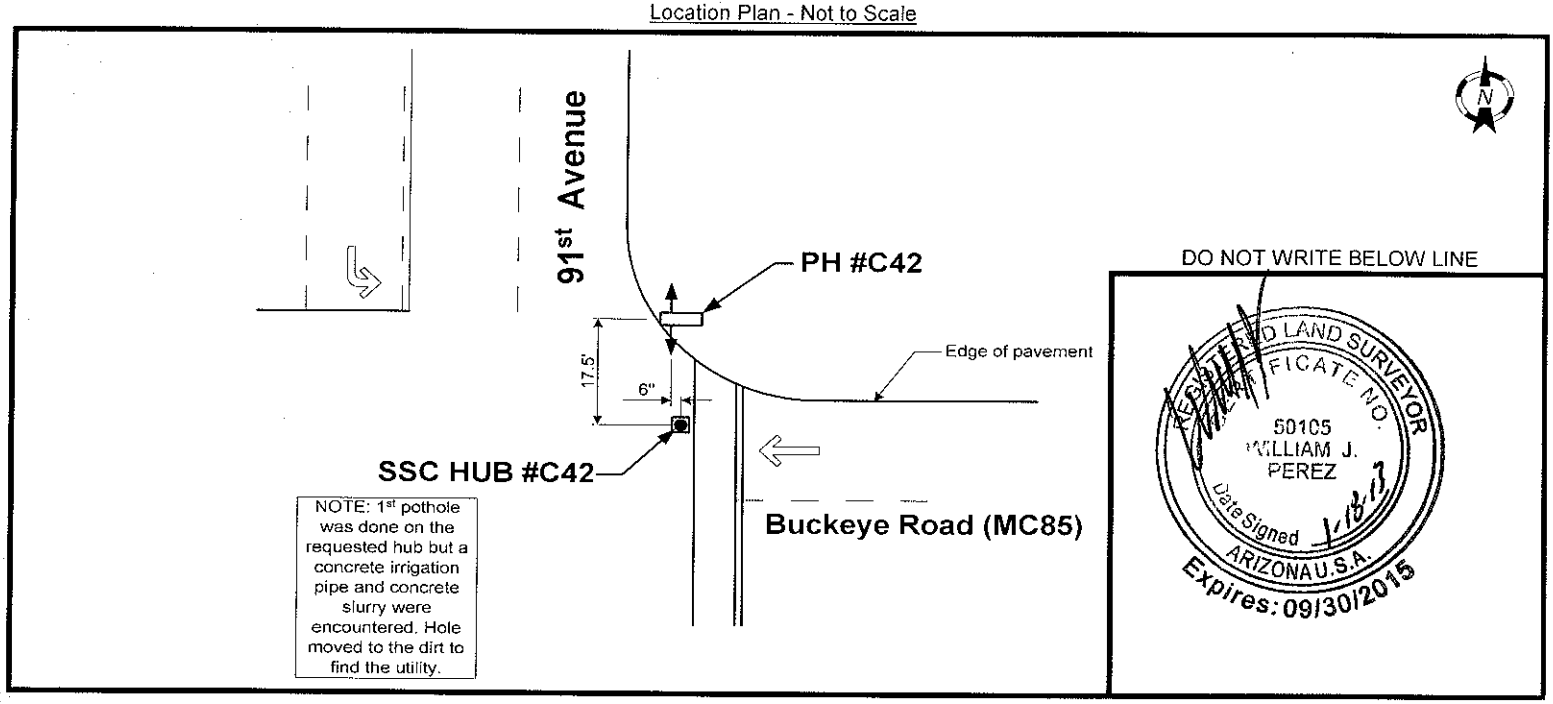
Elev. Bottom of Utility: 995.96

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



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Remarks: 1st pothole was done on requested hub but a concrete irrigation pipe and concrete slurry were encountered. Move north to locate.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C43 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1237+19.12 / 57.39' Lt. | Northing: 336415.47 | Easting: 596885.06 | Elevation: 1001.12

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.12			Station / Offset:	1237+19.12 / 57.39' Lt.
Rod Reading (HUB - Pothole Crew):	5.68	HUB: 5.68	T.O.U.: 7.88	Northing:	336415.47
Height of Instrument (H. I.):	1006.80	G. L.: 5.71	B.O.U.: 8.05	Easting:	596885.06

H. I. :	1006.80	H. I. :	1006.80	H. I. :	1006.80
(-) Rod Read Top Util. (T.O.U.):	7.88	(-) Rod Read Bottom Util. (B.O.U.):	8.05	(-) Rod Read Pothole (G.L.):	5.71
= Elevation Top Utility:	998.92	= Elevation Bottom Utility:	998.75	= Elevation Ground Level:	1001.09

Station / Offset: 1237+18.12 / 57.39' Lt.

Northing: 336415.47

Easting: 596884.06

Actual Field Measurement: 2.17
(Existing Grade to T.O.U.)

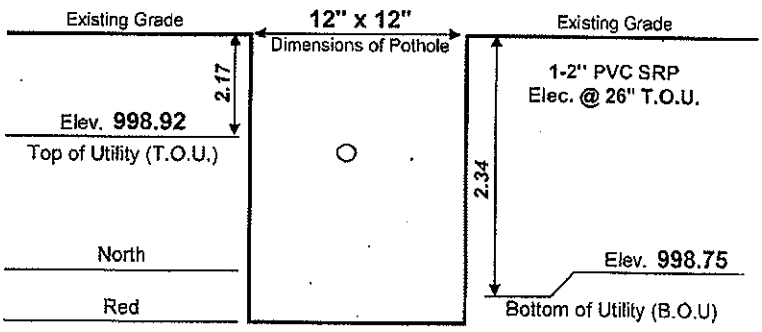
Elev. Top of Utility: 998.92

Actual Field Measurement: 2.34
(Existing Grade to B.O.U.)

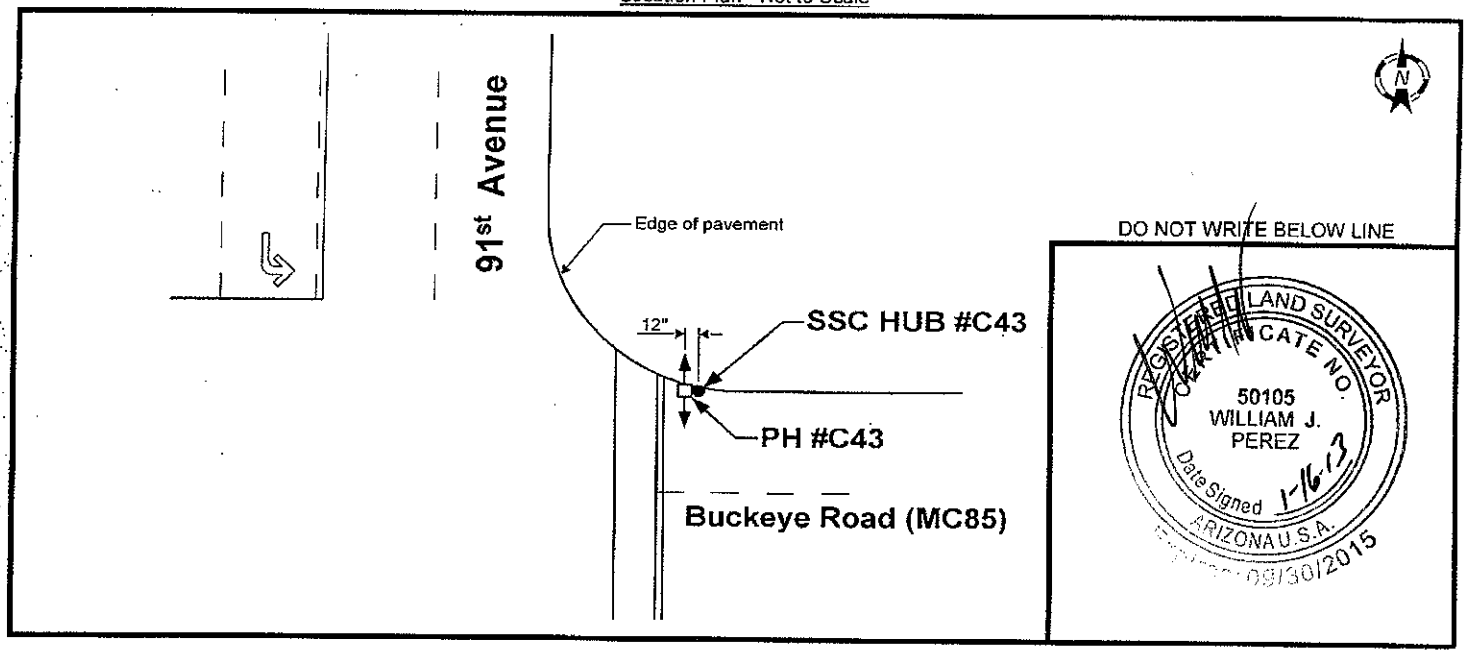
Elev. Bottom of Utility: 998.75

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
08/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: Remove 12" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. C44 | Date Dug: 01/03/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

City of Tolleson

Size / Type: Water

Station / Offset: 1237+38.89 / 62.40' Lt. | Northing: 336421.49 | Easting: 596904.42 | Elevation: 1001.67

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.67			Station / Offset:	1237+38.89 / 62.40' Lt.
Rod Reading (HUB - Pothole Crew):	5.12	HUB: 5.12	T.O.U.: 7.86	Northing:	336421.49
Height of Instrument (H. I.):	1006.79	G. L.: 5.12	B.O.U.: 10.36	Easting:	596904.42

H. I. :	1006.79	H. I. :	1006.79	H. I. :	1006.79
(-) Rod Read Top Util. (T.O.U.):	7.86	(-) Rod Read Bottom Util. (B.O.U.):	10.36	(-) Rod Read Pothole (G.L.):	5.12
= Elevation Top Utility:	998.93	= Elevation Bottom Utility:	996.43	= Elevation Ground Level:	**1001.67**

Station / Offset: 1237+38.89 / 62.40' Lt.

Northing: 336421.49

Easting: 596904.42

Actual Field Measurement: 2.74
(Existing Grade to T.O.U.)

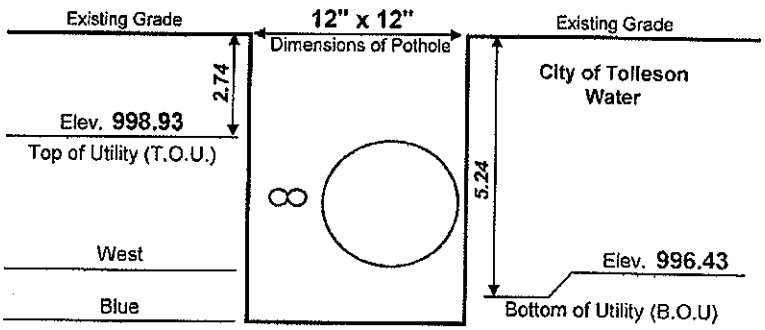
Elev. Top of Utility: 998.93

Actual Field Measurement: 5.24
(Existing Grade to B.O.U.)

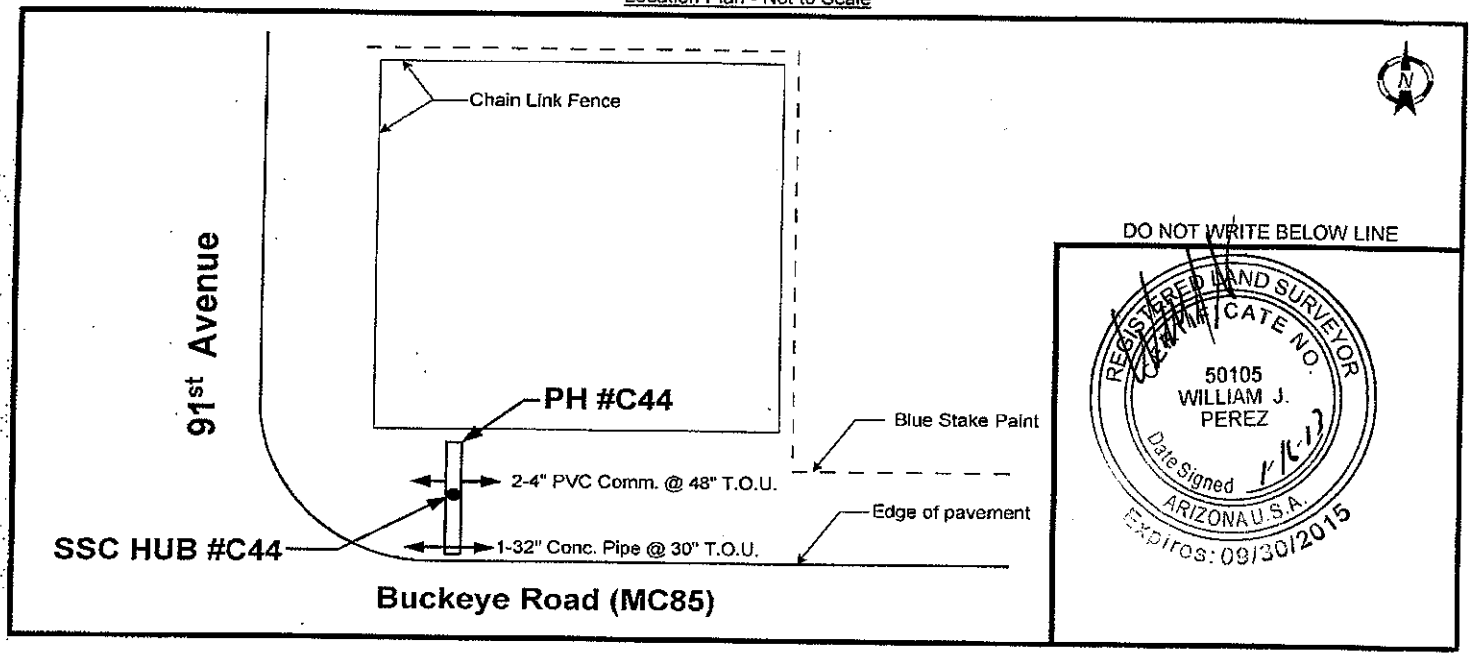
Elev. Bottom of Utility: 996.43

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub. COT Water was not found. Per Blue Stake, the water turns north on the east side of the fence.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D02 | Date Dug: 01/03/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Water

Station / Offset: 1242+25.24 / 72.57' Lt. | Northing: 336469.09 | Easting: 597385.13 | Elevation: 1002.60

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1002.60			Station / Offset:	1242+25.24 / 72.57' Lt.
Rod Reading (HUB - Pothole Crew):	4.20	HUB: 4.20	T.O.U.: 9.54	Northing:	336469.09
Height of Instrument (H. I.):	1006.80	G. L.: 4.31	B.O.U.: 10.71	Easting:	597385.13

H. I. :	1006.80	H. I. :	1006.80	H. I. :	1006.80
(-) Rod Read Top Util. (T.O.U.):	9.54	(-) Rod Read Bottom Util. (B.O.U.):	10.71	(-) Rod Read Pothole (G.L.):	4.31
= Elevation Top Utility:	997.26	= Elevation Bottom Utility:	996.09	= Elevation Ground Level:	1002.49

Station / Offset: 1242+25.24 / 72.57' Lt.

Northing: 336469.09

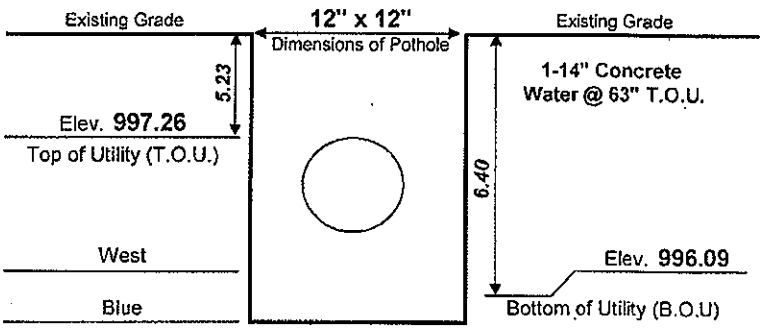
Easting: 597385.13

Actual Field Measurement: 5.23
(Existing Grade to T.O.U.)
Elev. Top of Utility: 997.26

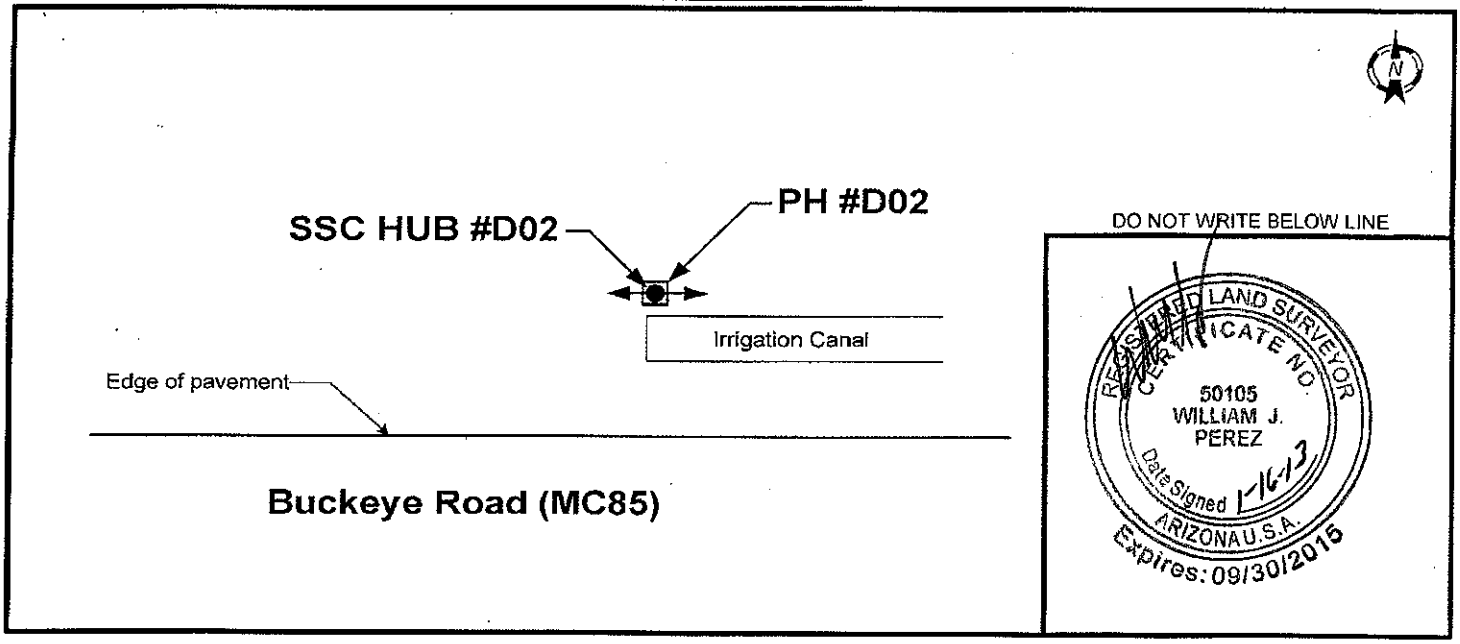
Actual Field Measurement: 6.40
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 996.09

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D04 | Date Dug: 01/03/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Water

Station / Offset: 1248+84.25 / 58.61' Lt. | Northing: 336534.86 | Easting: 598040.01 | Elevation: 1004.14

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1004.14			Station / Offset:	1248+84.25 / 58.61' Lt.
Rod Reading (HUB - Pothole Crew):	5.73	HUB:	5.73	T.O.U.:	11.28	Northing:	336534.86
Height of Instrument (H. I.):	1009.87	G. L.:	5.65	B.O.U.:	12.45	Easting:	598040.01

H. I. :	1009.87	H. I. :	1009.87	H. I. :	1009.87
(-) Rod Read Top Util. (T.O.U.):	11.28	(-) Rod Read Bottom Util. (B.O.U.):	12.45	(-) Rod Read Pothole (G.L.):	5.65
= Elevation Top Utility:	998.59	= Elevation Bottom Utility:	997.42	= Elevation Ground Level:	**1004.22**

Station / Offset: 1248+84.25 / 56.11' Lt.

Northing: 336532.36

Easting: 598040.01

Actual Field Measurement: (Existing Grade to T.O.U.) 5.63

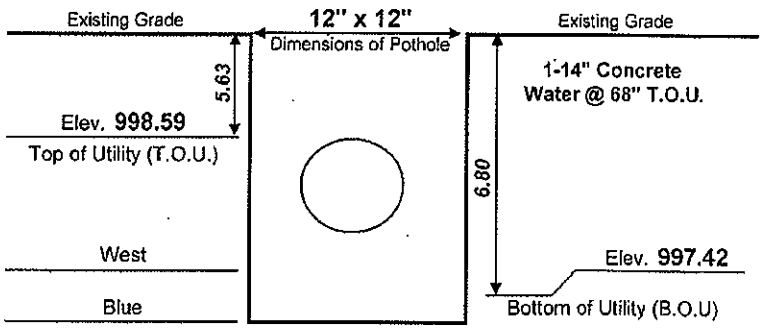
Elev. Top of Utility: 998.59

Actual Field Measurement: (Existing Grade to B.O.U.) 6.80

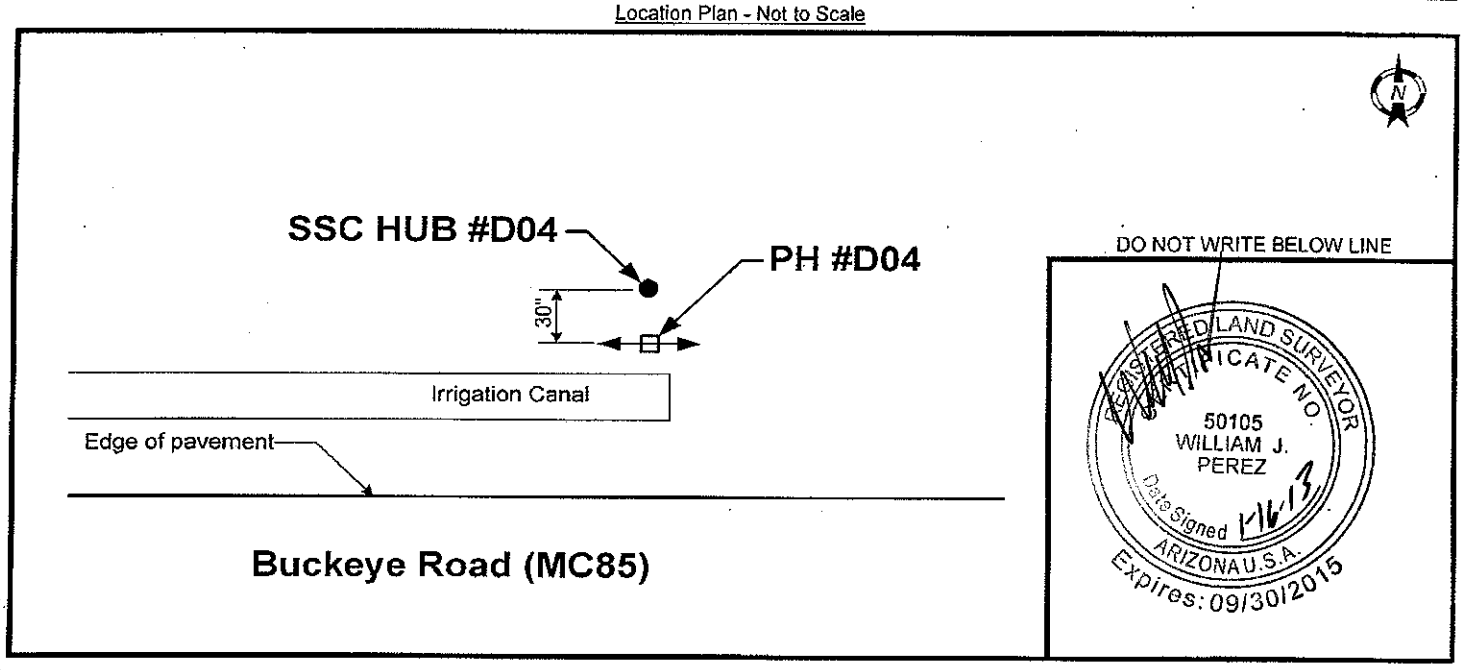
Elev. Bottom of Utility: 997.42

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D06 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1248+95.30 / 33.25' Lt. | Northing: 336510.93 | Easting: 598053.91 | Elevation: 1003.48

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1003.48					Station / Offset:	1248+95.30 / 33.25' Lt.
Rod Reading (HUB - Pothole Crew):	5.15	HUB:	5.15	T.O.U.:	10.37	Northing:	336510.93
Height of Instrument (H. I.):	1008.63	G. L.:	5.15	B.O.U.:	11.20	Easting:	598053.91

H. I. :	1008.63	H. I. :	1008.63	H. I. :	1008.63
(-) Rod Read Top Util. (T.O.U.):	10.37	(-) Rod Read Bottom Util. (B.O.U.):	11.20	(-) Rod Read Pothole (G.L.):	5.15
= Elevation Top Utility:	998.26	= Elevation Bottom Utility:	997.43	= Elevation Ground Level:	**1003.48**

Station / Offset: 1248+95.30 / 31.33' Lt.

Northing: 336509.01

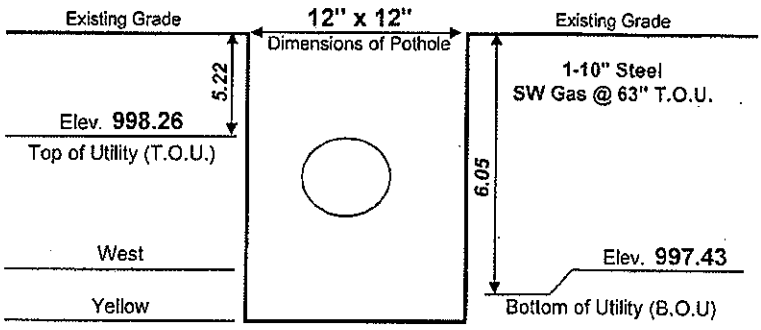
Easting: 598053.91

Actual Field Measurement: 5.22
(Existing Grade to T.O.U.)
Elev. Top of Utility: 998.26

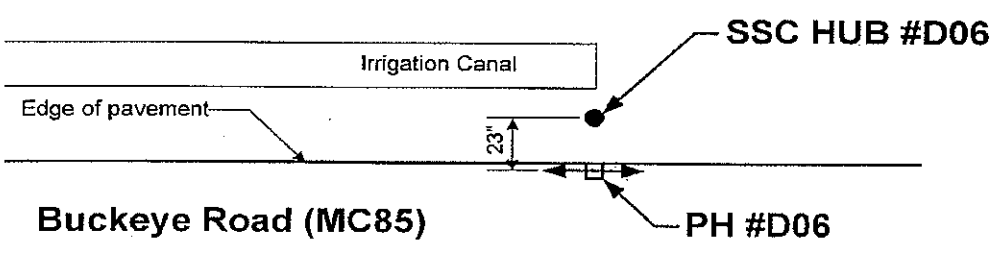
Actual Field Measurement: 6.05
(Existing Grade to B.O.U.)
Elev. Bottom of Utility: 997.43

Facing: West

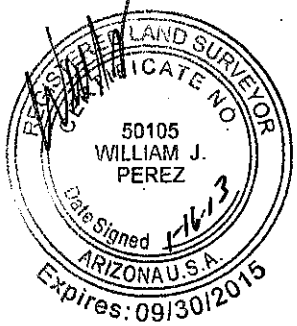
Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D08 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1287+97.81 / 94.27' Rt. | Northing: 336729.90 | Easting: 601947.55 | Elevation: 1006.98

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.98			Station / Offset:	1287+97.81 / 94.27' Rt.
Rod Reading (HUB - Pothole Crew):	6.01	HUB: 6.01	T.O.U.: 10.02	Northing:	336729.90
Height of Instrument (H. I.):	1012.99	G. L.: 6.01	B.O.U.: 10.35	Easting:	601947.55

H. I. :	1012.99	H. I. :	1012.99	H. I. :	1012.99
(-) Rod Read Top Util. (T.O.U.):	10.02	(-) Rod Read Bottom Util. (B.O.U.):	10.35	(-) Rod Read Pothole (G.L.):	6.01
= Elevation Top Utility:	1002.97	= Elevation Bottom Utility:	1002.64	= Elevation Ground Level:	1006.98

Station / Offset: 1287+96.81 / 94.27' Rt.

Northing: 336729.90

Easting: 601946.55

Actual Field Measurement: 4.01
(Existing Grade to T.O.U.)

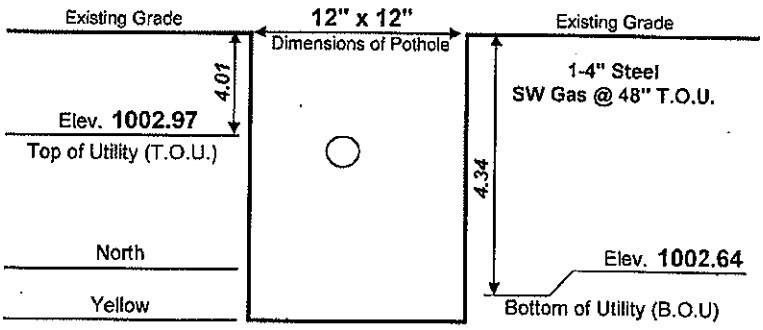
Elev. Top of Utility: 1002.97

Actual Field Measurement: 4.34
(Existing Grade to B.O.U.)

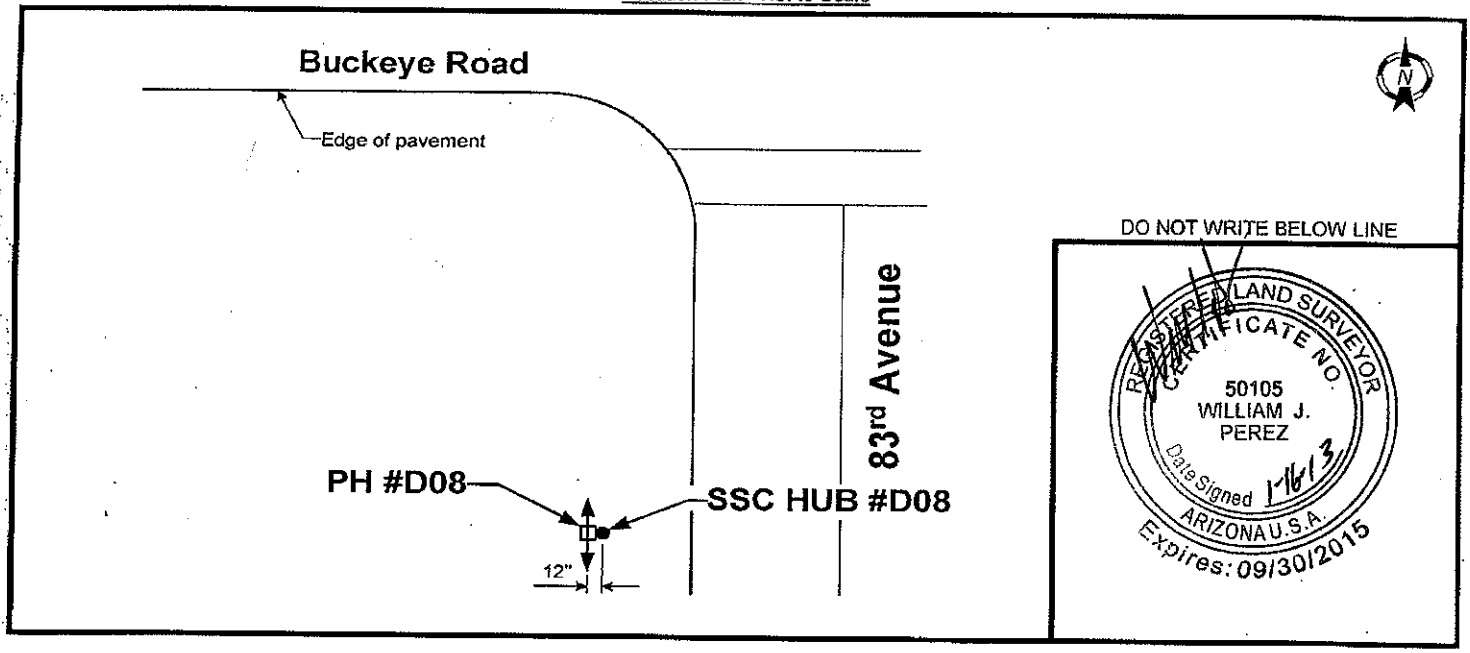
Elev. Bottom of Utility: 1002.64

Facing: North

Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D09 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1288+05.60 / 94.51' Rt. | Northing: 336729.94 | Easting: 601955.30 | Elevation: 1007.21

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.21			Station / Offset:	1288+05.60 / 94.51' Rt.
Rod Reading (HUB - Pothole Crew):	5.82	HUB:	5.82	T.O.U.: 9.35	Northing: 336729.94
Height of Instrument (H. I.):	1013.03	G. L.:	5.82	B.O.U.: 10.02	Easting: 601955.30

H. I. :	1013.03	H. I. :	1013.03	H. I. :	1013.03
(-) Rod Read Top Util. (T.O.U.):	9.35	(-) Rod Read Bottom Util. (B.O.U.):	10.02	(-) Rod Read Pothole (G.L.):	5.82
= Elevation Top Utility:	1003.68	= Elevation Bottom Utility:	1003.01	= Elevation Ground Level:	1007.21

Station / Offset: 1288+00.14 / 94.51' Rt.

Northing: 336729.94

Easting: 601949.84

Actual Field Measurement: 3.53 (Existing Grade to T.O.U.)

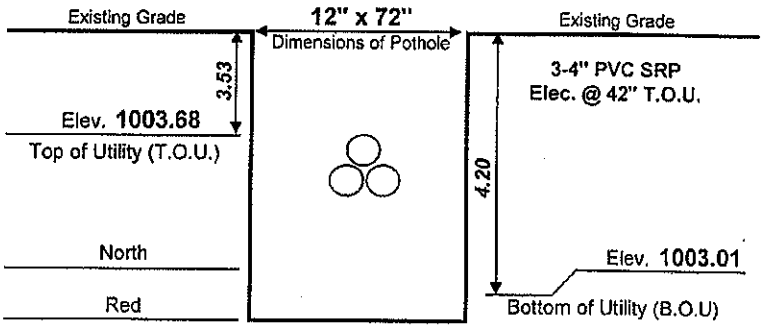
Elev. Top of Utility: 1003.68

Actual Field Measurement: 4.20 (Existing Grade to B.O.U.)

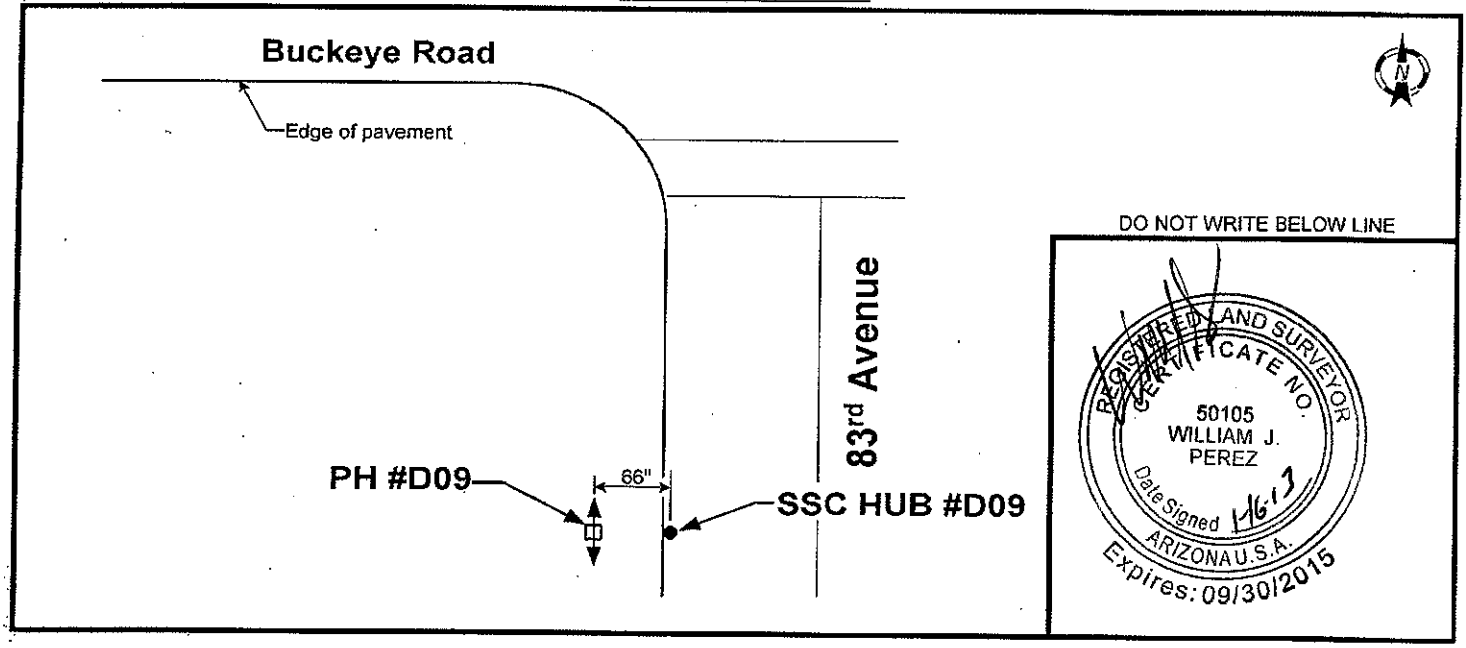
Elev. Bottom of Utility: 1003.01

Facing: North

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D09-A | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SW Gas

Station / Offset: 1288+05.60 / 94.51' Rt. | Northing: 336729.94 | Easting: 601955.30 | Elevation: 1007.21

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.21			Station / Offset:	1288+05.60 / 94.51' Rt.
Rod Reading (HUB - Pothole Crew):	6.00	HUB: 6.00	T.O.U.: 10.65	Northing:	336729.94
Height of Instrument (H. I.):	1013.21	G. L.: 6.00	B.O.U.: 10.98	Easting:	601955.30

H. I. :	1013.21	H. I. :	1013.21	H. I. :	1013.21
(-) Rod Read Top Util. (T.O.U.):	10.65	(-) Rod Read Bottom Util. (B.O.U.):	10.98	(-) Rod Read Pothole (G.L.):	6.00
= Elevation Top Utility:	1002.56	= Elevation Bottom Utility:	1002.23	= Elevation Ground Level:	1007.21

Station / Offset: 1288+03.60 / 94.51' Rt.

Northing: 336729.94

Easting: 601953.30

Actual Field Measurement: 4.65 (Existing Grade to T.O.U.)

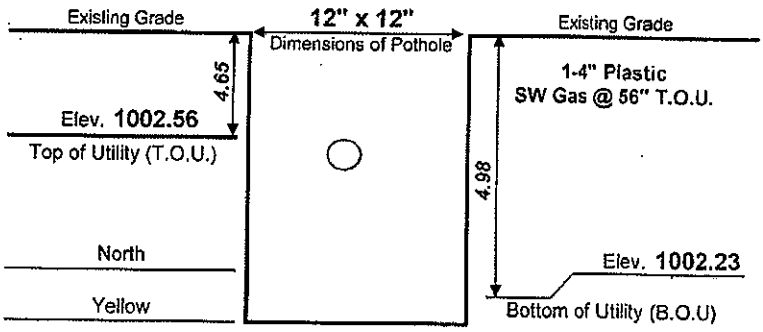
Elev. Top of Utility: 1002.56

Actual Field Measurement: 4.98 (Existing Grade to B.O.U.)

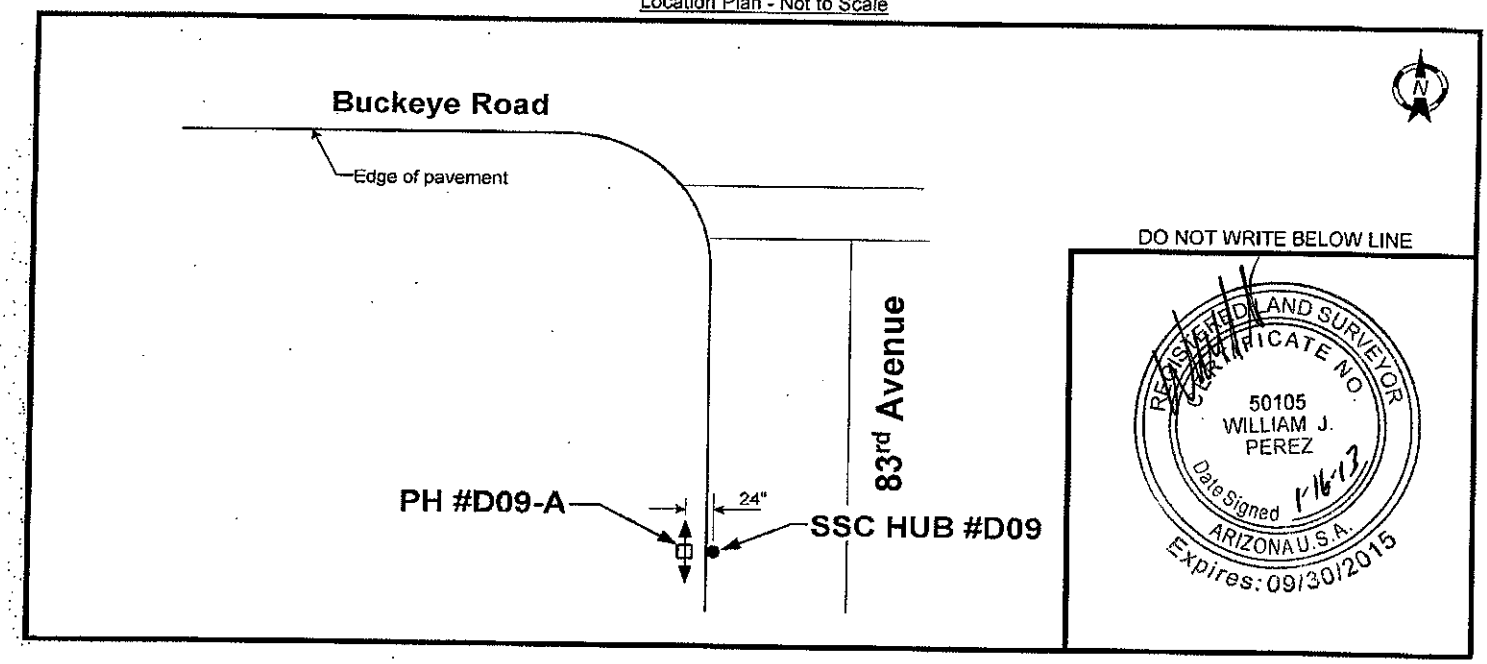
Elev. Bottom of Utility: 1002.23

Facing: North

Ribbon Color: Yellow



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D10 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Water

Station / Offset: 1288+34.65 / 96.46' Rt. | Northing: 336729.00 | Easting: 601984.25 | Elevation: 1007.30

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.30			Station / Offset:	1288+34.65 / 96.46' Rt.
Rod Reading (HUB - Pothole Crew):	5.19	HUB: 5.19	T.O.U.: 9.15	Northing:	336729.00
Height of Instrument (H. I.):	1012.49	G. L.: 5.19	B.O.U.: 10.32	Easting:	601984.25

H. I. :	1012.49	H. I. :	1012.49	H. I. :	1012.49
(-) Rod Read Top Util. (T.O.U.):	9.15	(-) Rod Read Bottom Util. (B.O.U.):	10.32	(-) Rod Read Pothole (G.L.):	5.19
= Elevation Top Utility:	1003.34	= Elevation Bottom Utility:	1002.17	= Elevation Ground Level:	1007.30

Station / Offset: 1288+34.65 / 96.46' Rt.

Northing: 336729.00

Easting: 601984.25

Actual Field Measurement: (Existing Grade to T.O.U.) 3.96

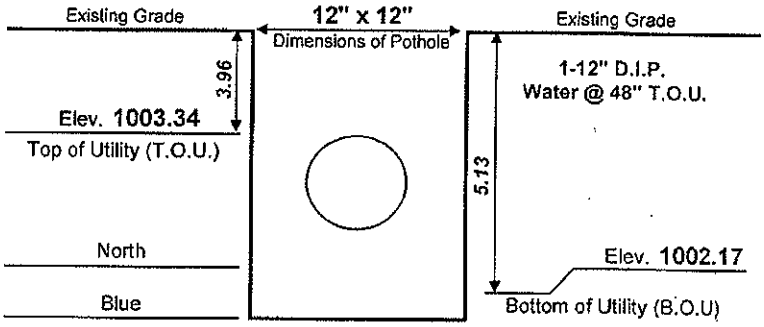
Elev. Top of Utility: 1003.34

Actual Field Measurement: (Existing Grade to B.O.U.) 5.13

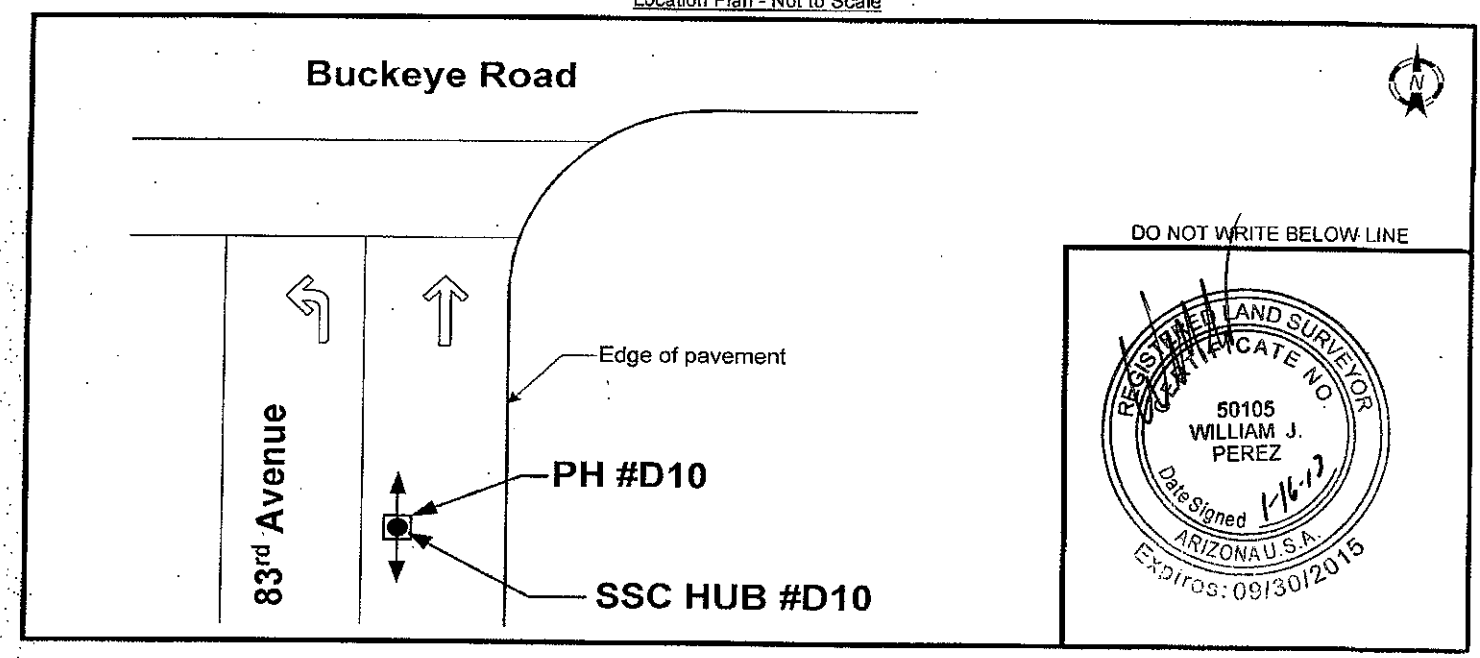
Elev. Bottom of Utility: 1002.17

Facing: North

Ribbon Color: Blue



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D11 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Eric/Arturo

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1288+37.25 / 96.35' Rt. | Northing: 336729.19 | Easting: 601986.83 | Elevation: 1007.25

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): | Station / Offset: 1288+37.25 / 96.35' Rt.

Rod Reading (HUB - Pothole Crew): | HUB: | T.O.U.: | Northing: 336729.19

Height of Instrument (H. I.): | G. L.: | B.O.U.: | Easting: 601986.83

H. I. :	H. I. :	H. I. :
(-) Rod Read Top Util. (T.O.U.):	(-) Rod Read Bottom Util. (B.O.U.):	(-) Rod Read Pothole (G.L.):
= Elevation Top Utility:	= Elevation Bottom Utility:	= Elevation Ground Level:

Station / Offset: 1288+37.25 / 96.35' Rt.

Northing: 336729.19

Easting: 601986.83

Actual Field Measurement: (Existing Grade to T.O.U.)

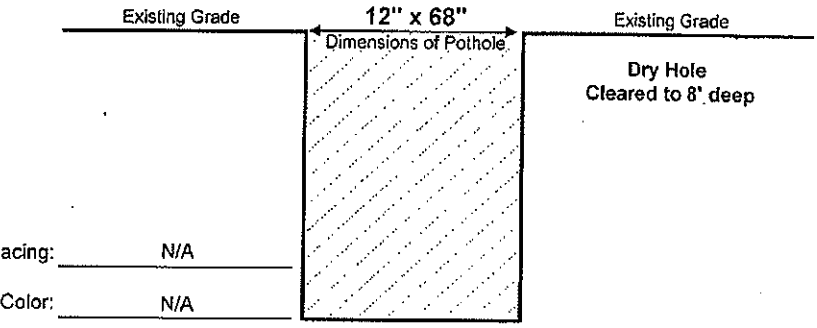
Elev. Top of Utility:

Actual Field Measurement: (Existing Grade to B.O.U.)

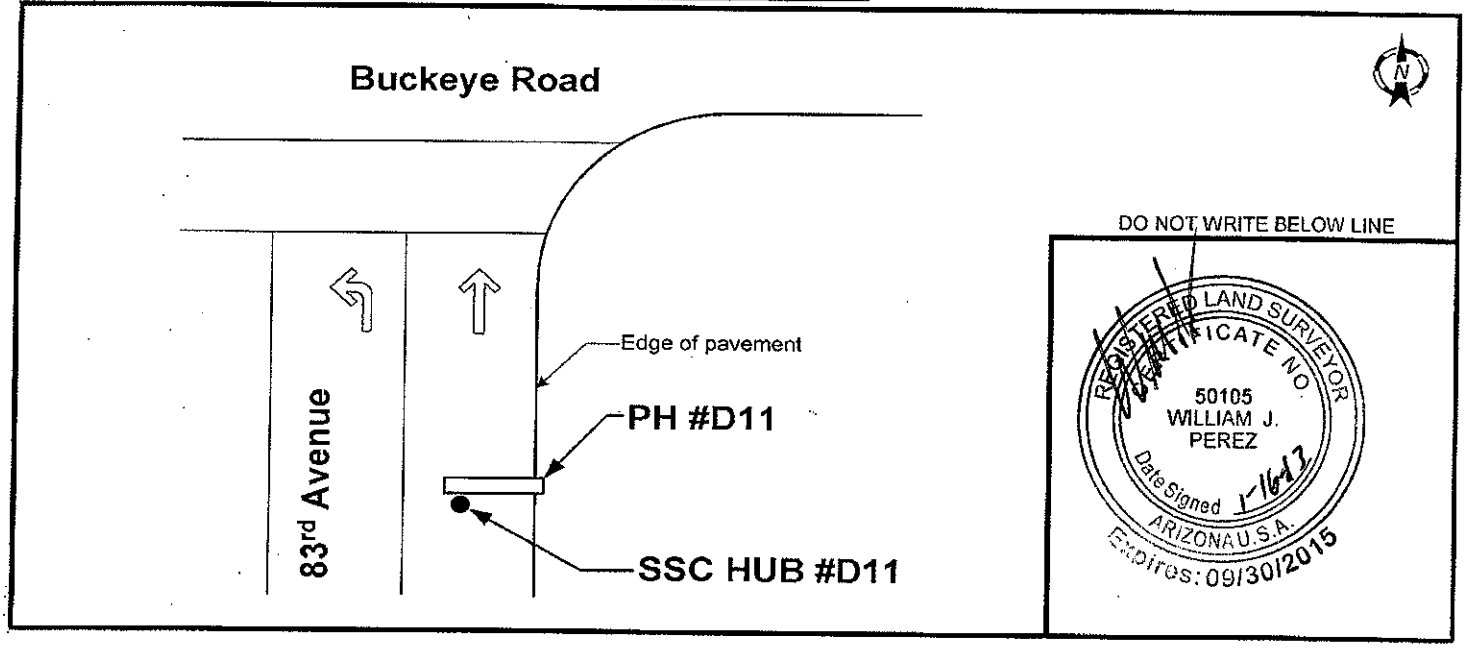
Elev. Bottom of Utility:

Facing: N/A

Ribbon Color: N/A



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub. No Blue Stake, No Valves found

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D12 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 409+01.46 / 43.12' Lt. | Northing: 335750.84 | Easting: 601898.30 | Elevation: 1006.09

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.09					Station / Offset:	409+01.46 / 43.12' Lt.
Rod Reading (HUB - Pothole Crew):	5.70	HUB:	5.70	T.O.U.:	9.92	Northing:	335750.84
Height of Instrument (H. I.):	1011.79	G. L.:	5.54	B.O.U.:	10.42	Easting:	601898.30

H. I. :	1011.79	H. I. :	1011.79	H. I. :	1011.79
(-) Rod Read Top Util. (T.O.U.):	9.92	(-) Rod Read Bottom Util. (B.O.U.):	10.42	(-) Rod Read Pothole (G.L.):	5.54
= Elevation Top Utility:	1001.87	= Elevation Bottom Utility:	1001.37	= Elevation Ground Level:	**1006.25**

Station / Offset: 409+01.46 / 52.62' Lt.

Northing: 335750.84

Easting: 601888.80

Actual Field Measurement: 4.38
(Existing Grade to T.O.U.)

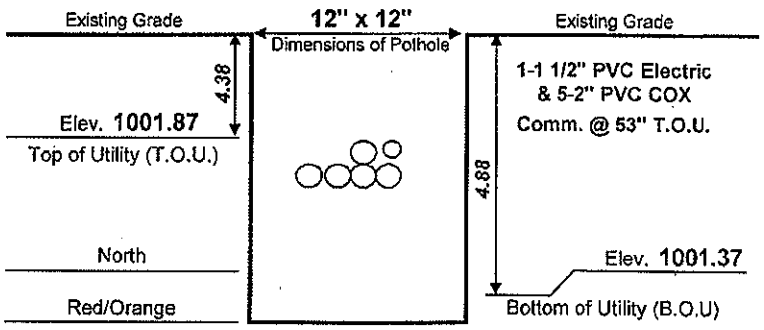
Elev. Top of Utility: 1001.87

Actual Field Measurement: 4.88
(Existing Grade to B.O.U.)

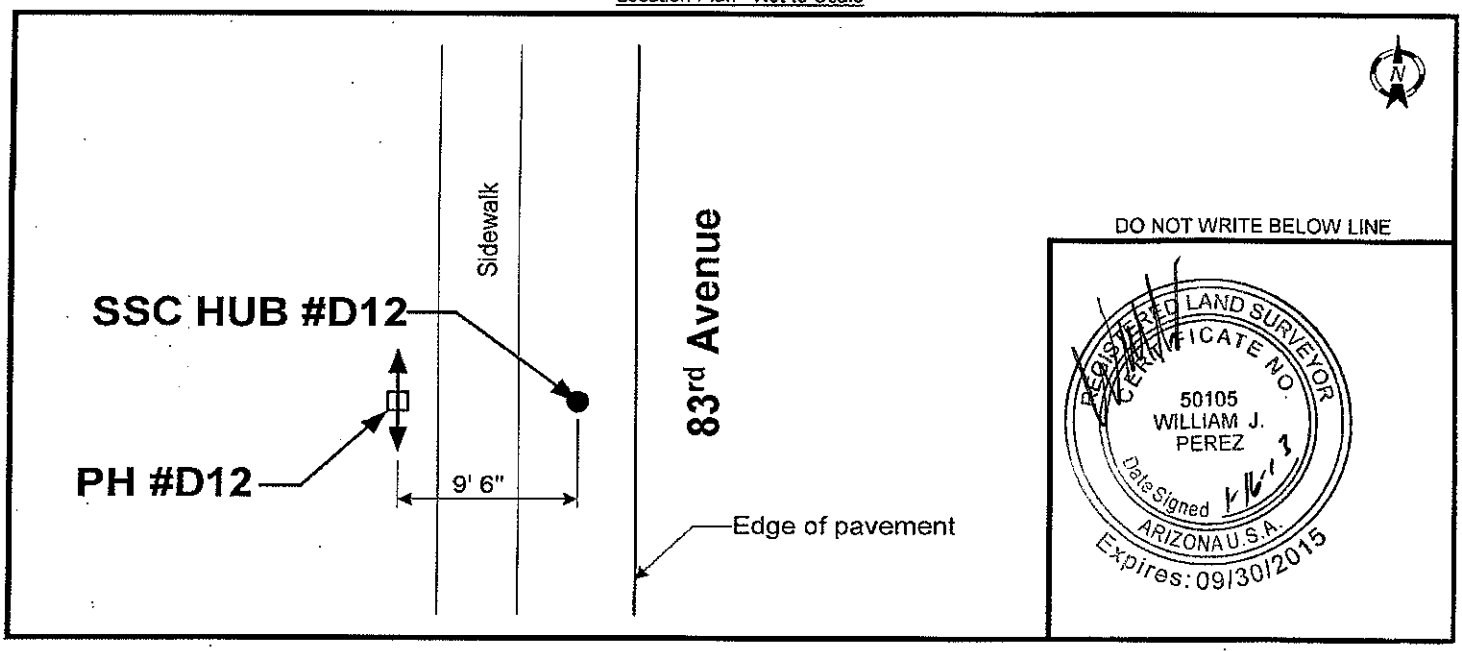
Elev. Bottom of Utility: 1001.37

Facing: North

Ribbon Color: Red/Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. D13 | Date Dug: 12/19/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 411+41.97 / 43.07' Lt. | Northing: 335991.29 | Easting: 601903.87 | Elevation: 1006.32

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.32			Station / Offset:	411+41.97 / 43.07' Lt.
Rod Reading (HUB - Pothole Crew):	5.75	HUB: 5.75	T.O.U.: 9.36	Northing:	335991.29
Height of Instrument (H. I.):	1012.07	G. L.: 5.62	B.O.U.: 9.86	Easting:	601903.87

H. I. :	1012.07	H. I. :	1012.07	H. I. :	1012.07
(-) Rod Read Top Util. (T.O.U.):	9.36	(-) Rod Read Bottom Util. (B.O.U.):	9.86	(-) Rod Read Pothole (G.L.):	5.62
= Elevation Top Utility:	1002.71	= Elevation Bottom Utility:	1002.21	= Elevation Ground Level:	1006.45

Station / Offset: 411+41.97 / 52.07' Lt.

Northing: 335991.29

Easting: 601894.87

Actual Field Measurement: 3.74
(Existing Grade to T.O.U.)

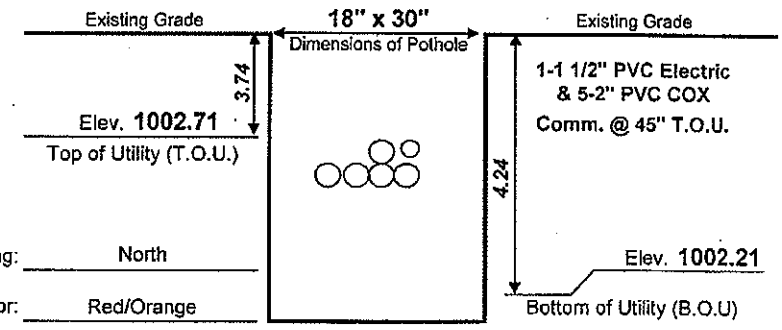
Elev. Top of Utility: 1002.71

Actual Field Measurement: 4.24
(Existing Grade to B.O.U.)

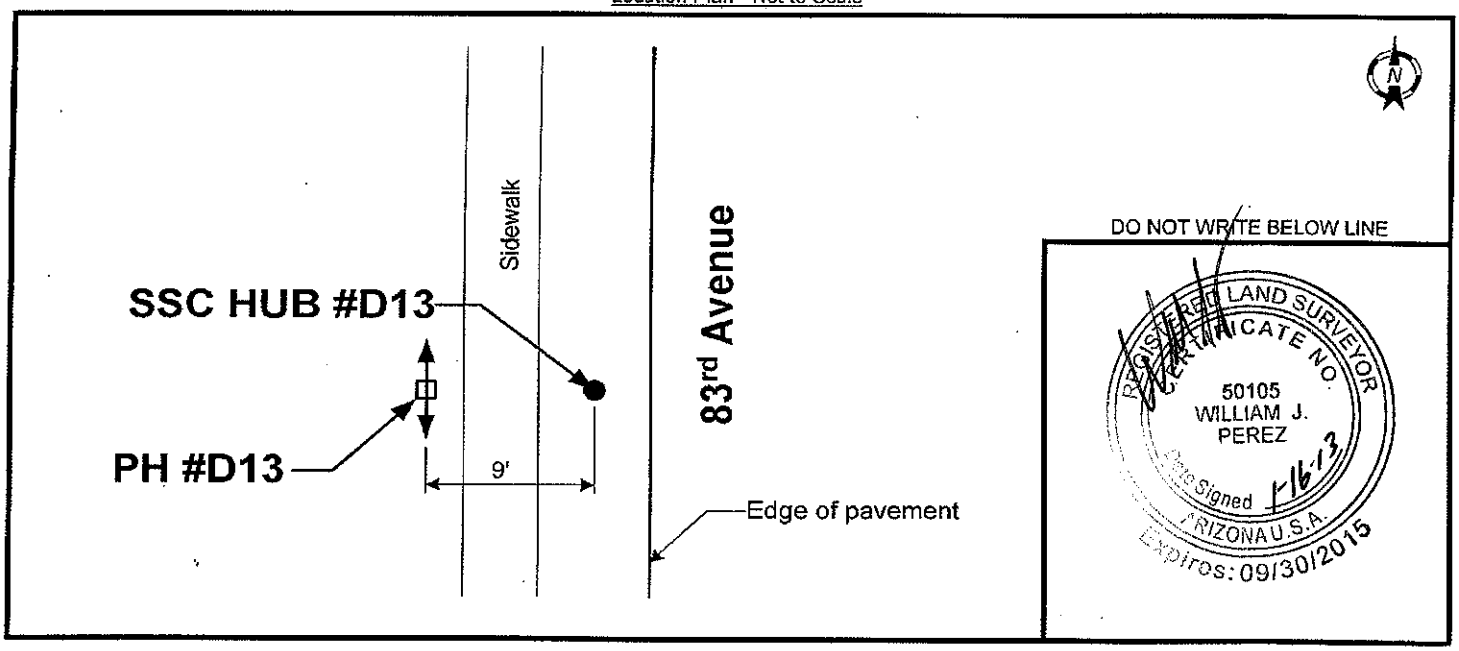
Elev. Bottom of Utility: 1002.21

Facing: North

Ribbon Color: Red/Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E01 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Size / Type: Level 3 Communication

Anticipated Utility Information

Station / Offset: 1289+21.81 / 5.27' Rt. | Northing: 336822.88 | Easting: 602068.24 | Elevation: 1008.52

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1008.52					Station / Offset:	1289+21.81 / 5.27' Rt.
Rod Reading (HUB - Pothole Crew):	5.26	HUB:	5.26	T.O.U.:	10.94	Northing:	336822.88
Height of Instrument (H. I.):	1013.78	G. L.:	5.32	B.O.U.:	11.94	Easting:	602068.24

H. I. :	1013.78	H. I. :	1013.78	H. I. :	1013.78
(-) Rod Read Top Util. (T.O.U.):	10.94	(-) Rod Read Bottom Util. (B.O.U.):	11.94	(-) Rod Read Pothole (G.L.):	5.32
= Elevation Top Utility:	1002.84	= Elevation Bottom Utility:	1001.84	= Elevation Ground Level:	1008.46

Station / Offset: 1289+21.81 / 7.94' Rt.

Northing: 336820.21

Easting: 602068.24

Actual Field Measurement: (Existing Grade to T.O.U.) 5.62

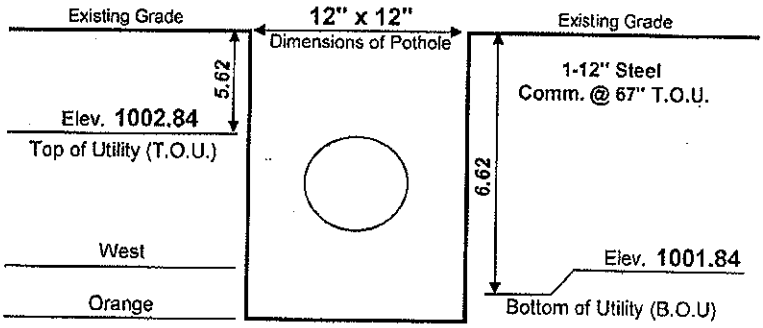
Elev. Top of Utility: 1002.84

Actual Field Measurement: (Existing Grade to B.O.U.) 6.62

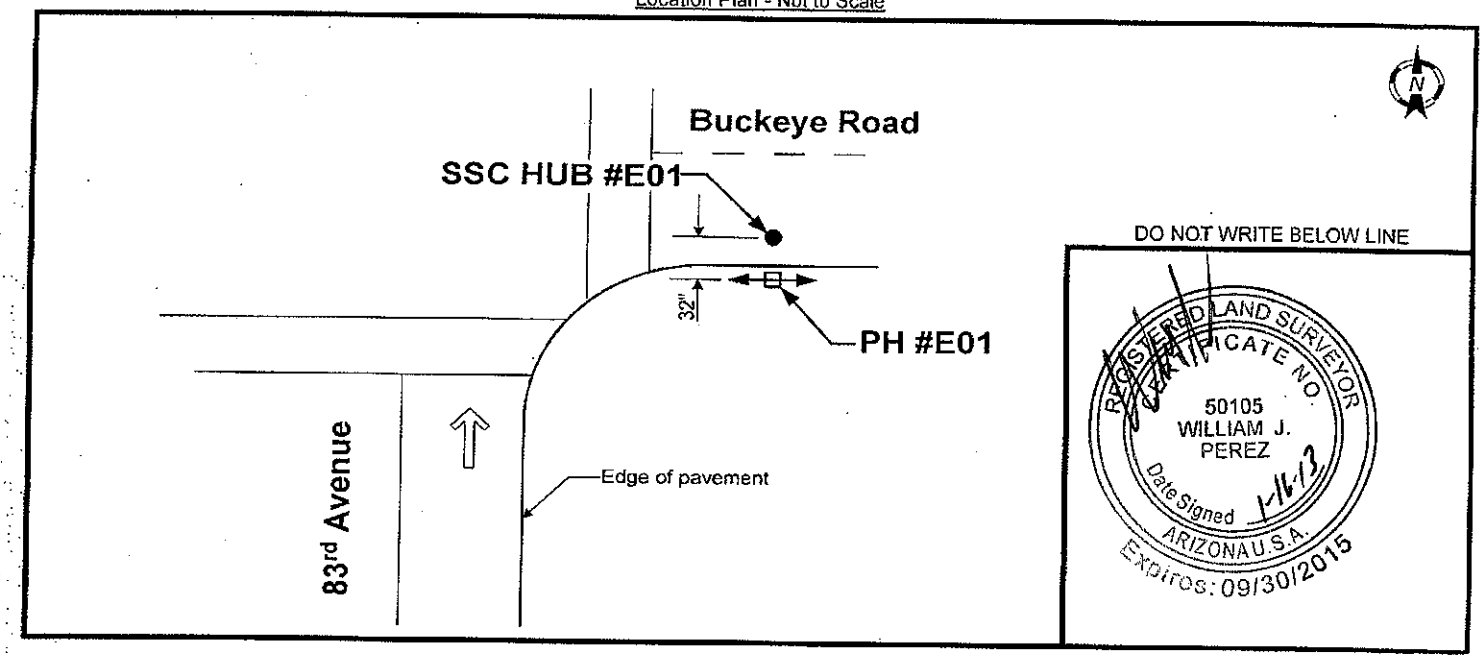
Elev. Bottom of Utility: 1001.84

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E02 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1289+20.93 / 9.76' Rt. | Northing: 336818.37 | Easting: 602067.49 | Elevation: 1008.39

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1008.39					Station / Offset:	1289+20.93 / 9.76' Rt.
Rod Reading (HUB - Pothole Crew):	5.42	HUB:	5.42	T.O.U.:	9.14	Northing:	336818.37
Height of Instrument (H. I.):	1013.81	G. L.:	5.42	B.O.U.:	9.89	Easting:	602067.49

H. I. :	1013.81	H. I. :	1013.81	H. I. :	1013.81
(-) Rod Read Top Util. (T.O.U.):	9.14	(-) Rod Read Bottom Util. (B.O.U.):	9.89	(-) Rod Read Pothole (G.L.):	5.42
= Elevation Top Utility:	1004.67	= Elevation Bottom Utility:	1003.92	= Elevation Ground Level:	1008.39

Station / Offset: 1289+20.93 / 11.26' Rt.

Northing: 336816.87

Easting: 602067.49

Actual Field Measurement: (Existing Grade to T.O.U.) 3.72

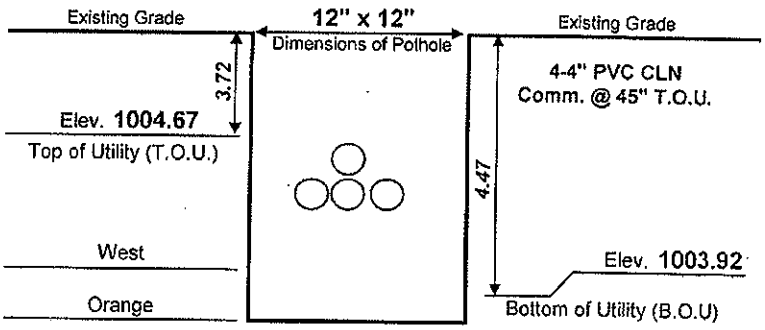
Elev. Top of Utility: 1004.67

Actual Field Measurement: (Existing Grade to B.O.U.) 4.47

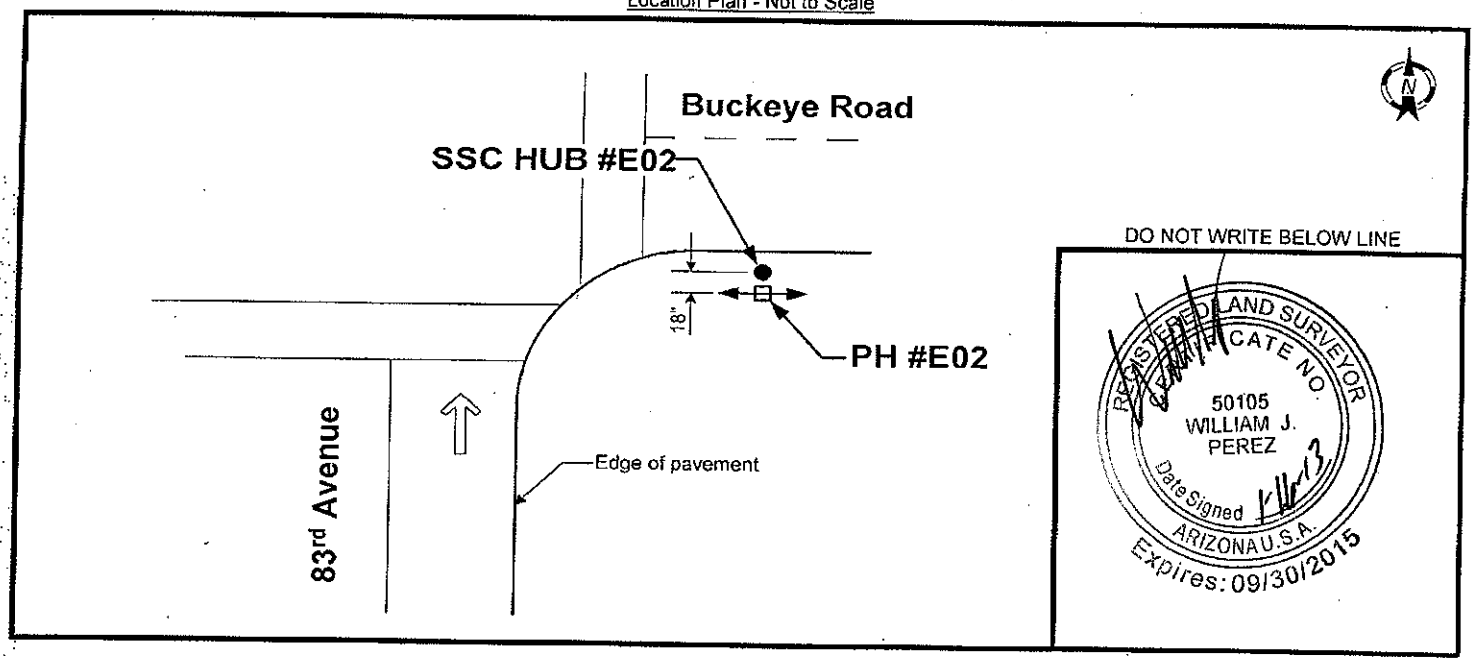
Elev. Bottom of Utility: 1003.92

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E02-A | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1289+20.93 / 9.76' Rt. | Northing: 336818.37 | Easting: 602067.49 | Elevation: 1008.39

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1008.39			Station / Offset:	1289+20.93 / 9.76' Rt.
Rod Reading (HUB - Pothole Crew):	5.42	HUB: 5.42	T.O.U.: 7.78	Northing:	336818.37
Height of Instrument (H. I.):	1013.81	G. L.: 5.42	B.O.U.: 7.91	Easting:	602067.49

H. I. :	1013.81	H. I. :	1013.81	H. I. :	1013.81
(-) Rod Read Top Util. (T.O.U.):	7.78	(-) Rod Read Bottom Util. (B.O.U.):	7.91	(-) Rod Read Pothole (G.L.):	5.42
= Elevation Top Utility:	1006.03	= Elevation Bottom Utility:	1005.90	= Elevation Ground Level:	1008.39

Station / Offset: 1289+20.93 / 9.76' Rt.

Northing: 336818.37

Easting: 602067.49

Actual Field Measurement: 2.36 (Existing Grade to T.O.U.)

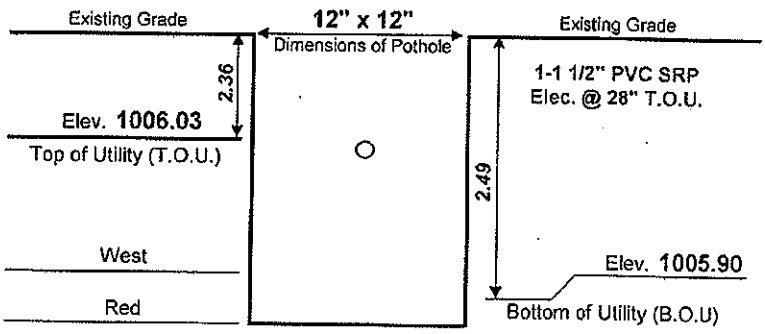
Elev. Top of Utility: 1006.03

Actual Field Measurement: 2.49 (Existing Grade to B.O.U.)

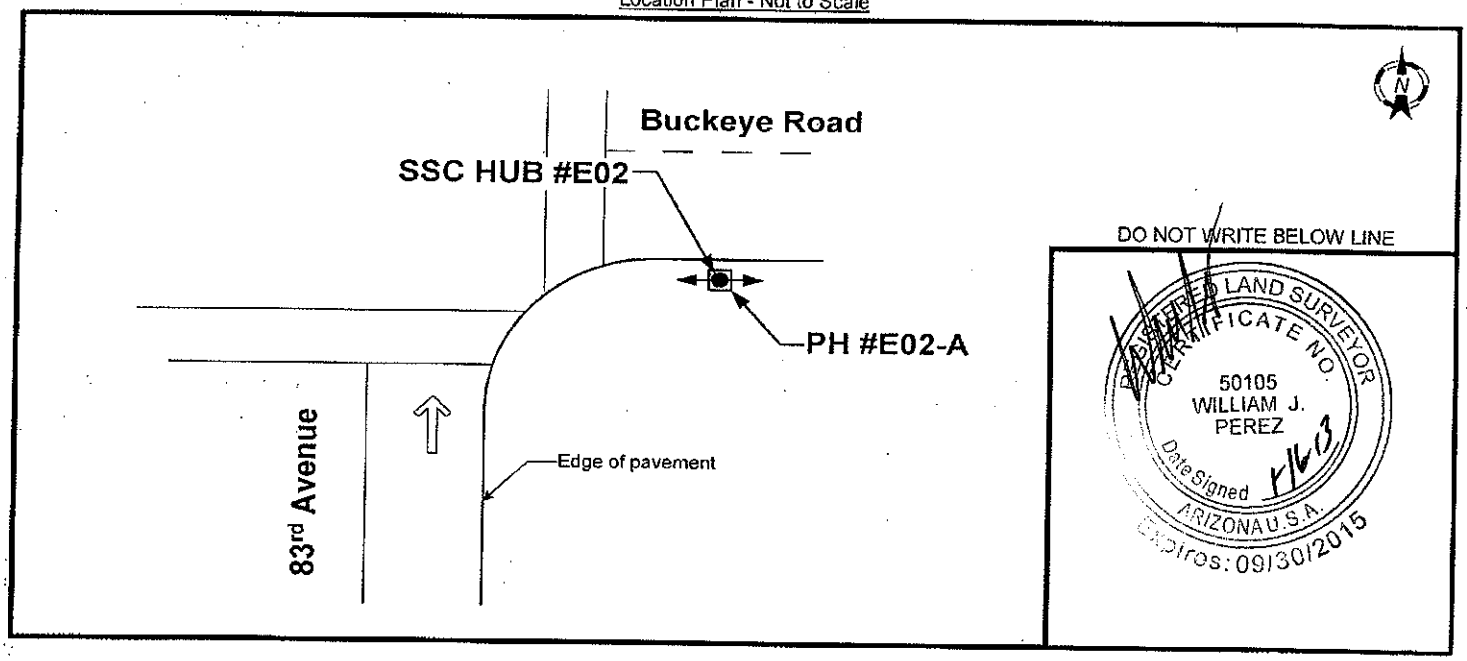
Elev. Bottom of Utility: 1005.90

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E03 | Date Dug: 01/07/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Southwest Gas

Station / Offset: 1289+23.91 / 41.22' Lt. | Northing: 336869.41 | Easting: 602068.99 | Elevation: 1009.19

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1009.19					Station / Offset:	1289+23.91 / 41.22' Lt.
Rod Reading (HUB - Pothole Crew):	5.30	HUB:	5.30	T.O.U.:	10.70	Northing:	336869.41
Height of Instrument (H. I.):	1014.49	G. L.:	5.31	B.O.U.:	11.53	Easting:	602068.99

H. I. :	1014.49	H. I. :	1014.49	H. I. :	1014.49
(-) Rod Read Top Util. (T.O.U.):	10.70	(-) Rod Read Bottom Util. (B.O.U.):	11.53	(-) Rod Read Pothole (G.L.):	5.31
= Elevation Top Utility:	1003.79	= Elevation Bottom Utility:	1002.96	= Elevation Ground Level:	**1009.18**

Station / Offset: 1289+23.91 / 40.22' Lt.

Northing: 336868.41

Easting: 602068.99

Actual Field Measurement: (Existing Grade to T.O.U.) 5.39

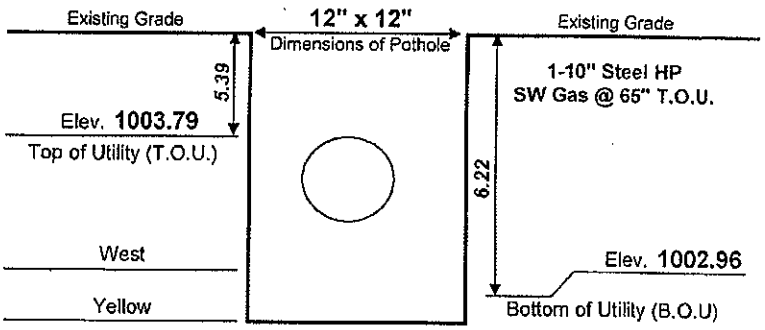
Elev. Top of Utility: 1003.79

Actual Field Measurement: (Existing Grade to B.O.U.) 6.22

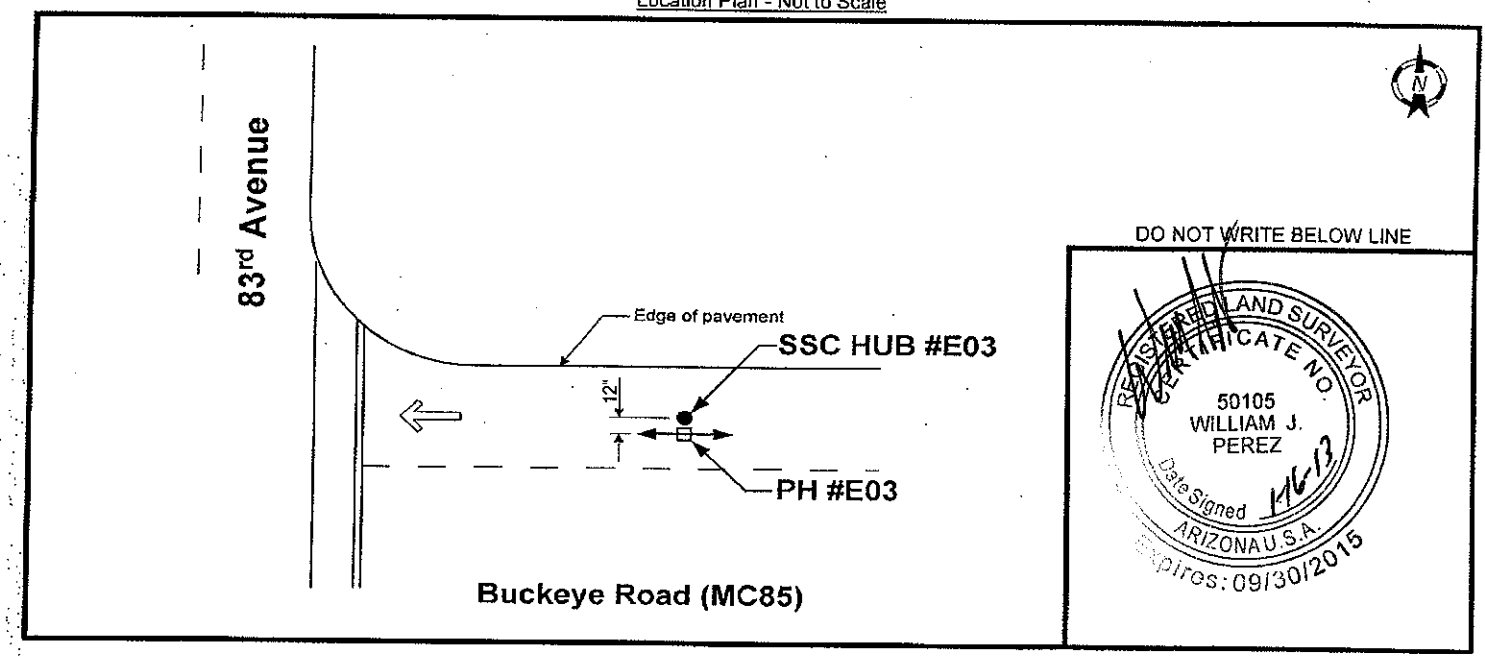
Elev. Bottom of Utility: 1002.96

Facing: West

Ribbon Color: Yellow



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E05 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Sewer

Station / Offset: 1289+31.58 / 77.97' Lt. | Northing: 336906.37 | Easting: 602075.62 | Elevation: 1006.96

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.96					Station / Offset:	1289+31.58 / 77.97' Lt.
Rod Reading (HUB - Pothole Crew):	6.82	HUB:	6.82	T.O.U.:	13.26	Northing:	336906.37
Height of Instrument (H. I.):	1013.78	G. L.:	4.51	B.O.U.:	14.84	Easting:	602075.62

H. I. :	1013.78	H. I. :	1013.78	H. I. :	1013.78
(-) Rod Read Top Util. (T.O.U.):	13.26	(-) Rod Read Bottom Util. (B.O.U.):	14.84	(-) Rod Read Pothole (G.L.):	4.51
= Elevation Top Utility:	1000.52	= Elevation Bottom Utility:	998.94	= Elevation Ground Level:	**1009.27**

Station / Offset: 1289+31.58 / 69.50' Lt.

Northing: 336897.90

Easting: 602075.62

Actual Field Measurement: 8.75
(Existing Grade to T.O.U.)

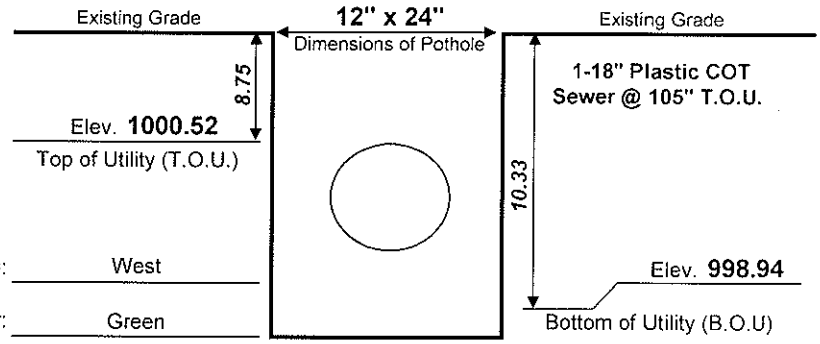
Elev. Top of Utility: 1000.52

Actual Field Measurement: 10.33
(Existing Grade to B.O.U.)

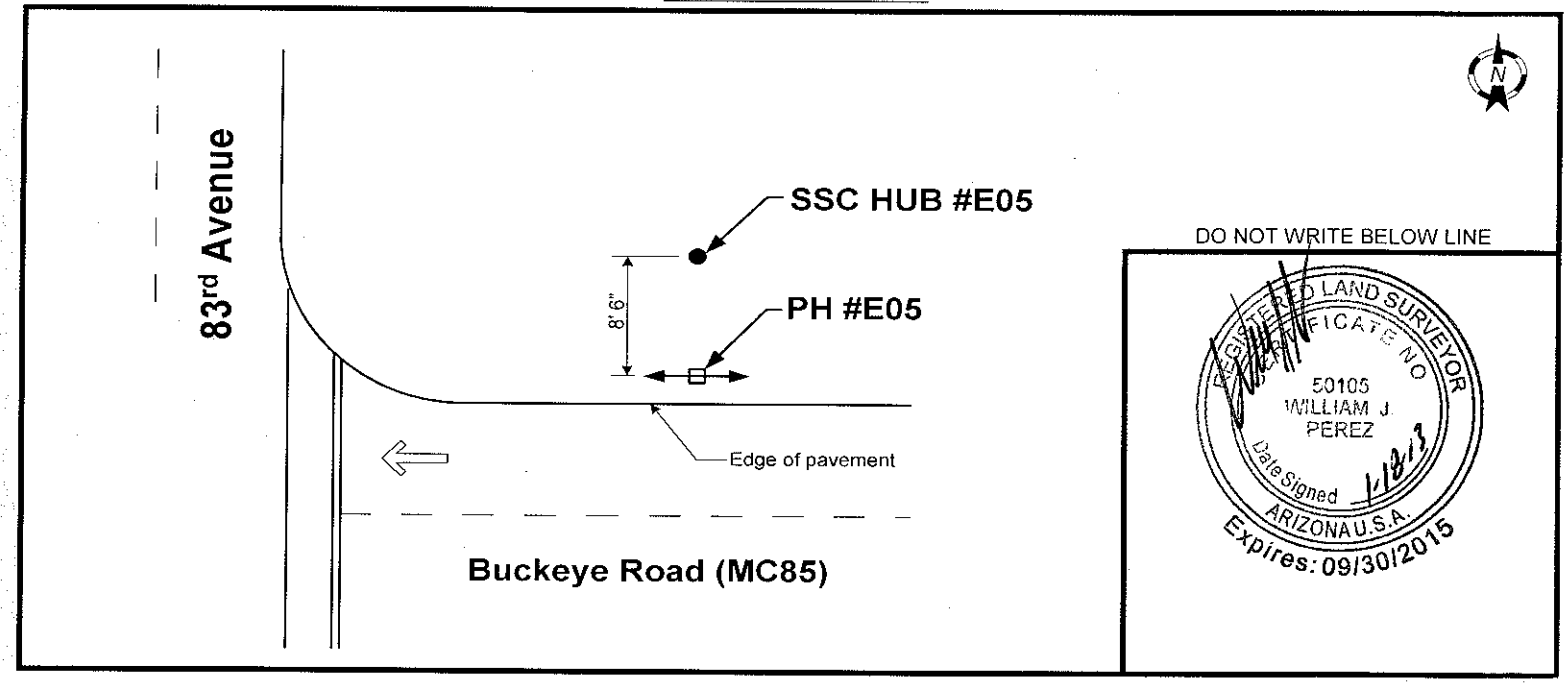
Elev. Bottom of Utility: 998.94

Facing: West

Ribbon Color: Green



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO
50105
WILLIAM J.
PEREZ
Date Signed 1/18/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E06 | Date Dug: 01/04/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 1289+26.51 / 82.33' Lt. | Northing: 336910.58 | Easting: 602070.41 | Elevation: 1008.59

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1008.59			Station / Offset:	1289+26.51 / 82.33' Lt.
Rod Reading (HUB - Pothole Crew):	5.22	HUB: 5.22	T.O.U.: 10.04	Northing:	336910.58
Height of Instrument (H. I.):	1013.81	G. L.: 5.11	B.O.U.: 10.12	Easting:	602070.41

H. I. :	1013.81	H. I. :	1013.81	H. I. :	1013.81
(-) Rod Read Top Util. (T.O.U.):	10.04	(-) Rod Read Bottom Util. (B.O.U.):	10.12	(-) Rod Read Pothole (G.L.):	5.11
= Elevation Top Utility:	1003.77	= Elevation Bottom Utility:	1003.69	= Elevation Ground Level:	1008.70

Station / Offset: 1289+26.51 / 87.33' Lt.

Northing: 336915.58

Easting: 602070.41

Actual Field Measurement: (Existing Grade to T.O.U.) 4.93

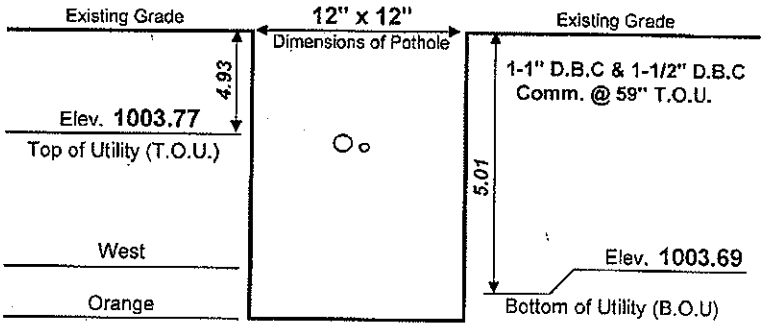
Elev. Top of Utility: 1003.77

Actual Field Measurement: (Existing Grade to B.O.U.) 5.01

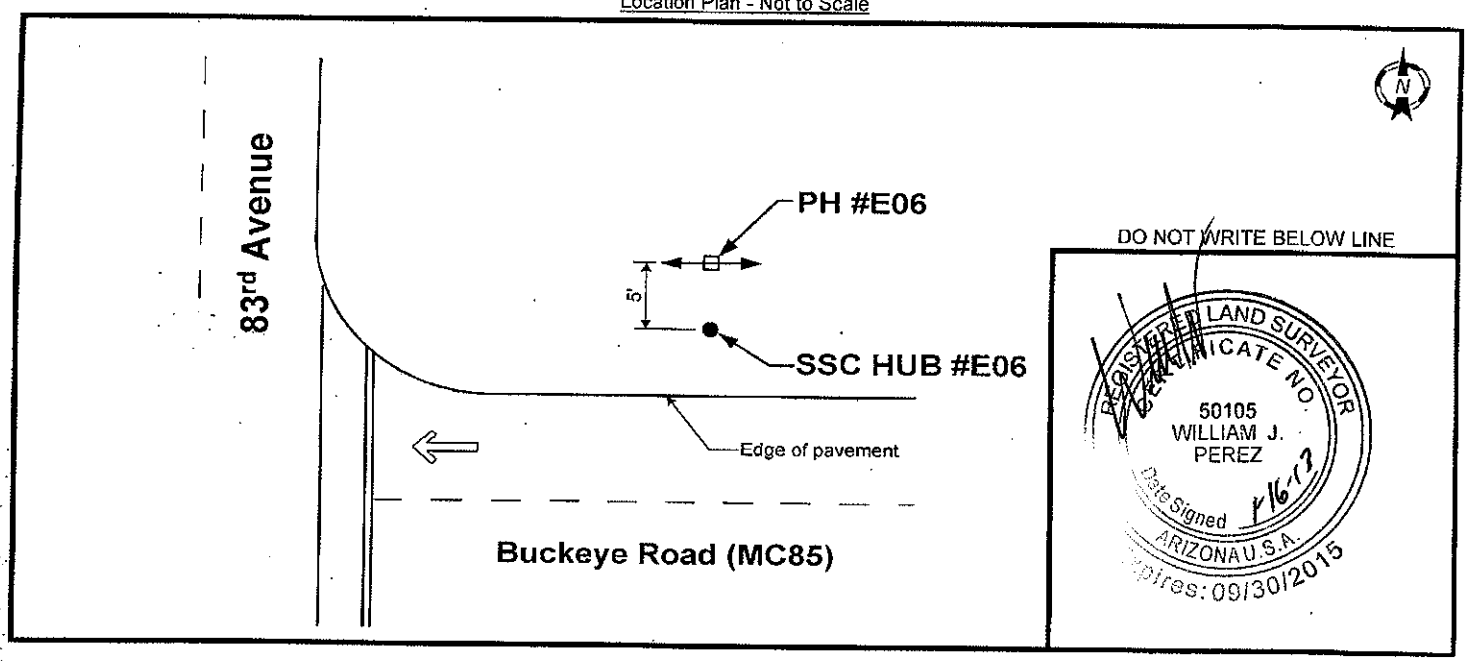
Elev. Bottom of Utility: 1003.69

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E07 | Date Dug: 01/14/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Tolleson Water

Station / Offset: 1289+11.56 / 90.14' Lt. | Northing: 336917.95 | Easting: 602055.16 | Elevation: 1007.93

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.93			Station / Offset:	1289+11.56 / 90.14' Lt.
Rod Reading (HUB - Pothole Crew):	6.36	HUB: 6.36	T.O.U.: 11.61	Northing:	336917.95
Height of Instrument (H. I.):	1014.29	G. L.: 5.59	B.O.U.: 12.94	Easting:	602055.16

H. I. :	1014.29	H. I. :	1014.29	H. I. :	1014.29
(-) Rod Read Top Util. (T.O.U.):	11.61	(-) Rod Read Bottom Util. (B.O.U.):	12.94	(-) Rod Read Pothole (G.L.):	5.59
= Elevation Top Utility:	1002.68	= Elevation Bottom Utility:	1001.35	= Elevation Ground Level:	1008.70

Station / Offset: 1289+11.56 / 85.64' Lt.

Northing: 336913.45

Easting: 602055.16

Actual Field Measurement: (Existing Grade to T.O.U.) 6.02

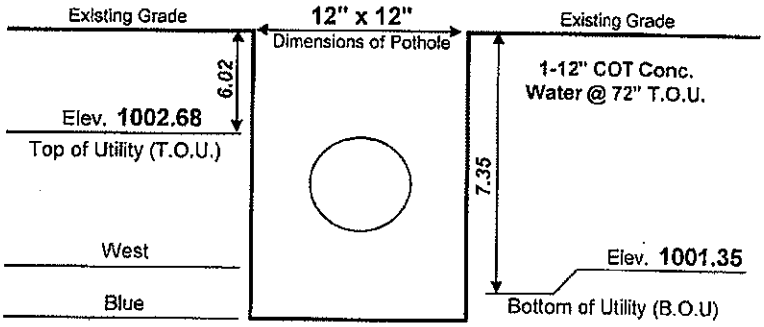
Elev. Top of Utility: 1002.68

Actual Field Measurement: (Existing Grade to B.O.U.) 7.35

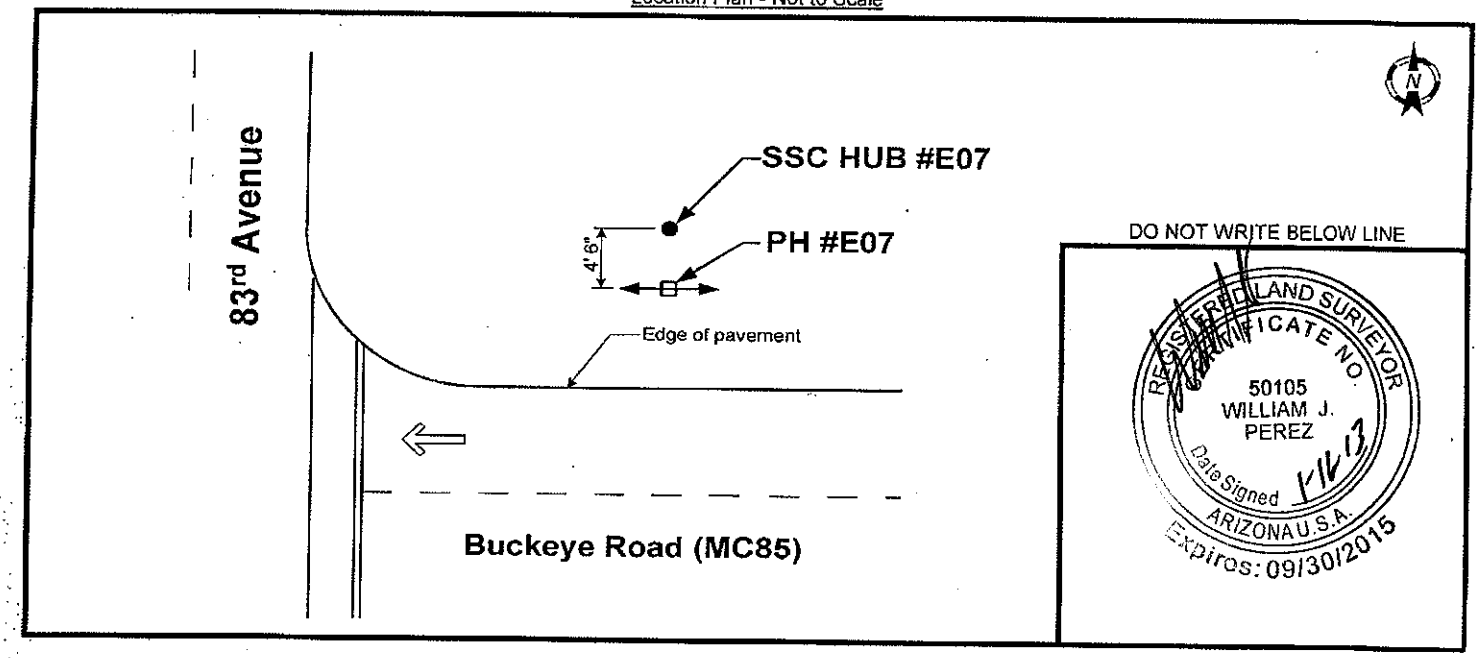
Elev. Bottom of Utility: 1001.35

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E08 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 427+42.98 / 59.25' Rt. | Northing: 337591.89 | Easting: 602026.38 | Elevation: 1012.09

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1012.09			Station / Offset:	427+42.98 / 59.25' Rt.
Rod Reading (HUB - Pothole Crew):	5.47	HUB: 5.47	T.O.U.: 10.55	Northing:	337591.89
Height of Instrument (H. I.):	1017.56	G. L.: 5.47	B.O.U.: 10.59	Easting:	602026.38

H. I. :	1017.56	H. I. :	1017.56	H. I. :	1017.56
(-) Rod Read Top Util. (T.O.U.):	10.55	(-) Rod Read Bottom Util. (B.O.U.):	10.59	(-) Rod Read Pothole (G.L.):	5.47
= Elevation Top Utility:	1007.01	= Elevation Bottom Utility:	1006.97	= Elevation Ground Level:	**1012.09**

Station / Offset: 427+42.98 / 59.25' Rt.

Northing: 337591.89

Easting: 602026.38

Actual Field Measurement: 5.08
(Existing Grade to T.O.U.)

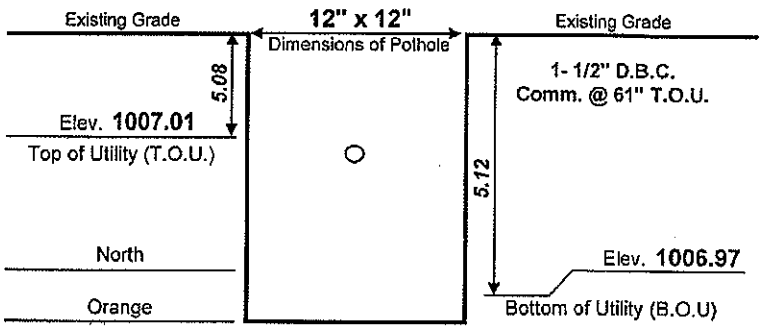
Elev. Top of Utility: 1007.01

Actual Field Measurement: 5.12
(Existing Grade to B.O.U.)

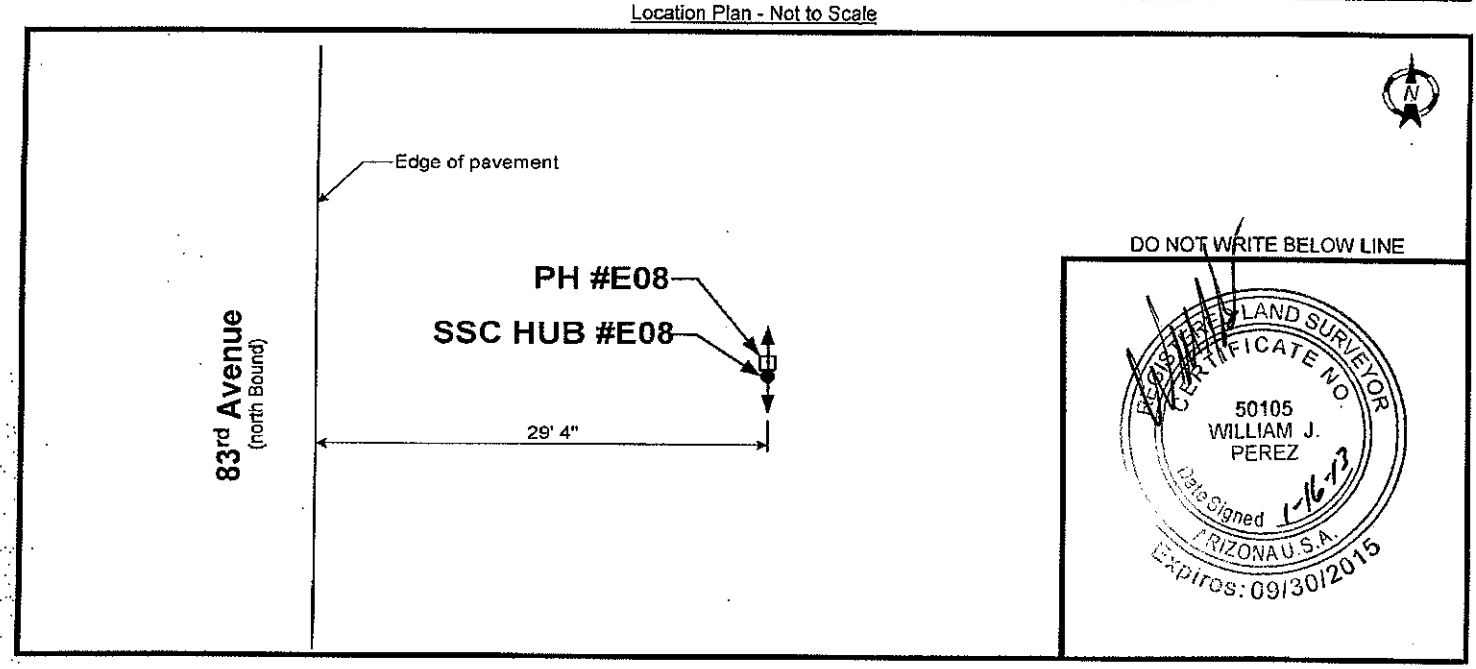
Elev. Bottom of Utility: 1006.97

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E09 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 427+43.02 / 56.83' Rt. | Northing: 337591.89 | Easting: 602023.96 | Elevation: 1012.04

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1012.04			Station / Offset:	427+43.02 / 56.83' Rt.
Rod Reading (HUB - Pothole Crew):	5.52	HUB: 5.52	T.O.U.: 10.98	Northing:	337591.89
Height of Instrument (H. I.):	1017.56	G. L.: 5.52	B.O.U.: 11.11	Easting:	602023.96

H. I. :	1017.56	H. I. :	1017.56	H. I. :	1017.56
(-) Rod Read Top Util. (T.O.U.):	10.98	(-) Rod Read Bottom Util. (B.O.U.):	11.11	(-) Rod Read Pothole (G.L.):	5.52
= Elevation Top Utility:	1006.58	= Elevation Bottom Utility:	1006.45	= Elevation Ground Level:	**1012.04**

Station / Offset: 427+43.02 / 56.33' Rt.

Northing: 337591.89

Easting: 602023.46

Actual Field Measurement: 5.46
(Existing Grade to T.O.U.)

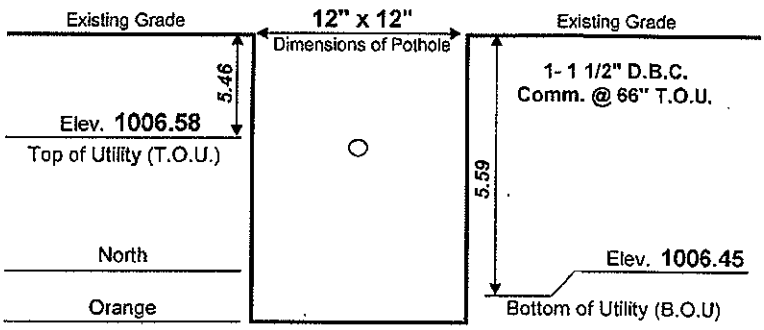
Elev. Top of Utility: 1006.58

Actual Field Measurement: 5.59
(Existing Grade to B.O.U.)

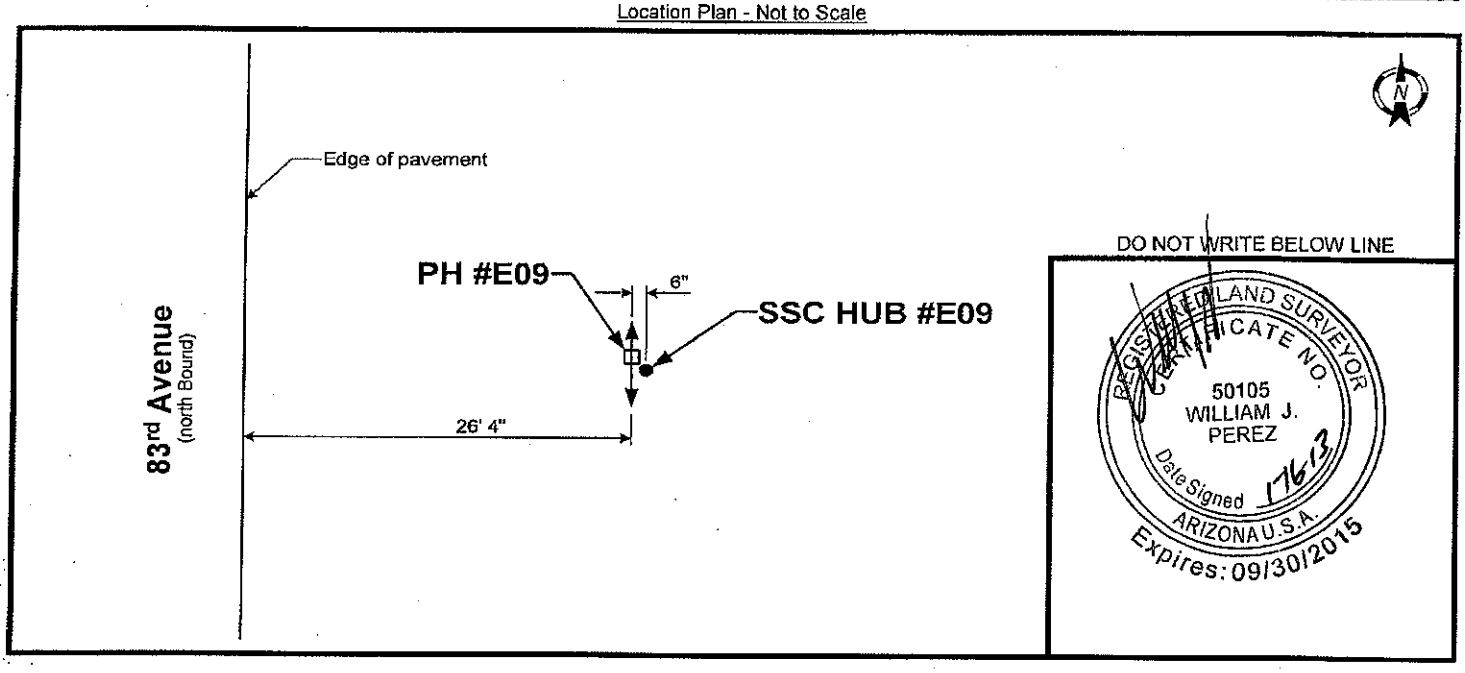
Elev. Bottom of Utility: 1006.45

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E10 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 429+94.04 / 38.61' Rt. | Northing: 337841.93 | Easting: 602005.64 | Elevation: 1015.32

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1015.32			Station / Offset:	429+94.04 / 38.61' Rt.
Rod Reading (HUB - Pothole Crew):	5.13	HUB: 5.13	T.O.U.: 9.34	Northing:	337841.93
Height of Instrument (H. I.):	1020.45	G. L.: 5.13	B.O.U.: 9.42	Easting:	602005.64

H. I. :	1020.45	H. I. :	1020.45	H. I. :	1020.45
(-) Rod Read Top Util. (T.O.U.):	9.34	(-) Rod Read Bottom Util. (B.O.U.):	9.42	(-) Rod Read Pothole (G.L.):	5.13
= Elevation Top Utility:	1011.11	= Elevation Bottom Utility:	1011.03	= Elevation Ground Level:	**1015.32**

Station / Offset: 430+01.54 / 38.61' Rt.

Northing: 337848.43

Easting: 602005.64

Actual Field Measurement: 4.21
(Existing Grade to T.O.U.)

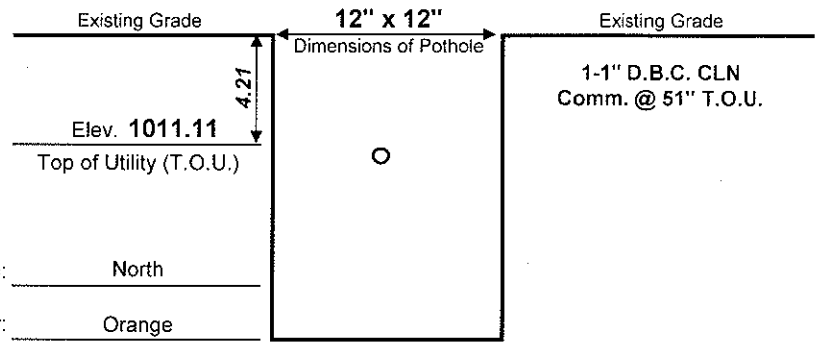
Elev. Top of Utility: 1011.11

Actual Field Measurement: 4.29
(Existing Grade to B.O.U.)

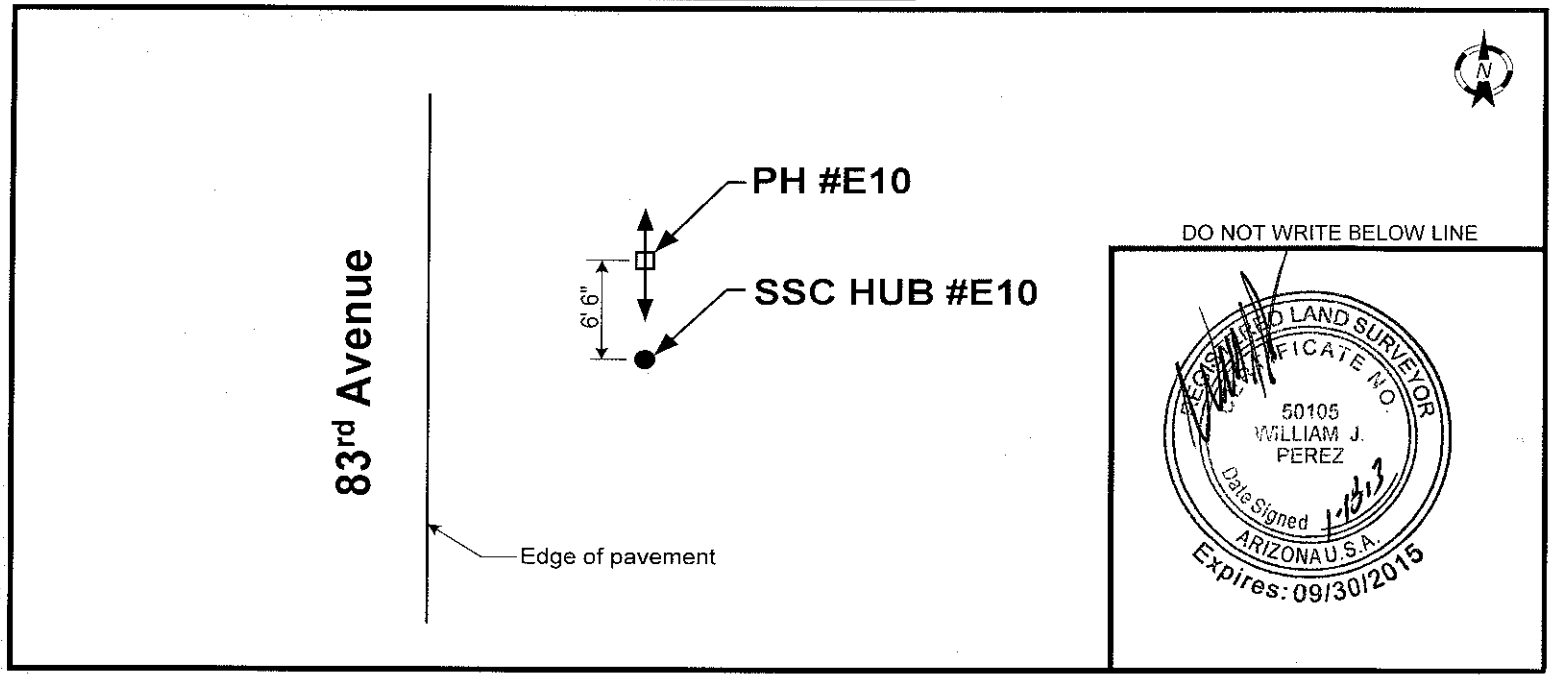
Elev. Bottom of Utility: 1011.03

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? NO | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E11 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 429+94.04 / 44.61' Rt. | Northing: 337841.93 | Easting: 602011.64 | Elevation: 1015.13

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1015.13			Station / Offset:	429+94.04 / 44.61' Rt.
Rod Reading (HUB - Pothole Crew):	5.32	HUB: 5.32	T.O.U.: 13.94	Northing:	337841.93
Height of Instrument (H. I.):	1020.45	G. L.: 5.34	B.O.U.: 14.61	Easting:	602011.64

H. I. :	1020.45	H. I. :	1020.45	H. I. :	1020.45
(-) Rod Read Top Util. (T.O.U.):	13.94	(-) Rod Read Bottom Util. (B.O.U.):	14.61	(-) Rod Read Pothole (G.L.):	5.34
= Elevation Top Utility:	1006.51	= Elevation Bottom Utility:	1005.84	= Elevation Ground Level:	**1015.11**

Station / Offset: 430+01.54 / 45.94' Rt.

Northing: 337848.43

Easting: 602012.97

Actual Field Measurement: 8.60
(Existing Grade to T.O.U.)

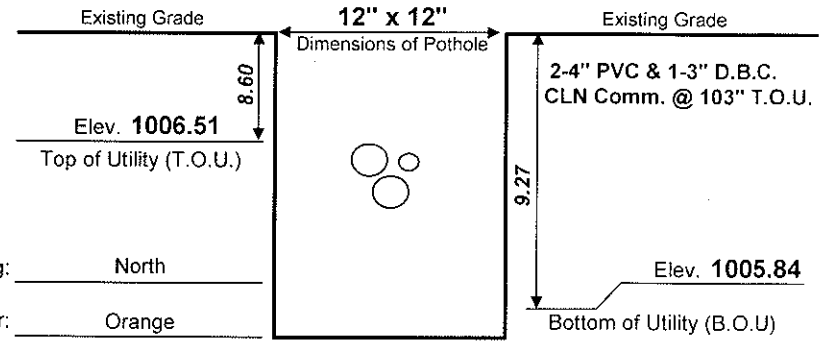
Elev. Top of Utility: 1006.51

Actual Field Measurement: 9.27
(Existing Grade to B.O.U.)

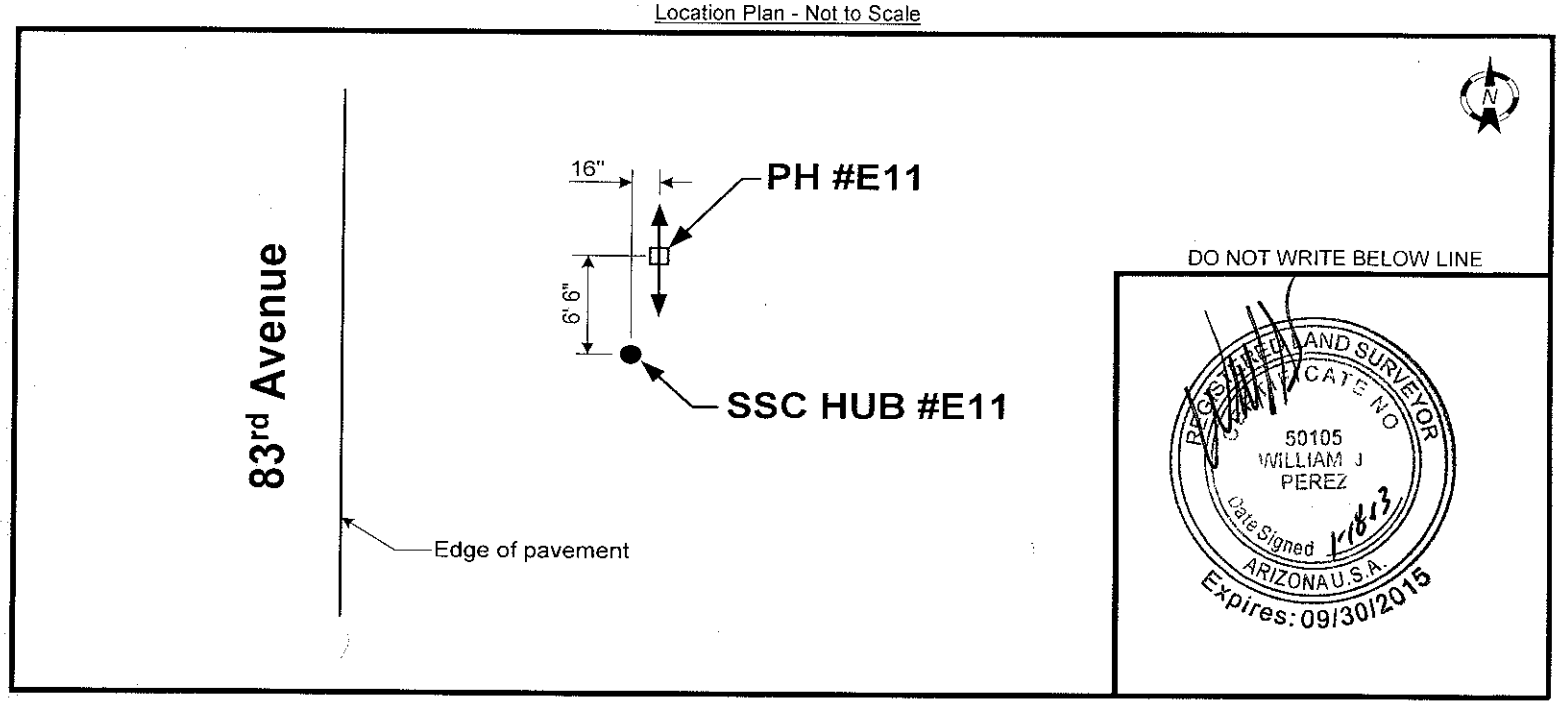
Elev. Bottom of Utility: 1005.84

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E12 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 429+94.28 / 56.83' Rt. | Northing: 337842.16 | Easting: 602023.86 | Elevation: 1014.97

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1014.97			Station / Offset:	429+94.28 / 56.83' Rt.
Rod Reading (HUB - Pothole Crew):	5.11	HUB: 5.11	T.O.U.: 7.52	Northing:	337842.16
Height of Instrument (H. I.):	1020.08	G. L.: 5.11	B.O.U.: N/A	Easting:	602023.86

H. I. :	1020.08	H. I. :	1020.08	H. I. :	1020.08
(-) Rod Read Top Util. (T.O.U.):	7.52	(-) Rod Read Bottom Util. (B.O.U.):	N/A	(-) Rod Read Pothole (G.L.):	5.11
= Elevation Top Utility:	1012.56	= Elevation Bottom Utility:	N/A	= Elevation Ground Level:	**1014.97**

Station / Offset: 429+93.28 / 57.58' Rt.

Northing: 337841.16

Easting: 602024.61

Actual Field Measurement: 2.41
(Existing Grade to T.O.U.)

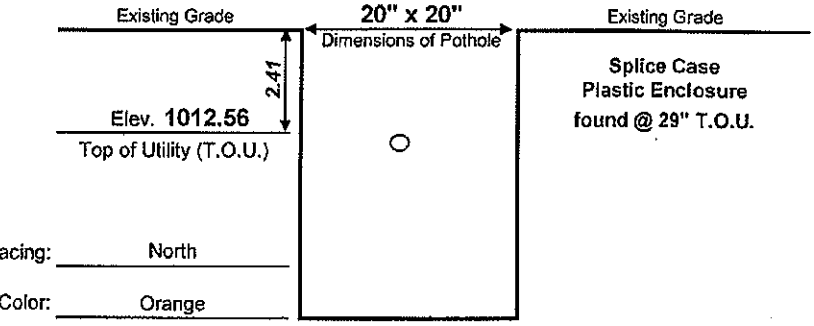
Elev. Top of Utility: 1012.56

Actual Field Measurement: N/A
(Existing Grade to B.O.U.)

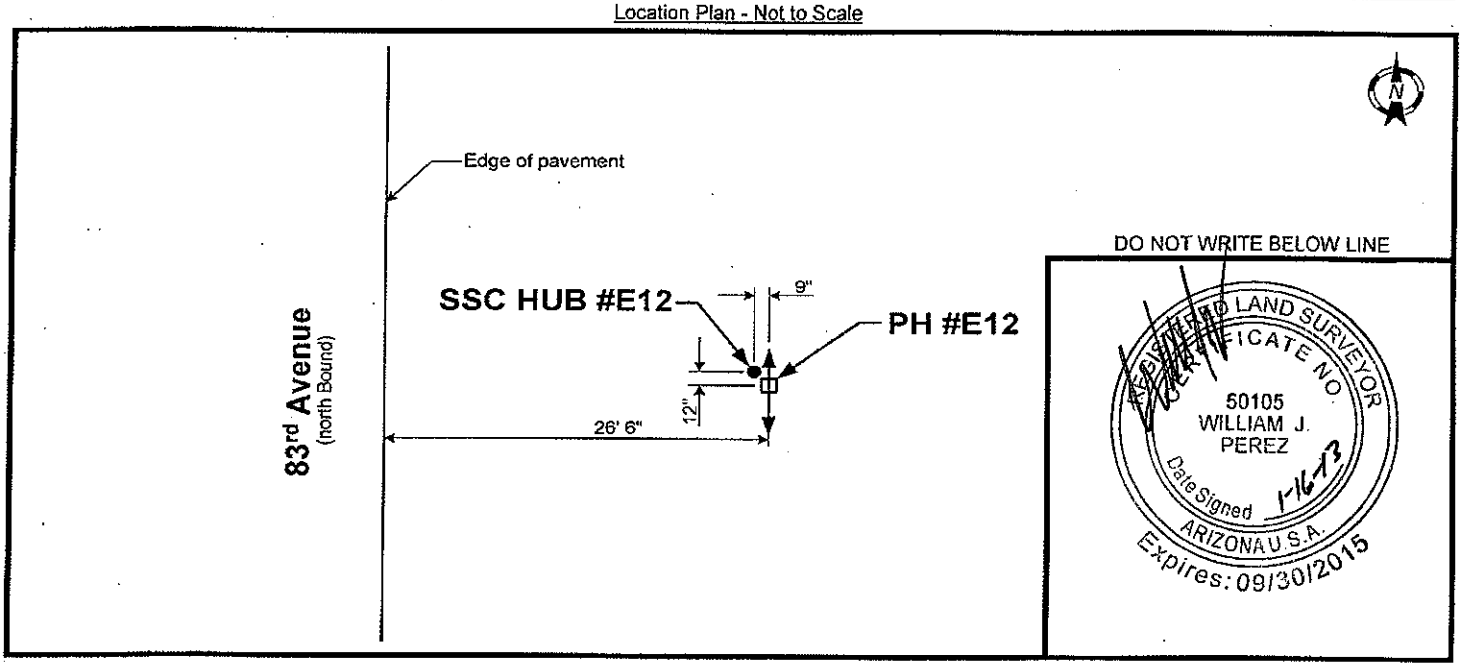
Elev. Bottom of Utility: N/A

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E13 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Century Link Communications

Station / Offset: 429+94.05 / 59.78' Rt. | Northing: 337841.93 | Easting: 602026.81 | Elevation: 1014.96

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1014.96			Station / Offset:	429+94.05 / 59.78' Rt.
Rod Reading (HUB - Pothole Crew):	5.11	HUB: 5.11	T.O.U.: 9.28	Northing:	337841.93
Height of Instrument (H. I.):	1020.07	G. L.: 5.11	B.O.U.: 9.32	Easting:	602026.81

H. I. :	1020.07	H. I. :	1020.07	H. I. :	1020.07
(-) Rod Read Top Util. (T.O.U.):	9.28	(-) Rod Read Bottom Util. (B.O.U.):	9.32	(-) Rod Read Pothole (G.L.):	5.11
= Elevation Top Utility:	1010.79	= Elevation Bottom Utility:	1010.75	= Elevation Ground Level:	**1014.96**

Station / Offset: 429+93.05 / 60.11' Rt.

Northing: 337840.93

Easting: 602027.14

Actual Field Measurement: 4.17
(Existing Grade to T.O.U.)

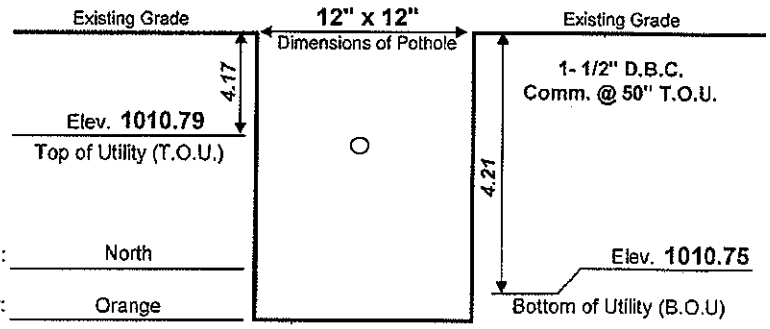
Elev. Top of Utility: 1010.79

Actual Field Measurement: 4.21
(Existing Grade to B.O.U.)

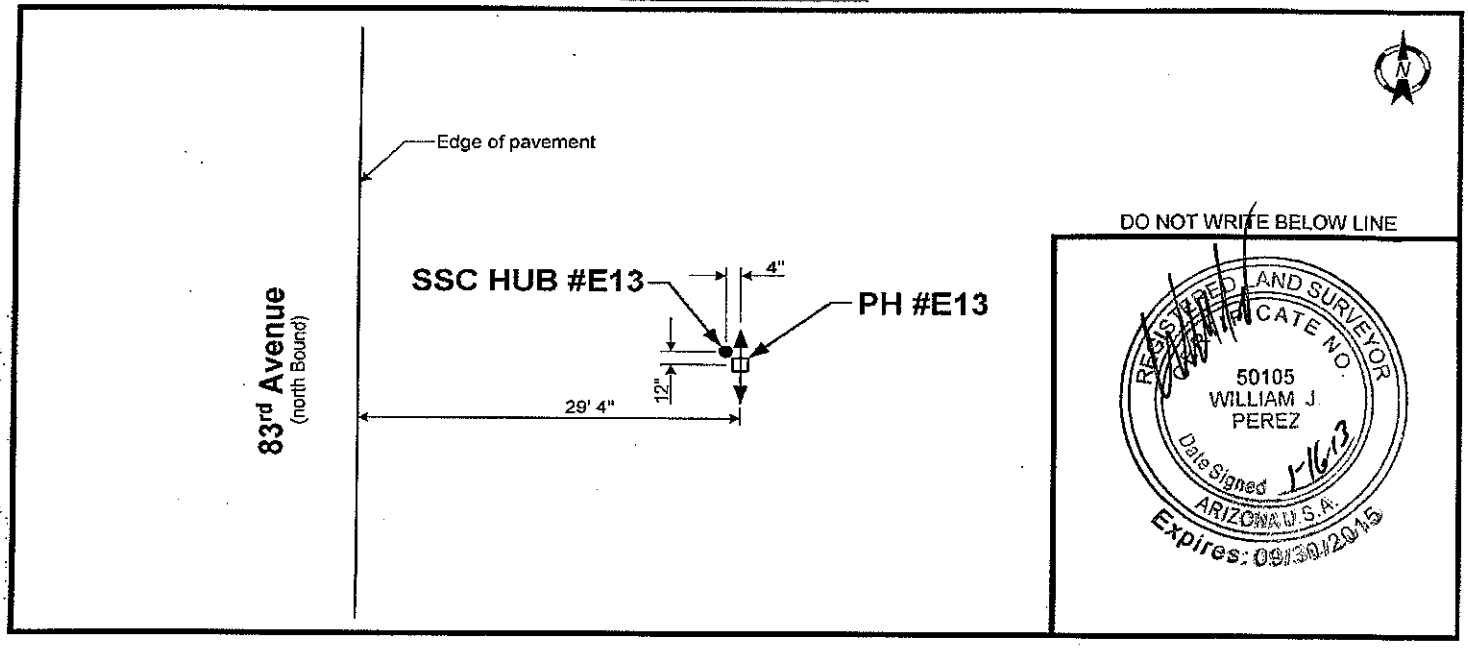
Elev. Bottom of Utility: 1010.75

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E300 | Date Dug: 12/17/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1237+10.85 / 39.08' Rt. | Northing: 336318.71 | Easting: 596881.67 | Elevation: 1001.52

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.52			Station / Offset:	1237+10.85 / 39.08' Rt.
Rod Reading (HUB - Pothole Crew):	5.56	HUB: 5.56	T.O.U.: 8.50	Northing:	336318.71
Height of Instrument (H. I.):	1007.08	G. L.: 5.56	B.O.U.: 8.75	Easting:	596881.67

H. I. :	1007.08	H. I. :	1007.08	H. I. :	1007.08
(-) Rod Read Top Util. (T.O.U.):	8.50	(-) Rod Read Bottom Util. (B.O.U.):	8.75	(-) Rod Read Pothole (G.L.):	5.56
= Elevation Top Utility:	998.58	= Elevation Bottom Utility:	998.33	= Elevation Ground Level:	**1001.52**

Station / Offset: 1237+14.68 / 39.08' Rt.

Northing: 336318.71

Easting: 596885.50

Actual Field Measurement: 2.94
(Existing Grade to T.O.U.)

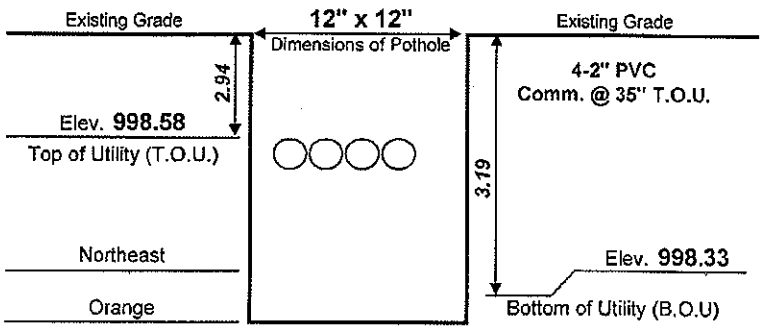
Elev. Top of Utility: 998.58

Actual Field Measurement: 3.19
(Existing Grade to B.O.U.)

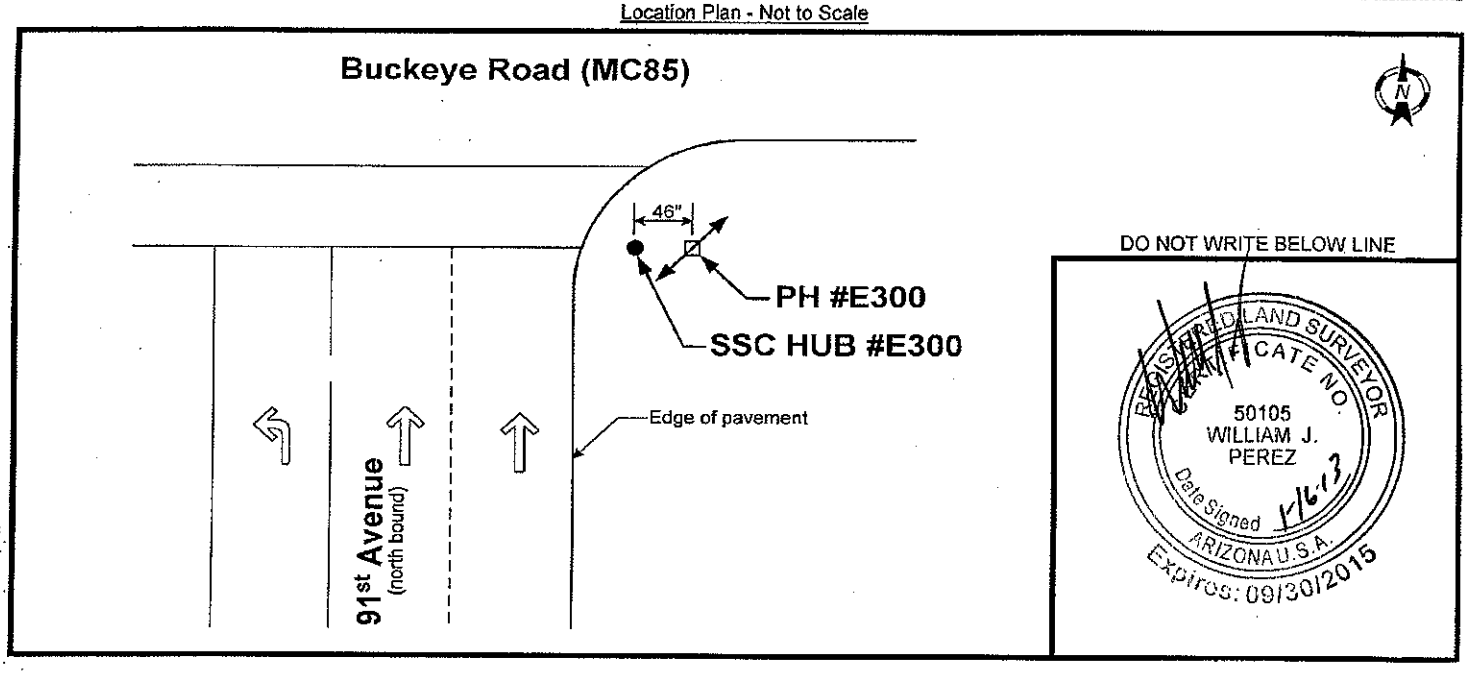
Elev. Bottom of Utility: 998.33

Facing: Northeast

Ribbon Color: Orange



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E301 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1238+25.07 / 14.16' Rt. | Northing: 336349.98 | Easting: 596994.63 | Elevation: 1001.80

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.80					Station / Offset:	1238+25.07 / 14.16' Rt.
Rod Reading (HUB - Pothole Crew):	5.12	HUB:	5.12	T.O.U.:	9.41	Northing:	336349.98
Height of Instrument (H. I.):	1006.92	G. L.:	5.61	B.O.U.:	10.16	Easting:	596994.63

H. I. :	1006.92	H. I. :	1006.92	H. I. :	1006.92
(-) Rod Read Top Util. (T.O.U.):	9.41	(-) Rod Read Bottom Util. (B.O.U.):	10.16	(-) Rod Read Pothole (G.L.):	5.61
= Elevation Top Utility:	997.51	= Elevation Bottom Utility:	996.76	= Elevation Ground Level:	**1001.31**

Station / Offset: 1238+25.07 / 22.83' Rt.

Northing: 336341.31

Easting: 596994.63

Actual Field Measurement: 3.80
(Existing Grade to T.O.U.)

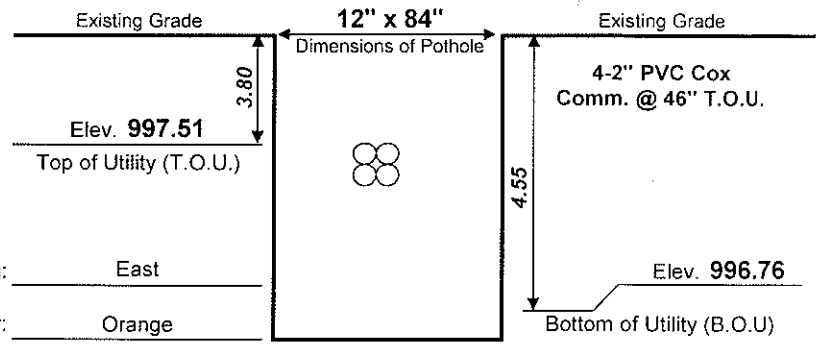
Elev. Top of Utility: 997.51

Actual Field Measurement: 4.55
(Existing Grade to B.O.U.)

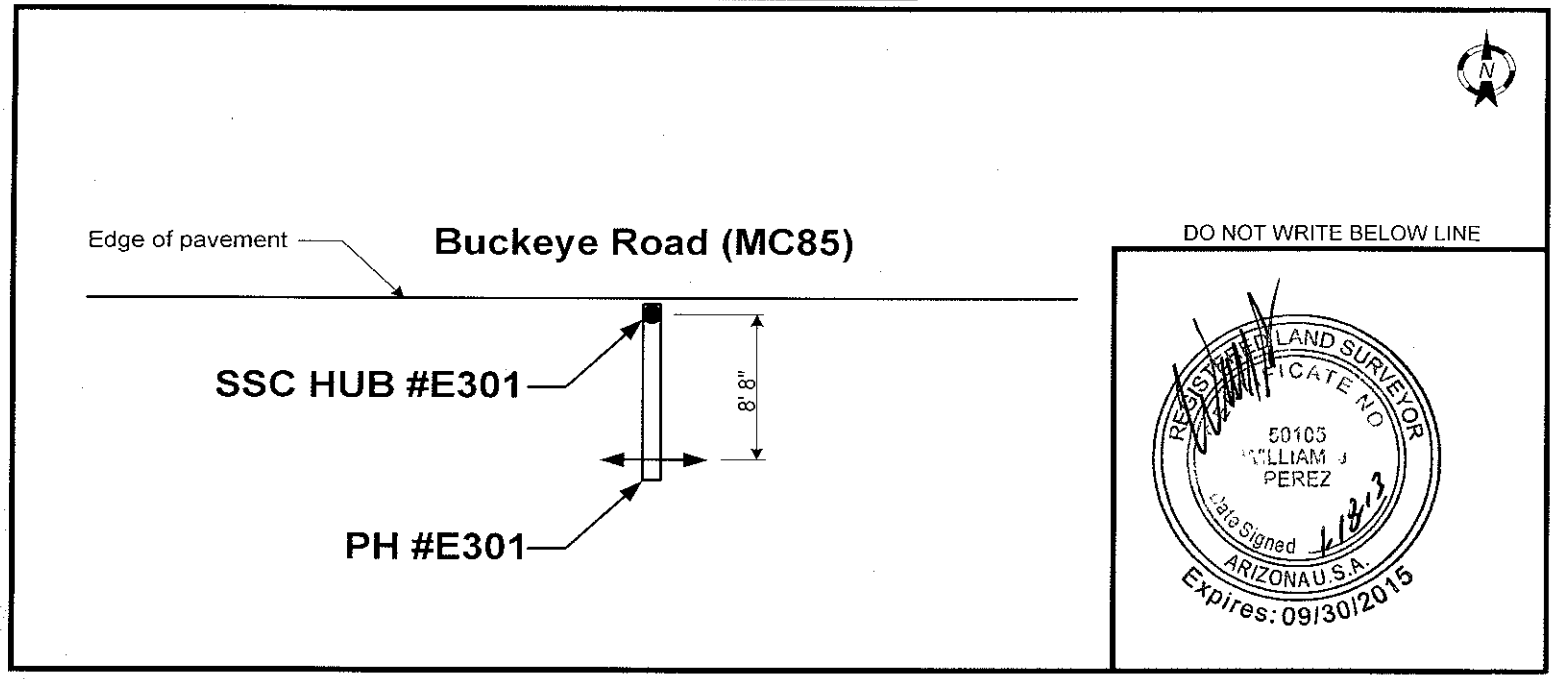
Elev. Bottom of Utility: 996.76

Facing: East

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. E302 | Date Dug: 01/03/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1245+82.46 / 16.08' Rt. | Northing: 336423.76 | Easting: 597749.28 | Elevation: 1002.27

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1002.27			Station / Offset:	1245+82.46 / 16.08' Rt.
Rod Reading (HUB - Pothole Crew):	6.00	HUB: 6.00	T.O.U.: 10.75	Northing:	336423.76
Height of Instrument (H. I.):	1008.27	G. L.: 5.75	B.O.U.: 11.08	Easting:	597749.28

H. I. :	1008.27	H. I. :	1008.27	H. I. :	1008.27
(-) Rod Read Top Util. (T.O.U.):	10.75	(-) Rod Read Bottom Util. (B.O.U.):	11.08	(-) Rod Read Pothole (G.L.):	5.75
= Elevation Top Utility:	997.52	= Elevation Bottom Utility:	997.19	= Elevation Ground Level:	**1002.52**

Station / Offset: 1245+82.46 / 14.08' Rt.

Northing: 336425.76

Easting: 597749.28

Actual Field Measurement: 5.00 (Existing Grade to T.O.U.)

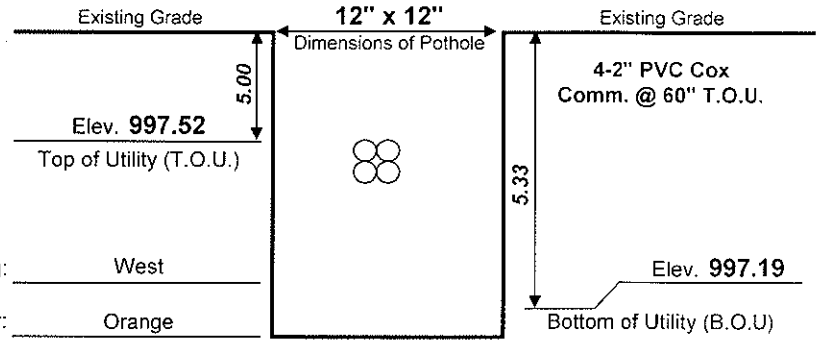
Elev. Top of Utility: 997.52

Actual Field Measurement: 5.33 (Existing Grade to B.O.U.)

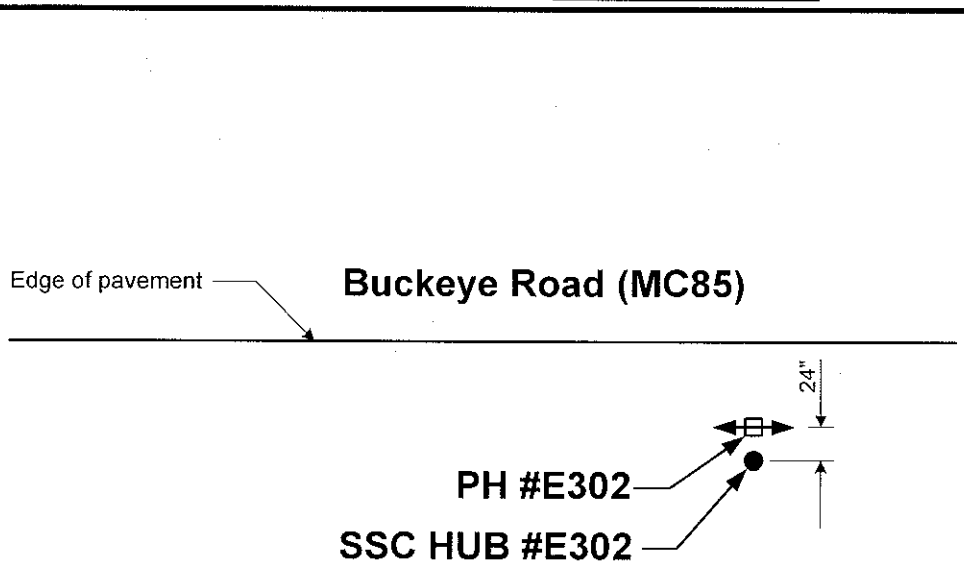
Elev. Bottom of Utility: 997.19

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 303 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1288+08.83 / 39.74' Rt. | Northing: 336784.79 | Easting: 601956.58 | Elevation: 1007.64

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.64					Station / Offset:	1288+08.83 / 39.74' Rt.
Rod Reading (HUB - Pothole Crew):	5.42	HUB:	5.42	T.O.U.:	18.80	Northing:	336784.79
Height of Instrument (H. I.):	1013.06	G. L.:	5.46	B.O.U.:	19.13	Easting:	601956.58

H. I. :	1013.06	H. I. :	1013.06	H. I. :	1013.06
(-) Rod Read Top Util. (T.O.U.):	18.80	(-) Rod Read Bottom Util. (B.O.U.):	19.13	(-) Rod Read Pothole (G.L.):	5.46
= Elevation Top Utility:	994.26	= Elevation Bottom Utility:	993.93	= Elevation Ground Level:	**1007.60**

Station / Offset: 1288+08.83 / 41.91' Rt.

Northing: 336782.62

Easting: 601956.58

Actual Field Measurement: 13.34 (Existing Grade to T.O.U.)

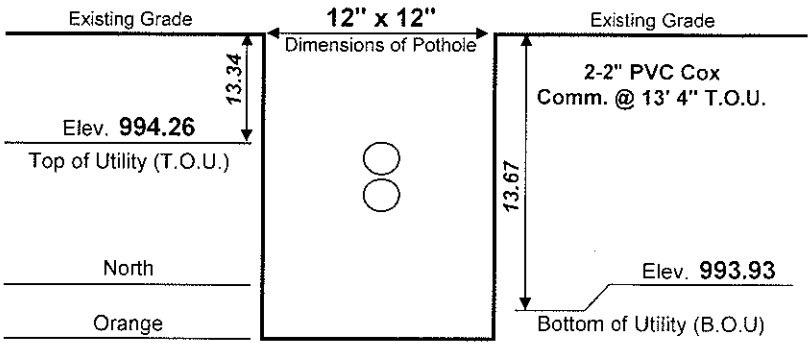
Elev. Top of Utility: 994.26

Actual Field Measurement: 13.67 (Existing Grade to B.O.U.)

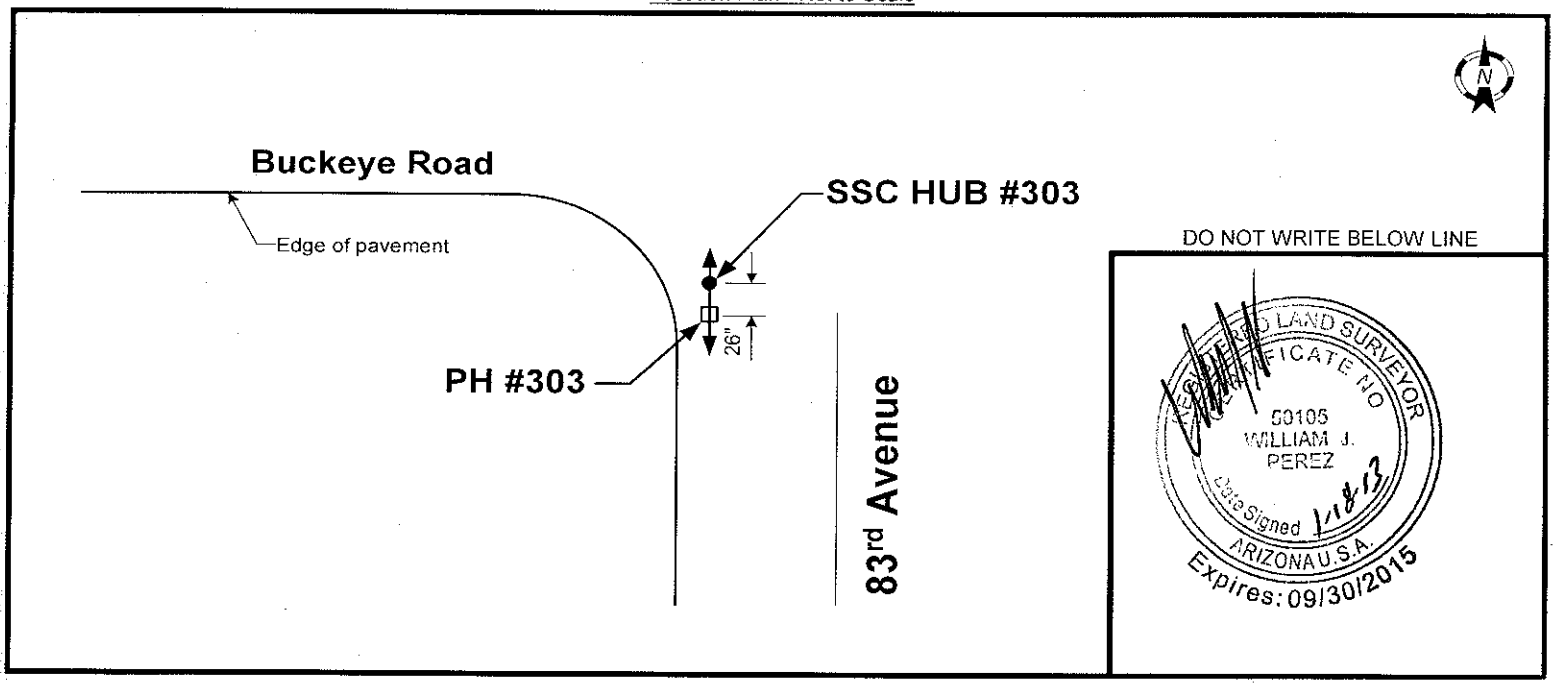
Elev. Bottom of Utility: 993.93

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 304 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 418+85.14 / 8.00' Lt. | Northing: 336733.30 | Easting: 601960.97 | Elevation: 1007.44

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.44					Station / Offset:	418+85.14 / 8.00' Lt.
Rod Reading (HUB - Pothole Crew):	5.62	HUB:	5.62	T.O.U.:	18.94	Northing:	336733.30
Height of Instrument (H. I.):	1013.06	G. L.:	5.70	B.O.U.:	19.27	Easting:	601960.97

H. I. :	1013.06	H. I. :	1013.06	H. I. :	1013.06
(-) Rod Read Top Util. (T.O.U.):	18.94	(-) Rod Read Bottom Util. (B.O.U.):	19.27	(-) Rod Read Pothole (G.L.):	5.70
= Elevation Top Utility:	994.12	= Elevation Bottom Utility:	993.79	= Elevation Ground Level:	1007.36

Station / Offset: 418+85.14 / 11.17' Lt.

Northing: 336733.30

Easting: 601957.80

Actual Field Measurement: (Existing Grade to T.O.U.) 13.24

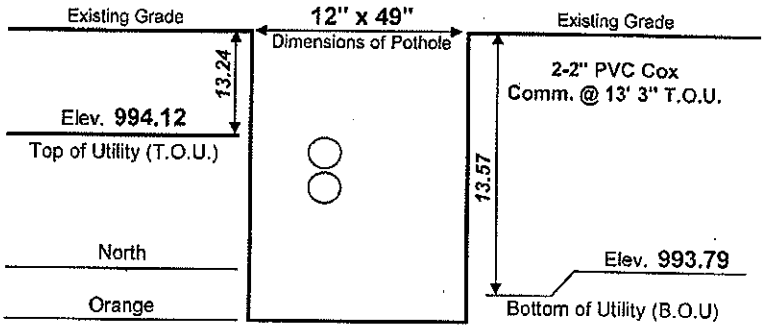
Elev. Top of Utility: 994.12

Actual Field Measurement: (Existing Grade to B.O.U.) 13.57

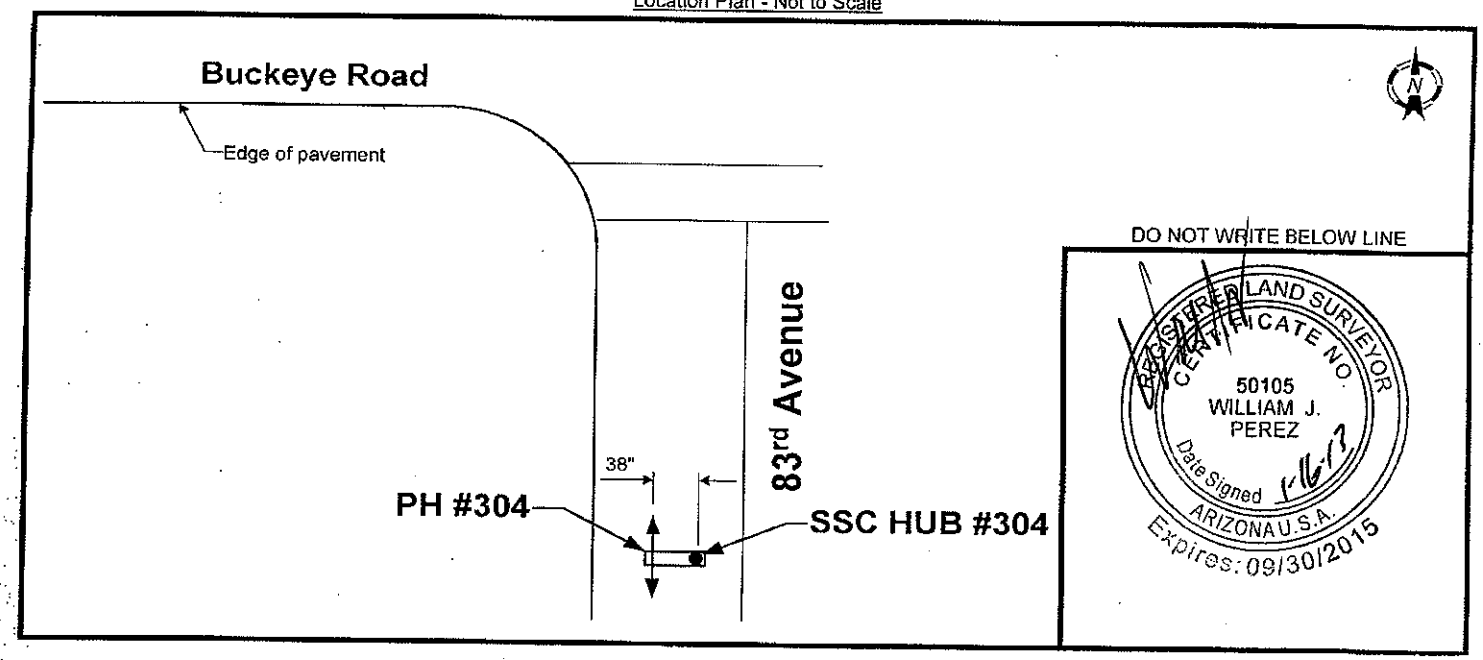
Elev. Bottom of Utility: 993.79

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1-16-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 305 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 418+78.25 / 7.81' Lt. | Northing: 336726.41 | Easting: 601961.00 | Elevation: 1007.43

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1007.43			Station / Offset:	418+78.25 / 7.81' Lt.
Rod Reading (HUB - Pothole Crew):	5.61	HUB: 5.61	T.O.U.: 19.02	Northing:	336726.41
Height of Instrument (H. I.):	1013.04	G. L.: 5.78	B.O.U.: 19.35	Easting:	601961.00

H. I. :	1013.04	H. I. :	1013.04	H. I. :	1013.04
(-) Rod Read Top Util. (T.O.U.):	19.02	(-) Rod Read Bottom Util. (B.O.U.):	19.35	(-) Rod Read Pothole (G.L.):	5.78
= Elevation Top Utility:	994.02	= Elevation Bottom Utility:	993.69	= Elevation Ground Level:	1007.26

Station / Offset: 418+78.25 / 11.14' Lt.

Northing: 336726.41

Easting: 601957.67

Actual Field Measurement: (Existing Grade to T.O.U.) 13.24

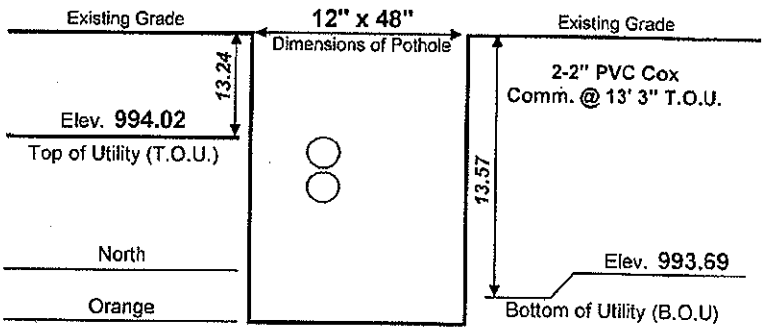
Elev. Top of Utility: 994.02

Actual Field Measurement: (Existing Grade to B.O.U.) 13.57

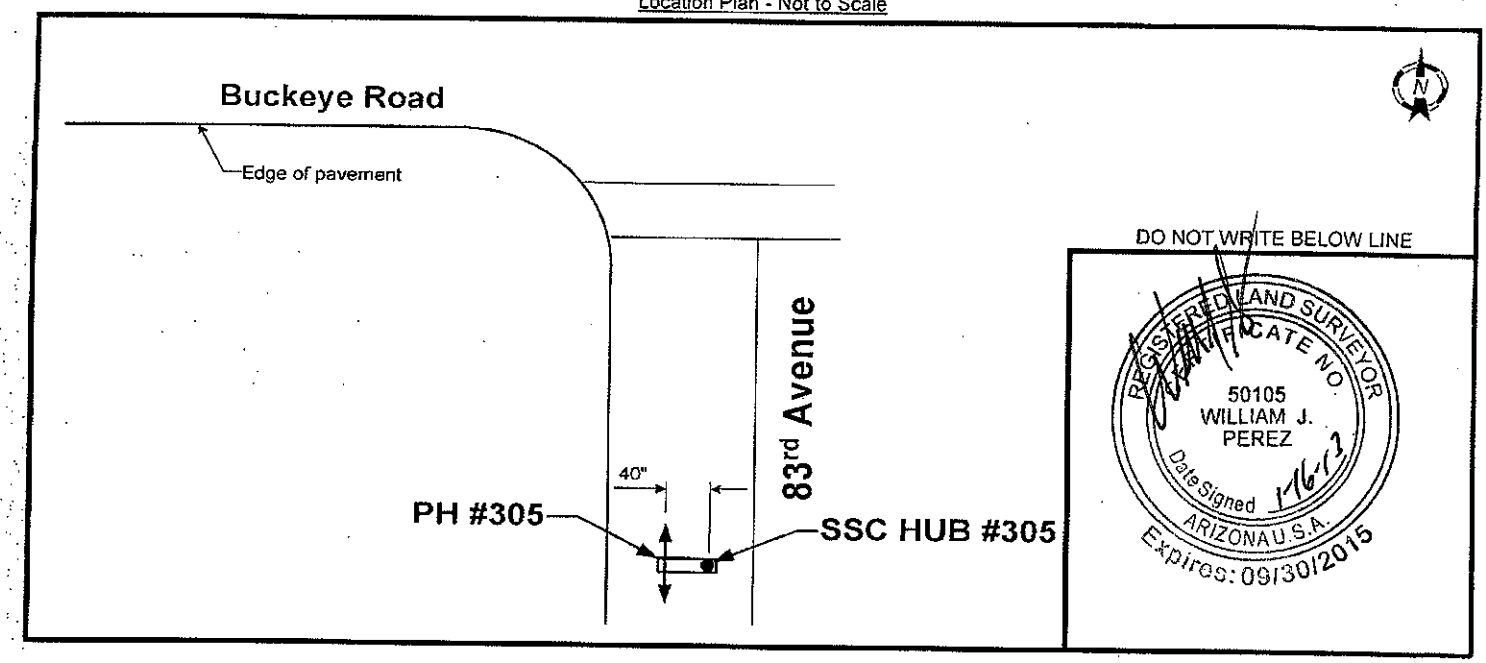
Elev. Bottom of Utility: 993.69

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 306 | Date Dug: 12/31/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1279+29.63 / 59.25' Lt. | Northing: 336830.96 | Easting: 601072.64 | Elevation: 1008.39

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1008.39			Station / Offset:	1279+29.63 / 59.25' Lt.
Rod Reading (HUB - Pothole Crew):	4.18	HUB: 4.18	T.O.U.: 7.32	Northing:	336830.96
Height of Instrument (H. I.):	1012.57	G. L.: 4.80	B.O.U.: 7.49	Easting:	601072.64

H. I. :	1012.57	H. I. :	1012.57	H. I. :	1012.57
(-) Rod Read Top Util. (T.O.U.):	7.32	(-) Rod Read Bottom Util. (B.O.U.):	7.49	(-) Rod Read Pothole (G.L.):	4.80
= Elevation Top Utility:	1005.25	= Elevation Bottom Utility:	1005.08	= Elevation Ground Level:	1007.77

Station / Offset: 1279+29.63 / 58.75 LT

Northing: 336830.46

Easting: 601072.64

Actual Field Measurement: (Existing Grade to T.O.U.) 2.52

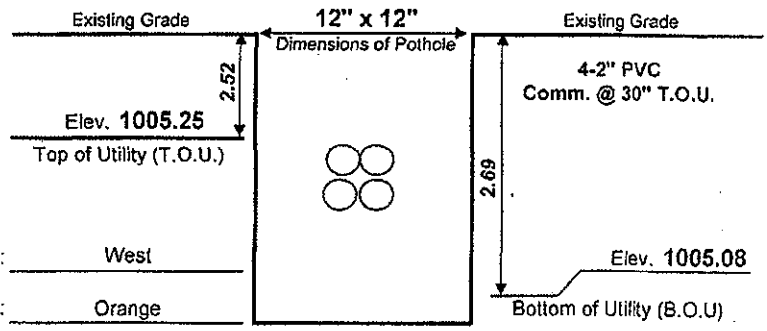
Elev. Top of Utility: 1005.25

Actual Field Measurement: (Existing Grade to B.O.U.) 2.69

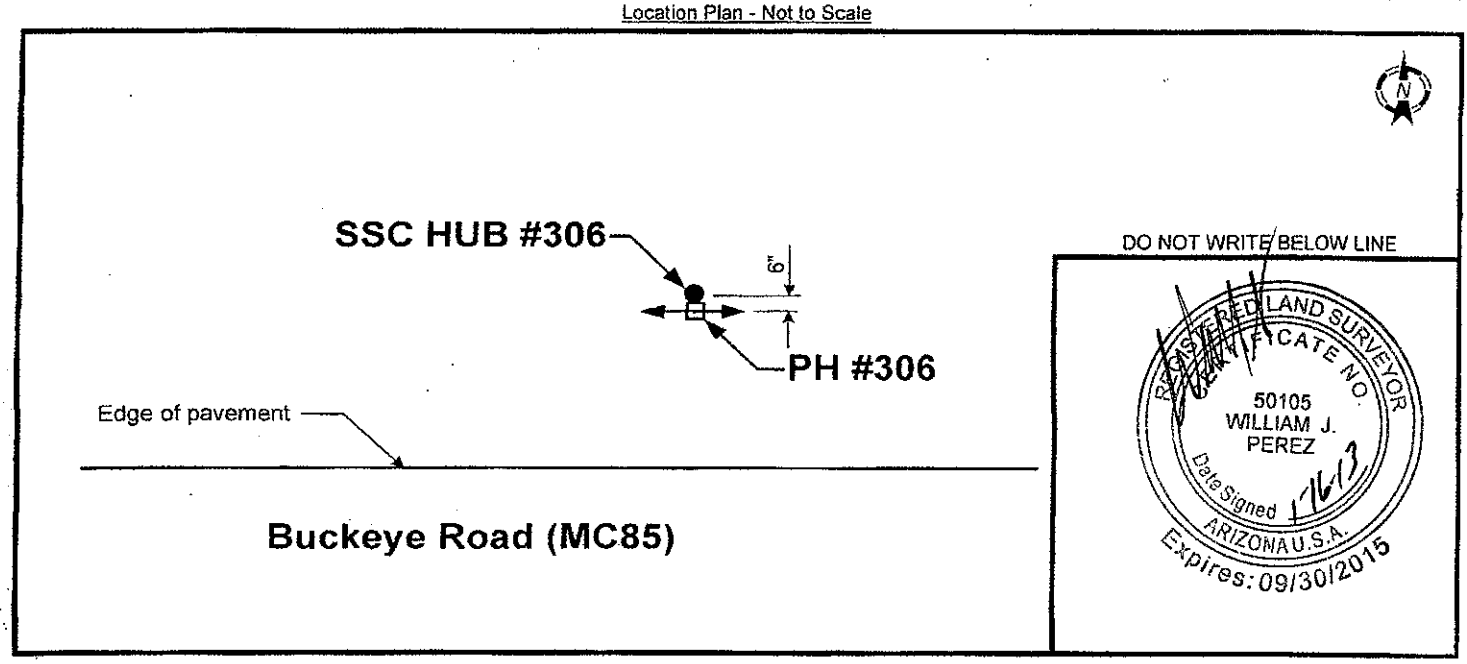
Elev. Bottom of Utility: 1005.08

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 307 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1273+25.77 / 57.76' Lt. | Northing: 336776.83 | Easting: 600471.02 | Elevation: 1005.33

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1005.33			Station / Offset:	1273+25.77 / 57.76' Lt.
Rod Reading (HUB - Pothole Crew):	6.15	HUB: 6.15	T.O.U.: 9.00	Northing:	336776.83
Height of Instrument (H. I.):	1011.48	G. L.: 6.13	B.O.U.: 9.33	Easting:	600471.02

H. I. :	1011.48	H. I. :	1011.48	H. I. :	1011.48
(-) Rod Read Top Util. (T.O.U.):	9.00	(-) Rod Read Bottom Util. (B.O.U.):	9.33	(-) Rod Read Pothole (G.L.):	6.13
= Elevation Top Utility:	1002.48	= Elevation Bottom Utility:	1002.15	= Elevation Ground Level:	1005.35

Station / Offset: 1273+25.77 / 56.26' Lt.

Northing: 336775.33

Easting: 600471.02

Actual Field Measurement: (Existing Grade to T.O.U.) 2.87

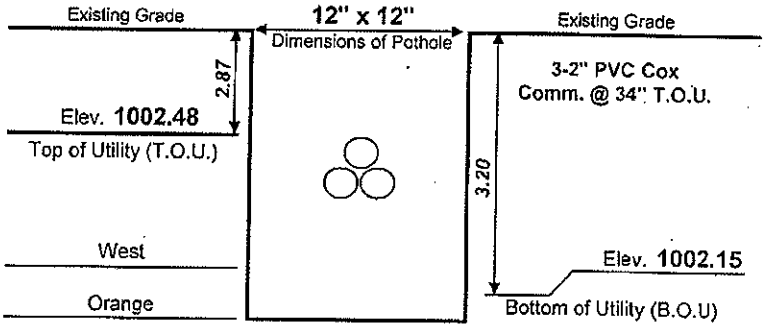
Elev. Top of Utility: 1002.48

Actual Field Measurement: (Existing Grade to B.O.U.) 3.20

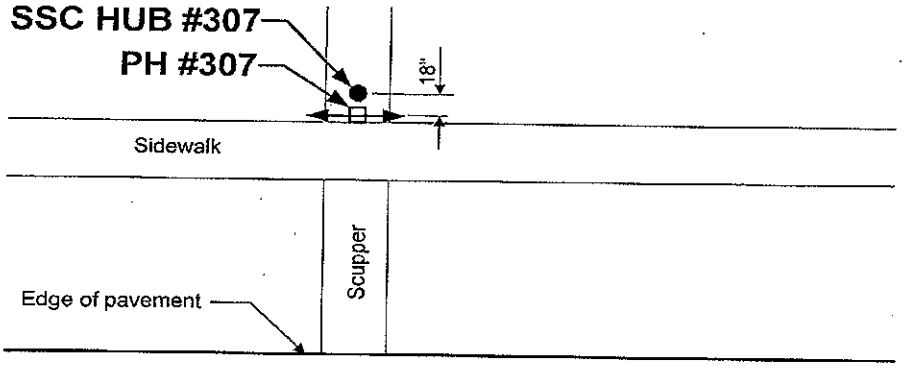
Elev. Bottom of Utility: 1002.15

Facing: West

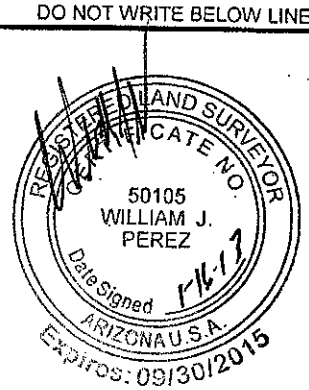
Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 308 | Date Dug: 01/08/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1268+14.70 / 57.41' Lt. | Northing: 336731.86 | Easting: 599961.94 | Elevation: 1006.34

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.34					Station / Offset:	1268+14.70 / 57.41' Lt.
Rod Reading (HUB - Pothole Crew):	5.31	HUB:	5.31	T.O.U.:	11.22	Northing:	336731.86
Height of Instrument (H. I.):	1011.65	G. L.:	5.26	B.O.U.:	11.55	Easting:	599961.94

H. I. :	1011.65	H. I. :	1011.65	H. I. :	1011.65
(-) Rod Read Top Util. (T.O.U.):	11.22	(-) Rod Read Bottom Util. (B.O.U.):	11.55	(-) Rod Read Pothole (G.L.):	5.26
= Elevation Top Utility:	1000.43	= Elevation Bottom Utility:	1000.10	= Elevation Ground Level:	**1006.39**

Station / Offset: 1268+14.70 / 56.91' Lt.

Northing: 336731.36

Easting: 599961.94

Actual Field Measurement: (Existing Grade to T.O.U.) 5.96

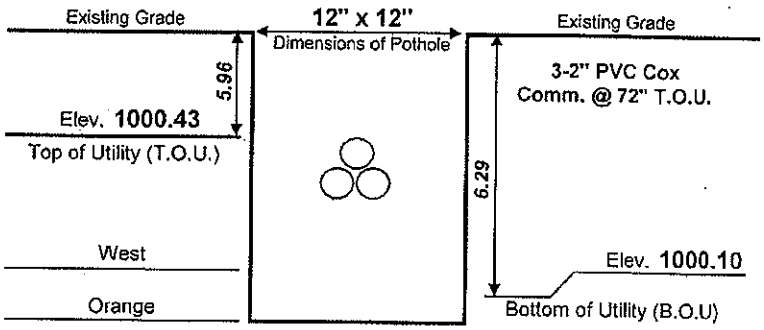
Elev. Top of Utility: 1000.43

Actual Field Measurement: (Existing Grade to B.O.U.) 6.29

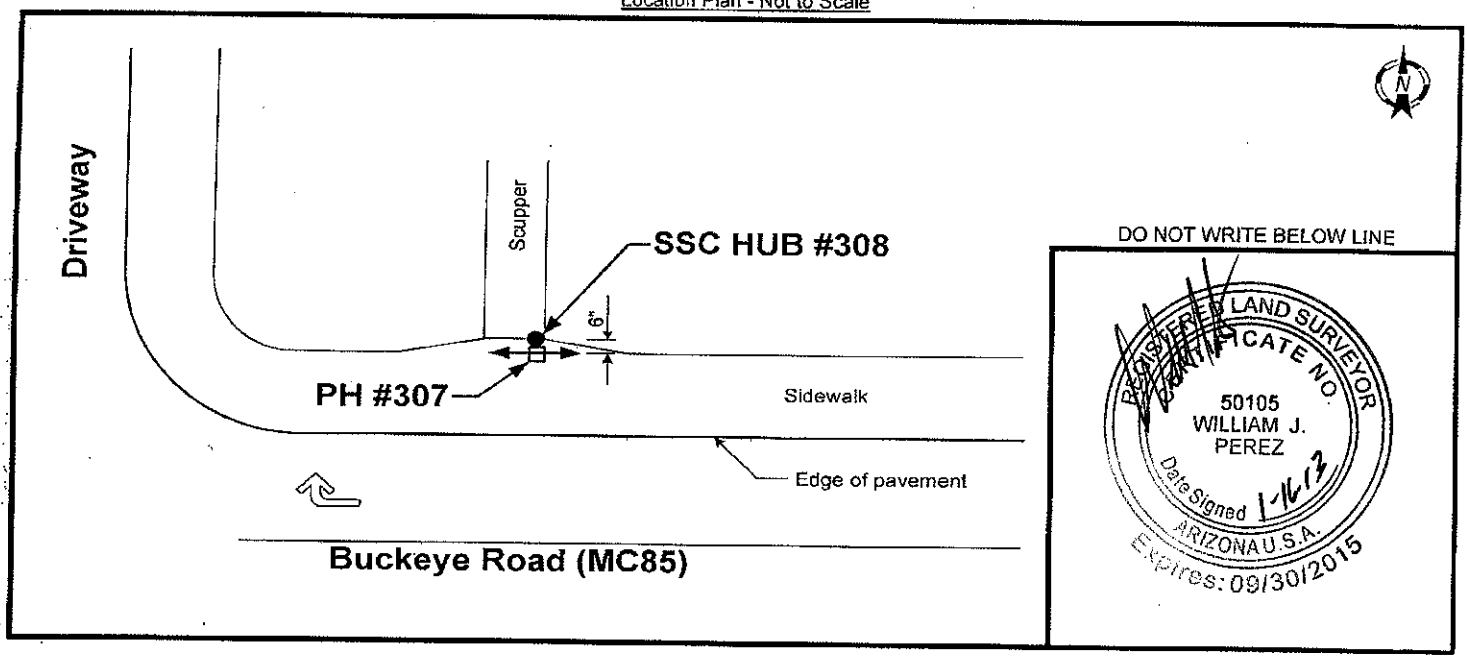
Elev. Bottom of Utility: 1000.10

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 309 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 1260+57.16 / 64.81' Lt. | Northing: 336662.73 | Easting: 599206.62 | Elevation: 1006.81

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1006.81					Station / Offset:	1260+57.16 / 64.81' Lt.
Rod Reading (HUB - Pothole Crew):	6.18	HUB:	6.18	T.O.U.:	11.81	Northing:	336662.73
Height of Instrument (H. I.):	1012.99	G. L.:	6.12	B.O.U.:	12.14	Easting:	599206.62

H. I. :	1012.99	H. I. :	1012.99	H. I. :	1012.99
(-) Rod Read Top Util. (T.O.U.):	11.81	(-) Rod Read Bottom Util. (B.O.U.):	12.14	(-) Rod Read Pothole (G.L.):	6.12
= Elevation Top Utility:	1001.18	= Elevation Bottom Utility:	1000.85	= Elevation Ground Level:	**1006.87**

Station / Offset: 1260+57.16 / 64.81' Lt.

Northing: 336662.73

Easting: 599206.62

Actual Field Measurement: 5.69 (Existing Grade to T.O.U.)

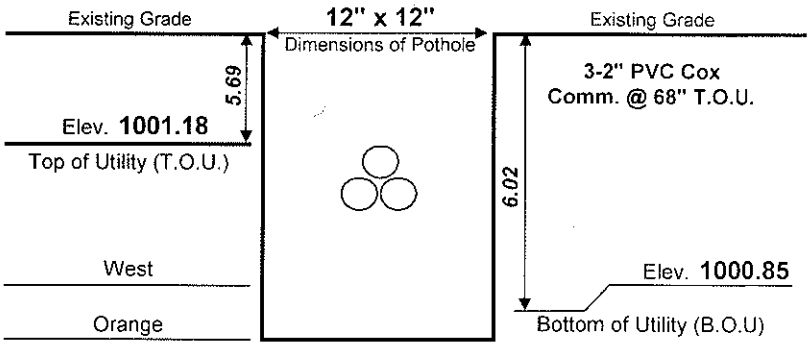
Elev. Top of Utility: 1001.18

Actual Field Measurement: 6.02 (Existing Grade to B.O.U.)

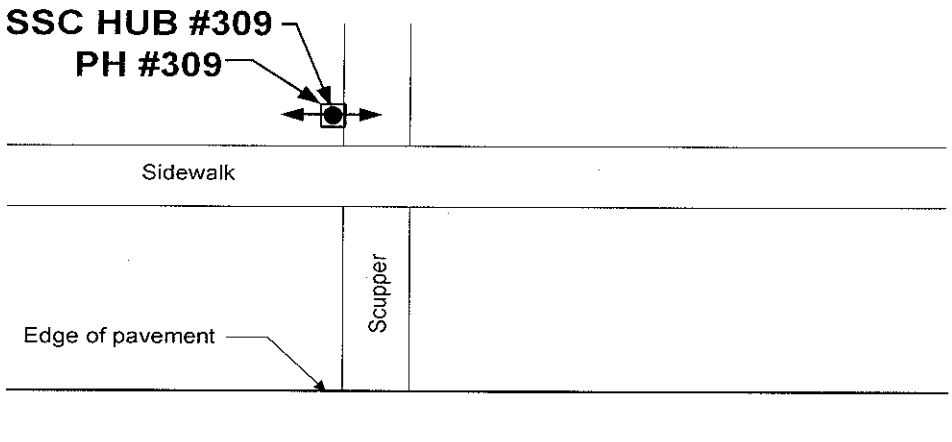
Elev. Bottom of Utility: 1000.85

Facing: West

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 310 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 306+69.34 / 17.76' Rt. | Northing: 335035.49 | Easting: 596797.24 | Elevation: 999.46

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.46					Station / Offset:	306+69.34 / 17.76' Rt.
Rod Reading (HUB - Pothole Crew):	5.44	HUB:	5.44	T.O.U.:	12.71	Northing:	335035.49
Height of Instrument (H. I.):	1004.90	G. L.:	5.44	B.O.U.:	13.04	Easting:	596797.24

H. I. :	1004.90	H. I. :	1004.90	H. I. :	1004.90
(-) Rod Read Top Util. (T.O.U.):	12.71	(-) Rod Read Bottom Util. (B.O.U.):	13.04	(-) Rod Read Pothole (G.L.):	5.44
= Elevation Top Utility:	992.19	= Elevation Bottom Utility:	991.86	= Elevation Ground Level:	**999.46**

Station / Offset: 306+69.34 / 17.34' Rt.

Northing: 335035.49

Easting: 596796.82

Actual Field Measurement: (Existing Grade to T.O.U.) 7.27

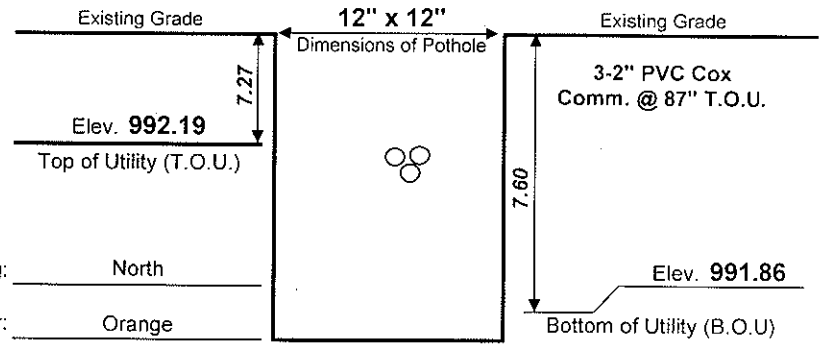
Elev. Top of Utility: 992.19

Actual Field Measurement: (Existing Grade to B.O.U.) 7.60

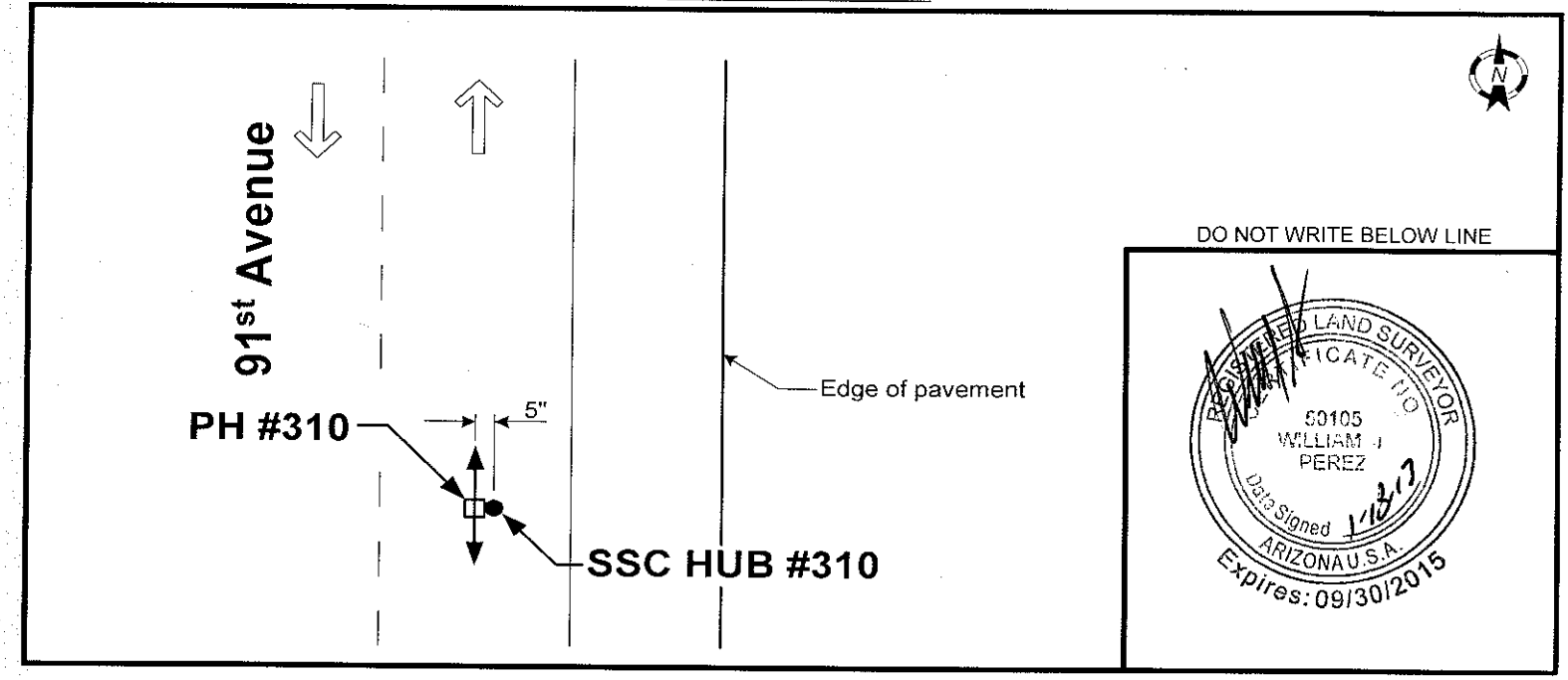
Elev. Bottom of Utility: 991.86

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



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Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 311 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: Cox Communications

Station / Offset: 308+97.48 / 21.73' Rt. | Northing: 335263.55 | Easting: 596804.41 | Elevation: 999.33

Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 999.33 | Station / Offset: 308+97.48 / 21.73' Rt.

Rod Reading (HUB - Pothole Crew): 5.36 | HUB: 5.36 | T.O.U.: 10.24 | Northing: 335263.55

Height of Instrument (H. I.): 1004.69 | G. L.: 5.34 | B.O.U.: 10.57 | Easting: 596804.41

H. I. :	1004.69	H. I. :	1004.69	H. I. :	1004.69
(-) Rod Read Top Util. (T.O.U.):	10.24	(-) Rod Read Bottom Util. (B.O.U.):	10.57	(-) Rod Read Pothole (G.L.):	5.34
= Elevation Top Utility:	994.45	= Elevation Bottom Utility:	994.12	= Elevation Ground Level:	**999.35**

Station / Offset: 308+97.48 / 20.90' Rt.

Northing: 335263.55

Easting: 596803.58

Actual Field Measurement: (Existing Grade to T.O.U.) 4.90

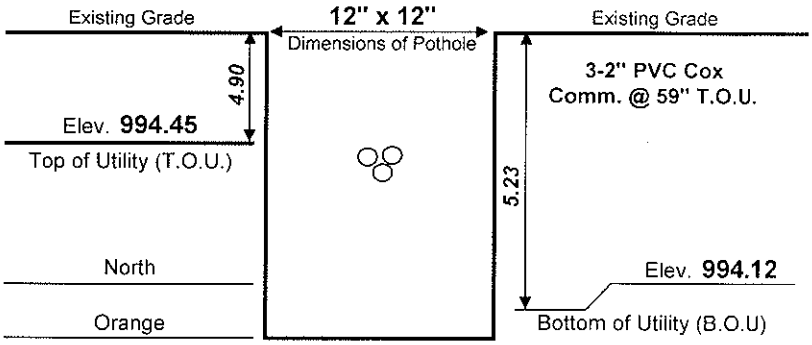
Elev. Top of Utility: 994.45

Actual Field Measurement: (Existing Grade to B.O.U.) 5.23

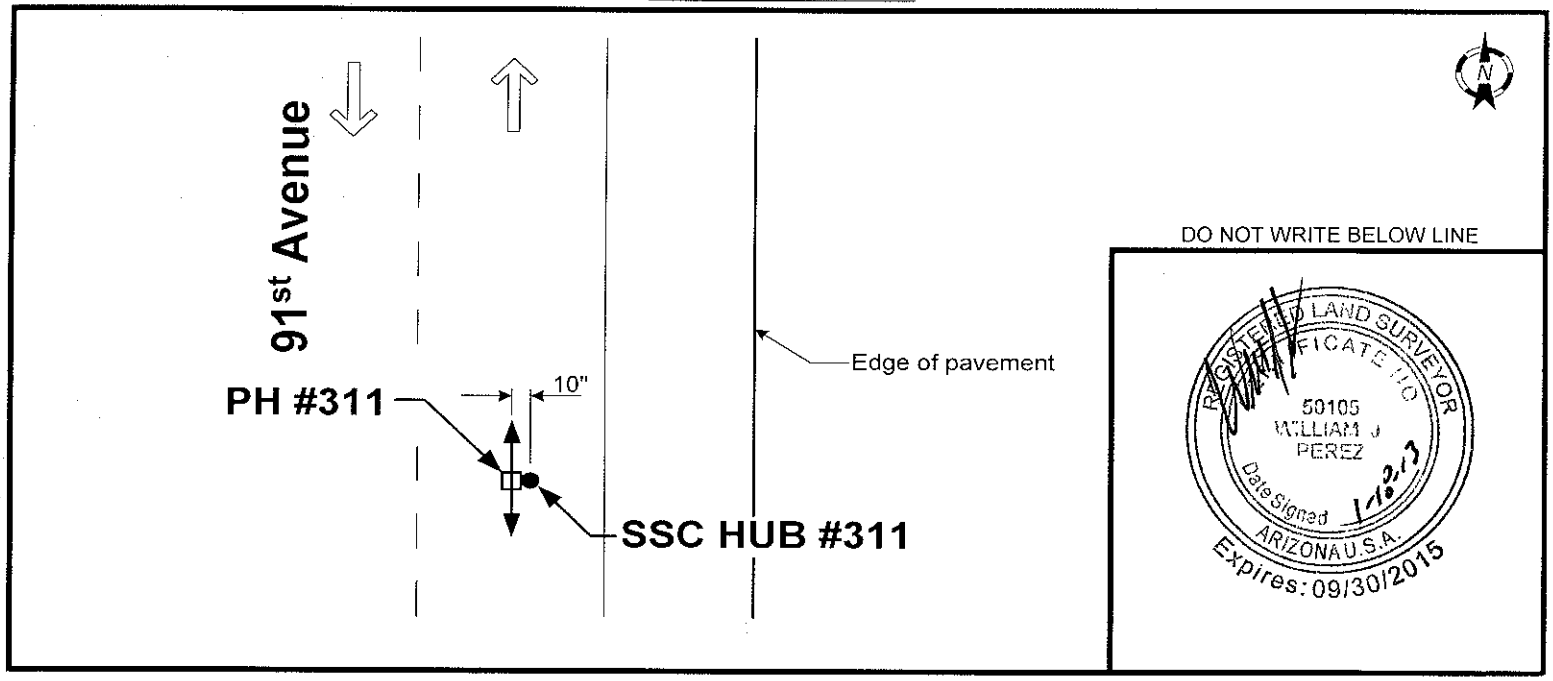
Elev. Bottom of Utility: 994.12

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



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REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J
PEREZ
Date Signed 1/18/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 312 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Michael

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 308+87.84 / 35.56' Rt. | Northing: 335253.72 | Easting: 596818.11 | Elevation: 999.33

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.33			Station / Offset:	308+87.84 / 35.56' Rt.
Rod Reading (HUB - Pothole Crew):	5.29	HUB: 5.29	T.O.U.: 9.51	Northing:	335253.72
Height of Instrument (H. I.):	1004.62	G. L.: 5.29	B.O.U.: 9.68	Easting:	596818.11

H. I. :	1004.62	H. I. :	1004.62	H. I. :	1004.62
(-) Rod Read Top Util. (T.O.U.):	9.51	(-) Rod Read Bottom Util. (B.O.U.):	9.68	(-) Rod Read Pothole (G.L.):	5.29
= Elevation Top Utility:	995.11	= Elevation Bottom Utility:	994.94	= Elevation Ground Level:	**999.33**

Station / Offset: 308+87.84 / 33.39' Rt.

Northing: 335253.72

Easting: 596815.94

Actual Field Measurement: 4.22 (Existing Grade to T.O.U.)

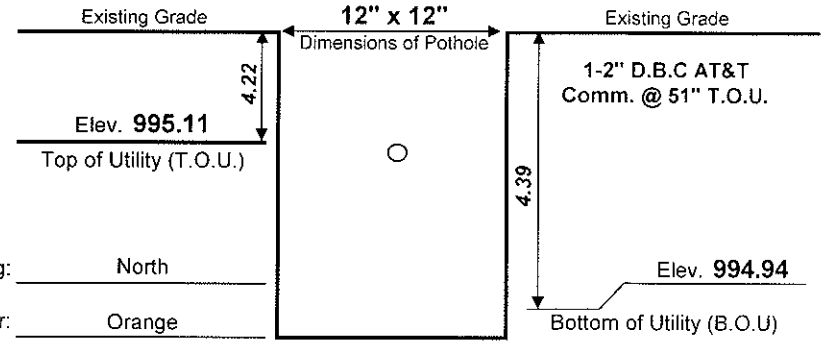
Elev. Top of Utility: 995.11

Actual Field Measurement: 4.39 (Existing Grade to B.O.U.)

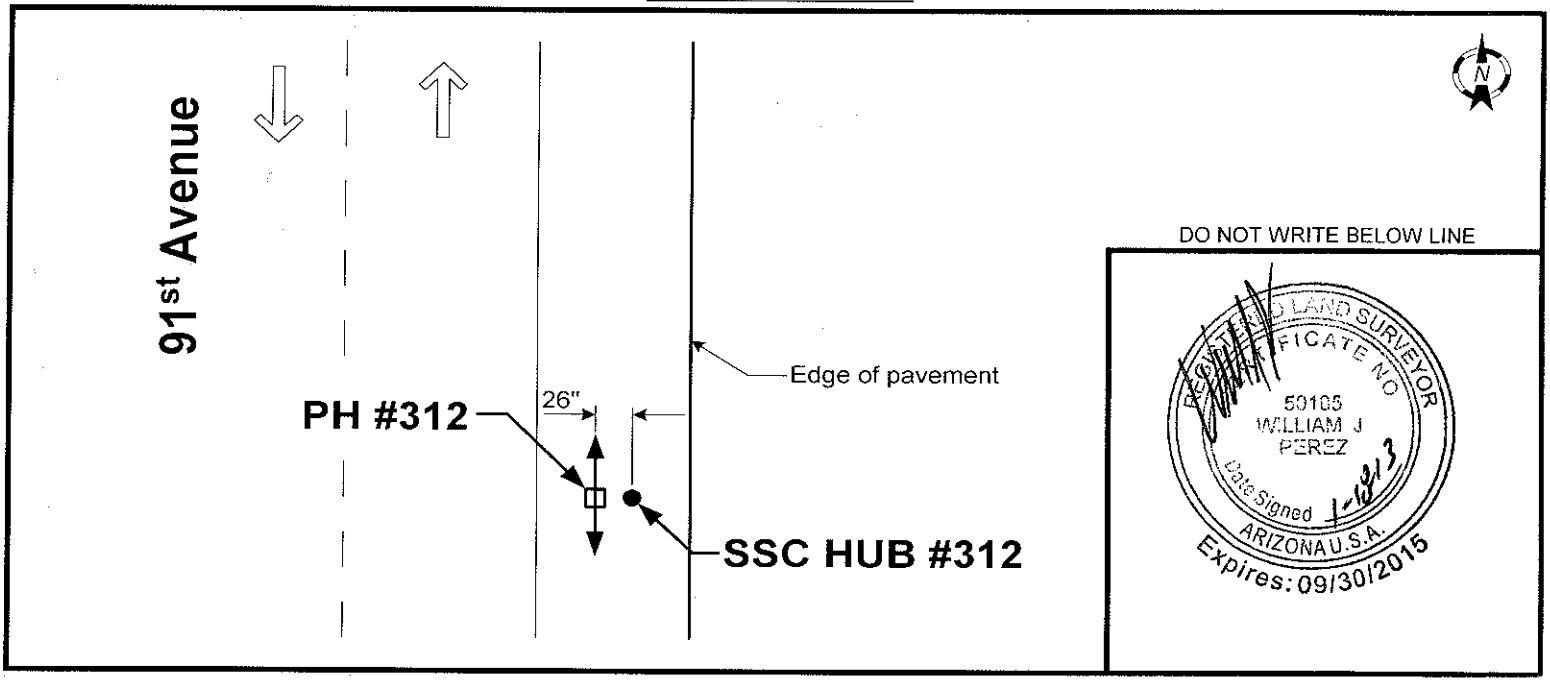
Elev. Bottom of Utility: 994.94

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO
50165
WILLIAM J
PEREZ
Date Signed 1-18-13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 313 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Sterling

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

AT&T

Size / Type: Communications

Station / Offset: 319+46.62 / 23.73' Lt. | Northing: 336313.48 | Easting: 596780.68 | Elevation: 1001.17

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.17			Station / Offset:	319+46.62 / 23.73' Lt.
Rod Reading (HUB - Pothole Crew):	5.16	HUB: 5.16	T.O.U.: 7.66	Northing:	336313.48
Height of Instrument (H. I.):	1006.33	G. L.: 5.35	B.O.U.: 7.83	Easting:	596780.68

H. I. :	1006.33	H. I. :	1006.33	H. I. :	1006.33
(-) Rod Read Top Util. (T.O.U.):	7.66	(-) Rod Read Bottom Util. (B.O.U.):	7.83	(-) Rod Read Pothole (G.L.):	5.35
= Elevation Top Utility:	998.67	= Elevation Bottom Utility:	998.50	= Elevation Ground Level:	1000.98

Station / Offset: 319+46.62 / 22.31' Lt.

Northing: 336313.48

Easting: 596782.10

Actual Field Measurement: 2.31
(Existing Grade to T.O.U.)

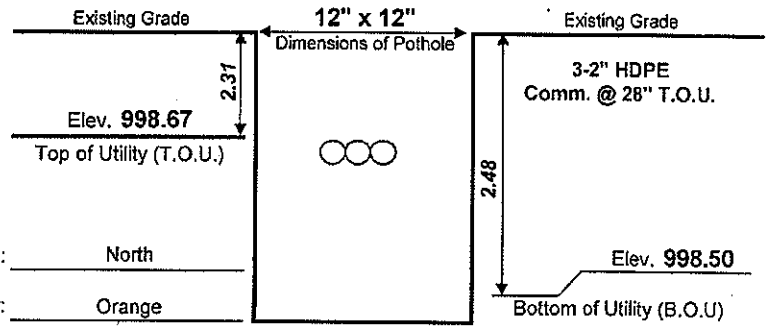
Elev. Top of Utility: 998.67

Actual Field Measurement: 2.48
(Existing Grade to B.O.U.)

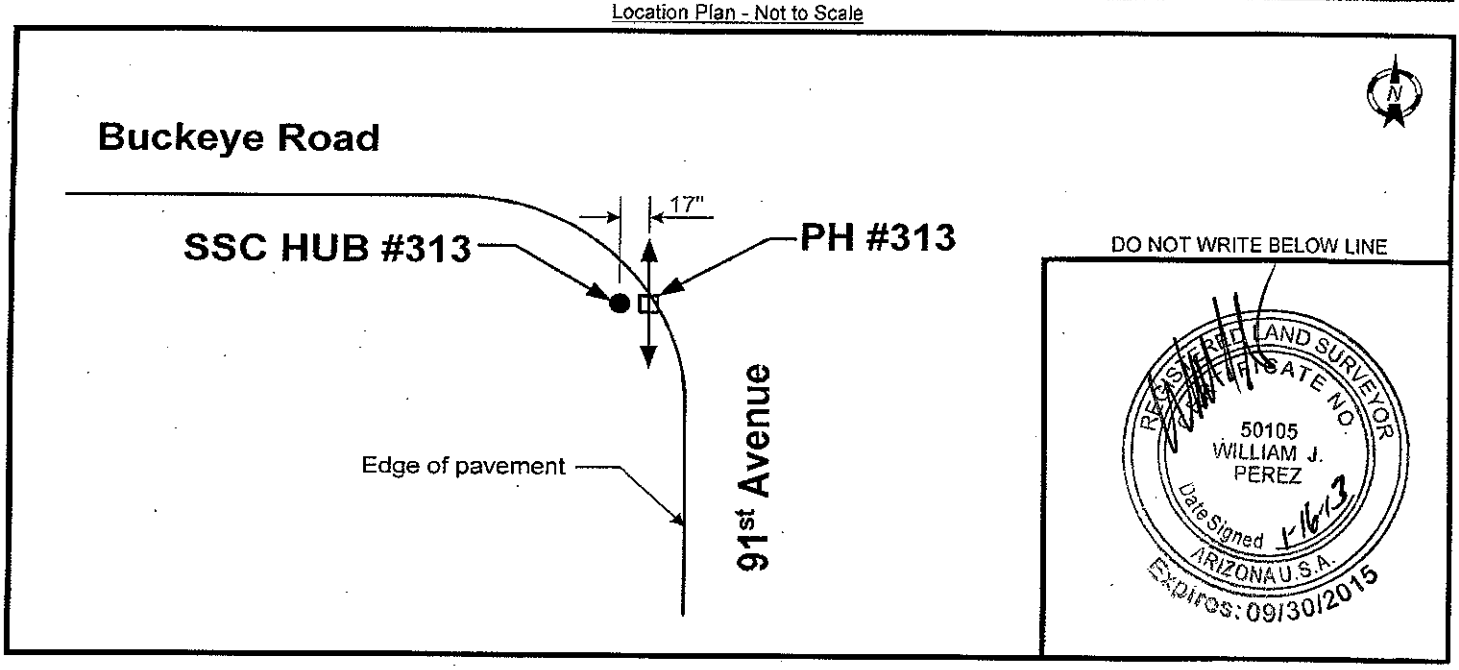
Elev. Bottom of Utility: 998.50

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 314 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 314+94.73 / 8.15' Rt. | Northing: 335860.94 | Easting: 596799.23 | Elevation: 999.96

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.96			Station / Offset:	314+94.73 / 8.15' Rt.
Rod Reading (HUB - Pothole Crew):	5.07	HUB:	5.07	T.O.U.:	10.17
Height of Instrument (H. I.):	1005.03	G. L.:	5.26	B.O.U.:	10.50
				Northing:	335860.94
				Easting:	596799.23

H. I. :	1005.03	H. I. :	1005.03	H. I. :	1005.03
(-) Rod Read Top Util. (T.O.U.):	10.17	(-) Rod Read Bottom Util. (B.O.U.):	10.50	(-) Rod Read Pothole (G.L.):	5.26
= Elevation Top Utility:	994.86	= Elevation Bottom Utility:	994.53	= Elevation Ground Level:	**999.77**

Station / Offset: 314+94.73 / 3.15' Rt.

Northing: 335860.94

Easting: 596794.23

Actual Field Measurement: 4.91
(Existing Grade to T.O.U.)

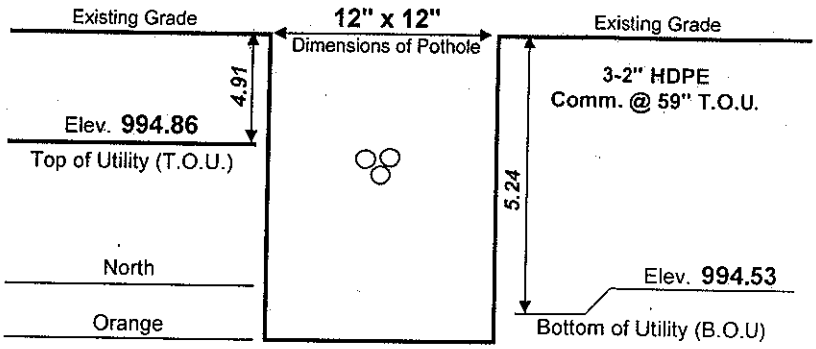
Elev. Top of Utility: 994.86

Actual Field Measurement: 5.24
(Existing Grade to B.O.U.)

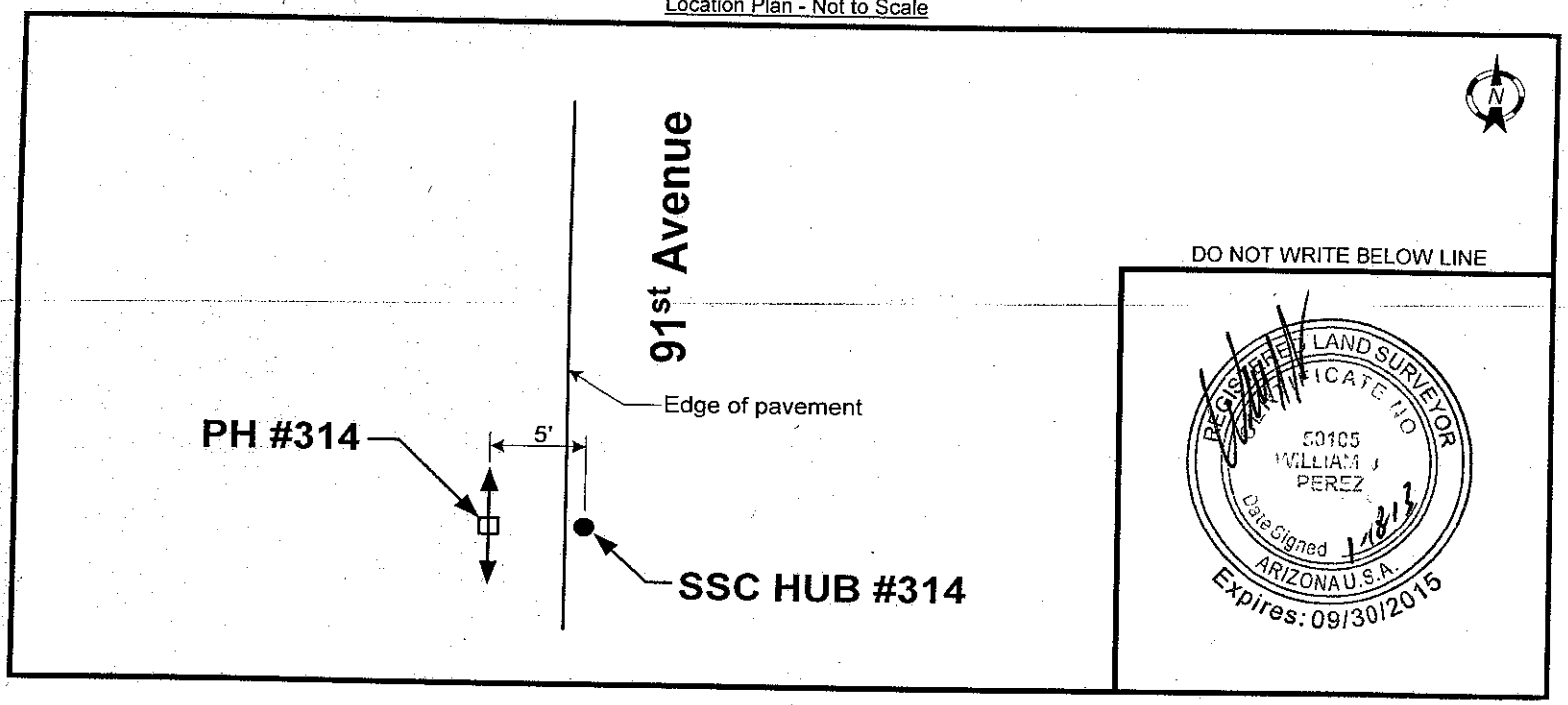
Elev. Bottom of Utility: 994.53

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 315 | Date Dug: 12/18/12

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 320+79.21 / 34.43' Lt. | Northing: 336445.77 | Easting: 596773.15 | Elevation: 1002.65

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1002.65			Station / Offset:	320+79.21 / 34.43' Lt.
Rod Reading (HUB - Pothole Crew):	5.10	HUB: 5.10	T.O.U.: 11.15	Northing:	336445.77
Height of Instrument (H. I.):	1007.75	G. L.: 5.10	B.O.U.: 11.32	Easting:	596773.15

H. I. :	1007.75	H. I. :	1007.75	H. I. :	1007.75
(-) Rod Read Top Util. (T.O.U.):	11.15	(-) Rod Read Bottom Util. (B.O.U.):	11.32	(-) Rod Read Pothole (G.L.):	5.10
= Elevation Top Utility:	996.60	= Elevation Bottom Utility:	996.43	= Elevation Ground Level:	**1002.65**

Station / Offset: 320+78.21 / 34.43' Lt.

Northing: 336444.77

Easting: 596773.15

Actual Field Measurement: 6.05
(Existing Grade to T.O.U.)

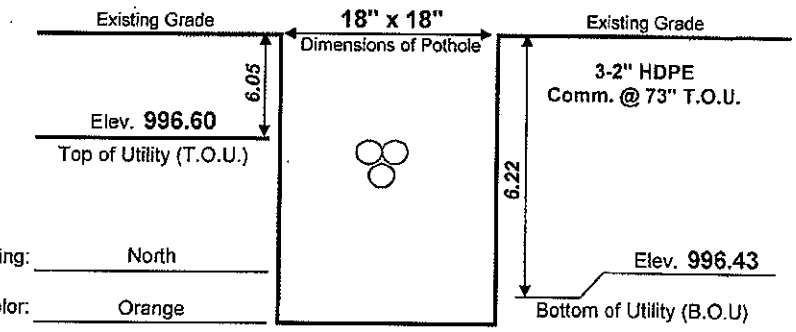
Elev. Top of Utility: 996.60

Actual Field Measurement: 6.22
(Existing Grade to B.O.U.)

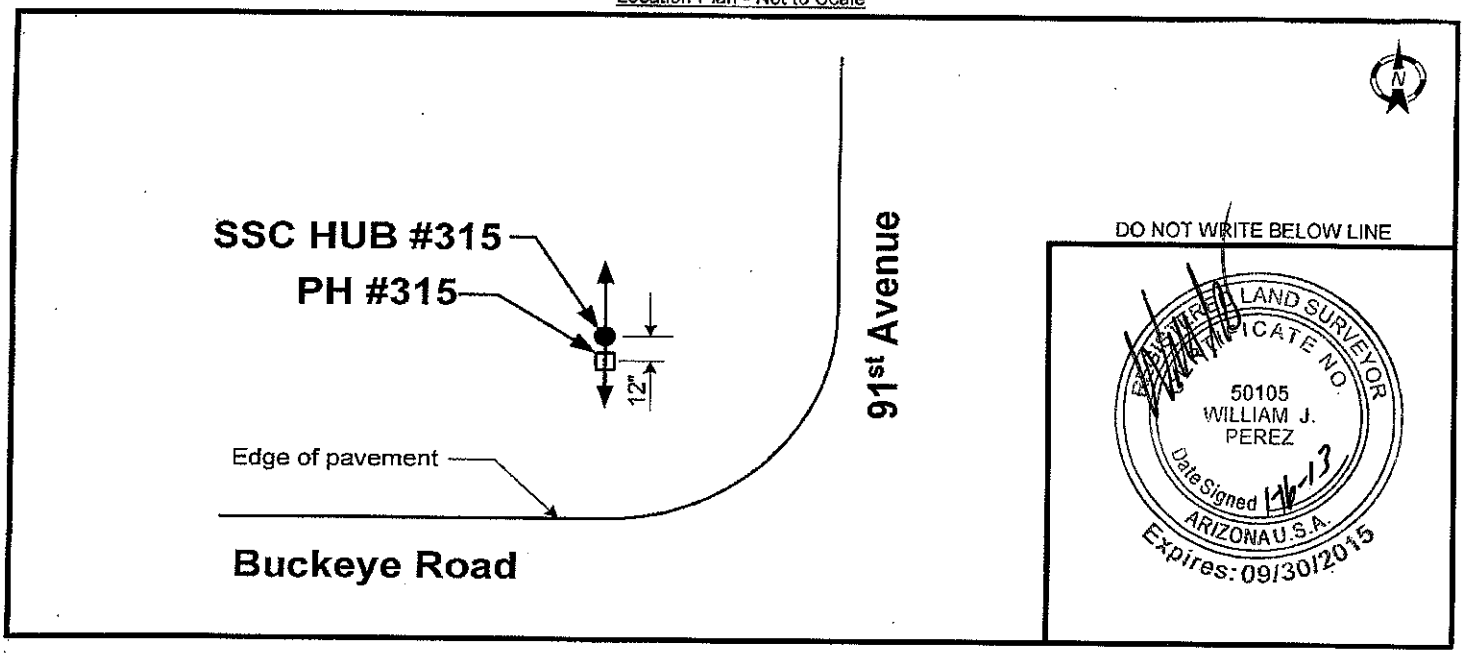
Elev. Bottom of Utility: 996.43

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 316 | Date Dug: 01/14/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 330+02.80 / 44.61' Lt. | Northing: 337369.57 | Easting: 596778.01 | Elevation: 1004.35

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1004.35			Station / Offset:	330+02.80 / 44.61' Lt.
Rod Reading (HUB - Pothole Crew):	5.49	HUB: 5.49	T.O.U.: 10.94	Northing:	337369.57
Height of Instrument (H. I.):	1009.84	G. L.: 5.49	B.O.U.: 11.27	Easting:	596778.01

H. I. :	1009.84	H. I. :	1009.84	H. I. :	1009.84
(-) Rod Read Top Util. (T.O.U.):	10.94	(-) Rod Read Bottom Util. (B.O.U.):	11.27	(-) Rod Read Pothole (G.L.):	5.49
= Elevation Top Utility:	998.90	= Elevation Bottom Utility:	998.57	= Elevation Ground Level:	1004.35

Station / Offset: 330+02.80 / 45.94' Lt.

Northing: 337369.57

Easting: 596776.68

Actual Field Measurement: (Existing Grade to T.O.U.) 5.45

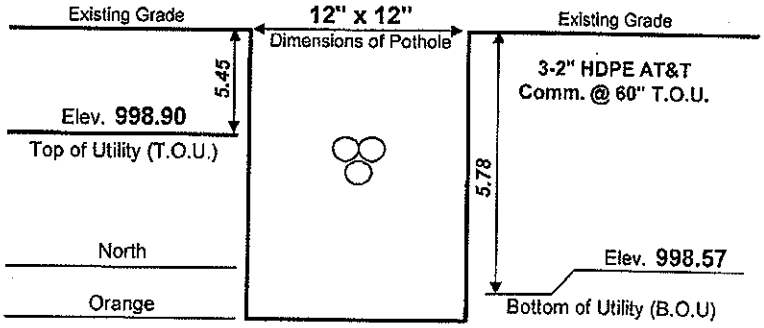
Elev. Top of Utility: 998.90

Actual Field Measurement: (Existing Grade to B.O.U.) 5.78

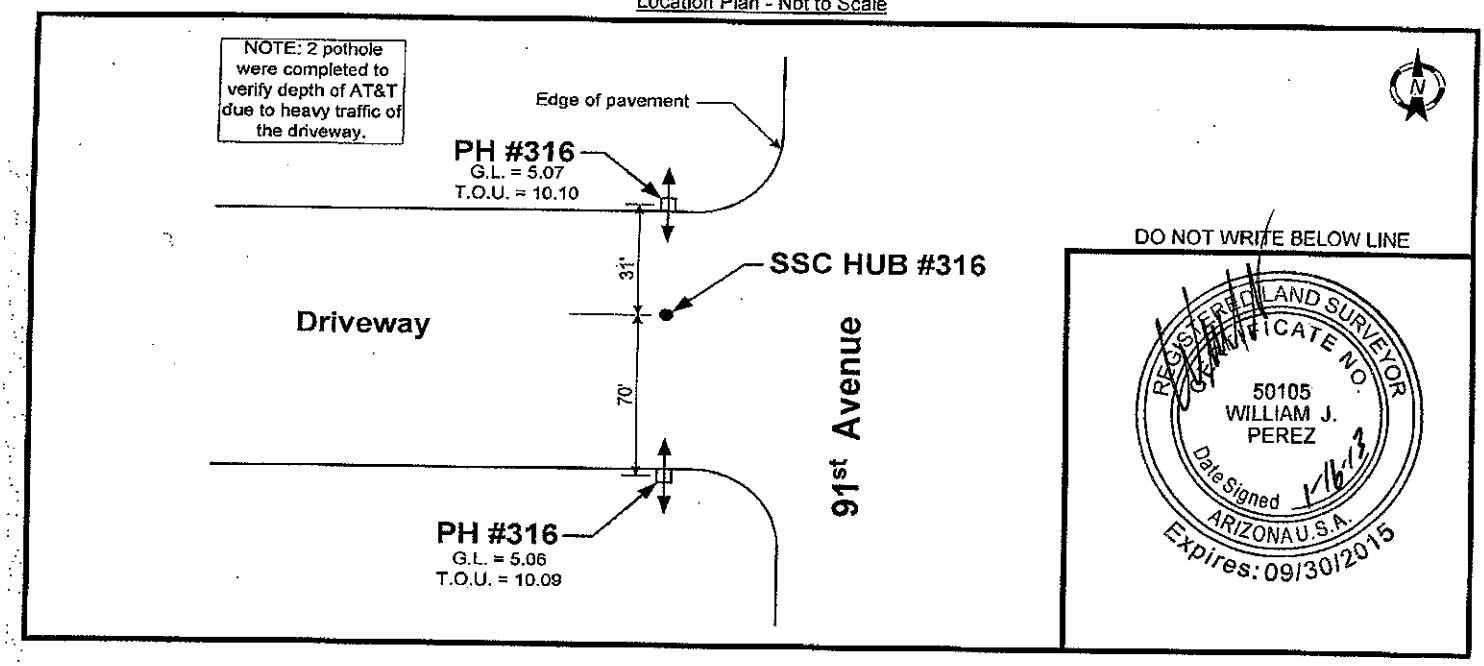
Elev. Bottom of Utility: 998.57

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
50105
WILLIAM J.
PEREZ
Date Signed 1/16/13
ARIZONA U.S.A.
Expires: 09/30/2015

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 317 | Date Dug: 01/17/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: James/Eric

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 313+01.51 / 9.77' Rt. | Northing: 335667.71 | Easting: 596798.13 | Elevation: 999.90

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.90					Station / Offset:	313+01.51 / 9.77' Rt.
Rod Reading (HUB - Pothole Crew):	4.90	HUB:	4.90	T.O.U.:	9.11	Northing:	335667.71
Height of Instrument (H. I.):	1004.80	G. L.:	4.93	B.O.U.:	9.44	Easting:	596798.13

H. I. :	1004.80	H. I. :	1004.80	H. I. :	1004.80
(-) Rod Read Top Util. (T.O.U.):	9.11	(-) Rod Read Bottom Util. (B.O.U.):	9.44	(-) Rod Read Pothole (G.L.):	4.93
= Elevation Top Utility:	995.69	= Elevation Bottom Utility:	995.36	= Elevation Ground Level:	**999.87**

Station / Offset: 313+01.51 / 9.77' Rt.

Northing: 335667.71

Easting: 596798.13

Actual Field Measurement: 4.18 (Existing Grade to T.O.U.)

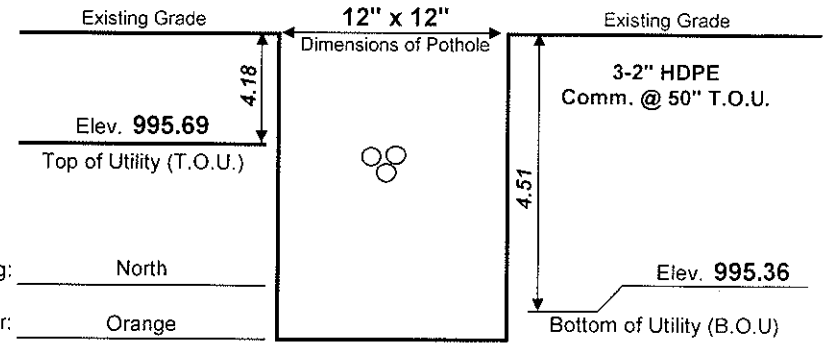
Elev. Top of Utility: 995.69

Actual Field Measurement: 4.51 (Existing Grade to B.O.U.)

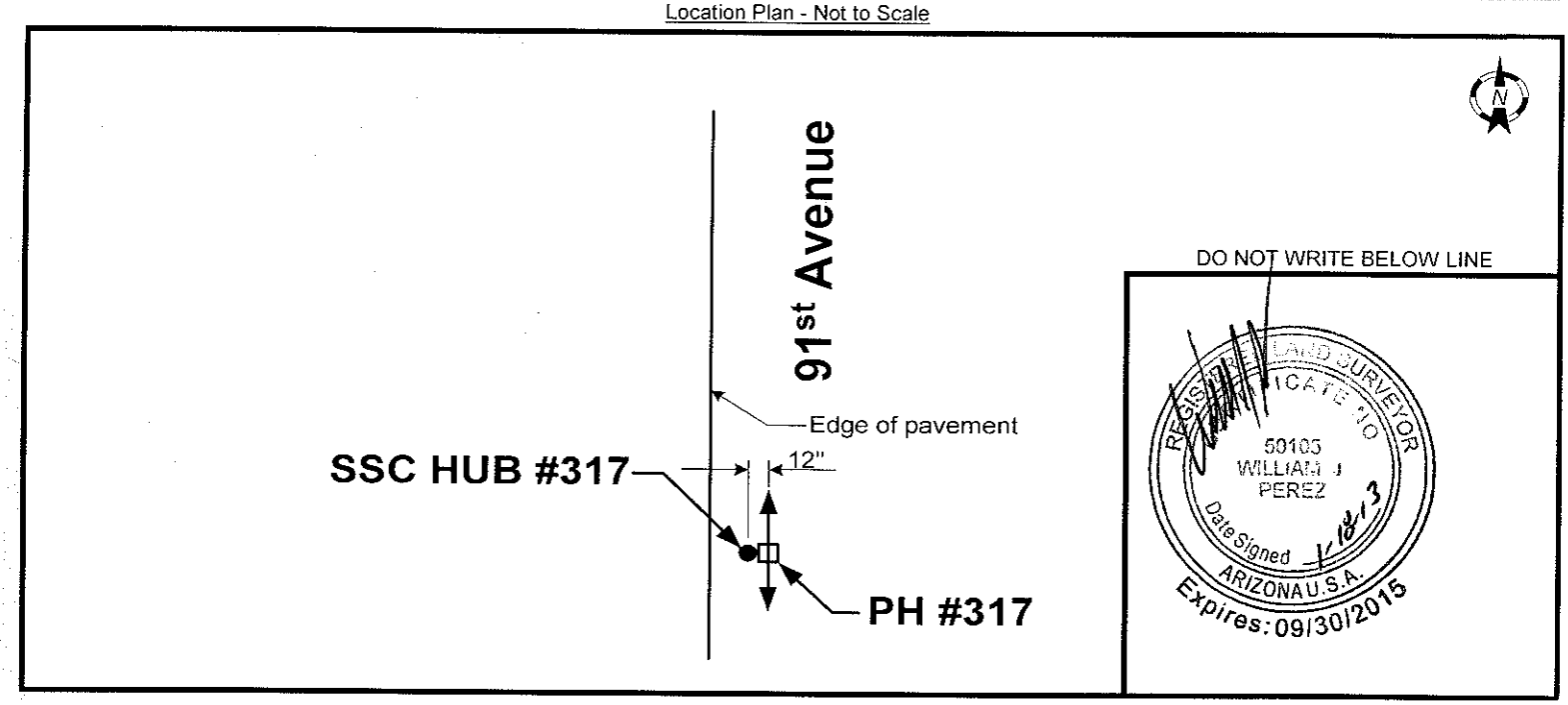
Elev. Bottom of Utility: 995.36

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 6 " of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 318 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

AT&T
Size / Type: Communications

Station / Offset: 314+12.42 / 11.70' Rt. | Northing: 335778.59 | Easting: 596801.62 | Elevation: 999.84

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.84					Station / Offset:	314+12.42 / 11.70' Rt.
Rod Reading (HUB - Pothole Crew):	5.40	HUB:	5.40	T.O.U.:	10.06	Northing:	335778.59
Height of Instrument (H. I.):	1005.24	G. L.:	5.38	B.O.U.:	10.39	Easting:	596801.62

H. I. :	1005.24	H. I. :	1005.24	H. I. :	1005.24
(-) Rod Read Top Util. (T.O.U.):	10.06	(-) Rod Read Bottom Util. (B.O.U.):	10.39	(-) Rod Read Pothole (G.L.):	5.38
= Elevation Top Utility:	995.18	= Elevation Bottom Utility:	994.85	= Elevation Ground Level:	**999.86**

Station / Offset: 314+12.42 / 10.20' Rt.

Northing: 335778.59

Easting: 596800.12

Actual Field Measurement: 4.68
(Existing Grade to T.O.U.)

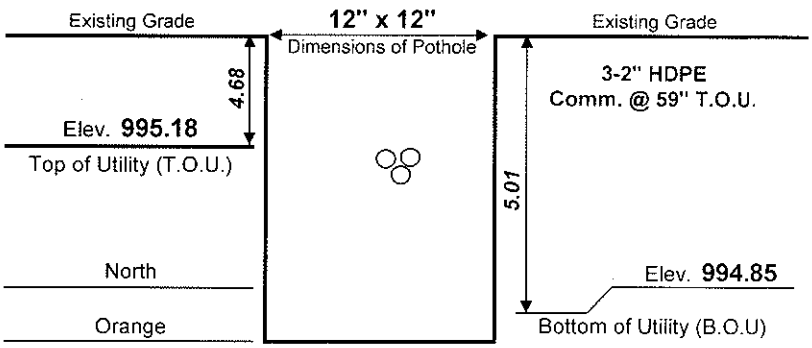
Elev. Top of Utility: 995.18

Actual Field Measurement: 5.01
(Existing Grade to B.O.U.)

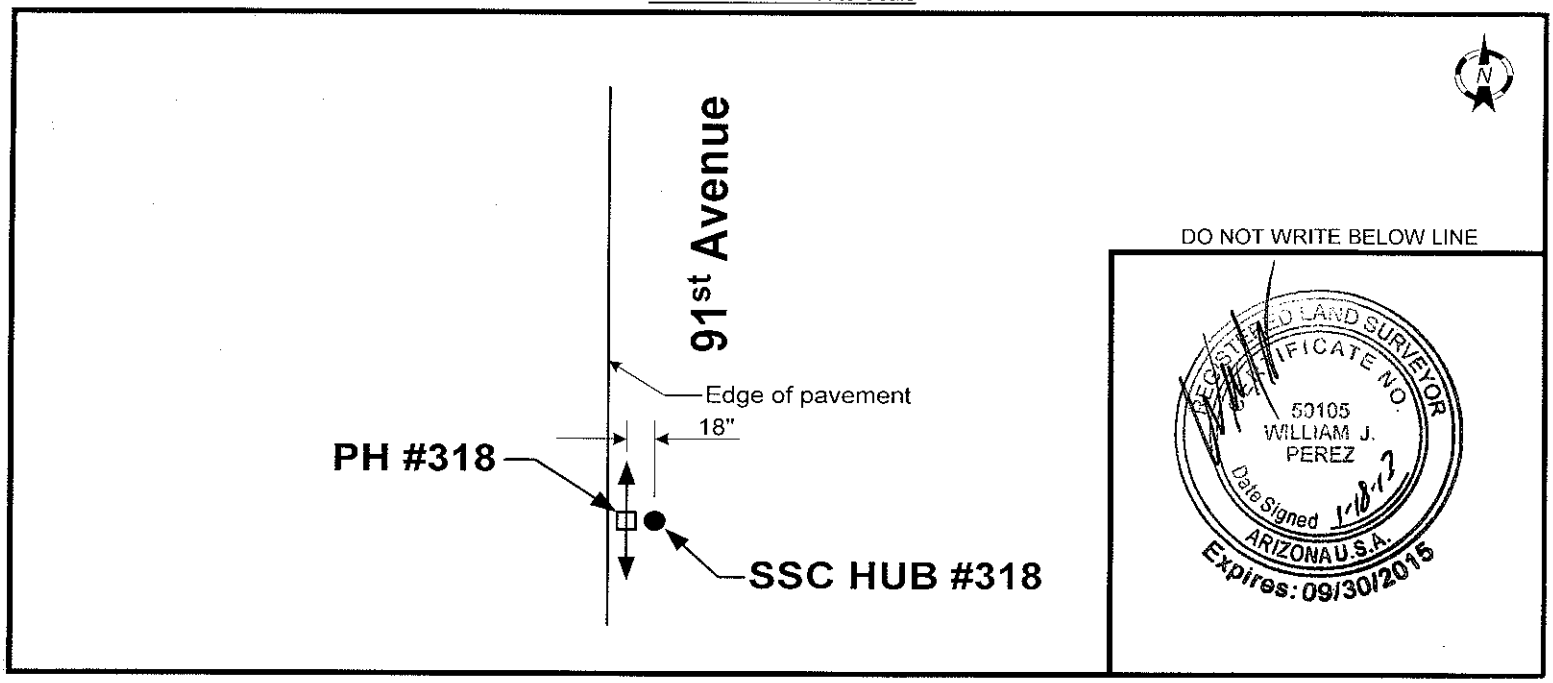
Elev. Bottom of Utility: 994.85

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 10" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 319 | Date Dug: 01/10/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: AT&T Communications

Station / Offset: 320+42.54 / 33.56' Lt. | Northing: 336409.10 | Easting: 596773.12 | Elevation: 1001.97

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1001.97			Station / Offset:	320+42.54 / 33.56' Lt.
Rod Reading (HUB - Pothole Crew):	5.30	HUB: 5.30	T.O.U.: 8.93	Northing:	336409.10
Height of Instrument (H. I.):	1007.27	G. L.: 5.24	B.O.U.: 9.26	Easting:	596773.12

H. I. :	1007.27	H. I. :	1007.27	H. I. :	1007.27
(-) Rod Read Top Util. (T.O.U.):	8.93	(-) Rod Read Bottom Util. (B.O.U.):	9.26	(-) Rod Read Pothole (G.L.):	5.24
= Elevation Top Utility:	998.34	= Elevation Bottom Utility:	998.01	= Elevation Ground Level:	1002.03

Station / Offset: 320+40.54 / 35.06' Lt.

Northing: 336407.10

Easting: 596771.62

Actual Field Measurement: (Existing Grade to T.O.U.) 3.69

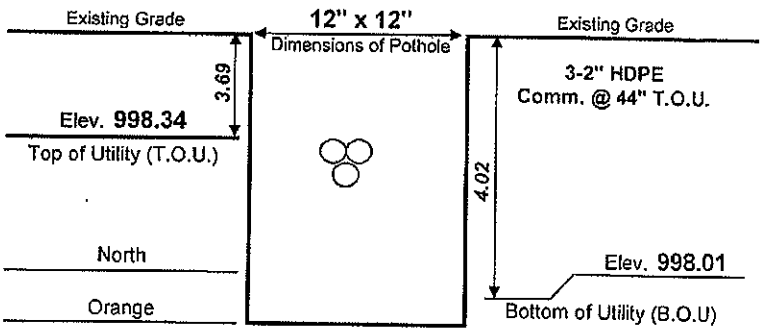
Elev. Top of Utility: 998.34

Actual Field Measurement: (Existing Grade to B.O.U.) 4.02

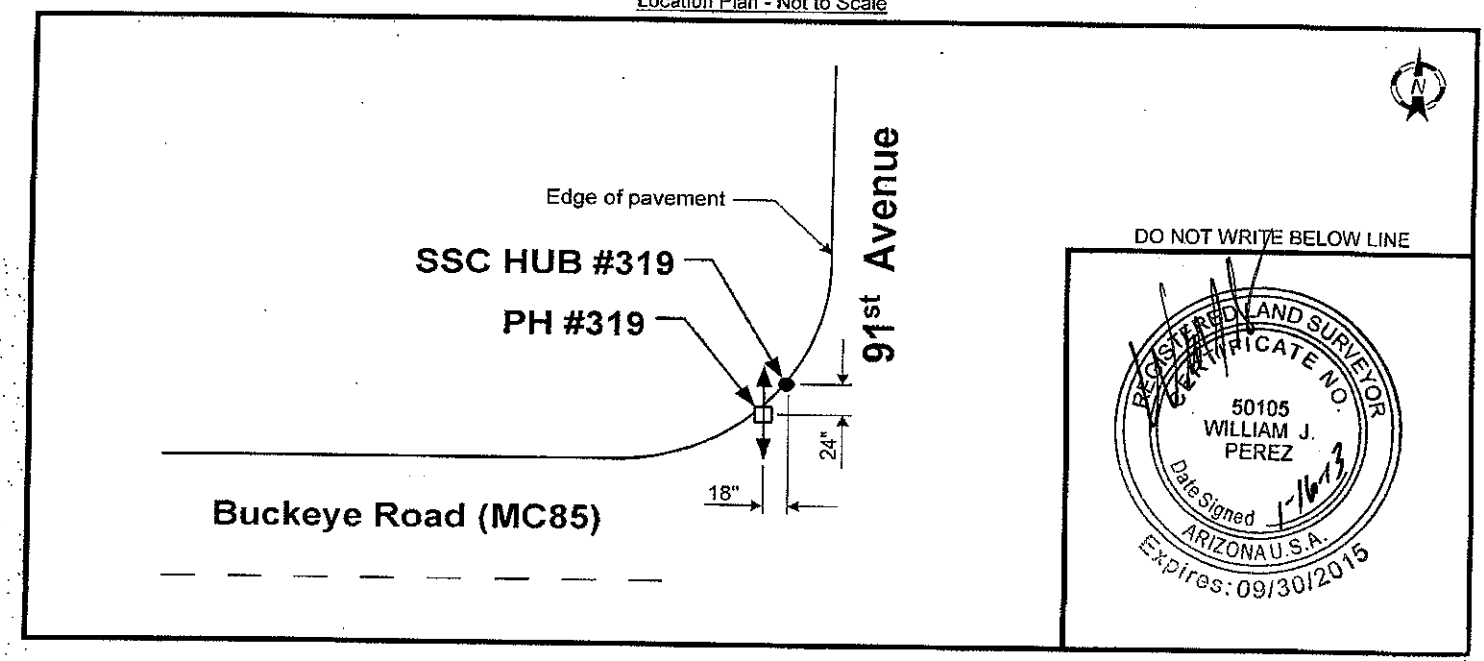
Elev. Bottom of Utility: 998.01

Facing: North

Ribbon Color: Orange



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 16" of asphalt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 320 | Date Dug: 01/14/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Arturo/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: SRP Electric

Station / Offset: 1228+56.26 / 81.47' Lt. | Northing: 336433.70 | Easting: 596028.19 | Elevation: 999.40

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	999.40					Station / Offset:	1228+56.26 / 81.47' Lt.
Rod Reading (HUB - Pothole Crew):	5.79	HUB:	5.79	T.O.U.:	10.84	Northing:	336433.70
Height of Instrument (H. I.):	1005.19	G. L.:	5.79	B.O.U.:	12.09	Easting:	596028.19

H. I. :	1005.19	H. I. :	1005.19	H. I. :	1005.19
(-) Rod Read Top Util. (T.O.U.):	10.84	(-) Rod Read Bottom Util. (B.O.U.):	12.09	(-) Rod Read Pothole (G.L.):	5.79
= Elevation Top Utility:	994.35	= Elevation Bottom Utility:	993.10	= Elevation Ground Level:	999.40

Station / Offset: 1228+56.26 / 80.47' Lt.

Northing: 336432.70

Easting: 596028.19

Actual Field Measurement: 5.05
(Existing Grade to T.O.U.)

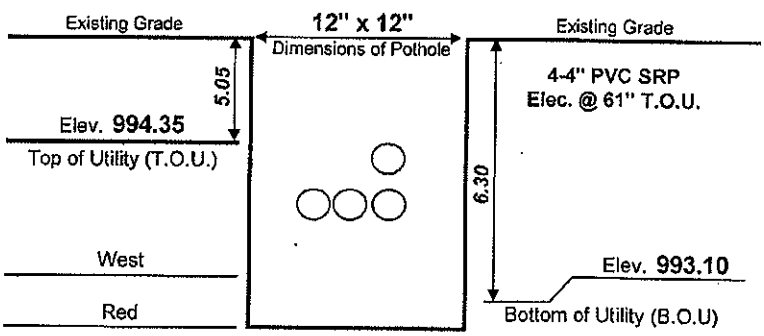
Elev. Top of Utility: 994.35

Actual Field Measurement: 6.30
(Existing Grade to B.O.U.)

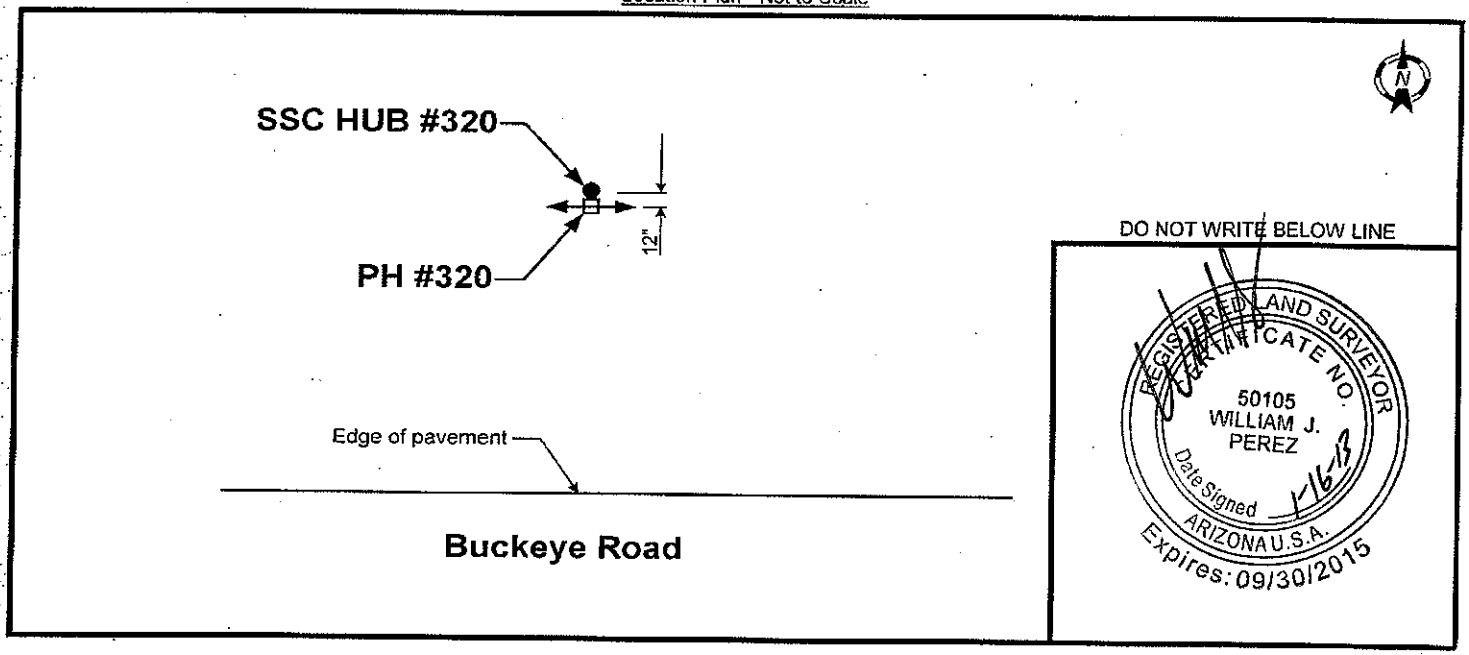
Elev. Bottom of Utility: 993.10

Facing: West

Ribbon Color: Red



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: "B" | Paving Thickness & Type: TH was dug in dirt.

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Full Service Survey Pothole Report

SSC Job No. 2180P | Cust. Job No. TT345 | Test Hole No. 321 | Date Dug: 01/15/13

Project Name: MC85 Buckeye Road Center Turn Lane Exp.

Checked by: Curtis | Crew Members: Jerome/Frankie

General Location: Buckeye Road 107th-75th | General: MCDOT

Anticipated Utility Information

Size / Type: City of Phoenix Water

Station / Offset: 1315+15.00 / 25.77' Rt. | Northing: 336794.67 | Easting: 604661.18 | Elevation: 1015.35

Benchmark Elevation Verification

Elev. B. M. (Survey Crew):	1015.35					Station / Offset:	1315+15.00 / 25.77' Rt.
Rod Reading (HUB - Pothole Crew):	4.94	HUB:	4.94	T.O.U.:	10.60	Northing:	336794.67
Height of Instrument (H. I.):	1020.29	G. L.:	4.94	B.O.U.:	11.77	Easting:	604661.18

H. I. :	1020.29	H. I. :	1020.29	H. I. :	1020.29
(-) Rod Read Top Util. (T.O.U.):	10.60	(-) Rod Read Bottom Util. (B.O.U.):	11.77	(-) Rod Read Pothole (G.L.):	4.94
= Elevation Top Utility:	1009.69	= Elevation Bottom Utility:	1008.52	= Elevation Ground Level:	**1015.35**

Station / Offset: 1315+15.00 / 25.77' Rt.

Northing: 336794.67

Easting: 604661.18

Actual Field Measurement: 5.66 (Existing Grade to T.O.U.)

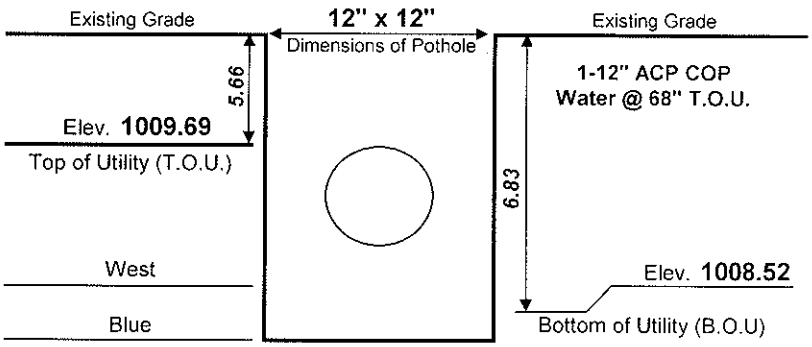
Elev. Top of Utility: 1009.69

Actual Field Measurement: 6.83 (Existing Grade to B.O.U.)

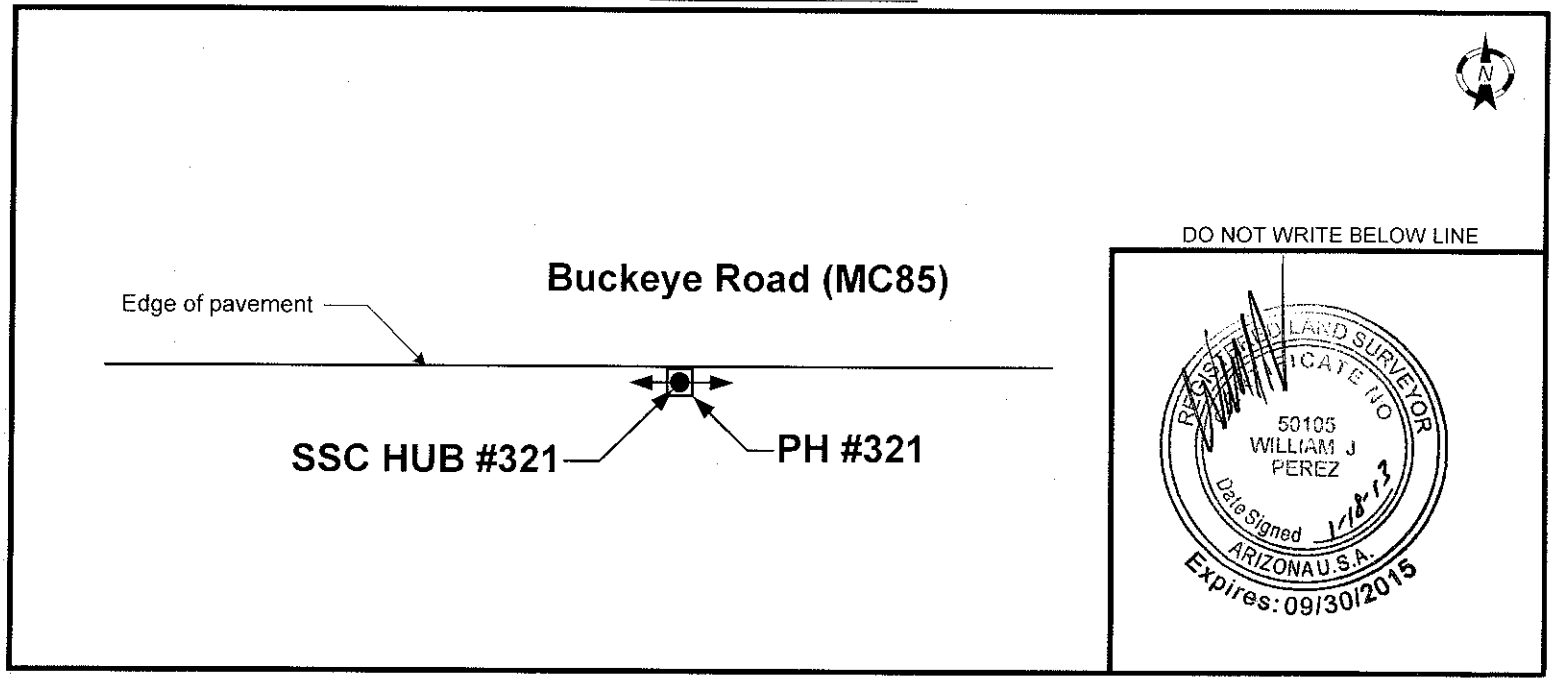
Elev. Bottom of Utility: 1008.52

Facing: West

Ribbon Color: Blue



Location Plan - Not to Scale



DO NOT WRITE BELOW LINE

Remarks: Elevation of utility was measured from Hub.

Was requested utility found? Yes | Soil Type: " B " | Paving Thickness & Type: Remove 10" of asphalt.

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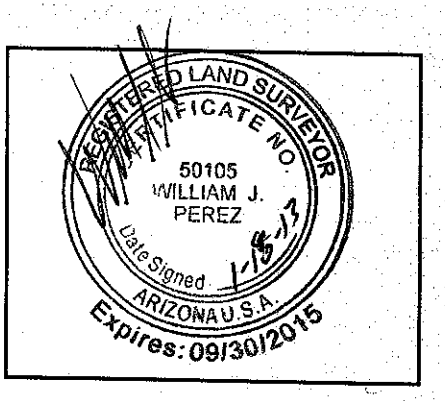

Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp
Project #: TT345
Encumbrance
SSC Job #: 2080P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

SSC
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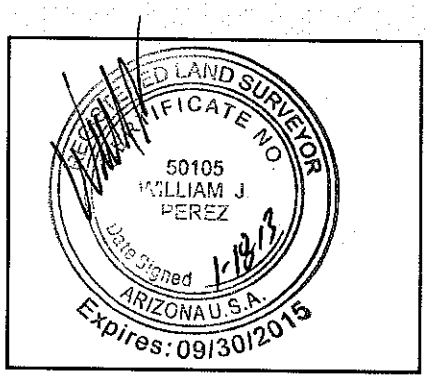
Underground, We're a Cut Above

TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
A01	Buckeye Road 107th-75th	336254.03	585248.17	Electric	12/27/12	990.95	990.37	989.53	SRP Electric	0.58
A02	Buckeye Road 107th-75th	336250.57	585497.49	Electric	12/27/12	992.14	990.15	989.98	SRP Electric	1.99
A03	Buckeye Road 107th-75th	336261.29	585614.25	Water	01/09/13	992.72	983.47	982.30	City of Avondale Water	9.25
A04	Buckeye Road 107th-75th	336221.44	585601.77	Electric	12/27/12	993.08	987.42	987.09	SRP Electric	5.66
A05	Buckeye Road 107th-75th	336245.10	585796.54	Electric	12/27/12	993.50	990.24	989.91	SRP Electric	3.26
A06	Buckeye Road 107th-75th	336215.32	585866.22	Communications	01/03/13	993.78	989.97	989.80	Cox Communication	3.81
A07	Buckeye Road 107th-75th	336226.25	586034.38	Water	12/19/12	993.17	987.84	987.17	City of Avondale Water	5.33
A08	Buckeye Road 107th-75th	336227.23	586041.45	Gas	01/08/13	0.00	0.00	0.00	Southwest Gas	0.00
A09	Buckeye Road 107th-75th	336222.11	586052.17	Electric	12/19/12	993.52	988.94	988.69	SRP Electric	4.58
A10	Buckeye Road 107th-75th	336222.42	586199.60	Electric	12/31/12	994.18	989.81	989.56	SRP Electric	4.37
A11	Buckeye Road 107th-75th	336188.98	586206.50	Electric	12/31/12	993.55	987.86	987.61	SRP Electric	5.69
A12	Buckeye Road 107th-75th	336177.27	586237.76	Gas	01/14/13	993.03	987.64	987.31	Southwest Gas	5.39
A13	Buckeye Road 107th-75th	336188.99	586246.74	Communications	01/09/13	993.02	989.51	989.01	Century Link Communications	3.51
A14	Buckeye Road 107th-75th	336189.27	586289.35	Water	01/07/13	993.24	986.87	985.20	City of Avondale Water	6.37
A15	Buckeye Road 107th-75th	336190.27	586293.25	Communications	01/07/13	993.18	986.49	986.43	Century Link Communications	6.69
A16	Buckeye Road 107th-75th	336274.48	586295.95	Communications	01/08/13	993.91	990.37	987.35	Century Link Communications	3.54
A17	Buckeye Road 107th-75th	336308.61	586309.86	Gas	01/09/13	994.00	987.98	987.15	Southwest Gas	6.02
A18	Buckeye Road 107th-75th	336259.72	586304.80	Communications	01/09/13	993.63	988.66	988.49	Level3 Communications	4.97
A19	Buckeye Road 107th-75th	336251.01	586311.14	Gas	1/09/13	993.37	989.70	989.53	Southwest Gas	3.67
A20	Buckeye Road 107th-75th	336249.22	586305.31	Communications	01/09/13	0.00	0.00	0.00	Cox Communications	0.00



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

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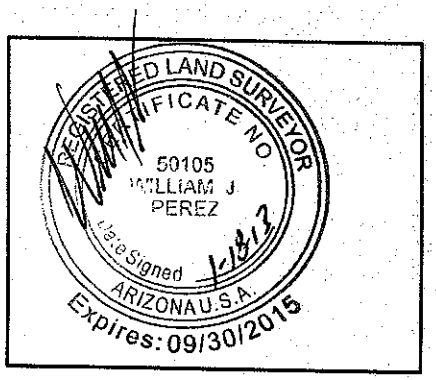
TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
A21	Buckeye Road 107th-75th	336250.33	586304.64	Electric	01/09/13	993.47	991.17	991.00	SRP Electric	2.30
A22	Buckeye Road 107th-75th	336240.68	586304.69	Electric	01/09/13	0.00	0.00	0.00	SRP Electric	0.00
A24	Buckeye Road 107th-75th	336190.35	586303.80	Gas	01/09/13	992.92	988.37	988.04	Southwest Gas	4.55
B01	Buckeye Road 107th-75th	336285.22	587607.69	Communications	01/07/13	988.57	982.54	981.37	Level3 Communications	6.03
B02	Buckeye Road 107th-75th	336281.03	587607.69	Communications	01/07/13	0.00	0.00	0.00	Century Link Communications	0.00
B03	Buckeye Road 107th-75th	336360.27	587768.35	Electric	12/31/12	988.82	982.56	980.96	SRP Electric	6.26
B04	Buckeye Road 107th-75th	336360.57	587814.70	Electric	12/31/12	989.16	985.90	985.57	SRP Electric	3.26
B05	Buckeye Road 107th-75th	336295.47	588883.96	Communications	01/07/13	991.00	985.65	984.48	Level3 Communications	5.35
B06	Buckeye Road 107th-75th	336332.28	591941.64	Communications	01/07/13	995.15	989.51	988.34	Level3 Communications	5.64
B07	Buckeye Road 107th-75th	336319.94	591441.21	Gas	12/19/12	994.48	990.73	990.23	Southwest Gas	3.75
B08	Buckeye Road 107th-75th	336313.28	591441.66	Electric	12/19/12	0.00	0.00	0.00	SRP Electric	0.00
B09	Buckeye Road 107th-75th	336382.09	591441.84	Gas	01/07/13	994.48	987.98	986.98	Southwest Gas	6.50
B11	Buckeye Road 107th-75th	336453.13	591441.57	Sewer	12/27/12	993.31	973.10	971.93	City of Tolleson Sewer	20.21
B13	Buckeye Road 107th-75th	336616.58	591530.46	Water	01/02/13	993.78	989.60	988.02	City of Tolleson Water	4.18
B14	Buckeye Road 107th-75th	336616.59	591527.80	Electric	01/02/13	993.84	990.58	990.50	SRP Electric	3.26
C01	Buckeye Road 107th-75th	336323.67	591655.92	Gas	12/20/12	994.54	990.98	990.24	Southwest Gas	3.56
C02	Buckeye Road 107th-75th	336332.26	591653.91	Communications	01/07/13	994.65	988.30	987.13	Level3 Communications	6.35
C03	Buckeye Road 107th-75th	336383.67	591653.92	Gas	01/07/13	994.80	989.29	988.29	Southwest Gas	5.51
C04	Buckeye Road 107th-75th	336388.73	591653.91	Sewer	01/07/13	994.79	990.20	989.03	City of Tolleson Sewer	4.59
C05	Buckeye Road 107th-75th	336409.03	591653.91	Communications	01/04/13	994.06	988.71	988.54	Century Link Communications	5.35



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

SSC
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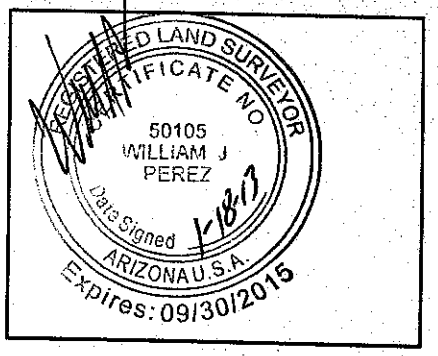
NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
C06	Buckeye Road 107th-75th	336424.19	591665.62	Sewer	01/02/13	992.52	985.65	983.98	City of Tolleson Sewer	6.87
C07	Buckeye Road 107th-75th	336433.91	591657.56	Sewer	01/02/13	992.88	987.78	986.78	City of Tolleson Sewer	5.10
C09	Buckeye Road 107th-75th	336410.35	594206.75	Sewer	12/18/12	998.55	994.30	993.13	City of Tolleson Sewer	4.25
C10	Buckeye Road 107th-75th	336410.27	594209.58	Sewer	12/20/12	998.64	990.61	984.61	City of Tolleson Sewer	8.03
C11	Buckeye Road 107th-75th	336410.68	594217.66	Sewer	12/20/12	998.63	991.59	989.92	City of Tolleson Sewer	7.04
C12	Buckeye Road 107th-75th	336411.23	594224.34	Sewer	12/20/12	998.46	991.44	989.69	City of Avondale Sewer	7.02
C13	Buckeye Road 107th-75th	336403.26	594235.40	Sewer	12/18/12	998.29	990.24	984.91	City of Phoenix Sewer	8.05
C14	Buckeye Road 107th-75th	336407.68	594242.65	Sewer	12/20/12	998.51	992.05	990.55	City of Tolleson Sewer	6.46
C15	Buckeye Road 107th-75th	336398.49	594253.02	Sewer	12/20/12	998.42	992.13	989.96	City of Tolleson Sewer	6.29
C17	Buckeye Road 107th-75th	336285.95	594202.04	Sewer	12/27/12	997.39	989.38	987.55	City of Tolleson Sewer	8.01
C18	Buckeye Road 107th-75th	336287.60	594208.30	Sewer	12/27/12	998.64	989.54	986.04	City of Tolleson Sewer	9.10
C19	Buckeye Road 107th-75th	1.50	594220.10	Sewer	12/13/12	998.32	993.00	990.92	City of Avondale Sewer	5.32
C20	Buckeye Road 107th-75th	336282.52	594252.47	Sewer	12/13/12	998.01	993.67	989.00	City of Phoenix Sewer	4.34
C21	Buckeye Road 107th-75th	336296.66	594233.81	Sewer	12/13/12	998.19	989.47	983.80	City of Phoenix Sewer	8.72
C22	Buckeye Road 107th-75th	334718.02	596708.92	Sewer	01/17/13	998.83	986.20	980.53	City of Phoenix Sewer	12.63
C23	Buckeye Road 107th-75th	334745.73	596709.63	Water	12/18/12	999.20	992.20	991.20	City of Phoenix Water	7.00
C24	Buckeye Road 107th-75th	334743.13	596708.83	Gas	12/18/12	999.15	995.99	995.82	SW Gas	3.16
C25	Buckeye Road 107th-75th	336323.55	596723.34	Electric	12/18/12	1001.32	994.26	993.93	SRP Electric	7.06
C26	Buckeye Road 107th-75th	336343.09	596723.35	Communications	01/10/13	1001.03	995.58	994.58	Level3 Communications	5.45
C27	Buckeye Road 107th-75th	336391.25	596723.81	Gas	01/10/13	1001.07	995.89	994.89	Southwest Gas	5.18



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

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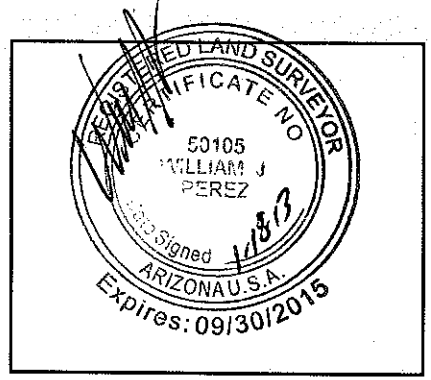
		Northing	Easting							
C29	Buckeye Road 107th-75th	336422.17	596720.31	Electric	12/17/12	1001.54	998.35	998.18	SRP Electric	3.19
C30	Buckeye Road 107th-75th	336420.98	596721.73	Communications	12/19/12	1001.51	996.89	996.56	Century Link Communications	4.62
C31	Buckeye Road 107th-75th	336444.69	596771.55	Electric	12/18/12	1002.80	999.10	998.94	SRP Electric	3.70
C32	Buckeye Road 107th-75th	337073.49	5967860!	Electric	01/14/13	1003.76	1001.84	1001.76	SRP Electric	1.92
C33	Buckeye Road 107th-75th	337346.20	596767.47	Electric	01/17/13	1004.55	1000.40	1000.23	SRP Electric	4.15
C34	Buckeye Road 107th-75th	336413.68	596768.74	Electric	01/15/13	1001.51	999.38	999.21	SRP Electric	2.13
C35	Buckeye Road 107th-75th	336407.09	596771.24	Electric	01/10/13	1002.04	999.48	999.23	SRP Electric	2.56
C36	Buckeye Road 107th-75th	336412.68	596840.17	Water	01/08/13	1001.28	993.24	991.91	City of Tolleson Water	8.04
C37	Buckeye Road 107th-75th	336414.05	596852.29	Electric	01/10/13	1001.27	994.13	993.71	SRP Electric	7.14
C38	Buckeye Road 107th-75th	336413.49	596853.02	Electric	01/10/13	1001.17	994.29	993.87	SRP Electric	6.88
C40	Buckeye Road 107th-75th	336414.97	596869.17	Gas	01/10/13	1001.25	994.57	994.32	Southwest Gas	6.68
C41	Buckeye Road 107th-75th	336414.91	596873.26	Communications	01/10/13	1001.21	999.38	N/A	Century Link Communications	1.83
C42	Buckeye Road 107th-75th	336432.41	596874.58	Communications	01/17/13	1001.45	996.29	995.96	Century Link Communications	5.16
C43	Buckeye Road 107th-75th	336415.47	596884.06	Electric	01/10/13	1001.09	998.92	998.75	SRP Electric	2.17
C44	Buckeye Road 107th-75th	336421.49	596904.42	Water	01/03/13	1001.67	998.93	996.43	City of Tolleson Water	2.74
D02	Buckeye Road 107th-75th	336469.09	597385.13	Water	01/03/13	1002.49	997.26	996.09	City of Tolleson Water	5.23
D04	Buckeye Road 107th-75th	336532.36	598040.01	Water	01/03/13	1004.22	998.59	997.42	City of Tolleson Water	5.63
D06	Buckeye Road 107th-75th	336509.01	598053.91	Gas	01/07/13	1003.48	998.26	997.43	Southwest Gas	5.22
D08	Buckeye Road 107th-75th	336729.90	601946.55	Gas	01/08/13	1006.98	1002.97	1002.64	Southwest Gas	4.01
D09	Buckeye Road 107th-75th	336729.94	601949.84	Electric	01/08/13	1007.21	1003.68	1003.01	SRP Electric	3.53



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

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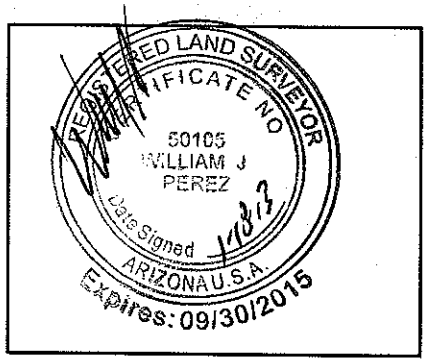
		Northing	Easting							
D10	Buckeye Road 107th-75th	336729.00	601984.25	Water	01/10/13	1007.30	1003.34	1002.17	City of Phoenix Water	3.96
D11	Buckeye Road 107th-75th	336729.19	601986.83	Gas	01/10/13	0.00	0.00	0.00	Southwest Gas	0.00
D12	Buckeye Road 107th-75th	335750.84	601888.80	Electric	12/19/12	1006.25	1001.87	1001.37	SRP Electric	4.38
D13	Buckeye Road 107th-75th	335991.29	601894.87	Electric	12/19/12	1006.45	1002.71	1002.21	SRP Electric	3.74
E01	Buckeye Road 107th-75th	336820.21	602068.24	Communications	01/07/13	1008.46	1002.84	1001.84	Level 3 Communication	5.62
E02	Buckeye Road 107th-75th	336816.87	602067.49	Communications	01/07/13	1008.39	1004.67	1003.92	Century Link Communications	3.72
E03	Buckeye Road 107th-75th	336868.41	602068.99	Gas	01/07/13	1009.18	1003.79	1002.96	Southwest Gas	5.39
E05	Buckeye Road 107th-75th	336897.90	602075.62	Sewer	01/17/13	1009.27	1000.52	998.94	City of Tolleson Sewer	8.75
E06	Buckeye Road 107th-75th	336915.58	602070.41	Communications	01/04/13	1008.70	1003.77	1003.69	Century Link Communications	4.93
E07	Buckeye Road 107th-75th	336913.45	602055.16	Water	01/14/13	1008.70	1002.68	1001.35	City of Tolleson Water	6.02
E08	Buckeye Road 107th-75th	337591.89	602026.38	Communications	12/17/12	1012.09	1007.01	1006.97	Century Link Communications	5.08
E09	Buckeye Road 107th-75th	337591.89	602023.46	Communications	12/17/12	1012.04	1006.58	1006.45	Century Link Communications	5.46
E10	Buckeye Road 107th-75th	337848.43	602005.64	Communications	01/17/13	1015.32	1011.11	1011.03	Century Link Communications	4.21
E11	Buckeye Road 107th-75th	337848.43	602012.97	Communications	01/17/13	1015.11	1006.51	1005.84	Century Link Communications	8.60
E12	Buckeye Road 107th-75th	337841.16	602024.61	Communications	12/17/12	1014.97	1012.56	N/A	Century Link Communications	2.41
E13	Buckeye Road 107th-75th	337840.93	602027.14	Communications	12/17/12	1014.96	1010.79	1010.75	Century Link Communications	4.17
E300	Buckeye Road 107th-75th	336318.71	596885.50	Communications	12/17/12	1001.52	998.58	998.33	Cox Communications	2.94
E301	Buckeye Road 107th-75th	336341.31	596994.63	Communications	01/15/13	1001.31	997.51	996.76	Cox Communications	3.80
E302	Buckeye Road 107th-75th	336425.76	597749.28	Communications	01/03/13	1002.52	997.52	997.19	Cox Communications	5.00
303	Buckeye Road 107th-75th	336782.62	601956.58	Communications	01/17/13	1007.60	994.26	993.93	Cox Communications	13.34



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

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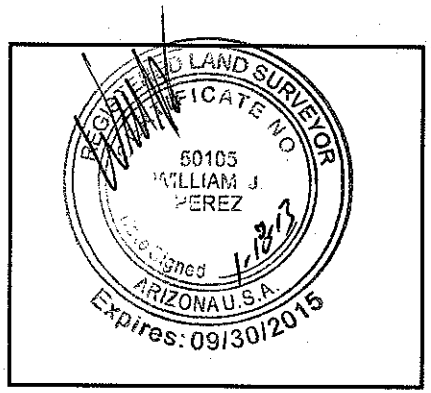
TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
304	MC85 Buckeye Road Center Turn Lane Exp.	336733.30	601957.80	Communications	01/08/13	1007.36	994.12	993.79	Cox Communications	13.24
305	MC85 Buckeye Road Center Turn Lane Exp.	336726.41	601957.67	Communications	01/08/13	1007.26	994.02	993.69	Cox Communications	13.24
306	MC85 Buckeye Road Center Turn Lane Exp.	336831.46	601072.64	Communications	12/31/12	1007.77	1005.25	1005.08	Cox Communications	2.52
307	MC85 Buckeye Road Center Turn Lane Exp.	336775.33	600471.02	Communications	01/08/13	1005.35	1002.48	1002.15	Cox Communications	2.87
308	MC85 Buckeye Road Center Turn Lane Exp.	336731.36	599961.94	Communications	01/08/13	1006.39	1000.43	1000.10	Cox Communications	5.96
309	MC85 Buckeye Road Center Turn Lane Exp.	336662.73	599206.62	Communications	01/15/13	1006.87	1001.18	1000.85	Cox Communications	5.69
310	MC85 Buckeye Road Center Turn Lane Exp.	335035.49	596796.82	Communications	01/17/13	999.46	992.19	991.86	Cox Communications	7.27
311	MC85 Buckeye Road Center Turn Lane Exp.	335263.55	596803.58	Communications	01/17/13	999.35	994.45	994.12	Cox Communications	4.90
312	MC85 Buckeye Road Center Turn Lane Exp.	335253.72	596815.94	Communications	01/15/13	999.33	995.11	994.94	AT&T Communications	4.22
313	MC85 Buckeye Road Center Turn Lane Exp.	336313.48	596782.10	Communications	12/18/12	1000.98	998.67	998.50	AT&T Communications	2.31
314	MC85 Buckeye Road Center Turn Lane Exp.	~~335855.94~~ 335860.94	~~596790.25~~ 596794.23	Communications	01/15/13	999.77	994.86	994.53	AT&T Communications	4.91
315	MC85 Buckeye Road Center Turn Lane Exp.	336444.77	596773.15	Communications	12/18/12	1002.65	996.60	996.43	AT&T Communications	6.05
316	MC85 Buckeye Road Center Turn Lane Exp.	337369.57	596776.68	Communications	01/14/13	1004.35	998.90	998.57	AT&T Communications	5.45
317	MC85 Buckeye Road Center Turn Lane Exp.	335667.71	596798.13	Communications	01/17/13	999.87	995.69	995.36	AT&T Communications	4.18
318	MC85 Buckeye Road Center Turn Lane Exp.	335778.59	596800.12	Communications	01/15/13	999.86	995.18	994.85	AT&T Communications	4.68
319	MC85 Buckeye Road Center Turn Lane Exp.	336407.10	596771.62	Communications	01/10/13	1002.03	998.34	998.01	AT&T Communications	3.69
320	MC85 Buckeye Road Center Turn Lane Exp.	336432.70	596028.19	Electric	01/14/13	999.40	994.35	993.10	SRP Electric	5.05
321	MC85 Buckeye Road Center Turn Lane Exp.	336794.67	604661.18	Water	01/15/13	1015.35	1009.69	1008.52	City of Phoenix Water	5.66
B08-A	MC85 Buckeye Road Center Turn Lane Exp.	336311.53	591441.66	Electric	12/20/12	994.06	990.77	990.69	SRP Electric	3.29
E02-A	MC85 Buckeye Road Center Turn Lane Exp.	336818.37	602067.49	Communications	01/07/13	1008.39	1006.03	1005.90	Century Link Communications	2.36



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 01/18/13
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2080P

SSC
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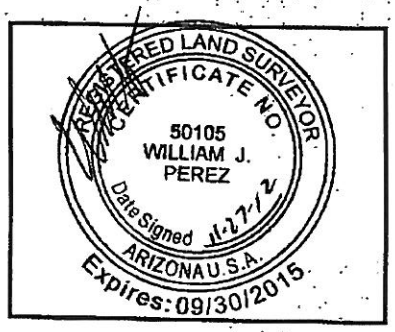
NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
D09-A	MC85 Buckeye Road Center Turn Lane Exp.	336729.94	601953.30	Gas	01/08/13	1007.21	1002.56	1002.23	Southwest Gas	4.65

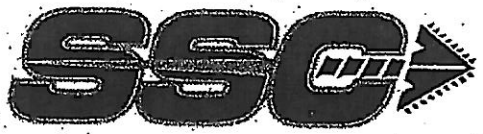


Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp
Project #: TT345
Encumbrance
SSC Job #: 2158P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.



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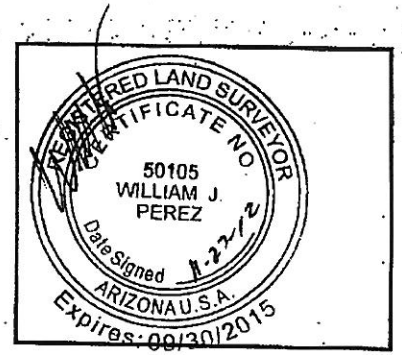
TH #	Street	Coordinates Northing	Coordinates Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
100	Buckeye Road 107th-75th	336276.23	586975.40	Communications	11/15/12	989.93	985.36	984.28	Level3 Fiber Optic	4.57
101	Buckeye Road 107th-75th	336265.81	586973.86	Gas	11/08/12	989.55	985.63	985.46	2" PE SW Gas	3.92
102	Buckeye Road 107th-75th	336263.71	586975.86	Communications	11/08/12	0.00	0.00	0.00	Century Link Telephone	0.00
103	Buckeye Road 107th-75th	336347.19	587324.96	Communications	11/08/12	988.77	985.17	985.09	Century Link Telephone	3.60
104	Buckeye Road 107th-75th	336280.82	587320.53	Communications	N/A	988.58	988.58	988.58	Per Blue Stake, No CLN at this location. No Pothole	0.00
191	Buckeye Road 107th-75th	336280.84	587421.46	Electric	11/08/12	987.73	983.28	982.53	SRP Electric	4.45
105	Buckeye Road 107th-75th	336270.18	587517.08	Electric	11/08/12	987.89	982.86	982.11	SRP Electric	5.03
106	Buckeye Road 107th-75th	336284.19	587766.85	Electric	11/09/12	989.05	985.62	983.34	SRP Electric	3.43
107	Buckeye Road 107th-75th	336293.62	588879.00	Irrigation	11/08/12	991.08	989.19	986.86	24" SRP Irrigation	1.89
110	Buckeye Road 107th-75th	336360.52	587938.93	Electric	11/08/12	989.66	986.86	985.50	SRP Electric	2.80
111	Buckeye Road 107th-75th	336301.94	591529.34	Gas	11/15/12	993.91	988.65	987.82	6" PE SW Gas	5.26
112	Buckeye Road 107th-75th	336300.96	591576.35	Communications	11/15/12	0.00	0.00	0.00	Century Link Telephone	0.00
115	Buckeye Road 107th-75th	336442.48	593106.11	Water	11/08/12	995.56	991.62	990.79	12" C.O.T. D.I.P. Water	3.94
116	Buckeye Road 107th-75th	336447.84	593118.69	Water	11/08/12	995.71	991.89	990.81	12" C.O.T. D.I.P. Water	3.82
117	Buckeye Road 107th-75th	336402.22	594364.62	Sewer	11/09/12	998.69	985.99	984.49	C.O.T. Sewer	12.70
118	Buckeye Road 107th-75th	336423.10	594962.30	Water	11/08/12	999.60	994.48	993.90	6" C.O.T. D.I.P. Water	5.12
124	Buckeye Road 107th-75th	336314.39	596795.94	Gas	11/15/12	1001.16	996.86	996.53	4" PE SW Gas	4.30
126	Buckeye Road 107th-75th	336315.92	596821.21	Water	11/16/12	1001.45	992.63	991.80	8" C.O.T. Water	8.82
128	Buckeye Road 107th-75th	336306.25	596842.78	Electric	11/15/12	1001.33	996.70	996.20	SRP Electric	4.63
129	Buckeye Road 107th-75th	336317.44	596848.01	Electric	11/20/12	1001.39	996.75	996.25	SRP Electric	4.64



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2158P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

SSC
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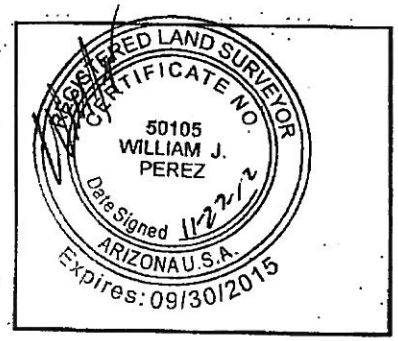
TH #	Street	Coordinates Northing	Coordinates Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
130	Buckeye Road 107th-75th	336315.48	596867.51	Gas	11/13/12	1001.37	996.07	995.90	2" PE SW Gas	5.30
131	Buckeye Road 107th-75th	336318.18	596871.04	Communications	11/13/12	1001.38	995.85	995.68	Century Link Telephone	5.53
132	Buckeye Road 107th-75th	336318.17	596874.60	Communications	11/13/12	0.00	0.00	0.00	Century Link Telephone	0.00
133	Buckeye Road 107th-75th	336319.20	596877.72	Electric	11/13/12	1001.57	999.26	999.09	SRP Electric	2.31
135	Buckeye Road 107th-75th	336432.87	597246.73	Gas	11/13/12	1002.05	996.79	995.79	10" HP SW Gas	5.26
138	Buckeye Road 107th-75th	336454.40	597243.49	Water	11/09/12	1001.47	996.38	995.26	12" C.O.T. Water	5.09
139	Buckeye Road 107th-75th	336425.39	597747.58	Communications	11/09/12	1002.61	997.65	997.48	Level3 Fiber Optic	4.96
140	Buckeye Road 107th-75th	336504.16	598609.06	Gas	11/09/12	0.00	0.00	0.00	2" PE SW Gas	0.00
141	Buckeye Road 107th-75th	336522.92	598709.13	Communications	11/13/12	1004.20	1000.02	998.94	Level3 Fiber Optic	4.18
142	Buckeye Road 107th-75th	336530.11	598804.25	Gas	11/10/12	1004.84	1001.28	1001.20	10" HP SW Gas	3.56
143	Buckeye Road 107th-75th	336573.19	599236.58	Communications	11/09/12	1005.50	1001.24	1000.16	Level3 Fiber Optic	4.26
144	Buckeye Road 107th-75th	336644.93	599970.51	Communications	11/14/12	1006.52	1001.26	1000.18	Level3 Fiber Optic	5.26
145	Buckeye Road 107th-75th	336688.59	600478.28	Communications	11/13/12	1006.64	1001.02	999.94	Level3 Fiber Optic	5.62
146	Buckeye Road 107th-75th	336705.96	600674.61	Communications	11/13/12	1007.19	1001.49	1000.41	Level3 Fiber Optic	5.70
152	Buckeye Road 107th-75th	336781.33	601956.12	Electric	11/16/12	1007.57	1002.71	1002.38	SRP Electric	4.86
153	Buckeye Road 107th-75th	336780.94	601948.73	Gas	11/16/12	1007.94	1001.15	1000.82	4" PE SW Gas	6.79
154	Buckeye Road 107th-75th	336784.29	601985.79	Water	11/16/12	1007.85	1002.59	1001.26	City of Phoenix Water	5.26
155	Buckeye Road 107th-75th	336784.17	601984.03	Communications	11/16/12	1007.84	1003.84	1003.76	Century Link Telephone	4.00
156	Buckeye Road 107th-75th	336785.34	601988.64	Communications	11/16/12	0.00	0.00	0.00	Century Link Telephone	0.00
159	Buckeye Road 107th-75th	336891.46	602144.76	Gas	11/11/12	1009.59	1004.99	1004.66	4" PE SW Gas	4.60



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2158P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

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Underground, We're a Cut Above

TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
160	Buckeye Road 107th-75th	336868.08	602145.21	Gas	11/15/12	1009.36	1003.60	1002.77	10" HP SW Gas	5.76
161	Buckeye Road 107th-75th	336844.71	602145.90	Communications	11/15/12	0.00	0.00	0.00	Century Link Telephone	0.00
162	Buckeye Road 107th-75th	336824.23	602146.21	Water	11/14/12	1008.55	1002.97	1001.80	City of Phoenx Water	5.58
163	Buckeye Road 107th-75th	336821.44	602146.46	Communications	11/13/12	1011.18	1006.77	1005.69	Level3 Fiber Optic	4.41
164	Buckeye Road 107th-75th	336886.65	602464.92	Gas	11/11/12	1009.69	1006.67	1006.34	4" PE SW Gas	3.02
165	Buckeye Road 107th-75th	336864.06	602466.06	Gas	11/15/12	1009.85	1004.39	1003.56	10" HP SW Gas	5.46
166	Buckeye Road 107th-75th	336839.60	602466.19	Communications	11/15/12	0.00	0.00	0.00	Century Link Telephone	0.00
167	Buckeye Road 107th-75th	336821.66	602466.20	Water	11/14/12	1009.43	1004.88	1003.71	City of Phoenix Water	4.55
168	Buckeye Road 107th-75th	336816.31	602464.87	Communications	11/13/12	1009.15	1004.03	1002.95	Level3 Fiber Optic	5.12
169	Buckeye Road 107th-75th	336869.26	602938.23	Gas	41224	1010.74	1006.24	1005.91	4" PE SW Gas	4.50
170	Buckeye Road 107th-75th	336859.19	602936.53	Gas	11/14/12	1010.85	1005.69	1004.77	10" HP SW Gas	5.16
171	Buckeye Road 107th-75th	336832.29	602936.25	Communications	N/A	1010.98	1010.98	1010.98	Per Blue Stake, No CLN at this location. No Pothole	0.00
172	Buckeye Road 107th-75th	336815.72	602936.01	Water	11/14/12	1010.57	1007.06	1005.89	City of Phoenix Water	3.51
173	Buckeye Road 107th-75th	336810.11	602934.40	Communications	11/13/12	1010.22	1005.08	1004.00	Level3 Fiber Optic	5.14
175	Buckeye Road 107th-75th	336824.93	603416.06	Communications	N/A	1011.88	1011.88	1011.88	Per Blue Stake, No CLN at this location. No Pothole	0.00
176	Buckeye Road 107th-75th	336810.45	603415.97	Water	11/14/12	1011.47	1007.02	1005.85	City of Phoenix Water	4.45
177	Buckeye Road 107th-75th	336804.02	603415.83	Communications	11/13/12	1011.37	1006.19	1005.11	Level3 Fiber Optic	5.18
178	Buckeye Road 107th-75th	336818.78	603811.05	Communications	N/A	1013.01	1013.01	1013.01	Per Blue Stake, No CLN at this location. No Pothole	0.00
179	Buckeye Road 107th-75th	336805.05	603810.86	Water	11/14/12	1012.57	1008.15	1006.98	City of Phoenix Water	4.42
180	Buckeye Road 107th-75th	336800.01	603808.83	Communications	11/13/12	1012.56	1007.37	1006.29	Level3 Fiber Optic	5.19

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2158P

NOTE:The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

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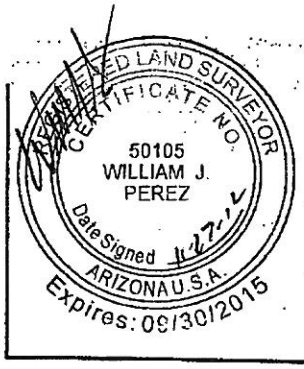
TH #	Street	Coordinates Northing	Coordinates Easting	Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
181	Buckeye Road 107th-75th	336814.92	604062.75	Communications	N/A	1013.71	1013.71	1013.71	Per Blue Stake, No CLN at this location. No Pothole	0.00
182	Buckeye Road 107th-75th	336802.60	604062.63	Water	11/14/12	1013.36	1009.39	1008.22	City of Phoenix Water	3.97
183	Buckeye Road 107th-75th	336812.21	604231.17	Communications	N/A	1014.30	1014.30	1014.30	Per Blue Stake, No CLN at this location. No Pothole	0.00
184	Buckeye Road 107th-75th	336800.05	604227.18	Water	11/14/12	1013.94	1009.60	1008.43	City of Phoenix Water	4.34
185	Buckeye Road 107th-75th	336794.46	604218.61	Communications	11/13/12	1013.60	1008.35	1007.27	Level3 Fiber Optic	5.25
187	Buckeye Road 107th-75th	336800.24	604615.56	Communications	N/A	1015.34	1015.34	1015.34	Per Blue Stake, No CLN at this location. No Pothole	0.00
188	Buckeye Road 107th-75th	336799.85	605256.24	Water	11/14/12	1016.80	1012.69	1011.52	City of Phoenix Water	4.11
189	Buckeye Road 107th-75th	336803.54	605846.18	Water	11/14/12	1018.69	1013.64	1012.47	City of Phoenix Water	5.05
190	Buckeye Road 107th-75th	336807.79	606576.18	Water	11/14/12	1021.08	1016.33	1015.16	City of Phoenix Water	4.75
202	Buckeye Road 107th-75th	337087.56	586343.61	Sewer	11/20/12	0.00	0.00	0.00	City of Tolleson Sewer	0.00
203	Buckeye Road 107th-75th	336980.66	586332.65	Electric	11/08/12	991.91	987.62	987.37	SRP Electric	4.29
204	Buckeye Road 107th-75th	336981.69	586333.45	Electric	11/08/12	0.00	0.00	0.00	SRP Electric	0.00
205	Buckeye Road 107th-75th	336785.78	586333.41	Electric	11/08/12	990.76	986.20	986.03	SRP Electric	4.56
208	Buckeye Road 107th-75th	335462.88	586302.14	Water	11/09/12	987.42	982.54	981.46	City of Avondale 12" Water	4.88
209	Buckeye Road 107th-75th	335463.05	586310.15	Gas	11/09/12	987.47	982.73	982.40	4" PE SW Gas	4.74
210	Buckeye Road 107th-75th	335461.97	586310.63	Communications	11/09/12	0.00	0.00	0.00	Century Link Telephone	0.00
235	Buckeye Road 107th-75th	336444.35	596840.22	Water	11/15/12	1001.36	993.95	992.62	City of Tolleson Water	7.41
236	Buckeye Road 107th-75th	336444.06	596855.11	Electric	11/16/12	1001.23	994.11	993.61	SRP Electric	7.12
237	Buckeye Road 107th-75th	336450.51	596863.75	Electric	11/20/12	1001.54	993.79	993.04	SRP Electric	7.75
238	Buckeye Road 107th-75th	336418.80	596808.85	Communications	11/15/12	1001.37	994.82	994.40	Century Link Telephone	6.55



Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2158P

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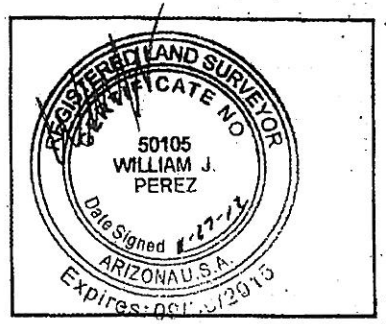
TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
240	Buckeye Road 107th-75th	336389.72	596808.26	Gas	11/15/12	1001.38	996.64	995.81	10" HP SW Gas	4.74
241	Buckeye Road 107th-75th	336350.12	596808.92	Communications	11/15/12	0.00	0.00	0.00	Level3 Fiber Optic	0.00
243	Buckeye Road 107th-75th	336264.92	596806.65	Water	11/15/12	1001.24	996.24	995.24	City of Tolleson 8" Water	5.00
244	Buckeye Road 107th-75th	336243.75	596806.05	Gas	11/15/12	1001.14	997.14	996.81	4" PE SW Gas	4.00
245	Buckeye Road 107th-75th	335262.28	596808.31	Gas	11/13/12	999.29	995.53	995.20	4" PE SW Gas	3.76
246	Buckeye Road 107th-75th	335260.77	596818.93	Electric	11/13/12	999.29	992.70	992.20	SRP Electric	6.59
247	Buckeye Road 107th-75th	335254.84	596817.18	Communications	11/13/12	0.00	0.00	0.00	Century Link Telephone	0.00
255	Buckeye Road 107th-75th	337127.83	602004.79	Communications	11/12/12	1009.51	1005.72	1005.64	Century Link Telephone	3.79
256	Buckeye Road 107th-75th	337128.83	602011.70	Communications	11/12/12	1009.49	1006.26	1005.26	Century Link Telephone	3.23
258	Buckeye Road 107th-75th	337128.81	602023.69	Communications	11/12/12	1009.19	1004.34	1004.21	Century Link Telephone	4.85
259	Buckeye Road 107th-75th	337128.80	602025.74	Communications	11/12/12	1009.14	1005.31	1005.23	Century Link Telephone	3.83
260	Buckeye Road 107th-75th	336972.91	601913.91	Gas	11/10/12	1009.02	1004.69	1004.36	4" PE SW Gas	4.33
261	Buckeye Road 107th-75th	336972.91	601920.64	Water	11/10/12	1009.11	1003.96	1002.79	City of Tolleson 12" Water	5.15
263	Buckeye Road 107th-75th	336953.20	601989.73	Water	11/16/12	1009.08	1003.63	1001.96	City of Tolleson 16" Water	5.45
266	Buckeye Road 107th-75th	336935.88	602015.63	Communications	11/12/12	1009.12	1003.15	1002.49	Century Link Telephone	5.97
267	Buckeye Road 107th-75th	336935.90	602016.35	Communications	11/12/12	1009.07	1003.10	1002.43	Century Link Telephone	5.97
268	Buckeye Road 107th-75th	336934.40	602017.59	Water	11/12/12	0.00	0.00	0.00	City of Tolleson 16" Water	0.00
269	Buckeye Road 107th-75th	336935.40	602023.32	Communications	11/12/12	1008.56	1003.65	1003.52	Century Link Telephone	4.91
270	Buckeye Road 107th-75th	336935.41	602025.64	Communications	11/12/12	1008.61	1004.11	1004.03	Century Link Telephone	4.50
271	Buckeye Road 107th-75th	336924.54	601989.72	Gas	11/16/12	1008.93	1002.86	1002.36	4" PE SW Gas	6.07



Testhole Data Summary

Prepared By:
Specialized Services Co.
2001 W. North Lane, Ste. A
Phoenix, AZ 85021
Tel. Office: (602) 997 - 6164
Tel. Fax: (602) 997 - 4811

Date: 11/30/12
Project Name: MC85 Buckeye Road Center Turn Lane Exp.
Project #: TT345
Encumbrance
SSC Job #: 2158P

NOTE: The coordinate and elevation values provided below depict the actual utility location. Adjustments were made, as needed, to the surveyed request location.

SSC
Boring • Drilling • Vacuum Excavating
Underground, We're a Cut Above

TH #	Street	Coordinates		Anticipated Utility	Date	Ground Elevation	Top Elevation	Bottom Elevation	Material Type, Outside Diameter and Comments	Depth of Cover
		Northing	Easting							
274	MC85 Buckeye Road Center Turn Lane Exp.	336892.69	601989.63	Communications	11/16/12	0.00	0.00	0.00	Century Link Telephone	0.00
275	MC85 Buckeye Road Center Turn Lane Exp.	336870.40	601989.51	Gas	11/16/12	1008.84	1004.09	Unknown	10" HP SW Gas	4.75
276	MC85 Buckeye Road Center Turn Lane Exp.	336824.64	601989.78	Communications	11/16/12	0.00	0.00	0.00	Level3 Fiber Optic	0.00
277	MC85 Buckeye Road Center Turn Lane Exp.	336817.09	601987.23	Water	11/16/12	1008.29	1002.46	1001.29	City of Phoenix 12" Water	5.83
280	MC85 Buckeye Road Center Turn Lane Exp.	337443.36	601919.91	Water	11/20/12	1010.59	1006.67	1005.59	City of Tolleson 12" Water	3.92
281	MC85 Buckeye Road Center Turn Lane Exp.	337442.64	601912.60	Gas	11/14/12	1010.84	1005.47	1005.14	4" PE SW Gas	5.37
282	MC85 Buckeye Road Center Turn Lane Exp.	337443.50	601901.62	Water	11/20/12	0.00	0.00	0.00	City of Tolleson 12" Water	0.00
255A	MC85 Buckeye Road Center Turn Lane Exp.	337127.83	602005.46	Communications	11/12/12	1009.51	1007.62	1007.45	Century Link Telephone	1.89
159A	MC85 Buckeye Road Center Turn Lane Exp.	336893.21	602144.76	Gas	11/11/12	1009.59	1007.44	1007.36	4" PE SW Gas	2.15
169A	MC85 Buckeye Road Center Turn Lane Exp.	336877.76	602935.96	Gas	41224.00	1011.03	1006.70	1006.37	4" PE SW Gas	4.33
163A	MC85 Buckeye Road Center Turn Lane Exp.	336818.44	602146.46	Communications	11/13/12	1011.18	1008.84	1008.67	Level3 Fiber Optic	2.34

Appendix B –

Environmental Documents

Western Technologies Inc.

ASBESTOS AND LEAD-BASED PAINT SURVEY

TT0651 – MC 85 AND 91ST AVENUE
MC 85/Buckeye Road from 95th Avenue to 87th Avenue
Maricopa County, Arizona
WT Reference No. 2181JC348

PREPARED FOR:
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Attn: Andrew Klakulak

October 5, 2021

Theodore Stude
Environmental Project Manager

David Regonini, REPA
Technical Director, Environmental Services

SURVEY INFORMATION SUMMARY

Consulting Firm: Western Technologies Inc., 3737 East Broadway Road, Phoenix, Arizona, 85040, Telephone: (602) 437-3737

Current Property Owner: Maricopa County

Site Location: MC 85/Buckeye Road from 95th Avenue to 87th Avenue
Approximate Latitude and Longitude: 33.435784, -112.255129

Facility Description: Roadway

Date of Survey: September 23, 2021

Inspector: Theodore Stude

Certification Numbers & Expiration Dates:
Asbestos Building Inspector: ON-4644-5273-040221, Expires 04-02-2022
Lead Risk Assessor: LBP-R-102140-2, Expires 04-05-2023
Western Technologies Inc. Lead Certification: LBP-2695-2, Expires 02-10-2024

Training Providers: The Asbestos Institute (Asbestos), Allstate Services, LLC (Lead)

Number of Samples & Dates Analyzed:
58 (09-29-2021) using Polarized Light Microscopy (PLM), EPA 600/R-93/116 Method
7 (09-29-2021) using Inductively Coupled Plasma (ICP) atomic emission spectrometry, EPA 6010D (Total Lead)

Laboratories: Fiberquant Analytical Services, 5025 South 33rd Street, Phoenix, Arizona 85040
Arizona Department of Health Services (AZDHS) Environmental Laboratory License No. AZ0633
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code: 101031-0 (Asbestos)

Pace Analytical National, 12065 Lebanon Road, Mount Juliet, Tennessee 37122
AZDHS Environmental Laboratory License No. AZ0612 (Total Lead)

Asbestos-Containing Materials Identified: None by laboratory analysis.

Lead-Based Paint Identified: None by laboratory analysis.

Lead-Containing Paint Identified: Yellow traffic striping, on asphalt roadway
White traffic striping, on asphalt roadway
Yellow paint, on concrete curb
White paint, on concrete curb

October 5, 2021

Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Attn: Andrew Klakulak

Re: Asbestos and Lead-Based Paint Survey — WT Job No. 2181JC348
TT0651 – MC 85 and 91st Avenue
MC 85/Buckeye Road from 95th Avenue to 87th Avenue
Maricopa County, Arizona

INTRODUCTION

Western Technologies Inc. (WT) presents this report of the asbestos and lead-based paint inspection services at the referenced project. WT was authorized by Andrew Klakulak with the Maricopa County Department of Transportation (MCDOT) to perform these services according to the scope of work under WT's Task Offer (WT Ref. No. 2181PC481), dated September 20, 2021, and Contract for Environmental Services 200217-ITN between Maricopa County and WT.

The purpose of the TT0651 project is to widen MC 85 to five-lanes from 95th Avenue to 87th Avenue and improve 91st Avenue. WT was provided portions of MCDOT plans for the construction of TT0651 – MC 85 & 91st Ave. According to the plans, the project will affect pavement sections, sidewalks, drainage features, underground and aboveground utilities, street lighting, traffic sign assemblies, and guardrail. WT was unable to access and assess the following materials listed on the plans for removal: concrete slab located in the roadway of MC 85 / Buckeye Road; rubber gasketed reinforced concrete pipes (RGRCP) located underground; and conduits, also located underground.

FIELD SAMPLING ACTIVITIES – ASBESTOS CONTAINING MATERIAL (ACM)

Theodore Stude, an EPA-accredited building inspector with WT, conducted the field survey on September 23, 2021. A copy of the inspector's credentials is presented in Appendix C. The survey was accomplished by walking and driving the project limits to identify homogeneous areas likely to be disturbed. WT collected 58 samples of suspect ACMs comprising 14 different homogeneous materials. Sample locations and the condition of the sampled materials were recorded on WT's field data sheets, which are presented in Appendix E. WT submitted the samples to Fiberquant Analytical Services (Fiberquant) for the microscopic analysis of the samples using polarized light microscopy (PLM) according to EPA method 600/R-93/116, method for the determination of asbestos in bulk materials. Fiberquant is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of asbestos in bulk samples. The samples analyzed were reported as no asbestos detected.

Appendix D contains a table summarizing the homogeneous materials sampled within the project area. The laboratory reports and chain-of-custody records are presented in Appendix F.

FIELD SAMPLING ACTIVITIES – LEAD-BASED PAINT (LBP)

Theodore Stude, an EPA-accredited Lead-Based Paint Inspector/Risk Assessor with WT, conducted the field survey on September 23, 2021. A copy of the inspector's credentials is presented in Appendix C. The survey was accomplished by walking and driving the project limits to identify homogeneous areas likely to be disturbed. WT collected four samples of four suspect paint films. Sample locations and the condition of the sampled materials were recorded on WT's field data sheets, which are presented in Appendix H. WT submitted the samples to Pace Analytical National (Pace) for the analysis of the samples using inductively coupled plasma (ICP) atomic emission spectrometry according to EPA method 6010D. Pace is licensed by the Arizona Department of Health Services to perform the requested analysis. All four samples analyzed were reported with lead levels above the method reporting limit. Samples YS-01, WS-01, YC-01, and WC-01 were reported with a lead content of 5.49, 3.96, 8.69, and 10.3 milligrams per kilogram (mg/kg), respectively.

Appendix G contains a table summarizing the suspect paint films sampled within the project area. The laboratory reports and chain-of-custody records are presented in Appendix I.

SUMMARY OF ACM

Based on the results of this survey, ACMs were not identified from the analyzed samples.

SUMMARY OF LBP

LBP is defined by the United States Department of Housing and Urban Development (HUD) as a paint or other surface coating with lead content equal to or greater than 0.5% by weight (5,000 mg/kg) or 1.0 milligram per square centimeter by area.

Based on the results of this survey, LBPs were not identified from the analyzed samples.

The lead in construction standard is intended to apply to any detectable concentration of lead in paint since even small concentrations of lead may result in exposures above permissible exposure limits and action levels, depending on the method of removal and other workplace conditions. Exposure monitoring or the use of historical or objective data is needed to evaluate potential lead exposures in the workplace. For the application of objective data to certain tasks such as manual demolition of structures (e.g., dry wall), manual scraping, manual sanding, heat gun applications, and power tool cleaning with dust collection systems, OSHA permits the use of the Consumer Products Safety Commission (CPSC) threshold of 0.06% under a limited set of conditions to calculate the potential exposures to an employee. Therefore, WT recommends documenting an employee exposure assessment in connection with the removal of the identified lead-containing surfaces.

Based on the results of this survey, the yellow (5.49 mg/kg) and white (3.96 mg/kg) traffic striping, on asphalt roadway, and the yellow (8.69 mg/kg) and white (10.3 mg/kg) paint, on concrete curb were identified as lead-containing materials.

LIMITATIONS

Conditions can exist within structures and below the ground surface that are not apparent visually or disclosed by sampling data. This study is limited to the conditions expressly disclosed in this report, and it does not represent the assessment or absence of any other conditions on or affecting the Property. WT's findings are based on the assumption that the sampling locations, and the resulting data, are representative of assessed conditions. WT's interpretation, discussion and opinions of the results obtained from the referenced methods, observed conditions, and tested samples are applicable only to the specifically tested locations at the times stated herein.

The regulatory standards referenced in this report are based on our knowledge of applicable regulatory standards in effect at the time the work was performed. WT cannot anticipate potential future changes to regulatory standards by appropriate governmental agencies.

This asbestos inspection report is not intended to be used as design for abatement activities. It is prepared to identify locations and other specific information regarding the asbestos containing building materials identified at the time of the inspection under our specific scope of work tasks.

Potential damage caused to the structure(s) during the inspection was described in our proposal, accepted and acknowledged by acceptance of the proposal by the Owner, and is unavoidable when conducting asbestos surveys.

WT has performed our services in accordance with our contract with our Client, utilizing the ordinary degree of skill and care practiced by other firms providing similar services in the locality of the site. No other warranty or representation express, or implied, is made.

CLOSURE

Thank you for the opportunity to provide services for this project. Please call our office if you have any questions concerning the inspection, the report, or to provide a quotation for additional consulting services at (602) 437-3737.

Sincerely,
WESTERN TECHNOLOGIES INC.
Environmental Services

Theodore Stude
Environmental Project Manager

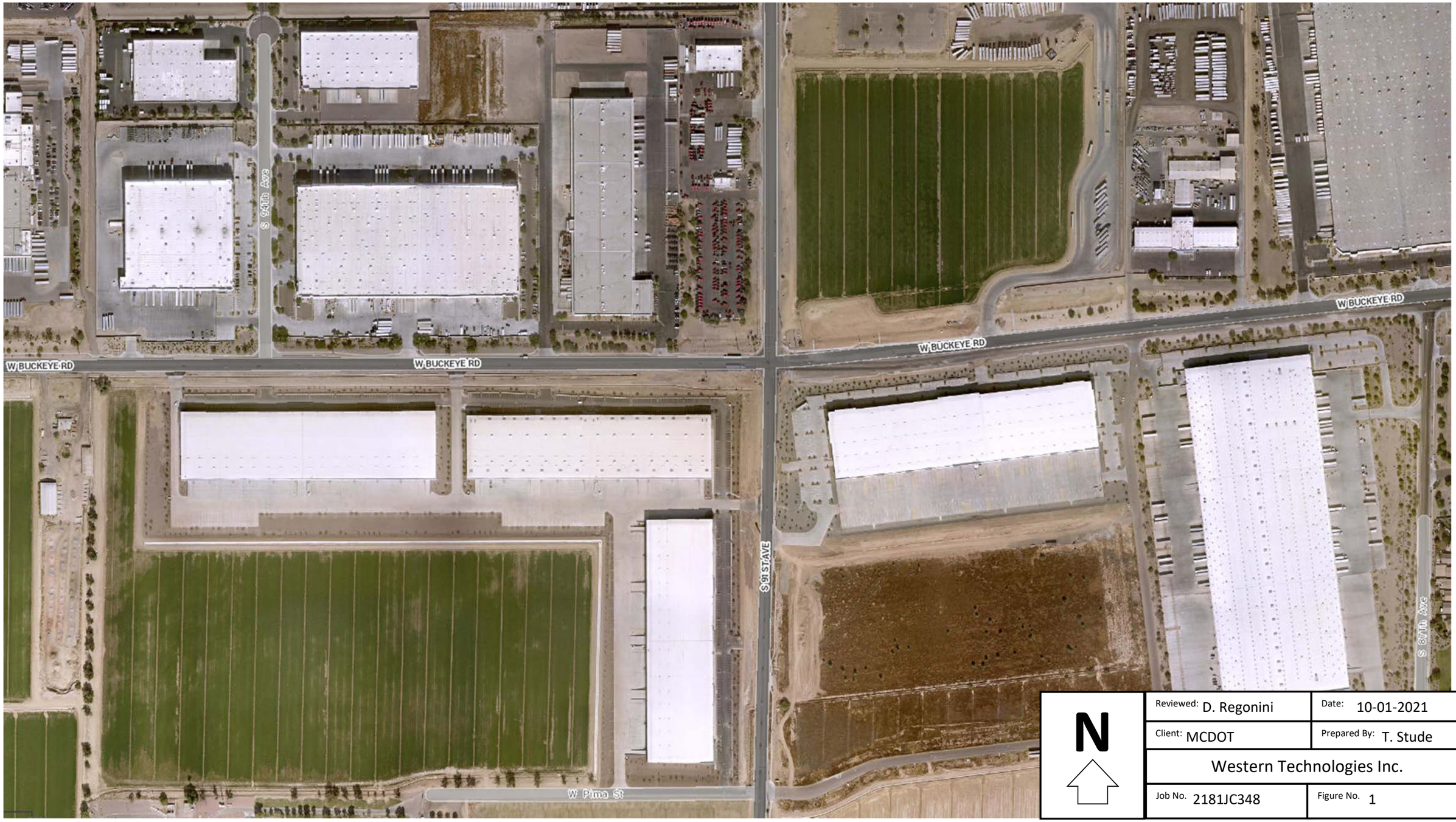
David Regonini, REPA
Technical Director, Environmental Services

Appendices: Appendix A, Figures
Appendix B, Photographic Log
Appendix C, Certifications and Accreditations
Appendix D, Summary of Homogeneous Materials
Appendix E, Asbestos Survey Field Data Sheets
Appendix F, Asbestos Analytical Report and Chain-of-Custody
Appendix G, Summary of Suspect Paint Films
Appendix H, Lead Survey Field Data Sheet
Appendix I, Lead Analytical Report and Chain-of-Custody

APPENDIX A, FIGURES

FIGURE 1 – 2020 AERIAL PHOTOGRAPH

TT0651 – MC 85 AND 91ST AVENUE – APPROXIMATE PROJECT AREA
MC 85/BUCKEYE ROAD FROM 95TH AVENUE TO 87TH AVENUE
MARICOPA COUNTY, ARIZONA



N	Reviewed: D. Regonini	Date: 10-01-2021
	Client: MCDOT	Prepared By: T. Stude
	Western Technologies Inc.	
	Job No. 2181JC348	Figure No. 1

APPENDIX B, PHOTOGRAPHIC LOG

Maricopa County Department of Transportation
TT0651 – MC 85 and 91st Avenue
MC 85/Buckeye Road from 95th Avenue to 87th Avenue
Maricopa County, Arizona
Photographic Log
WESTERN TECHNOLOGIES INC.

WT Job No.: 2181JC348 Date: September 23, 2021

Picture 1 – 91st Avenue, driveway near station 330+00, left of centerline.

Picture 2 – 91st Avenue, driveway near station 314+50, left of centerline.

Picture 3 – Intersection of 91st Avenue and MC85 / Buckeye Road.

Picture 4 – MC85 / Buckeye Road, driveway near station 232+00, left of centerline.

Picture 5 – MC85 / Buckeye Road, driveway near station 1212+00, left of centerline.

Picture 6 – MC85 / Buckeye Road, concrete irrigation canal near station 1208+00, right of centerline.

APPENDIX C, CERTIFICATIONS AND ACCREDITATIONS

THE ASBESTOS INSTITUTE

Certifies that

Theodore Stude

has attended and received instruction in the EPA approved course

AHERA Building Inspector Refresher

on

April 02, 2021

and successfully completed and passed the competency exam.

Certificate:
ON-4644-5273-040221

Date of Examination:
2-Apr-2021
Date of Expiration:
02-Apr-2022

William T. Cavness
Director

Approved Instructor

THE ASBESTOS INSTITUTE
20033 N. 19th Ave, Building 6, Phoenix, AZ 85027
602-864-6564 – www.theasbestosinstitute.com

This training meets all requirements for asbestos certification under Toxic Substance Control Act Title II.

United States Environmental Protection Agency

This is to certify that

Theodore P Stude

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires April 05, 2023

LBP-R-102140-2
Certification #

March 05, 2020
Issued On

Adrienne Priselac, Manager, Toxics Office
Land Division

United States Environmental Protection Agency

This is to certify that

Western Technologies

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires February 10, 2024

LBP-2695-2

Certification #

January 11, 2021

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

APPENDIX D, SUMMARY OF HOMOGENEOUS MATERIALS

TABLE 1, SUMMARY OF HOMOGENOUS MATERIALS
TT0651 - MC 85 AND 91ST AVENUE
MC 85/BUCKEYE ROAD FROM 95TH AVENUE TO 87TH AVENUE
MARICOPA COUNTY, ARIZONA
WT JOB NO. 2181JC348
INSPECTION DATE: SEPTEMBER 23, 2021

Material Description	Sample Numbers	Location	Friability	Quantity	Lab Report	ACM
CONCRETE, gray, curb and gutter	CON1-1-1, -2-2, -3-3, -4-4, -5-5, and -6-6	Along MC 85 and 91st Avenue	NF	7,440	202108769	**NO**
CONCRETE, gray, sidewalk	CON2-1-7, -2-8, -3-9, -4-10, -5-11, and -6-12	Along MC 85 and 91st Avenue	NF	13,040	202108769	**NO**
CONCRETE, gray, sidewalk ramp	CON3-1-13, -2-14, -3-15, -4-16, and -5-17	Along MC 85 and 91st Avenue	NF	3,260	202108769	**NO**
CONCRETE, gray, driveway	CON4-1-18, -2-19, -3-20, -4-21, -5-22, -6-23, -7-24, and -8-25	Along MC 85 and 91st Avenue	NF	16,130	202108769	**NO**
CONCRETE, gray, valley gutter	CON5-1-26, -2-27, and -3-28	Along MC 85 and 91st Avenue	NF	3,360	202108769	**NO**
CONCRETE, gray, ditch lining, old	CON6-1-29, -2-30, and -3-31	South side of Buckeye Road from station 1198+34 to 1210+74	NF	8,225	202108769	**NO**
CONCRETE, gray, driveway patch	CON7-1-32, -2-33, and -3-34	Along MC 85 and 91st Avenue	NF	1,790	202108769	**NO**
EXPANSION JOINT, black	EXP1-1-35, -2-36, and -3-37	Along MC 85 and 91st Avenue	NF	500	202108769	**NO**
CONCRETE, gray, single curb	CON8-1-38, -2-39, -3-40, -4-41, -5-42, and -6-43	Along MC 85 and 91st Avenue	NF	1,090	202108769	**NO**
CONCRETE, gray, ditch lining, new	CON9-1-44, -2-45, -3-46	South side of Buckeye Road from station 1198+34 to 1210+74	NF	500	202108769	**NO**
PAINT, yellow, traffic striping	STP1-1-47, -2-48, -3-49	Along MC 85 and 91st Avenue	NF	7,800	202108769	**NO**
PAINT, white, traffic striping	STP2-1-50, -2-51, -3-52	Along MC 85 and 91st Avenue	NF	15,800	202108769	**NO**
PAINT, yellow, on curbing	PNT1-1-53, -2-54, -3-55	On curbing at southeast entrance to parcel no. 101-06-430	NF	20	202108769	**NO**
PAINT, white, on curbing	PNT2-1-56, -2-57, -3-58	On curbing at southeast entrance to parcel no. 101-06-430	NF	25	202108769	**NO**

APPENDIX E, ASBESTOS SURVEY FIELD SHEETS

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project: MCDOT – TT0651

Location: MC85: 95th Ave to 87th Ave

Address: —

Homogeneous Area No.:	Material Description: / Material Location:	AHERA: Surfacing TSI (Misc.)	NESHAP: RACM CAT1 CAT2	Condition: (Good) Fair Poor	Friability: Friable (Nonfriable)	Quantity: (LF or FT2)
CON1-	CONCRETE; gray, curb & gutter / along 91st Ave & MC85	Sample Nos.				7,440
1-1	Location: 91st Ave, sta 330+45, 30'Lt					
2-2	Location: MC85, sta 1236+00, 40'Lt					
3-3	Location: MC85, sta 1231+85, 50'Lt					
CON1-	CONCRETE, gray, curb & gutter / along 91st Ave & MC85	Sample Nos.				7,440
4-4	Location: MC85, sta 1222+00, 38'Lt					
5-5	Location: MC85, sta 1217+20, 48'Lt					
6-6	Location: MC85, sta 1211+40, 37'Lt					

Homogeneous Area No.:	Material Description: / Material Location:	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
		Sample Nos.				
	Location:					
	Location:					
	Location:					

Homogeneous Area No.:	Material Description: / Material Location:	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
		Sample Nos.				
	Location:					
	Location:					
	Location:					

Inspector: Theodore Stude

Inspection Date: September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project: MCDOT – TT0651

Location: MC85: 95th Ave to 87th Ave

Address:

Homogeneous Area No.: CON2-

Material Description: CONCRETE, gray, sidewalk

Material Location: along 91st Ave & MC85

Sample Nos.	AHERA: Surfacing TSI (Misc)	NESHAP: RACM CAT1 CAT2	Condition: (Good) Fair Poor	Friability: Friable (Nonfriable)	Quantity: (LF or FT2)
1-7	Location: 91st Ave, sta 330+45, 30'Lt				13,040
2-8	Location: MC85, sta 1235+85, 40'Lt				
3-9	Location: MC85, sta 1231+70, 43'Lt				

Homogeneous Area No.: CON2-

Material Description: CONCRETE, gray, sidewalks

Material Location: along 91st Ave & MC85

Sample Nos.	AHERA: Surfacing TSI (Misc)	NESHAP: RACM CAT1 CAT2	Condition: (Good) Fair Poor	Friability: Friable (Nonfriable)	Quantity: (LF or FT2)
4-10	Location: MC85, sta 1222+00, 42'Lt				13,040
5-11	Location: MC85, sta 1217+15, 50'Lt				
6-12	Location: MC85, sta 1214+25, 45'Lt				

Homogeneous Area No.:

Material Description:

Material Location:

Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Homogeneous Area No.:

Material Description:

Material Location:

Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Inspector: Theodore Stude

Inspection Date: September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project: MCDOT – TT0651

Location: MC85: 95th Ave to 87th Ave

Address: ———

Homogeneous Area No.: CON 3-

Material Description: CONCRETE, gray, sidewalk ramp

Material Location: along 91st Ave & MC85

Sample Nos.	AHERA: Surfacing TSI (Misc.)	NESHAP: RACM CAT1 CAT2	Condition: (Good) Fair Poor	Friability: Friable (Nonfriable)	Quantity: (LF or FT2)
1-13	Location: 91st Ave, sta 330+30, 40'Lt				3,260
2-14	Location: MC85, sta 1236+00, 40'Lt				
3-15	Location: MC85, sta 1222+35, 60'Lt				

Homogeneous Area No.: CON 3-

Material Description: CONCRETE, gray, sidewalk ramp

Material Location: along 91st Ave & MC85

Sample Nos.	AHERA: Surfacing TSI (Misc.)	NESHAP: RACM CAT1 CAT2	Condition: (Good) Fair Poor	Friability: Friable (Nonfriable)	Quantity: (LF or FT2)
4-16	Location: MC85, sta 1217+05, 62'Lt				3,260
5-17	Location: MC85, sta 1211+45, 47'Lt				
[redacted]	Location:				

Homogeneous Area No.:

Material Description:

Material Location:

Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Homogeneous Area No.:

Material Description:

Material Location:

Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Inspector: Theodore Stude

Inspection Date: September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project: MCDOT – TT0651

Location: MC85: 95th Ave to 87th Ave

Address:

Homogeneous Area No.:	Material Description:	Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON4-	CONCRETE, gray, driveway	along 91st Ave & MC85	Surfacing TSI (Misc)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	16,130

Sample Nos.	Location:
1-18	91st Ave, sta 330+20, 45'Lt
2-19	91st Ave, sta 314+80, 44' Lt
3-20	91st Ave, sta 303+60, 20'Lt

Homogeneous Area No.:	Material Description:	Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON4-	CONCRETE, gray, driveway	along 91st Ave & MC85	Surfacing TSI (Misc)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	16,130

Sample Nos.	Location:
4-21	MC85, sta 1232+45, 85'Lt
5-22	MC85, sta 1222+35, 50'Lt
6-23	MC85, sta 1217+00, 55'Lt

Homogeneous Area No.:	Material Description:	Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON4-	CONCRETE, gray, driveway	along 91st Ave & MC85	Surfacing TSI (Misc)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	16,130

Sample Nos.	Location:
7-24	MC85, sta 1211+55, 60'Lt
8-25	MC85, sta 1210+20, 40'Lt
	Location:

Homogeneous Area No.:	Material Description:	Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
			Surfacing TSI Misc.	RACM CAT1 CAT2	Good Fair Poor	Friable Nonfriable	

Sample Nos.	Location:
	Location:
	Location:
	Location:

Inspector: Theodore Stude

Inspection Date: September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348		
Project: MCDOT – TT0651	Location: MC85: 95th Ave to 87th Ave	Address: ————

Homogeneous Area No.: CONS-	Material Description: CONCRETE, gray, valley gutter				
	Material Location: along 91st Ave & MC85				
Sample Nos.	AHERA: Surfacing TSI Misc. (circled: Misc.)	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor (circled: Good)	Friability: Friable Nonfriable (circled: Nonfriable)	Quantity: (LF or FT2) 3,360
1-26	Location: MC85, sta ~~1231+70~~ 1232+95 dps, 50' Lt				
2-27	Location: MC85, sta 1222+15, 37' Lt				
3-28	Location: MC85, sta 1217+45, 48' Lt				

Homogeneous Area No.:	Material Description:				
	Material Location:				
Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Homogeneous Area No.:	Material Description:				
	Material Location:				
Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Homogeneous Area No.:	Material Description:				
	Material Location:				
Sample Nos.	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
	Location:				
	Location:				
	Location:				

Inspector:	Inspection Date:
Theodore Stude	September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project:	Location:	Address:
MCDOT – TT0651	MC85: 95th Ave to 87th Ave	

Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON6-	CONCRETE, gray, ditch lining, old south of Buckeye Rd from sta 1198+34 to 1210+74	Surfacing TSI (Misc.)	RACM CAT1 CAT2	Good (Fair) Poor	Friable (Nonfriable)	8,225
Sample Nos.						
1-29	Location: MC85, sta 1209+30, 33' Rt					
2-30	Location: MC85, sta 1207+00, 33' Rt					
3-31	Location: MC85, sta 1210+25, 33' Rt					
CON7-	CONCRETE, gray, driveway patch along 91st Ave & MC85	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	1,790
Sample Nos.						
1-32	Location: 91st Ave, sta 330+10, 50' Lt					
2-33	Location: 91st Ave, sta 303+60, 20' Lt					
3-34	Location: MC85, sta 1211+50, 42' Lt					
EXP1-	EXPANSION JOINT, black along 91st Ave & MC85	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	500
Sample Nos.						
1-35	Location: 91st Ave, sta 330+45, 30' Lt					
2-36	Location: MC85, sta 1235+85, 40' Lt					
3-37	Location: MC85, sta 1222+00, 38' Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA: Surfacing TSI Misc.	NESHAP: RACM CAT1 CAT2	Condition: Good Fair Poor	Friability: Friable Nonfriable	Quantity: (LF or FT2)
Sample Nos.						
	Location:					
	Location:					
	Location:					

Inspector:	Inspection Date:
Theodore Stude	September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project:	Location:	Address:
MCDOT – TT0651	MC85: 95th Ave to 87th Ave	

Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON8-	CONCRETE, gray, single curb / along 91st Ave & MC85	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable ~~Nonfriable~~	1,090
Sample Nos.						
1 - 38	Location: 91st Ave, sta 330+10, 60'Lt					
2 - 39	Location: 91st Ave, sta 314+50, 30'Lt					
3 - 40	Location: MC85, sta 1232+05, 70'Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON8-	CONCRETE, gray, single curb / along 91st Ave & MC85	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable ~~Nonfriable~~	1,090
Sample Nos.						
4 - 41	Location: MC85, sta 1222+20, 40'Lt					
5 - 42	Location: MC85, sta 1217+45, 48'Lt					
6 - 43	Location: MC85, sta 1211+40, 37'Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
		Surfacing TSI Misc.	RACM CAT1 CAT2	Good Fair Poor	Friable Nonfriable	
Sample Nos.						
	Location:					
	Location:					
	Location:					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
CON9	CONCRETE, gray, ditch lining, new / south of Buckeye Rd from sta 1198+34 to 1210+74	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable ~~Nonfriable~~	SOD
Sample Nos.						
1 - 44	Location: MC85, sta 1208+10, 33'Rt					
2 - 45	Location: " , sta 1208+00, 33'Rt					
3 - 46	Location: " , sta 1207+90, 33'Rt					

Inspector:	Inspection Date:
Theodore Stude	September 23, 2021

ASBESTOS SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project:	Location:	Address:
MCDOT – TT0651	MC85: 95th Ave to 87th Ave	

Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
STP1-	PAINT, yellow, traffic striping / 91st Ave & MC85 centerline striping	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	7,800
Sample Nos.						
1-47	Location: 91st Ave, sta 314+50, 6'Lt					
2-48	Location: MC85, sta 1221+90, 7'Lt					
3-49	Location: MC85, sta 1210+30, 7'Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
STP2-	PAINT, white, traffic striping / 91st Ave & MC85 centerline striping	Surfacing TSI (Misc.)	RACM CAT1 CAT2	(Good) Fair Poor	Friable (Nonfriable)	15,800
Sample Nos.						
1-50	Location: 91st Ave, sta 314+50, 20'Lt					
2-51	Location: MC85, sta 1221+90, 23'Lt					
3-52	Location: MC85, sta 1210+30, 23'Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
PNT1-	PAINT, yellow, on curbing / at southeast entrance to parcel no. 101-06-430	Surfacing TSI (Misc.)	RACM CAT1 CAT2	Good (Fair) Poor	Friable (Nonfriable)	20
Sample Nos.						
1-53	Location: MC85, sta 1232+20, 50'Lt					
2-54	Location: " sta 1232+22, 55'Lt					
3-55	Location: " sta 1232+24, 60'Lt					
Homogeneous Area No.:	Material Description: / Material Location:	AHERA:	NESHAP:	Condition:	Friability:	Quantity: (LF or FT2)
PNT2-	PAINT, white, on curbing / at southeast entrance to parcel no. 101-06-430	Surfacing TSI (Misc.)	RACM CAT1 CAT2	Good (Fair) Poor	Friable (Nonfriable)	25
Sample Nos.						
1-56	Location: MC85, sta 1232+33, 50'Lt					
2-57	Location: " sta 1232+30, 50'Lt					
3-58	Location: " sta 1232+27, 50'Lt					

Inspector:	Inspection Date:
Theodore Stude	September 23, 2021

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APPENDIX F, ASBESTOS LABORATORY REPORT AND CHAIN-OF-CUSTODY

FIBERQUANT ANALYTICAL SERVICES

Polarized Light Microscope (PLM) Analysis for Asbestos in Bulk Sample

JobNumber:	**202108769**

Amended Report **Original Report Date: 9/30/2021**

Client: **WESTERN TECHNOLOGIES INC**

3737 E BROADWAY RD

PHOENIX, AZ 85040-2966

Office Phone: (602) 437-3737

FAX: (602) 470-1341

 # Samples: 58 PLM **Rec:** 9/23/2021 **Method:** EPA 600/R-93/116 The "New" Method; see below

Client Job: 2181JC348/MC85 & 91st Ave **PO Number:**

Report Date: 10/1/2021 **Date Analyzed:** 9/29/2021 **Routing Number:** -

Method and Analysis Information: **Fiberquant Internal SOP:** PLMn

Each bulk sample is first dissected under a 7-30x magnification stereo-microscope. This examination is used to determine the general type of sample, how many and what type of layers it has, and initial estimates of fiber types and quantities. Second, liquid media mounts are made of each layer - such mounts may be of selected fibers (used solely for identification purposes) or may be representative of the layer as a whole (used for quantitation purposes). The mounts may be made in a synthetic Canadian balsam, one of several solvents, or in refractive index oils (media of known refractive index). Generally, a variety of different mounts are made: some optimized for fiber visibility, some optimized for fiber identification, and some optimized for fiber quantitation. The mounted slides are then examined at 50-400x magnification on a Nikon Labphot-pol microscope. Optical characteristics are used to identify each observed fiber type; the optical data are contained for each sample on its detail analysis sheet, attached.

Current EPA and NESHAP regulations designate a result of ≤1 % asbestos as "negative" or "non-regulated"and >1 % asbestos as "positive" or "regulated." Samples containing layers that have been determined to be "positive" may have to be handled differently during a renovation or demolition than samples whose layers have been determined to be "negative." OSHA under CFR 1926.1101 regulates work done involving any detectable concentration of asbestos.

The method of fiber identification and quantitation is the "Standard Operating Procedures for the Analysis of Asbestos in Bulk Samples using Polarized Light Microscopy", Chapter 7 of the Quality Assurance and Management Manual. This SOP and its associated reporting have been designed to satisfy all requirements in both EPA Method 600/M4-82-020 (The Interim Method) and EPA Method 600/R-93/116 (The New Method). The Interim Method is the required method for AHERA (US EPA 40 CFR Pt. 763), but this method calls for the reporting of composited results of multi-layered samples that is no longer an acceptable reporting practice in most circumstances. Current EPA rules, such as NESHAP (US EPA 40 CFR Pt. 61), as well as NVLAP accreditation policies, call for separate reporting for each layer of multi-layered samples. The New Method contains the same procedures for identification and quantification of asbestos as does the Interim Method, except that multi-layered samples are reported to comply with the latest US EPA rule. Fiberquant not only reports the asbestos content of each layer of multi-layered samples separately (satisfying current EPA and NVLAP reporting requirements), but Fiberquant also reports what percentage of the sample each layer comprises. Therefore, the results may be arithmetically composited to satisfy the reporting requirements of the Interim Method. The method of fiber quantitation is an estimation technique in which the analysts quantitation is routinely calibrated by reference quantitation standards, and which has been shown to be equivalent in precision and accuracy to point counting. Friability is estimated for the purposes of deciding when to point count. Friabilities determined in the field take precedence over those determined in the laboratory. Those sample layers which are friable and estimated by the analyst to contain <= 1% asbestos are point counted using 400 points. Such point counting is required by NESHAP (National Emission Standards for Hazardous Air Polutants, Nov. 1990) in order to rely on analytical results that are ≤ 1%. The coefficient of variation for the estimation quantitation technique is 100% in the range 0-5%. This means that PLM analysis is not capable of conclusively determining whether a layer containing close to 1% asbestos is actually "positive" or "negative". For this reason, Fiberquant refers to results where asbestos was detected but ≤ 1% as "borderline negative", and results where asbestos was >1 % but <= 2% as "borderline positive" to indicate the uncertainty in assigning a "positive" or "negative" label. In the sample summary, "ND" means that no asbestos was detected during the analysis. A "Tr" or "Trace" of asbestos reported is defined for our purposes as the detection of several asbestos fibers during the analysis; this level would be right at the limit of detection for the method. Trace is only reported on the analysis detail - in the summary a trace would be reported as <=1%. The limit of detection (the smallest % of asbestos that can be detected) varies greatly depending on the matrix in which the asbestos is found. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 1% stated in the method. During the analysis, the analyst, for Fiberquant identification purposes only, determines the "apparent sample type" and "apparent layer types." It must be emphasized that these types are only what is apparent. Often, different materials appear similar or identical after sampling, so the analyst may assign a type other than what was sampled.

Floor tiles present a special problem for PLM asbestos analysis. Floor tile can contain chrysotile fibers so thin that they cannot be resolved by optical methods. In such a case, we may observe a percentage of asbestos which is lower than the actual percentage, or not observe asbestos at all when some is present. For this reason, floor tiles reported as negative should be confirmed to be negative using transmission electron microscope (TEM) analysis. Likewise, vermiculite insulation materials containing traces of asbestiform asbestos present a problem for routine PLM analysis - the amphiboles are sometimes present in trace amounts inhomogeneously distributed. For this reason, loose vermiculite samples reported as negative should be confirmed to contain no amphibole using hydroseparation techniques.

The samples were analyzed under the following ongoing quality assurance program: Blank samples are routinely analyzed to maintain contamination-free materials. Each analyst has at least a bachelor's degree in physical science, and has also completed extensive training specific to asbestos analysis for 1-3 months before being allowed to analyze client samples. Qualitative reference samples are routinely analyzed to assure that analysts

can identify asbestos and asbestos-look-alike fibers. Quantitative reference samples are routinely analyzed to calibrate and characterize the estimation procedure. Microscope alignment is checked each day. Refractive index oils are calibrated at least quarterly. At least 10% of client samples are re-analyzed from scratch by a different analyst than the original, and any discrepancies are resolved for the sample and similar sample types before the results are reported. All quality checks performed for these samples were in control except as detailed in the "Analytical Notes" below. All analysts participate in interlab round robins and proficiency testing to assure competence. Fiberquant is accredited by NVLAP (Lab code #101031) for the analysis of bulk samples for asbestos using PLM. Accreditation does not imply endorsement by the EPA, any other United States governmental agency or any private agency or association. Each lab analysis refers only to the sample tested, and may not, due to the sampling process, be representative of the material sampled. This report may not be reproduced except in full, without the approval of Fiberquant Analytical Services.

Some results may have been calculated using client supplied data, such as volume or area sampled, for which Fiberquant assumes no liability for accuracy.

Job Analysis Notes:

Per client, change job name from JJ to JC - RLE 10.1.21

PLM Analysis Summary: **Job Number: 202108769** 2181JC348/MC85 & 91st Ave

Sample Number / Layer	Color	Apparent Layer Type *	Lab Number	Apparent Sample Type *	Asbestos Detected Yes or No
			Asbestos Results		
Sample # **CON1-1-1**			2021-08769- 1	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON1-2-2**			2021-08769- 2	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON1-3-3**			2021-08769- 3	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON1-4-4**			2021-08769- 4	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON1-5-5**			2021-08769- 5	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON1-6-6**			2021-08769- 6	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-1-7**			2021-08769- 7	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-2-8**			2021-08769- 8	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-3-9**			2021-08769- 9	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-4-10**			2021-08769- 10	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-5-11**			2021-08769- 11	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON2-6-12**			2021-08769- 12	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON3-1-13**			2021-08769- 13	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON3-2-14**			2021-08769- 14	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON3-3-15**			2021-08769- 15	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON3-4-16**			2021-08769- 16	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON3-5-17**			2021-08769- 17	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-1-18**			2021-08769- 18	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-2-19**			2021-08769- 19	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-3-20**			2021-08769- 20	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-4-21**			2021-08769- 21	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-5-22**			2021-08769- 22	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-6-23**			2021-08769- 23	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-7-24**			2021-08769- 24	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON4-8-25**			2021-08769- 25	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON5-1-26**			2021-08769- 26	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON5-2-27**			2021-08769- 27	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		

Sample # **CON5-3-28**			2021-08769- 28	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON6-1-29**			2021-08769- 29	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON6-2-30**			2021-08769- 30	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON6-3-31**			2021-08769- 31	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON7-1-32**			2021-08769- 32	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON7-2-33**			2021-08769- 33	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON7-3-34**			2021-08769- 34	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **EXP1-1-35**			2021-08769- 35	Miscellaneous	Asbestos Detected? No
Layer # 1	black	expansion joint	*no asbestos detected*		
Sample # **EXP1-2-36**			2021-08769- 36	Miscellaneous	Asbestos Detected? No
Layer # 1	black	expansion joint	*no asbestos detected*		
Sample # **EXP1-3-37**			2021-08769- 37	Miscellaneous	Asbestos Detected? No
Layer # 1	black	expansion joint	*no asbestos detected*		
Sample # **CON8-1-38**			2021-08769- 38	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON8-2-39**			2021-08769- 39	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON8-3-40**			2021-08769- 40	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON8-4-41**			2021-08769- 41	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON8-5-42**			2021-08769- 42	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON8-6-43**			2021-08769- 43	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON9-1-44**			2021-08769- 44	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON9-2-45**			2021-08769- 45	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **CON9-3-46**			2021-08769- 46	Cementitious	Asbestos Detected? No
Layer # 1	gray	concrete	*no asbestos detected*		
Sample # **STP1-1-47**			2021-08769- 47	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **STP1-2-48**			2021-08769- 48	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **STP1-3-49**			2021-08769- 49	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **STP2-1-50**			2021-08769- 50	Surfacing	Asbestos Detected? No
Layer # 1	white	paint, textured	*no asbestos detected*		
Sample # **STP2-2-51**			2021-08769- 51	Surfacing	Asbestos Detected? No
Layer # 1	white	paint, textured	*no asbestos detected*		
Sample # **STP2-3-52**			2021-08769- 52	Surfacing	Asbestos Detected? No
Layer # 1	white	paint, textured	*no asbestos detected*		
Sample # **PNT1-1-53**			2021-08769- 53	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **PNT1-2-54**			2021-08769- 54	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **PNT1-3-55**			2021-08769- 55	Surfacing	Asbestos Detected? No
Layer # 1	yellow	paint, textured	*no asbestos detected*		
Sample # **PNT2-1-56**			2021-08769- 56	Surfacing	Asbestos Detected? No
Layer # 1	white	paint	*no asbestos detected*		
Sample # **PNT2-2-57**			2021-08769- 57	Surfacing	Asbestos Detected? No
Layer # 1	white	paint	*no asbestos detected*		
Sample # **PNT2-3-58**			2021-08769- 58	Surfacing	Asbestos Detected? No
Layer # 1	white	paint	*no asbestos detected*		

* Apparent Sample Types and Apparent Layer Types are as they appeared to the analyst. Since many types of materials appear similar after sampling damage, the apparent type of material may not be the actual type of material.

Sample CON1-1-1 **Lab Number** 2021-08769- 1 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON1-2-2 **Lab Number** 2021-08769- 2 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON1-3-3 **Lab Number** 2021-08769- 3 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON1-4-4 **Lab Number** 2021-08769- 4 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON1-5-5 **Lab Number** 2021-08769- 5 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON1-6-6 **Lab Number** 2021-08769- 6 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-1-7 **Lab Number** 2021-08769- 7 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-2-8 **Lab Number** 2021-08769- 8 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-3-9 **Lab Number** 2021-08769- 9 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-4-10 **Lab Number** 2021-08769- 10 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-5-11 **Lab Number** 2021-08769- 11 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON2-6-12 **Lab Number** 2021-08769- 12 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON3-1-13 **Lab Number** 2021-08769- 13 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON3-2-14 **Lab Number** 2021-08769- 14 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON3-3-15 **Lab Number** 2021-08769- 15 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON3-4-16 **Lab Number** 2021-08769- 16 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON3-5-17 **Lab Number** 2021-08769- 17 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-1-18 **Lab Number** 2021-08769- 18 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-2-19 **Lab Number** 2021-08769- 19 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-3-20 **Lab Number** 2021-08769- 20 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-4-21 **Lab Number** 2021-08769- 21 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-5-22 **Lab Number** 2021-08769- 22 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-6-23 **Lab Number** 2021-08769- 23 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-7-24 **Lab Number** 2021-08769- 24 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON4-8-25 **Lab Number** 2021-08769- 25 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON5-1-26 **Lab Number** 2021-08769- 26 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON5-2-27 **Lab Number** 2021-08769- 27 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	cellulose fiber					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON5-3-28 **Lab Number** 2021-08769- 28 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON6-1-29 **Lab Number** 2021-08769- 29 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON6-2-30 **Lab Number** 2021-08769- 30 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON6-3-31 **Lab Number** 2021-08769- 31 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON7-1-32 **Lab Number** 2021-08769- 32 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON7-2-33 **Lab Number** 2021-08769- 33 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON7-3-34 **Lab Number** 2021-08769- 34 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/29/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample EXP1-1-35 **Lab Number** 2021-08769- 35 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): bitumen, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	expansion joint	100	black	4	70-80%	-	-	-	-	-
	Total %	100		**Overall %**	70-80%	-	-	-	-	-
				Fiber Identification:	cellulose fiber					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample EXP1-2-36 **Lab Number** 2021-08769- 36 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): bitumen, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	expansion joint	100	black	4	70-80%	-	-	-	-	-
	Total %	100		**Overall %**	70-80%	-	-	-	-	-
				Fiber Identification:	cellulose fiber					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample EXP1-3-37 **Lab Number** 2021-08769- 37 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Miscellaneous Fibrous Mat
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): bitumen, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	expansion joint	100	black	4	70-80%	-	-	-	-	-
	Total %	100		**Overall %**	70-80%	-	-	-	-	-
				Fiber Identification:	cellulose fiber					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	cellulose fiber	W	F	N	N	H	+	U					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample CON8-1-38 **Lab Number** 2021-08769- 38 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON8-2-39 **Lab Number** 2021-08769- 39 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers

		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON8-3-40 **Lab Number** 2021-08769- 40 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON8-4-41 **Lab Number** 2021-08769- 41 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON8-5-42 **Lab Number** 2021-08769- 42 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	<=1%	-	-	-	-	-
	Total %	100		**Overall %**	<=1%	-	-	-	-	-
				Fiber Identification:	synthetic fiber (extr					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	synthetic fiber (extruded)	W	E	N	N	H	+	P					
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON8-6-43 **Lab Number** 2021-08769- 43 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON9-1-44 **Lab Number** 2021-08769- 44 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON9-2-45 **Lab Number** 2021-08769- 45 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample CON9-3-46 **Lab Number** 2021-08769- 46 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Cementitious Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): powder, rock,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	concrete	100	gray	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using dilute HCl acid.

Sample STP1-1-47 **Lab Number** 2021-08769- 47 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample STP1-2-48 **Lab Number** 2021-08769- 48 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample STP1-3-49 **Lab Number** 2021-08769- 49 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample STP2-1-50 **Lab Number** 2021-08769- 50 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample STP2-2-51 **Lab Number** 2021-08769- 51 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample STP2-3-52 **Lab Number** 2021-08769- 52 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT1-1-53 **Lab Number** 2021-08769- 53 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT1-2-54 **Lab Number** 2021-08769- 54 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT1-3-55 **Lab Number** 2021-08769- 55 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, glass,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint, textured	100	yellow	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT2-1-56 **Lab Number** 2021-08769- 56 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT2-2-57 **Lab Number** 2021-08769- 57 **Sampled:** 9/23/2021 **Condition:** acceptable
Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid
Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No
Non-Fibrous Components (in approx. decreasing order): polymer, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note
Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Sample PNT2-3-58 **Lab Number** 2021-08769- 58 **Sampled:** 9/23/2021 **Condition:** acceptable

Analyzed By DMS 9/30/2021 **An?** OK **Apparent Smp Type** Surfacing Non-fibrous Solid

Homogeneous Yes **# Layers** 1 **Asbestos Detected?** No

Non-Fibrous Components (in approx. decreasing order): polymer, ,

Layers

#	Layer Type	%	Color	Friability	Calibrated Visual Estimate of Percents of Each Fiber: Fib 1	Fib 2	Fib 3	Fib 4	Fib 5	Fib 6
1	paint	100	white	1	n.d.	-	-	-	-	-
	Total %	100		**Overall %**	n.d.	-	-	-	-	-
				Fiber Identification:	none					

Fibers		Color	Mrph	Iso	Pleo	Bi	Elg	Ext	Refractive Index Determinations: Oil	Col Par	Col Per	RI Par	RI Per
1	none												
2													
3													
4													
5													
6													

Sample Analytical Note

Procedure: tweased apart using forceps. Procedure: dissolution of matrix using solvent.

Fr=Friability: 1=very non-friable; 2= non-friable; 3=friable; 4=highly friable
Colors: B=black;BL=blue;BR=brown;CL=clear;G=Green;GY=gray;OR=orange;OW=off-white;PN=pink;PU=purple;R=red;TN=tan;W=white;Y=yellow;V=various
Fiber Morphology: A=fine fibers/bundles, white, sinewy, flexible; B=fine fibers/bundles, w-br, straight, broomed ends; C=fine fibers/bundles, blue, straight, broomed ends; D=fine to coarse fibers, CL-B, brittle; E=coarse fibers,CL or dyed, striated; F=coarse fibers or splinters, W-BR, ribbon-like; G=lath-like or shards, low aspect ratio, may taper
Iso=isotropism - may be yes or no; Pleo=pleochroism - may be yes or no; Bi=birefringence - may be None, Low, Medium or High
Elg=sign of elongation - may be +, - or B (both); Ext=extinction - may be Parallel, Oblique, None or Undulating; Oil=medium used to for dispersion staining
Col Par=dispersion staining colors parallel to the fiber (fiber/halo): b/w=black/white; dg/py=dark gray/pale yellow; vg/y=violet gray/yellow; db/ly=dark blue/lemon yellow; vb/g= vivid blue/gold; sb/o=sky blue/orange; pb/r=pale blue/red; gb/dr=gray blue/dark red; w/b=white/black. Col Perp=same only perpendicular to fiber.
RI Par=refractive index parallel to fiber; RI Perp=refractive index perpendicular to fiber

Analyst: DAVID M. SCHALLER

Printed: 01-Oct-21

Original Print Date: 30-Sep-21

Larry S. Pierce, Approved Accreditation Signatory

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CHAIN OF CUSTODY

☐ INDUSTRIAL HYGIENE ☐ MICROBIAL
☒ ASBESTOS ☐ LEAD

PROJECT NAME	PROJECT ADDRESS	PROJECT MANAGER
Asb Survey	MC85 & 91st Ave	T. Stude
WT JOB NO.	**PURCHASE ORDER NO.**	**EMAIL ADDRESS**
2181JC348		
SAMPLER — *SIGNATURE*	**SAMPLER — *PLEASE PRINT NAME***	single layer analysis
	T. Stude	

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: BULK	WIPE	SWAB	AIR	WATER	SOIL	TEST METHOD: PLM	VOLUME / AREA	COMMENTS
CON1-1-1	09/23/21		TT0651	1	X						X		concrete
-2-2													
-3-3													
-4-4													
-5-5													
-6-6													
CON2-1-7													concrete
-2-8													
-3-9													
-4-10													
-5-11													
-6-12													
CON3-1-13													concrete
-2-14													
-3-15													
-4-16													
-5-17													

RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*	RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*
	09/23/21	1437	9-23-21				
RELINQUISHED BY — *SIGNATURE*	**DATE**	**TIME**	**RECEIVED FOR LABORATORY BY — *SIGNATURE***	**DATE**	**TIME**	**REQUESTED TURNAROUND TIME**	
						☒ 1-3 DAYS ☐ _____ HOURS	

White – Testing Laboratory; Yellow – Department Job File; Pink – Field Sample

Review of Analytical Report (Initials) K.L.K

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CHAIN OF CUSTODY

☐ INDUSTRIAL HYGIENE ☐ MICROBIAL
☒ ASBESTOS ☐ LEAD

PROJECT NAME	PROJECT ADDRESS	PROJECT MANAGER
Asb Survey	MC85 & 91st Ave	T. Stude
WT JOB NO.	**PURCHASE ORDER NO.**	**EMAIL ADDRESS**
218TJC348		
SAMPLER — *SIGNATURE*	**SAMPLER — *PLEASE PRINT NAME***	single layer analysis
	T. Stude	

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: BULK	WIPE	SWAB	AIR	WATER	SOIL	TEST METHOD: PLM	VOLUME / AREA	COMMENTS
CON4-1-18	09/23/21		TT0651	1	X						X		concrete
-2-19	↓		↓	↓	↓						↓		↓
-3-20													
-4-21													
-5-22													
-6-23													
-7-24													
-8-25													↓
CON5-1-26													concrete
-2-27													↓
-3-28													
CON6-1-29													concrete
-2-30													↓
-3-31													
CON7-1-32													concrete
-2-33													↓
-3-34	↓		↓	↓	↓						↓		

RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*	RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*
	09/23/21	1437	9-23-21 239				

RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED FOR LABORATORY BY — *SIGNATURE*	DATE	TIME	REQUESTED TURNAROUND TIME
						☒ 1-3 DAYS ☐ _____ HOURS

White – Testing Laboratory; Yellow – Department Job File; Pink – Field Sample

Review of Analysis Reports (Initials) LLL

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CHAIN OF CUSTODY

☐ INDUSTRIAL HYGIENE ☐ MICROBIAL
☒ ASBESTOS ☐ LEAD

PROJECT NAME	PROJECT ADDRESS	PROJECT MANAGER
Asb Survey	MC85 & 91st Ave	T. Stude
WT JOB NO.	PURCHASE ORDER NO.	EMAIL ADDRESS
2181JC348		
SAMPLER — *SIGNATURE*	SAMPLER — *PLEASE PRINT NAME*	single layer analysis
	T. Stude	

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: BULK	WIPE	SWAB	AIR	WATER	SOIL	TEST METHOD: PLM	VOLUME / AREA	COMMENTS
EXP1-1-35	09/23/21		TT0651	1	X						X		expansion joint
-2-36													↓
-3-37													
CON8-1-38													concrete
-2-39													
-3-40													↓
-4-41													
-5-42													
-6-43													
CON9-1-44													concrete
-2-45													↓
-3-46													
STP1-1-47													paint (yellow)
-2-48													↓
-3-49													
STP2-1-50													paint (white)
-2-51													↓
-3-52	↓		↓	↓	↓						↓		

RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*	RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED BY — *SIGNATURE*
	09/23/21	1437	9.23.21 1437				
RELINQUISHED BY — *SIGNATURE*	DATE	TIME	RECEIVED FOR LABORATORY BY — *SIGNATURE*	DATE	TIME	REQUESTED TURNAROUND TIME	
						☒ 1-3 DAYS ☐ _____ HOURS	

White – Testing Laboratory; Yellow – Department Job File; Pink – Field Sample

Review of Analysis Request (initials) _____

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CHAIN OF CUSTODY

☐ INDUSTRIAL HYGIENE ☐ MICROBIAL
☒ ASBESTOS ☐ LEAD

PROJECT NAME	PROJECT ADDRESS	PROJECT MANAGER
Asb Survey	MC85 & 91st Ave	T. Stucke
WT JOB NO.	**PURCHASE ORDER NO.**	**EMAIL ADDRESS**
218 JC348		
SAMPLER – *SIGNATURE*	**SAMPLER – *PLEASE PRINT NAME***	single layer analysis
	T. Stucke	

SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: BULK	WIPE	SWAB	AIR	WATER	SOIL	TEST METHOD: PLM	VOLUME / AREA	COMMENTS
PNT1-1-53	09/23/21		TT0651	1	X						X		paint (yellow)
-2-54	↓		↓	↓	↓						↓		↓
-3-55													
PNT2-1-56													paint (white)
-2-57													↓
-3-58	↓		↓	↓	↓						↓		

RELINQUISHED BY – *SIGNATURE*	DATE	TIME	RECEIVED BY – *SIGNATURE*	RELINQUISHED BY – *SIGNATURE*	DATE	TIME	RECEIVED BY – *SIGNATURE*
	09/23/21	1437	9-23-21 1437				

RELINQUISHED BY – *SIGNATURE*	DATE	TIME	RECEIVED FOR LABORATORY BY – *SIGNATURE*	DATE	TIME	REQUESTED TURNAROUND TIME
						☒ 1-3 DAYS ☐ _____ HOURS

White – Testing Laboratory; Yellow – Department Job File; Pink – Field Sample

Review of Analysis Request (Initials) _____

2021087269

APPENDIX G, SUMMARY OF SUSPECT PAINT FILMS

TABLE 2, SUMMARY OF SUSPECT PAINT FILMS
TT0651 - MC 85 AND 91ST AVENUE
MC 85/BUCKEYE ROAD FROM 95TH AVENUE TO 87TH AVENUE
MARICOPA COUNTY, ARIZONA
WT JOB NO. 2181JC348
INSPECTION DATE: SEPTEMBER 23, 2021

Material Description	Sample Numbers	Location	Condition	Quantity	Lab Report	Lead Content (mg/kg)
PAINT, yellow, traffic striping	YS-01	Along MC 85 and 91st Avenue	INTACT	7,800	L1408282	5.49
PAINT, white, traffic striping	WS-01	Along MC 85 and 91st Avenue	INTACT	15,800	L1408282	3.96
PAINT, yellow, on curbing	YC-01	On curbing at southeast entrance to parcel no. 101-06-430	FAIR	20	L1408282	8.69
PAINT, white, on curbing	WC-01	On curbing at southeast entrance to parcel no. 101-06-430	FAIR	25	L1408282	10.3

APPENDIX H, LEAD SURVEY FIELD DATA SHEETS

LEAD SURVEY FIELD DATA SHEET

WT Job No.: 2181JC348

Project: MCDOT – TT0651

Location: MC85: 95th Ave to 87th Ave

Address: —

Homogeneous Area No.: YS-01

Material Description: PAINT, yellow, traffic striping

Material Location: 91st Ave & MC85 centerline striping

Sample Nos.	Color:	Type:	Condition:	Quantity: (LF or FT2)
	Yellow	Paint	Intact	7,800

Location (rm/por/xyh): 91st Ave, sta 314+50, 6'Lt

Location (rm/por/xyh): MC85, sta 1221+90, 7'Lt

Location (rm/por/xyh): MC85, sta 1210+30, 7'Lt

Homogeneous Area No.: WS-01

Material Description: PAINT, white, traffic striping

Material Location: 91st Ave & MC85 traffic lane striping

Sample Nos.	Color:	Type:	Condition:	Quantity: (LF or FT2)	Color:
	White	Paint	Intact	15,800	—

Location (rm/por/xyh): 91st Ave, sta 314+50, 20'Lt

Location (rm/por/xyh): MC85, sta 1221+90, 23'Lt

Location (rm/por/xyh): MC85, sta 1210+30, 23'Lt

Homogeneous Area No.: YC-01

Material Description: PAINT, yellow, on curb

Material Location: at southeast entrance to parcel no. 101-06-430

Sample Nos.	Color:	Type:	Condition:	Quantity: (LF or FT2)	Color:
	Yellow	Paint	Fair	20	—

Location (rm/por/xyh): MC85, sta 1232+20, 50'Lt

Location (rm/por/xyh): ↓, sta 1232+22, 55'Lt

Location (rm/por/xyh): ↓, sta 1232+24, 60'Lt

Homogeneous Area No.: WC-01

Material Description: PAINT, white, on curb

Material Location: at southeast entrance to parcel no. 101-06-430

Sample Nos.	Color:	Type:	Condition:	Quantity: (LF or FT2)	Color:
	White	Paint	Fair	25	—

Location (rm/por/xyh): MC85, sta 1232+33, 50'Lt

Location (rm/por/xyh): ↓, sta 1232+30, 50'Lt

Location (rm/por/xyh): ↓, sta 1232+27, 50'Lt

Inspector: Theodore Stude

Inspection Date: September 23, 2021

APPENDIX I, LEAD LABORATORY REPORT AND CHAIN-OF-CUSTODY

ANALYTICAL REPORT

September 29, 2021

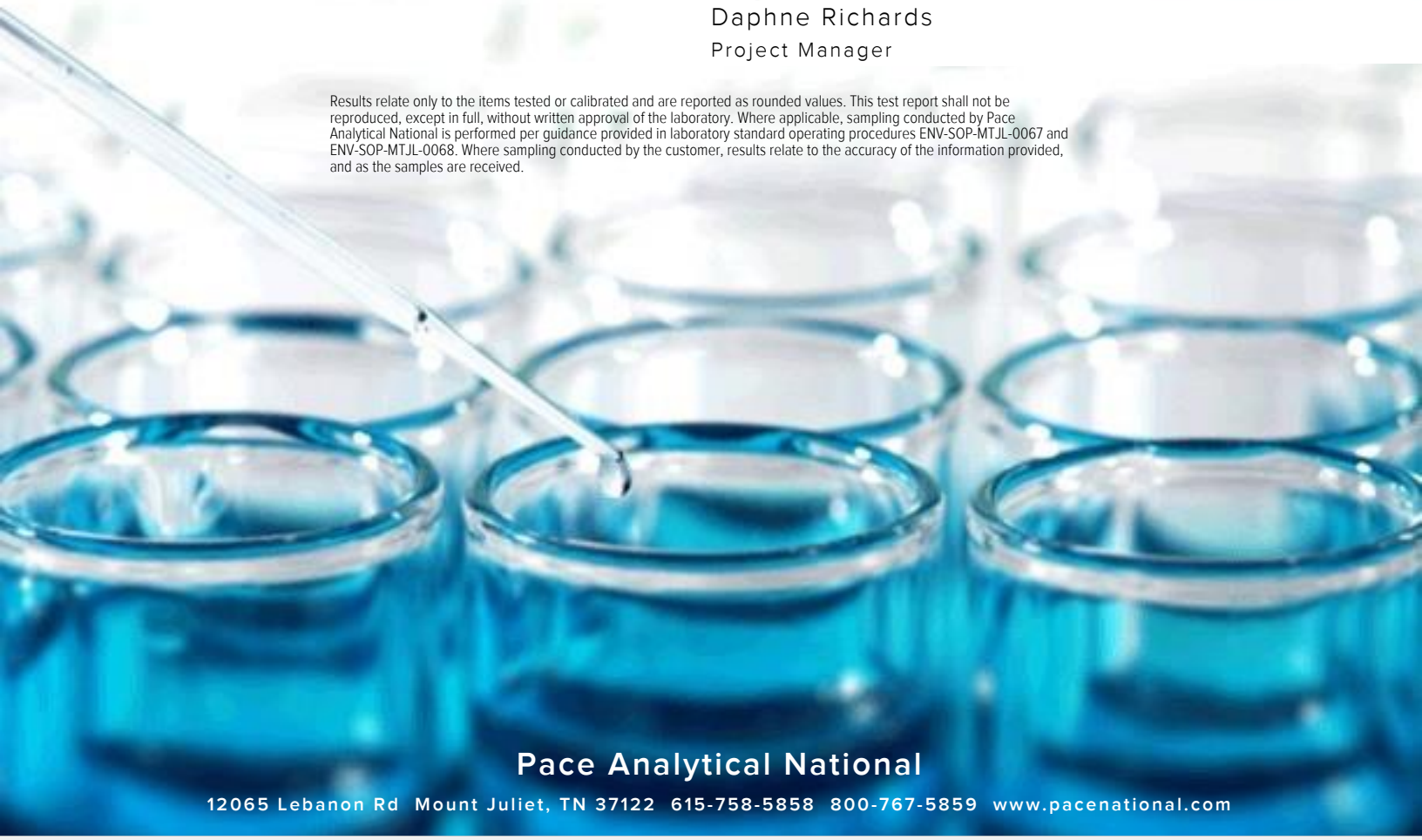
Western Technologies

Sample Delivery Group:	L1408282
Samples Received:	09/24/2021
Project Number:	2181JC348
Description:	2181JC348

Report To: Theodore Stude
3737 East Broadway Rd.
Phoenix, AZ 85040

Entire Report Reviewed By: Daphne R Richards

Daphne Richards
Project Manager



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

YS-01 L1408282-01 Solid

Collected by: Theodore Stude
Collected date/time: 09/23/21 09:15
Received date/time: 09/24/21 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Metals (ICP) by Method 6010D	WG1746854	1	09/27/21 07:51	09/29/21 04:04	EL	Mt. Juliet, TN

WS-01 L1408282-02 Solid

Collected by: Theodore Stude
Collected date/time: 09/23/21 09:30
Received date/time: 09/24/21 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Metals (ICP) by Method 6010D	WG1746854	1	09/27/21 07:51	09/29/21 04:07	EL	Mt. Juliet, TN

YC-01 L1408282-03 Solid

Collected by: Theodore Stude
Collected date/time: 09/23/21 10:15
Received date/time: 09/24/21 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Metals (ICP) by Method 6010D	WG1746854	1	09/27/21 07:51	09/29/21 04:10	EL	Mt. Juliet, TN

WC-01 L1408282-04 Solid

Collected by: Theodore Stude
Collected date/time: 09/23/21 10:30
Received date/time: 09/24/21 08:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Metals (ICP) by Method 6010D	WG1746854	2	09/27/21 07:51	09/29/21 04:13	EL	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Daphne Richards
Project Manager

Sample Delivery Group (SDG) Narrative

Insufficient sample volume to perform MS/MSD analyses per method QC requirements.

Lab Sample ID	Project Sample ID	Method
L1408282-04	WC-01	6010D

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Lead	5.49		0.208	0.500	1	09/29/2021 04:04	WG1746854

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Lead	3.96		0.208	0.500	1	09/29/2021 04:07	WG1746854

Metals (ICP) by Method 6010D

Analyte	Result mg/kg	Qualifier	MDL mg/kg	RDL mg/kg	Dilution	Analysis date / time	Batch
Lead	8.69		0.208	0.500	1	09/29/2021 04:10	WG1746854

Metals (ICP) by Method 6010D

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/kg		mg/kg	mg/kg		date / time	
Lead	10.3		0.416	1.00	2	09/29/2021 04:13	WG1746854

QUALITY CONTROL SUMMARY

L1408282-01,02,03,04

Method Blank (MB)

(MB) R3710098-1 09/29/21 03:17

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Lead	U		0.208	0.500

Laboratory Control Sample (LCS)

(LCS) R3710098-2 09/29/21 03:19

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Lead	100	97.4	97.4	80.0-120	

L1408396-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1408396-04 09/29/21 03:22 • (MS) R3710098-5 09/29/21 03:30 • (MSD) R3710098-6 09/29/21 03:33

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Lead	100	1010	1880	1830	866	817	1	75.0-125	M3	M3	2.66	20

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Western Technologies
3737 E. Broadway Rd.
Phoenix, AZ 85040

Billing Information: ← same

Pres Chk

Report to: Theodore Stude

Email To: t.stude@wt-us.com

Project Description: 2181JC348

City/State Collected: Phoenix, AZ

Phone: 602-437-3737
Fax: 602-470-1341

Client Project # 2181JC348

Lab Project #

Collected by (print): Theodore Stude

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N X Y ___

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
X Three Day

Quote #

Date Results Needed

No. of Cntrs

Analysis / Container / Preservative

Metals (SLP) by Method 6010D, Lead Only

TCLP Extraction by Method 1311/6010D, Lead Only

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	Cntrs	Remarks	Sample # (lab only)
YS-01	—	—	—	09-23-21	0915	1		-01
WS-01	—	—	—		0930	1		02
YC-01	—	—	—		1015	1		03
WC-01	—	—	—		1030	1		04
YT-01	—	—	—		1115	1	Hold	05
XWT-01	—	—	—		1130	1	Hold	06
YS 09-23-21								

Chain of Custody Page 1 of 1

Pace Analytical®
National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L1408282
C047

Acctnum: WESTECPAZ

Template:

Prelogin:

TSR: Daphne Richards

PB:

Shipped Via:

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks: Hold samples YT-01 & WT-01 pending results of YS-01, WS-01, YC-01, & WC-01

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier __ _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: __NP _X_ __N
COC Signed/Accurate: _X_ __N
Bottles arrive intact: _X_ __N
Correct bottles used: _X_ __N
Sufficient volume sent: _X_ __N
If Applicable
VOA Zero Headspace: __Y __N
Preservation Correct/Checked: __Y __N

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeOH TBR
	09-23-21	1500		
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 0.2 °C Bottles Received: 6
	9-23-21	1800		0.5-1=0.4
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 9/24/21 Time: 8:00

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

Appendix C –
Geotechnical Reports

GEOTECHNICAL ENGINEERING SERVICES
MC-85 (BUCKEYE ROAD)
FROM 107TH AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA
MCDOT JOB NO. TT345

Kleinfelder Project No.: 129067

December 28, 2012

Prepared for:
Mr. Gant P. Yasanayake, PhD, P.E.
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Ramon Padilla, P.E.
Geotechnical Project Manager

Reviewed By:
Keith H. Dahlen, P.E.
Senior Principal Geotechnical Engineer

KLEINFELDER
Bright People. Right Solutions.

December 28, 2012
Project No.: 129067

Mr. Gant P. Yasanayake, PhD, P.E.
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

SUBJECT: Geotechnical Engineering Services
Proposed Roadway Improvements
MC-85 (Buckeye Road) – From 107th Avenue to 75th Avenue
Maricopa County (Phoenix), Arizona
MCDOT Job No. TT345

Dear Mr. Yasanayake:

This report transmits the findings of our geotechnical evaluation for the proposed MC-85 (Buckeye Road) roadway improvements from 107th Avenue to 75th Avenue in Maricopa County (Phoenix), Arizona. Kleinfelder's services were conducted in general accordance with the scope of services presented in our Proposal No. 126948\TEM12P030R3, dated August 21, 2012. Our work was performed under our existing On-Call Contract No. 2012-034 with Maricopa County Department of Transportation (MCDOT).

We appreciate the opportunity to be of service on this project. If we can be of additional assistance as the design progresses, please do not hesitate to contact us.

Sincerely,
KLEINFELDER WEST, INC.

Ramon Padilla, P.E.
Geotechnical Project Manager

Reviewed By:
Keith H. Dahlen, P.E.
Senior Principal Geotechnical Engineer

1335 West Auto Drive, Tempe, AZ 85284 p | 480.763.1200 f | 480.763.1212

TABLE OF CONTENTS

Due to the various engineering services Kleinfelder provided for this project, this report was divided into the following sections. A more detailed table of contents is provided at the beginning of each section.

SECTION 1

INTRODUCTION

TABLE OF CONTENTS

FIGURES

1 INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical engineering services for the proposed MC-85 (Buckeye Road) roadway improvements from 107th Avenue to 75th Avenue in Maricopa County (Phoenix), Arizona. The approximate location of the site is shown on the Site Vicinity Map (Figure I-1).

The recommendations contained in this report are subject to the limitations presented in the 'Limitations' section of this report. In addition, as a member of ASFE (The Association of Engineering Firms Practicing the Geosciences), we included a brochure prepared by ASFE in this report. We recommend that all individuals using this report read the limitations along with the accompanying ASFE document.

1.2 PROJECT DESCRIPTION

MC-85 (Buckeye Road) from 107th Avenue to 75th Avenue is planned to be adopted by the City of Phoenix. As part of the adopting process, MC-85 will undergo some construction in order to meet the City of Phoenix roadway specifications. The proposed roadway improvements will include the construction of a continuous 5-lane section with mostly a lowered finished grade and also underground storm-drain improvements.

We understand that a Portland cement concrete pavement (PCCP) roadway was constructed within the MC-85 right-of-way in the 1930s. The PCCP roadway was comprised of adjacent PCCP slabs measuring 6-feet wide by 16-feet in length. The total width of the PCCP roadway at the time it was constructed was approximately 18 feet (consisting of 3 adjacent 6-foot wide slabs). We understand the PCCP roadway was buried at a later date by the construction of a newer asphalt concrete (AC) pavement. Specific information documenting the existing pavement structure (including the buried PCCP) were not available at the time of this report. Based on relatively recent boring/coring log data from other consultants, we understand the depth of the PCCP roadway varies from immediately underneath up to a few feet beneath the AC pavement structure.

Our engineering services included site reconnaissance, review of historical aerial photographs and previous geotechnical reports, subsurface explorations and geophysical surveys, pavement coring, soil sampling, field and laboratory testing, engineering analyses, and preparation of this report. The purposes of our engineering services at the site were to obtain data in an effort to better delineate the extents (widths, lengths and depths) of the buried Portland cement concrete pavement, explore the subsurface conditions for the proposed storm drain line, perform percolation testing for the proposed storm-water retention basins, and consolidate the pavement design information from previous reports.

As part of our engineering services, Kleinfelder reviewed geotechnical and pavement design reports previously prepared by other consultants for the site. These reports were provided to Kleinfelder by MCDOT. These previous reports are included as appendices throughout the different sections of this report. Where appropriate, the data presented in these reports was relied upon and used for the preparation of this report. The following is a list of the reports provided by MCDOT for this project:

- Mactec, Report of Geotechnical Evaluation, MC85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona (Mactec Project No. 4975-03-1401, report dated June 17 and revised October 23, 2003).
- DMJM Harris/AECOM, Pavement Design Report, MC 85, 107th Avenue to 91st Avenue, Maricopa County, Arizona (DMJM Harris Project No. 6490.0000, report dated April 25, 2006).
- DMJM Harris/AECOM, Stormwater Detention Basin Percolation Testing and Earthwork Factor Estimates, MC 85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona (DMJM Harris Project No. 6490.0000, report dated November 8, 2006).
- Ninyo and Moore (N&M), Geotechnical Evaluation, MC-85 Roadway Improvements, 75th Avenue to 91st Avenue, Maricopa, Arizona (N&M Project No. 601301002, report dated September 28, 2010).

1.3 SITE DESCRIPTION

At the time of our field exploration along MC-85, the site consisted of an AC paved roadway divided into 2 travel lanes each way. The lanes along the site alternated between 5 lanes (2 lanes each way with a center median/turn lane) and 4 lanes (2 lanes each way) with the center median/turn lane transitioning from a full width center turn lane to just a stripe dividing the east and west travel lanes. As previously mentioned, future plans include construction of a continuous 5-lane section across the site.

The site was bounded by private properties. The majority of the properties adjacent to the site along the south consisted of agricultural land; and the properties adjacent to the site along the north consisted of agricultural land, industrial facilities and commercial properties. A dirt and/or gravel shoulder with variable widths was typically observed adjacent to the AC paved roadway where the site was bounded by agricultural land. We observed several concrete-lined irrigation canals adjacent to the edge of the right-of-way along the edge of the agricultural land. In areas of the site bounded by an industrial facility or commercial development, the AC paved roadway generally included improvements of curb, gutter, sidewalk and landscaped areas. The following are pictures of MC-85 (Buckeye Road) taken facing east and west along the south side of the roadway. The pictures were taken near major crossroads (at the end of each mile along the site) starting from the west end of the project.

Picture 1 – Near 107th Ave.; Facing East

Picture 2 – Near 99th Ave.; Facing West

Picture 3 – Near 99th Ave.; Facing East

Picture 4 – Near 91st Ave.; Facing West

Picture 5 – Near 91st Ave.; Facing East

Picture 6 – Near 83rd Ave.; Facing West

Picture 7 – Near 83rd Ave.; Facing East

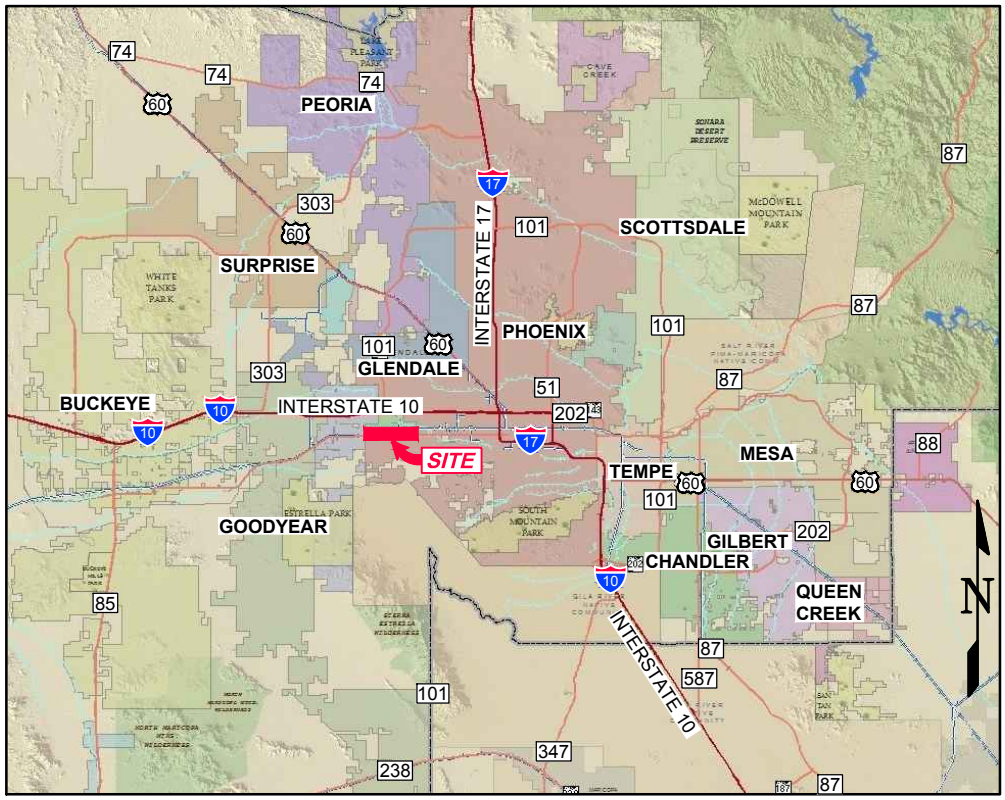
Picture 8 – Near 75th Ave.; Facing West

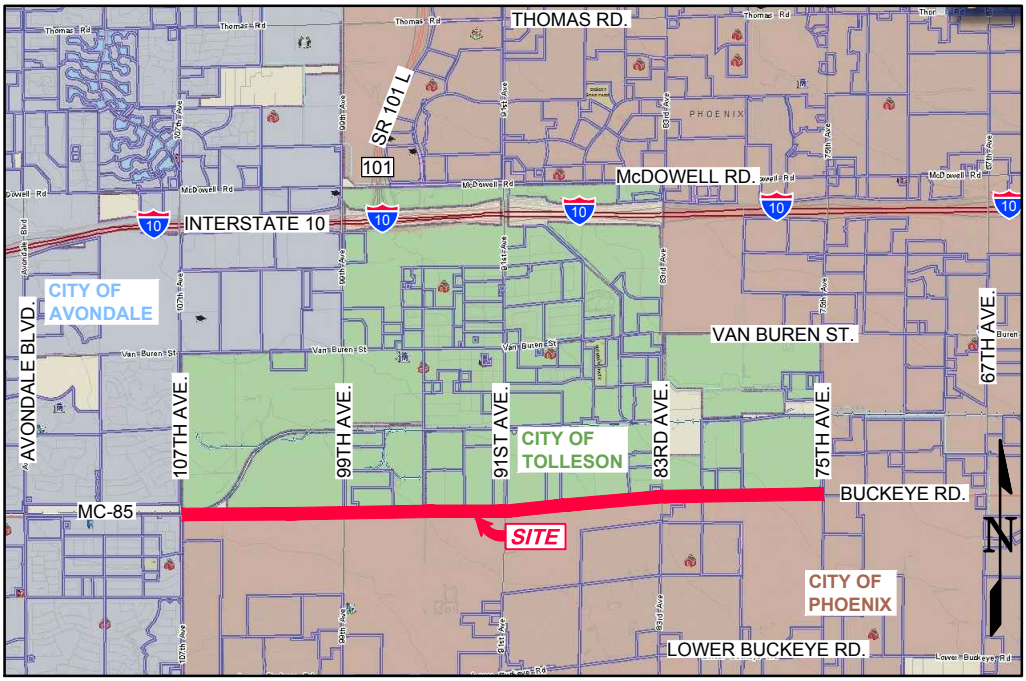
1.4 PRIVATE PROPERTY ACCESS

The site of the MC-85 project is approximately 4 miles long, extending west to east from 107th Avenue to 75th Avenue. MCDOT provided to us a list with the contact information of 68 private property owners adjacent to the site. The private properties located adjacent to the site totaled approximately 78 parcels. As directed by MCDOT, Kleinfelder requested access to these private properties by mailing the property owners a letter titled *Roadway Engineering Work, Along MC-85 (Buckeye Road), From 107th Avenue to 75th Avenue, Maricopa County (Phoenix / Tolleson), Arizona* (dated September 24, 2012). We received a response to our letters providing authorization to access approximately 28 parcels. Where requested by the property owners, Kleinfelder coordinated the field work with the property tenants. We did not receive authorization to access the remaining parcels, either by not receiving a response to our letter, or a response was received indicating no authorization to access. Kleinfelder located the work areas along

existing right-of-way property or on private properties with authorized access. Some of the proposed work areas were not accessible. Detailed information describing the work Kleinfelder performed is presented in the following sections of this report.

FIGURE





VICINITY MAPS

NOT TO SCALE

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www.kleinfelder.com

PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	DMF
CHECKED BY:	RP
FILE NAME:	129067_F1.dwg

SITE VICINITY MAP

MC-85 (BUCKEYE ROAD)
FROM 107TH AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
I-1

ATTACHED IMAGES: Images: Vicinity1.jpg Images: Vicinity2.jpg
ATTACHED XREFS:
RIVERSIDE, CA
CAD FILE: L:\2012\CADD\129067\ LAYOUT: 1
PLOTTED: 15 Nov 2012, 10:31am, dfahrney

SECTION 2

HISTORICAL AERIAL PHOTOGRAPH REVIEW

TABLE OF CONTENTS

FIGURES

APPENDIX H-A

2 HISTORICAL AERIAL PHOTOGRAPH REVIEW

2.1 GENERAL

Kleinfelder reviewed aerial photographs as part of our services for the project. The historical aerial photograph review was performed in an effort to identify possible agricultural waste areas that may be within the proposed right-of-way for the project. In addition, the aerial photographs were also reviewed in an effort to aid in locating, where possible, the limits of the Portland cement concrete pavement (PCCP) buried across the site.

2.2 HISTORICAL AERIAL PHOTOGRAPH SOURCES

The sources used by Kleinfelder to obtain aerial photographs of the site were Cooper Aerial Surveys Co. (Cooper Aerial), the United States Department of Agriculture - Farm Service Department - Aerial Photography Field Office (USDA-FSA-APFO), and the Flood Control District of Maricopa County (FCDMC).

The aerial photographs of the site obtained from Cooper Aerial that Kleinfelder observed were dated 1961, 1978, 1984, 1986 and 1999. The aerial photographs of the site obtained from the USDA-FSA-APFO that Kleinfelder observed were dated 1958, 1964 and 1970. The aerial photographs observed from the FCDMC (website) were dated 1937, 1949, 1959, 1969, 1979, 1992-93, 1996-97, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2003-04, 2004-05, 2005-06, 2006-07, 2007-08, 2008-09, and 2009-10. The Maricopa County Assessors Web Site and Google Earth Pro were also used to observe more recent aerial photographs of the site.

2.3 OBSERVATIONS

Selected aerial photographs obtained from the FCDMC website and Google Earth Pro were compiled for each of the 4 miles along the project and are presented in Figures H-1 through H-4. The aerial photographs presented on Figures H-1 through H-4 include red outlines in areas where features were observed to no longer be present on the aerial photograph when compared to an older aerial photograph. At selected areas with a red outline, Borings F1, F2, SD12 and SD13 were drilled to explore the subsurface conditions as part of our field investigation for the proposed storm drain line. Detailed information on these borings is presented in the storm drain

line section of this report. At the locations of Borings F1, F2, SD12 and SD13, fill soils underlain by native soil deposits were encountered, and evidence of agricultural waste was not observed. Figures H-5 and H-6 indicate the approximate location of Borings F1, F2, SD12 and SD13, followed by Appendix H-A with the logs for these borings. Based on our observations of the aerial photographs reviewed, agricultural waste areas were not observed adjacent to the proposed right-of-way of the site.

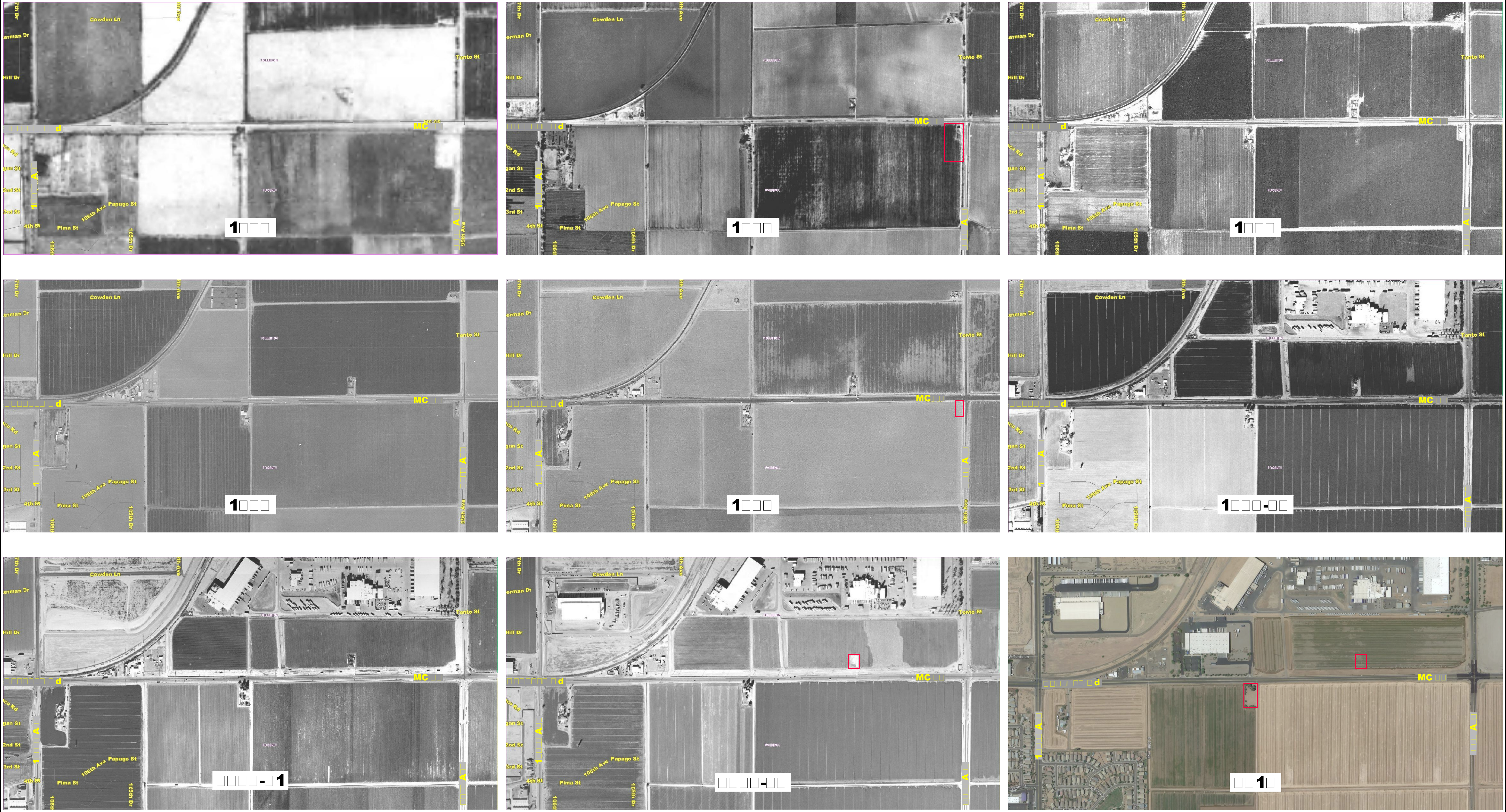
Several of the red outlines marked on Figures H-1 through H-4 were located in areas where it appears relatively small building structures were removed. At these areas, we anticipate (possibly abandoned) features such as underground utility lines and their trenches servicing the previous structures may still be present near the area of the proposed right-of-way. Some of these previous building structures may have also included septic systems.

Due to the low resolution of the older aerial photographs that likely include the Portland Cement Concrete Pavement (PCCP), the PCCP was not clearly identified nor were we able to obtain quantifiable measurements from the aerial photographs to aid with delineating the location of the PCCP at the site.

Our aerial photograph observations are limited to those described in this report and are limited to those observations that were apparent to us. The presence of previous features not depicted or apparent in the aerial photographs is possible.

FIGURES

ATTACHED IMAGES: Images: 1937 - 107th to 99th.jpg Images: 1949 - 107th to 99th.jpg Images: 1959 - 107th to 99th.jpg Images: 1969 - 107th to 99th.jpg Images: 1979 - 107th to 99th.jpg Images: 1996-97 - 107th
ATTACHED XREFS:
LONG BEACH, CA CAD FILE: L:\CADD\2012\129067\HistAerialPhoto_11-2012\H-1_107th-99th\ LAYOUT: H-1 PLOTTED: 19 Dec 2012, 5:43pm, MGriffin



N

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The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

EXPLANATION

APPROXIMATE AREA WHERE FEATURE(S) OBSERVED IN PREVIOUS PHOTOGRAPH IS NO LONGER PRESENT

SOURCE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY WEB SITE (ALL IMAGES EXCEPT 2012).
GOOGLE EARTH PRO, 6/08/12 (2012 IMAGE).

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-Fig_H-1.dwg

HISTORICAL AERIAL PHOTOGRAPHS

MC-85 (BUCKEYE ROAD)
FROM 107TH TO 99TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE

H-1

ATTACHED IMAGES: Images: 1937 - 99th to 91st.jpg Images: 1949 - 99th to 91st.jpg Images: 1959 - 99th to 91st.jpg Images: 1969 - 99th to 91st.jpg Images: 1979 - 99th to 91st.jpg Images: 1999-00 - 99th to 91st.j
ATTACHED XREFS:
LONG BEACH, CA

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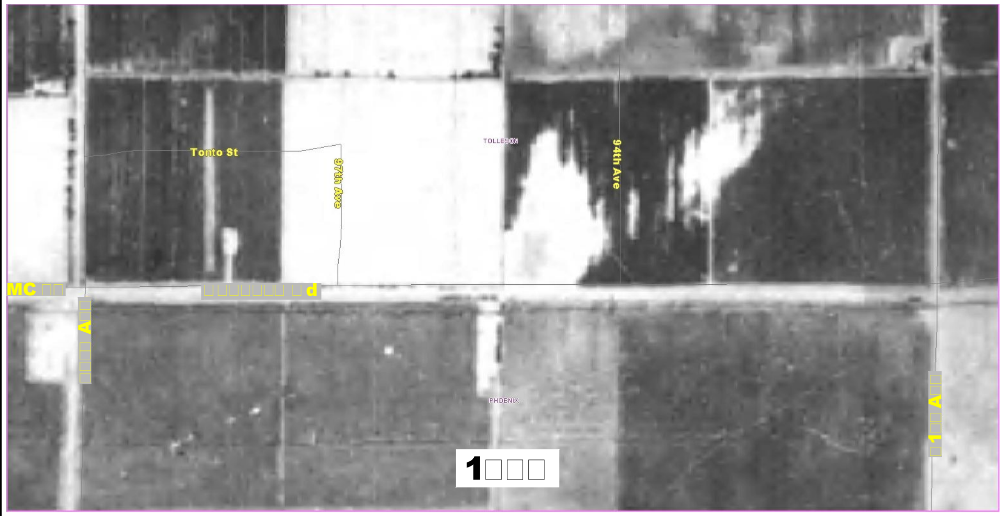

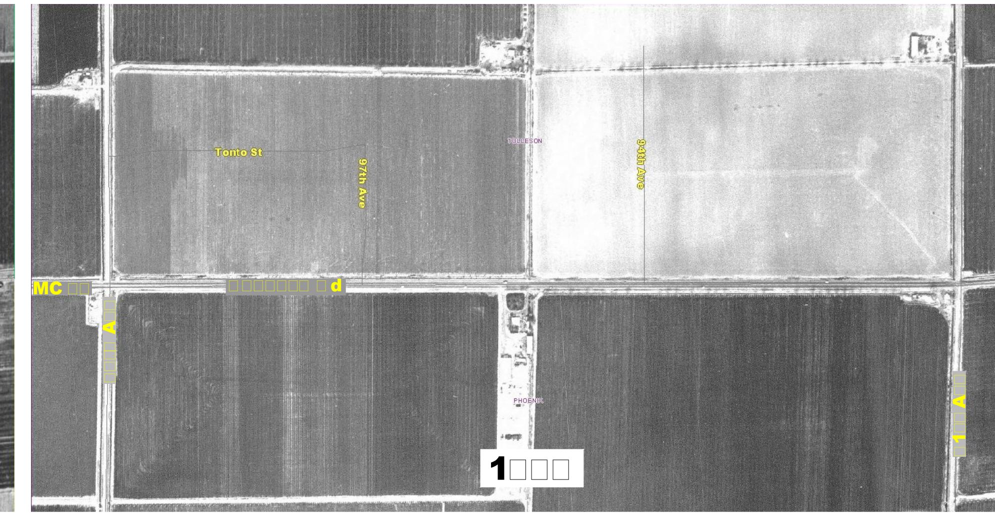

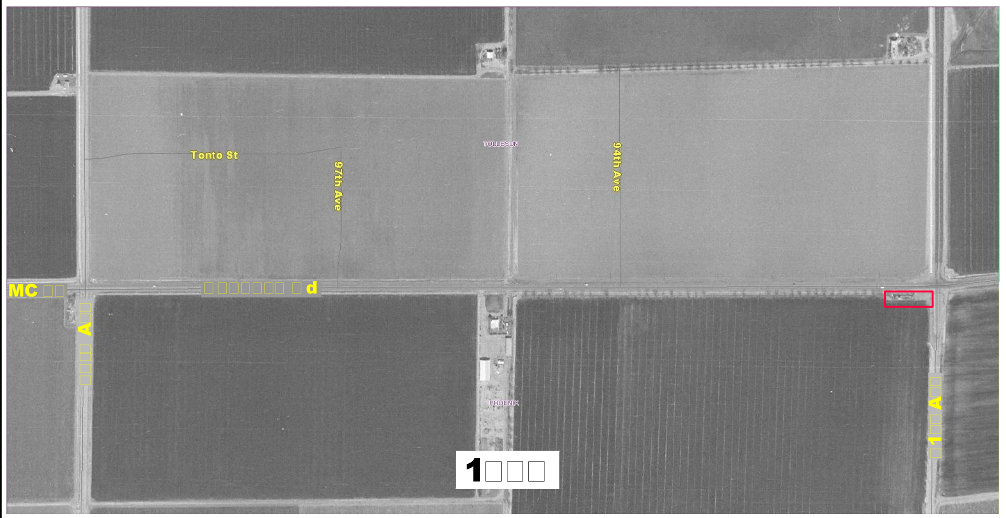

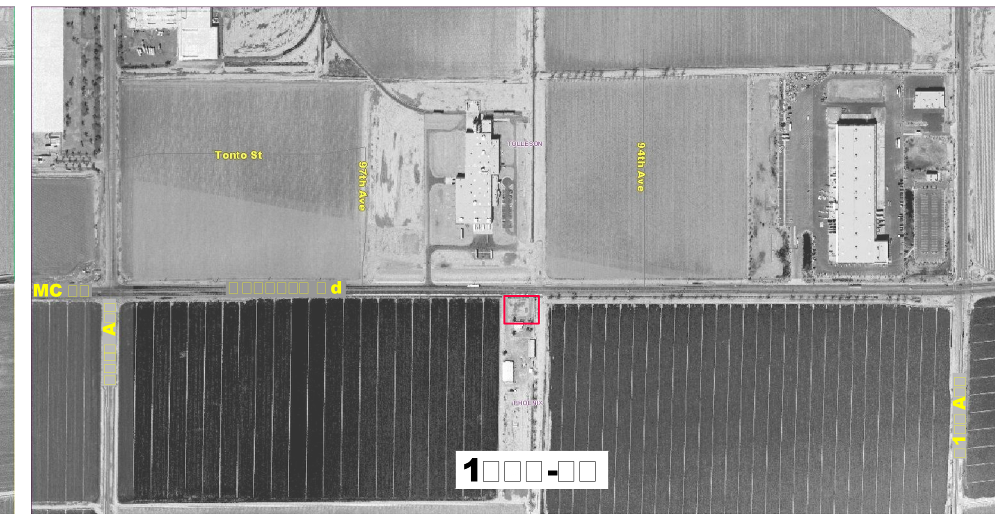

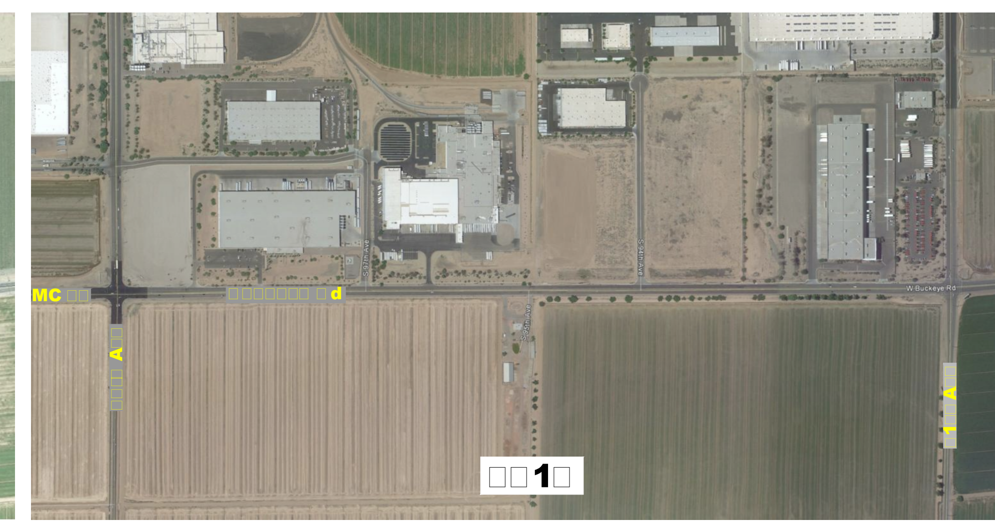

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□ APPROXIMATE AREA WHERE FEATURE(S) OBSERVED IN PREVIOUS PHOTOGRAPH IS NO LONGER PRESENT

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DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-Fig_H-2.dwg

□IST□□ICA□ AE□IA□ P□□T□□□AP□S

MC-85 (BUCKEYE ROAD)
FROM 99TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
□ -□

ATTACHED IMAGES: Images: 1937 - 91st to 83rd.jpg Images: 1949 - 91st to 83rd.jpg Images: 1959 - 91st to 83rd.jpg Images: 1969 - 91st to 83rd.jpg Images: 1979 - 91st to 83rd.jpg Images: 1996-97 - 91st to 83rd.
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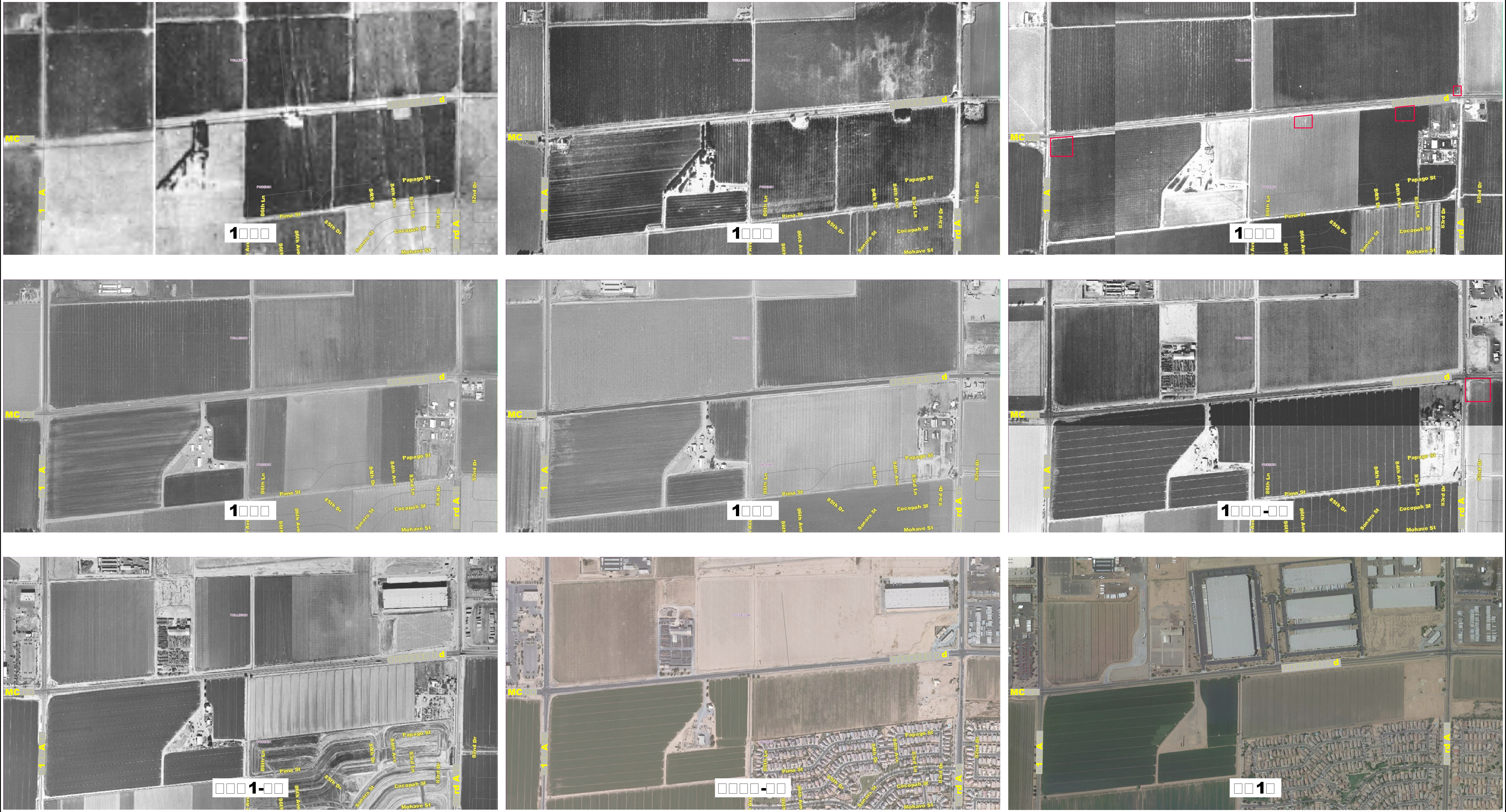

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DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-Fig_H-3.dwg

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MC-85 (BUCKEYE ROAD)
FROM 91ST AVENUE TO 83RD AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
□-□

ATTACHED IMAGES: Images: 1937 - 83rd to 75th.jpg Images: 1949 - 83rd to 75th.jpg Images: 1959 - 83rd to 75th.jpg Images: 1969 - 83rd to 75th.jpg Images: 1979 - 83rd to 75th.jpg Images: 1996-97 - 83rd to 75th.jpg

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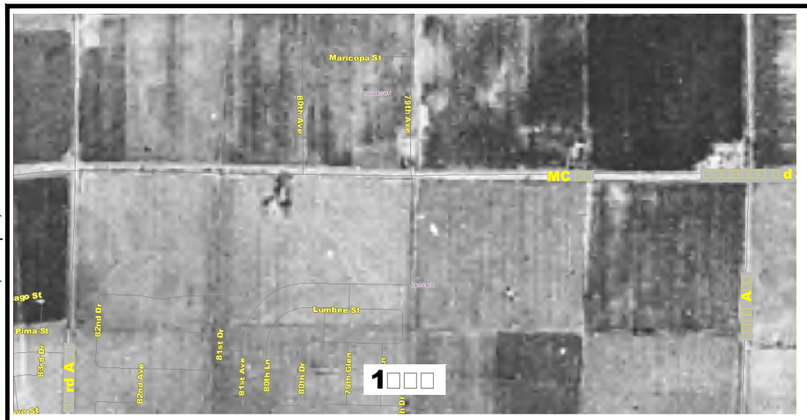
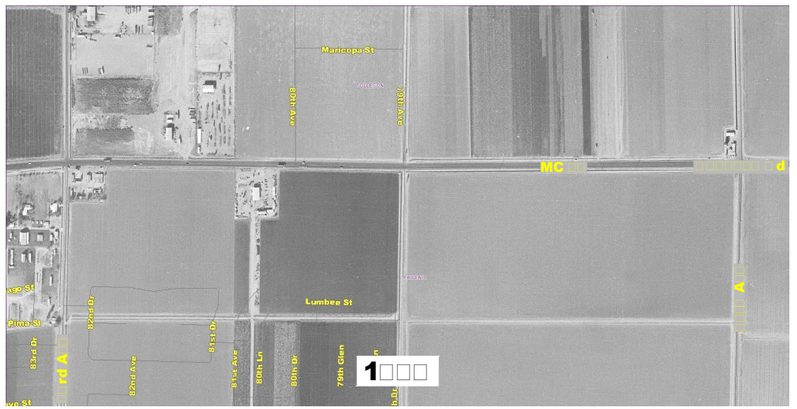
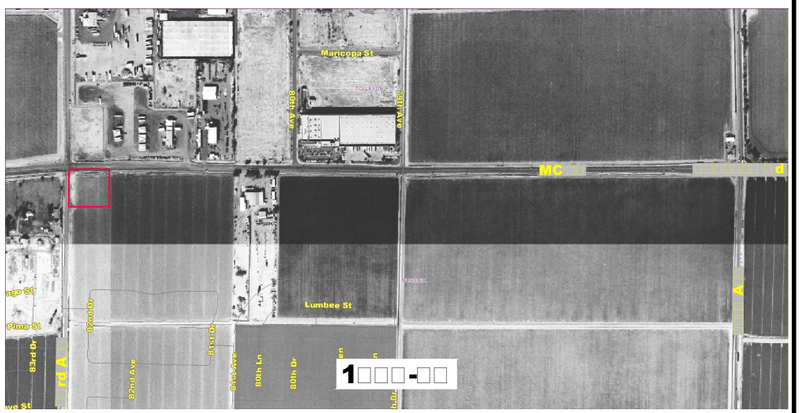
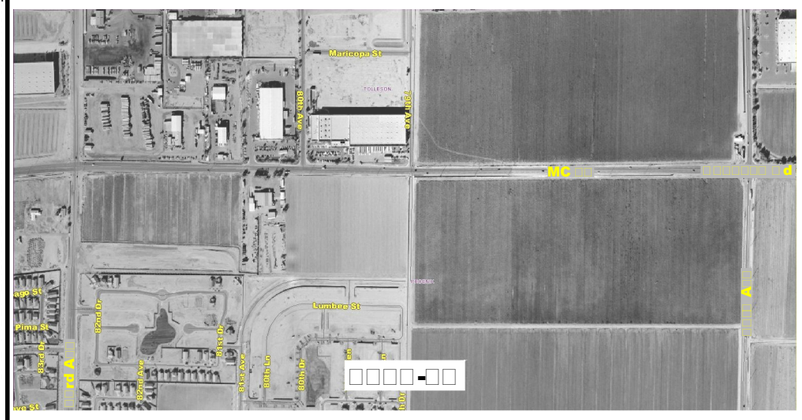
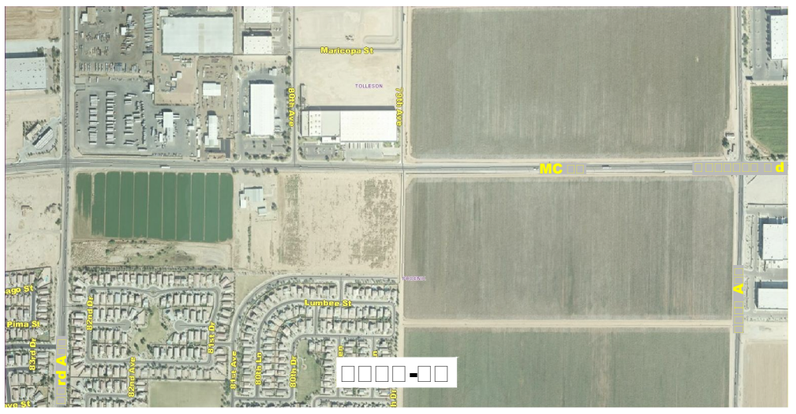
LONG BEACH, CA











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CHECKED BY:	RP
FILE NAME:	129067-Fig_H-4.dwg

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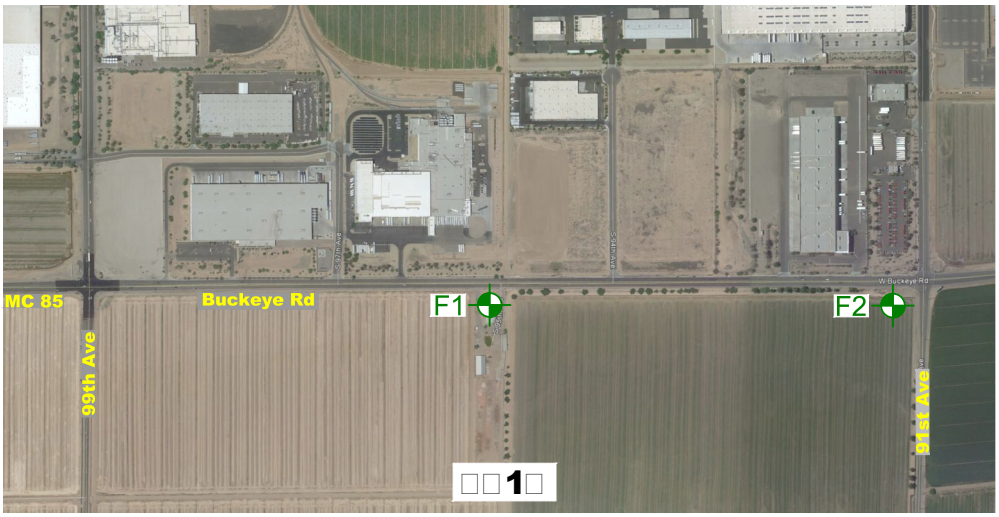
MC-85 (BUCKEYE ROAD)
FROM 83RD AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
□ -□



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APPROXIMATE KLEINFELDER BORING LOCATION

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PROJECT NO.	129067
DRAWN:	12/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-Fig_H-5.dwg

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□1 AN□ □□ MAP

MC-85 (BUCKEYE ROAD)
FROM 99TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

PLATE
□ -□

ATTACHED IMAGES: Images: 1969 - 99th to 91st.jpg Images: 1999-00 - 99th to 91st.jpg Images: Aerial-Image_1250_6-8-2012_99th-91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg
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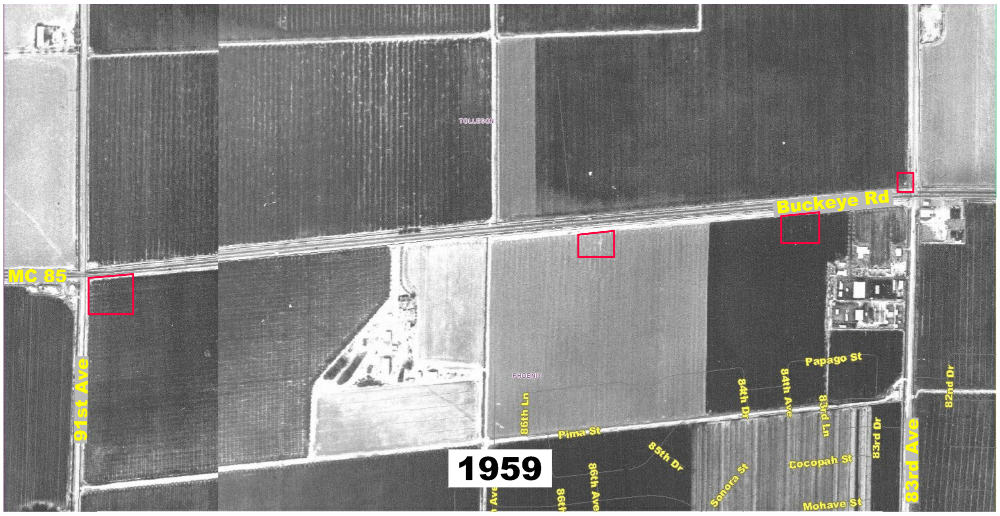

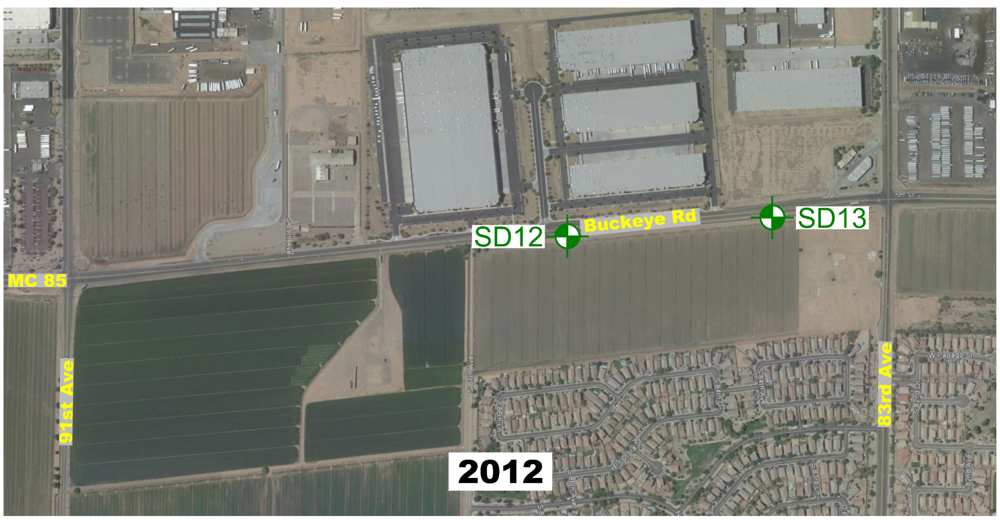

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EXPLANATION

⊕ APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY WEB SITE (ALL IMAGES EXCEPT 2012).
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PROJECT NO.	129067	**BORING LOCATION SD12 AND SD13 MAP**	PLATE
DRAWN:	12/2012		**H-6**
DRAWN BY:	MRG		
CHECKED BY:	RP	MC-85 (BUCKEYE ROAD) FROM 91ST AVENUE TO 83RD AVENUE MARICOPA COUNTY (PHOENIX), ARIZONA	
FILE NAME: 129067-Fig_H-6.dwg			

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ATTACHED XREFS:
LONG BEACH, CA
CAD FILE: \\kleinfelder.com\shares\LONGBEACH-DATA\LIBRARY\CADD\2012\129067\HistAerialPhoto_11-

APPENDIX H-A

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LESS THAN 5% PASSING NO. 200 SIEVE	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LESS THAN 5% PASSING NO. 200 SIEVE	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing No. 200 sieve require dual USCS symbols. (See KEY A3 if provided)

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Report Date:	Project Number:
December 2012	129067

UNIFIED SOIL CLASSIFICATION SYSTEM

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A1

GEO-KEY_A1_SOIL 129067 MC-85.GPJ 12/06/12

LOG SYMBOLS

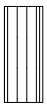
BULK / GRAB SAMPLE

MODIFIED CALIFORNIA SAMPLER
(2 inch inside diameter)

RING (PORTER) SAMPLER
(2-1/2 inch inside diameter)

STANDARD PENETRATION
SPLIT SPOON SAMPLER
(1.4 inch inside diameter)

SHELBY TUBE
(3 inch outside diameter)



HQ-3 SIZE CORE BARREL
(2.4 inch inside diameter)

WATER LEVEL
(level after completion)

WATER LEVEL
(level where first encountered)

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.
5. NA = Not Analyzed

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Report Date:	Project Number:
December 2012	129067

LOG KEY

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A2

GEO-KEY_A2_LOG 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.4356° Longitude: -112.26408°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.0 feet
														Graded landscaped area, developed parcel
				8			49	30	99	77			CL	**LEAN CLAY with SAND:** brown, soft, medium to high plasticity, no cementation, trace gravel, moist, upper roughly 12 inches disturbed by previous grading.
			2-3-3	7										
				3										
				4										
				8										
5			24/12	10	102	19								Note: brown to light brown, firm, weak cementation, and vesicular below about 5 feet.
				11										
				18										
				20										
			11-13-11											
10													SM	**SILTY SAND:** brown to light brown, medium dense, non-plastic, no cementation, slightly damp.
			24/12		104	6								Note: trace fine gravel below about 14 feet.
15														Stopped drilling at 14.0 feet. Stopped sampling at 15.0 feet. No groundwater encountered. Cave-in to 12.0 feet.
20														

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LOG OF BORING F1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A3

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43561° Longitude: -112.25579°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet
														Graded dirt shoulder - Buckeye Road
				12									FILL	**FILL: CLAYEY SAND:** brown, low plasticity, trace gravel, slightly damp.
				6									CH	**NATIVE: FAT CLAY with SAND:** brown to light brown, moderately firm, high plasticity, weak cementation, trace gravel, damp.
			15/12	5	95	17								
				6										
	5			6										
			4-5-5	6			50	32	99	79				
				9										
				12										
				14										
			34/12		106	8							CL	**SANDY CLAY:** brown to light brown, very firm, low to medium plasticity, weak cementation, slightly damp.
	10													
														Note: stratified with thin layers of clayey sand below about 14 feet.
			11-11-25											
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING F2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A4

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43654° Longitude: -112.24486°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	5.4

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 5.4 feet Graded dirt shoulder - Buckeye Road
			12-12-12				41	26	90	56	Max Dry Dens = 117.8pcf Opt Moist = 13.8% Swell = 3.1% R-value = 5		FILL	**FILL: SANDY LEAN CLAY:** brown and gray, firm, medium plasticity, no cementation, some gravel, slightly damp.
	5		50/5											Note: hard at 5 feet.
														Auger refusal at 5.0 feet. Sampler refusal at 5.4 feet. No groundwater encountered in test boring.
	10													
	15													
	20													

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LOG OF BORING SD12

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A5

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43694° Longitude: -112.24062°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.0 feet
														Graded dirt shoulder - Buckeye Road
													FILL	**FILL: SILTY SAND:** brown, non-plastic, slightly damp.
			4-6-3										SC	**NATIVE: CLAYEY SAND:** brown, loose, low plasticity, weak cementation, trace gravel, slightly damp.
							40	23	97	75			CL	**LEAN CLAY with SAND:** light brown, firm, medium plasticity, weak cementation, trace gravel, damp.
	5		16/12		105	15								
			7-10-14										CL-ML	**SANDY, CLAYEY SILT:** light brown, firm, low plasticity, weak cementation, slightly damp.
	10													
													SC	**CLAYEY SAND:** light brown, very dense, low plasticity, weak cementation, damp.
			62/12		103	19								
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 10.7 feet.
	20													

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LOG OF BORING SD13

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
H-A6

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

SECTION 3

GROUND PENETRATING RADAR SURVEY

TABLE OF CONTENTS

APPENDIX GPR-A

Geological Consultants, Inc. (GCI) report titled *Ground Penetrating Radar Survey, Locate Buried Concrete Pavement Section, MC 85 (Buckeye Road), 75th Avenue to 107th Avenue, Phoenix, Arizona* (GCI Project No. 2012-126, report dated October 17, 2012).

3 GROUND PENETRATING RADAR SURVEY

3.1 GENERAL

Ground penetrating radar (GPR) surveys across the MC-85 roadway were performed throughout the extent of the project. Kleinfelder subcontracted Geological Consultants, Inc. (GCI) to perform the GPR surveys for the project. The GPR surveys across the site were performed in an effort to aid delineating the buried Portland cement concrete pavement (PCCP) at the project. GCI's services for this project are presented in a GPR Survey Report, which is included as Appendix GPR-A in this section.

3.2 GPR FIELD WORK

Prior to the GPR survey field work, Kleinfelder obtained a MCDOT right-of-way permit (Tracking No. TC20120646), and subcontracted Highway Technologies, Inc. (HT) to submit a traffic control plan to MCDOT. The traffic control plan for the GPR survey work was approved by MCDOT on August 31, 2012. The project is surrounded by the cities of Phoenix, Tolleson and Avondale. In order to inform these surroundings municipalities of our GPR survey work, we provided them traffic control information and obtained required right-of-way permits. We notified a MCDOT inspector 24 hours prior to our field work. Traffic control for the project was provided by HT in general accordance with the approved traffic control plan.

The GPR surveys were performed by GCI on September 3rd through the 8th, 2012. The GPR survey work was performed at night between the hours of 8:00P.M. to 5:00A.M. The traffic control, including 4 (off-duty) City of Phoenix police officers, was utilized to reduce traffic to one lane in each direction. The GPR surveys were performed perpendicular to the MC-85 roadway and across the majority of the existing right-of-way. Traffic, if any, was stopped each time the GPR surveys were performed across the roadway travel lanes. Each GPR survey across the roadway was generally performed in approximately 5 minutes or less. Once a GPR survey line was performed across the roadway, the traffic control setup was moved and re-established at the next GPR survey location. A total of 124 GPR survey lines were performed at approximately 200 feet (or less) spacings across the 4 mile long project. Kleinfelder performed periodic site visits during most of the GPR survey shifts and assisted with project and field coordination.

3.3 GPR SUMMARY

The results of the GPR surveys indicate the buried PCCP is present beneath the existing roadway throughout the 4 miles of the project. As indicated in the GPR Survey Report, there appears to either be occasional discontinuities in the buried PCCP or the PCCP may be buried at a depth out of the GPR range. The GPR surveys indicated the width of the PCCP was variable across the project, possibly due to past improvements on the site such as the installation of a southwest gas high pressure line along most of the northern portion of the roadway. The GPR detected anomalies interpreted as the buried PCCP was labeled as an "A" anomaly. Other anomalies interpreted from the GPR along the survey lines were labeled as "B, C or D." GPR surveys were performed at periodic intervals across the site. Continuity of the buried PCCP between GPR survey lines is only assumed. It is possible that conditions could vary between or beyond the data evaluated. A field exploration to core selected GPR anomaly areas was performed by Kleinfelder after the GPR survey work, and detailed information is presented as a separate section of this report (Section 4).

APPENDIX GPR-A

Ground Penetrating Radar Survey Report

GEOLOGICAL CONSULTANTS INC

KENNETH M. EUGE, R.G.

Report Prepared for:

Kleinfelder
1335 West Auto Drive
Tempe, AZ 85284

Attention: Mr. Ramon Padilla, P.E.
Geotechnical Project Manager
Kleinfelder Project No. 129067
Kleinfelder Work Order No. 1 (Master Agreement KA12-002)

Report Prepared by:

Geological Consultants Inc.
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Registered Geophysicist
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Kerry Hennon
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Date 10/15/12
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Prepared by:
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EXP 09-30-2014

Prepared & Reviewed by:
Kenneth M. Euge, R.G.

GROUND PENETRATING RADAR SURVEY

LOCATE BURIED CONCRETE PAVEMENT SECTION
MC 85 (BUCKEYE ROAD)
75TH AVENUE TO 107TH AVENUE
PHOENIX, ARIZONA

October 17, 2012

GCI Project No. 2012-126

NOTICE

The geophysical survey interpretations, findings, conclusions and recommendations presented in this report are based on (1) available roadway information from unpublished sources available at the time of this study; (2) ground penetrating radar (Radar) geophysical surveys of selected roadway sites; and (3) the analysis and interpretation of the Radar geophysical data gathered along MC 85 between 75th Avenue and 107th Avenue. The services provided by Geological Consultants Inc. (GCI) to Kleinfelder were performed using that degree of care and skill ordinarily exercised under similar circumstances, by reputable members of their profession practicing in the same or similar locality at the time of this study.

It must be recognized that subsurface geologic conditions may vary from place to place and from those found at locations where measurements or surveys are made by the investigator. Opinions regarding the subsurface geological and soil conditions presented in this report are based on the results of this investigation and the interpretation of Radar geophysical data and it may not be possible for others to accurately correlate the geological material, geophysical interpretations, and survey results to test explorations or investigations conducted by others. No warranty or representation, either expressed or implied, is or should be construed regarding geological/geophysical conditions at locations other than those evaluated by the investigator(s) as part of this geophysical site investigation.

This report was prepared by the scope of work outlined in the GCI proposal for geological services dated May 31, 2012 and as authorized through the Master Agreement for Subcontractor Services (No. KA12-002) between Kleinfelder and GCI dated July 20, 2012 and the Kleinfelder Work Order No. 1 dated August 30, 2012 for Kleinfelder Project No. 129067.

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FIGURES

GROUND PENETRATING RADAR SURVEY

LOCATE BURIED CONCRETE PAVEMENT SECTION MC 85 (BUCKEYE ROAD) 75TH AVENUE TO 107TH AVENUE PHOENIX, ARIZONA

1.0 INTRODUCTION

This report describes the results of the surface geophysical ground penetrating radar (Radar) surveys conducted at selected locations along MC 85 (Buckeye Road) between 75th Avenue and 107th Avenue in Phoenix, Arizona (Figure 1).

The purpose of the geophysical Radar survey was to provide the necessary geophysical services to complete Radar surveys at selected locations along portions of a four-mile stretch of MC 85 with the purpose to identify buried, old Portland Cement Concrete Pavement (PCCP) sections that were left in place and buried by the subsequent construction of the existing MC 85 roadway. Radar surveys were run perpendicular to the four-lane MC 85 roadway as well as the accessible roadway shoulders

Because of the periodic heavy traffic along MC 85 during the Radar survey, traffic control was used at each Radar profile line location to limit traffic travel to east and westbound inside lines with temporary traffic stoppages during the Radar surveys. The traffic control plan, and its implementation, was designed to minimize to the fullest possible extent, potential impacts to traveling public and the personnel conducting the Radar surveys and to maximize the site safety consideration consistent with the Kleinfelder site-specific health and safety plan.

The Scope of Work performed to accomplish the objectives of this investigation included:

- Mobilization and demobilization of personnel and equipment to and from the job site.
- Prior to undertaking the site work, a task-specific Health and Safety Plan was provided that identified the hospital or medical facility nearest to project area.
- Reports and boring logs from previous geotechnical investigations (DMJM Harris, 2005; MACTEC, 2003; Ninyo & Moore, 2010) were reviewed prior to the Radar survey of the MC 85 alignment to determine the locations where the buried PCCP had been identified.

- Reconnoiter of the site investigation area to assess the general condition of the search area, identify cultural features that could influence the geophysical survey areas, and define the specific work area sequence to minimize roadway traffic lane closure impacts to MC 85.

- A National Geodetic Survey (NGS) monument near MC 85 was selected and the monument was located and occupied to reference the Radar survey profile line GPS location survey.

- Radar survey testing and antenna calibration sites along the MC 85 roadway were coordinated and jointly selected by GCI and Kleinfelder. These test sites focused on area where the buried concrete pavement section had been identified ("tagged") during previous geotechnical investigations. Radar surveys were conducted at fifteen test/calibration sites.

- A total of one hundred-twenty-four (124) Radar survey profiles were completed along MC 85 between 107th Avenue and 75th Avenue, including production, supplemental, and test/calibration profiles. The Radar profile survey lines were located on the average of about 185-feet, on-center. Each Radar profile line start point and the anomalies identified during the Radar survey were marked on the pavement and surveyed for future reference.

- GPS surveying to locate the Radar profiles line was conducted concurrently the Radar survey profiling to locate the identified Radar anomalies.

- Radar and GPS data were processed to interpret and identify the Radar anomalies and to construct the Radar survey profile line and anomaly maps.

- Prepare this report documenting the Radar survey, its finding, interpretations, conclusions, and recommendations.

The Radar and GPS surveys were performed between the hours of 8:00 P.M. and about 5:00 A.M. each day between September 3, 2012 and September 8, 2012. Radar calibrations and testing of selected sites were conducted on September 3, 2012 and the production Radar surveys were conducted on September 4, 2012 through 5:00 A.M. on September 8, 2012. The Radar surveys were conducted by Mr. Kerry Hennon, P.Gp., Principal Geophysicist with Kenneth M. Euge, R.G., Principal Geologist and Project Manager of Geological Consultants Inc. (GCI). Mr. Ramon Padilla, P.E. with Kleinfelder was on the site periodically during the Radar and GPS surveys to facilitate coordination of the work and with the traffic control personnel and the

County. No direct subsurface explorations (bore holes or trenches), materials sampling, nor laboratory testing was performed by GCI as part of this geophysical survey investigation.

2.0 METHODOLOGY AND PROCEDURES

Surface geophysical surveys are the appropriate methodology for rapidly characterizing this site for buried structures that may pose constraints to future roadway and site development if not identified and, if necessary, mitigated. The Radar survey method is used to identify and interpret the location of the reported buried concrete pavement as well as buried debris, backfilled excavations, and public and private utilities that could be encountered along the Radar profile lines. These subsurface features, if present, generally form dielectric contrast relative to the surrounding native in-place soil. The Radar method can detect these physical property contrasts.

2.1 Site Health and Safety

Prior to the start of work, a health and safety meeting with the Kleinfelder GCI personnel, and other site personnel were held to address any identified health and safety issues that could affect the Radar or GPS survey work. Appropriate personal protective equipment, including hard hats, safety vests, and work boots, was used by the personnel conducting the Radar and GPS surveys. The primary health and safety concern identified at this site was traffic flow throughout the Radar survey area along MC 85 from 107th Avenue to 75th Avenue. Another significant safety concern was vehicular traffic entering the work corridor between the major intersection. Where required to minimize the traffic conflicts, the Radar survey works utilized a traffic control plan provided by Kleinfelder that consisted of traffic lane restrictions, flood lights, message board with lighted direction signals, traffic cones, flag-men, and off-duty police officers. During the Radar surveys, the 'buddy system' including a flag man and off-duty police were used to provide an awareness to the public of the presence of the Radar survey and the GPS survey crew and for the protection to the Radar/GPS operator and the equipment. No health and safety incidents or 'near misses' occurred during the survey.

2.2 Ground Penetrating Radar (Radar)

2.2.1 Ground Penetrating Radar Methodology

Radar can detect objects composed of a variety of materials (metal, concrete, steel, and ceramics). Radar uses high frequency waves to locate three-dimensional changes in the subsurface dielectric properties. Waves transmitted into the ground are partially reflected back to the surface by dielectric contrasts between these objects and the surrounding soil. A steel or fiberglass underground storage tank, for example, should produce a significant cylindrical, high-amplitude, radar anomaly. A buried concrete slab or septic tank would

produce a flat-topped, high-amplitude radar anomaly. Small dimension metal objects and utilities produce small-sized, high-amplitude anomalies. Several of these anomalies closely spaced may represent a debris burial pit. A backfilled excavation where tanks may have been removed may cause a discrete change in the regular reflection patterns if the soil backfill has different electrical properties that the native soil.

2.2.2 Ground Penetrating Radar Procedures

Geophysical surveys conducted along MC 85 will conform to ASTM D6432, Standard Guide for Using Surface Ground Penetrating Radar Method for Subsurface Investigation. Radar data were measured with a digital Geophysical Survey Systems, Inc., model SIR-3000 ground penetrating radar unit with a 300-MHz and 400-MHz (1-million cycles/second) antennae. Estimated penetration at this site was to a depth of about five feet below the ground surface. The instrument has been maintained according to the manufactures specifications and it was calibrated at the site prior to the data collection. Almost continuous (about 1-inch intervals) radar data were recorded along the profile lines. Selected drill hole sites where logs reported "tagging" the buried concrete pavement section were used to calibrate the antennae used with the Radar system to determine which antenna was best suited to obtain representative concrete pavement GPR anomaly signatures. Additional Radar tests were also conducted at locations where no buried concrete pavement was tagged in drill hole logs.

Profile line start points were painted along the south side of MC 85 at the edge of the pavement at intervals of 300 feet or less beginning at 107th Avenue and eastward to 75th Avenue. Profile lines were approximately oriented perpendicular to roadway alignment. With the Radar survey profile line spacing and the one-inch radar recording interval, this geometry is adequate for detecting small-dimension pipes, cable, buried debris, backfilled excavations, buried concrete slabs.

Data anomaly locations interpreted as significant buried structures including the old, buried concrete pavement, were paint-marked on the ground as the survey progressed at the site.

2.3 Global Positioning System (GPS)

A Trimble model Ag-114 GPS antenna was connected to the radar antenna to provide accurate tracking of the radar data being recorded. This instrument records data at one-second intervals from as many as twelve available satellites and provides atmospheric corrections from the OMNISTAR satellite. The antenna calculated real-time differential

corrections, applied it to the data and then stored the results (North American Datum (NAD) 1983).

The GPS survey was tied to the National Geodetic Survey (NGS, 2006) monument designation 1BB1, PID #AJ3821 that is located approximately 0.6 miles south of the intersection of MC 85 (Buckeye Road) and 91st Avenue. The GPS location data has an estimated uncertainty of ±1-foot. The GPS geodetic coordinates were transformed into the Arizona State Plane-Central Zone for map production using the US Army Corps of Engineers CORPSCON conversion software.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The surface Radar survey along the MC 85 (Buckeye Road) alignment between 107th Avenue and 75th Avenue, (Figures 1) detected several anomalies interpreted to represent the buried Portland cement concrete pavement (Sheets A thru Sheet K). Radar data were recorded along all of the profile lines depicted on Sheet A thru Sheet K. The significant Radar anomalies are depicted in Figure 2.

Based on the results of the site reconnaissance, Radar survey, and data interpretations, the following conclusions are provided. These interpreted data anomalies may require excavation to directly determine the buried structure causing them and their actual depth below existing grades:

- A total of one hundred-twenty-four (124) Radar survey profiles were completed along MC 85 between 107th Avenue and 75th Avenue, including production, supplemental, and test/calibration profiles. The Radar profile survey lines were located on the average of about 185-feet, on-center. Each Radar profile line start point and the anomalies identified during the Radar survey were marked on the pavement and surveyed for future reference.

- Radar detected anomalies interpreted as the buried Portland cement concrete pavement (PCCP) at 104 north oriented profiles between station distances of 1147 feet and 1339+80 feet. Figure 2 upper graph shows a typical radar anomaly interpreted as the PCCP roadway and its burial depth below grade surface (bgs). No roadway anomaly was detected at two profiles (1172+50 feet and 1183 feet) possibly because the PCCP is missing or did not generate a recognizable dielectric contrast with the surrounding soils. Radar anomaly depths ranged between 12 and 29 inches bgs and agreed within ±±3 inches with PCCP encountered in eight borings. Anomalies were detected on 54 profiles east of 1247+42 where five borings did not encounter PCCP.

- The PCCP could either be unusually deep or missing between distances of 1131+66 feet and 1147 feet. MACTAC Boring B11 at 1134+84 feet encountered PCCP at 48 inches bgs. DMJM Boring C3 at 1149+93 feet (1509 feet east of Boring B11) encountered PCCP at 13 inches bgs. Radar detected the PCCP at 1147, 1148+50, and 1149+93 feet in agreement with Boring C3 and also for another 8407 feet eastward to DMJM Boring B16. Radar did not detect roadway anomalies west of Boring B11. Even the lower frequency radar antenna with

slightly deeper penetration (about 5 feet) did not detect the PCCP west of 1147 feet. The PCCP may have been removed during previous construction activities west of 1147 feet.

- The interpreted PCCP radar anomalies are generally centered within about 8 feet of the current MC85 center line, except between 1181+50 feet and 1185 feet (350 feet interval) where it deviates about 12 feet southward.

- Two other anomalies (C and D) were detected on many radar profiles as shown in the lower graph (Figure 2). They may represent buried structures or utility lines adjacent to the shoulders of the PCCP roadway.

- Radar survey results, including the profile lines and the geophysical anomaly location information are compiled and plotted on plan sheets prepared in AutoCAD format. These maps uses a geo-referenced calibration point with established X-Y coordinates from an existing NGS benchmark located approximately 0.6 miles south of the MC 85-91st Avenue intersection.

4.0 REFERENCES

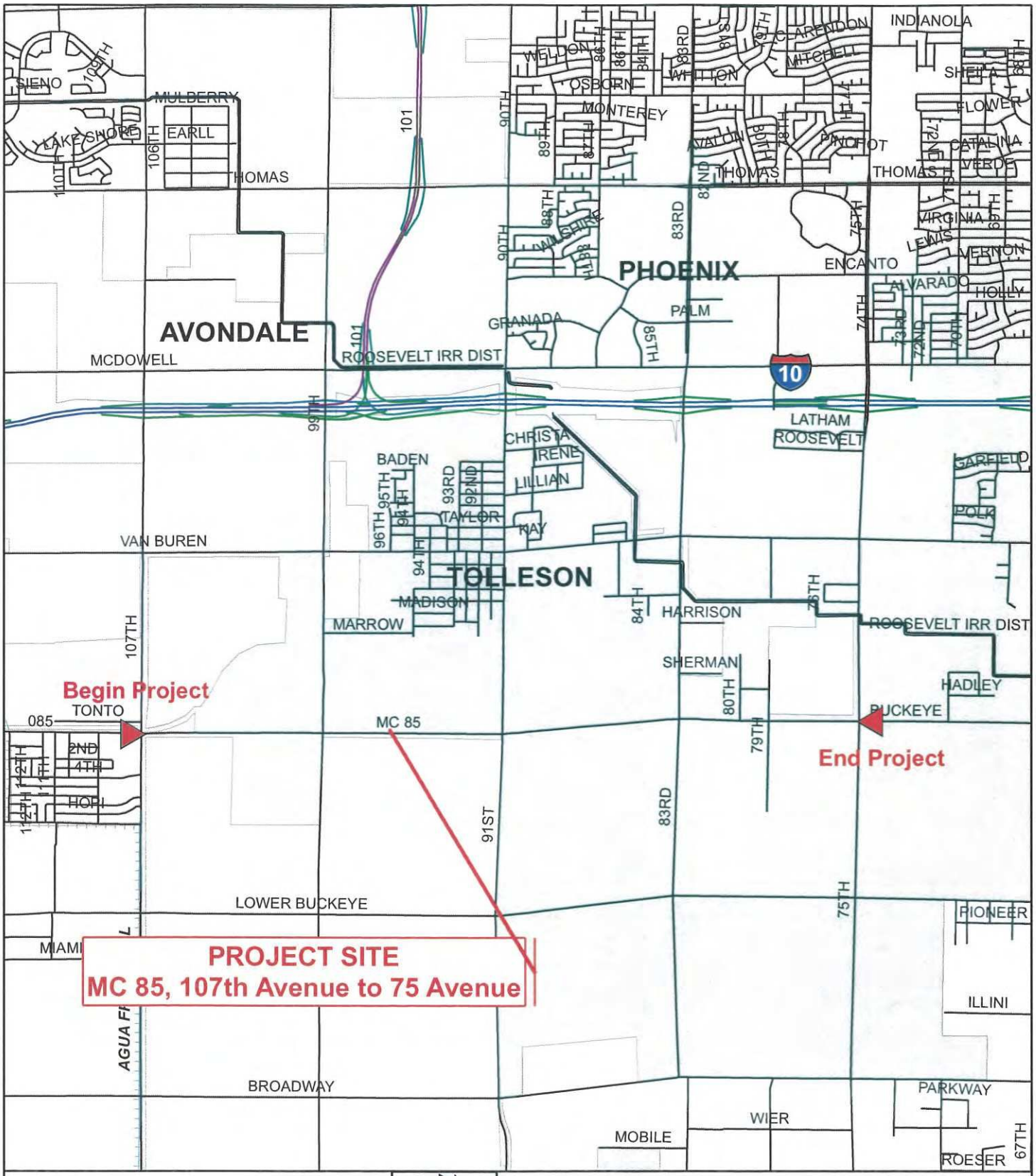
DMJM Harris; 2007; Geotechnical Investigation Report, MC 85 from 107th Avenue to 91st Avenue, Phoenix, AZ.

MACTEC; 2003; Preliminary Geotechnical Investigation, MC 85 - 107th Avenue to 91st Avenue, MACTEC Project 4975-03-1401, June17, 2003, revised October 23, 2003

National Geodetic Survey, 2006; Survey Control Monument Data Sheet, Designation 1BB1, PID AJ3821, USGS Tolleson Quadrangle, Maricopa County, AZ

Ninyo & Moore; 2010; Geotechnical Evaluation, MC 85 Roadway Improvements 75th Avenue to 91st Avenue, Maricopa County, AZ; Ninyo & Moore Project No. 601301002, September 28, 2010.

FIGURES



Ground Penetrating Radar Survey
Locate Buried Concrete Pavement Section
MC 85, 75th Avenue to 107th Avenue, Phoenix, AZ.
Figure 1: Location Map

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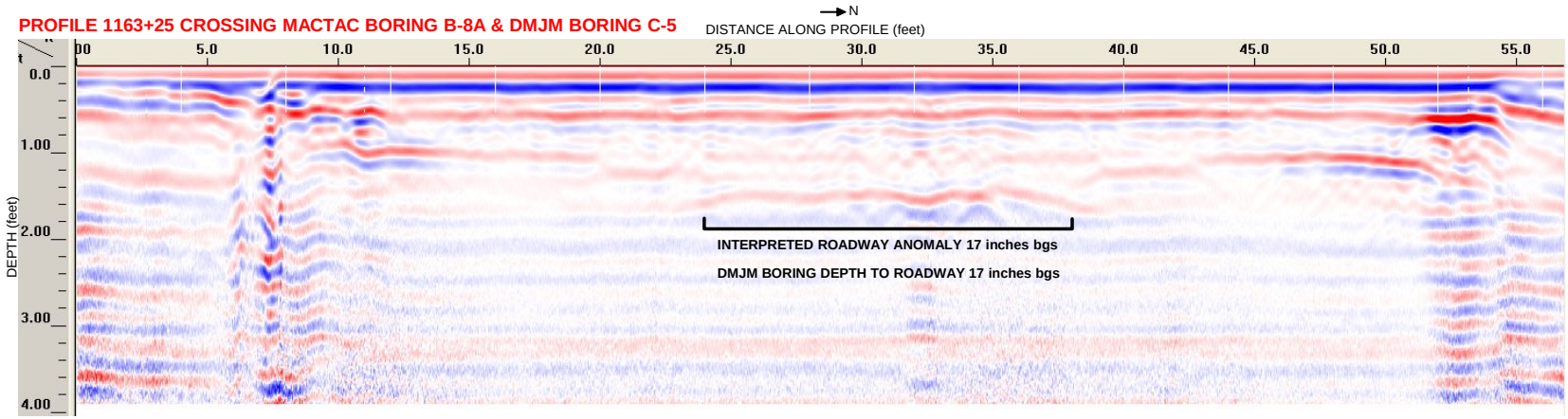
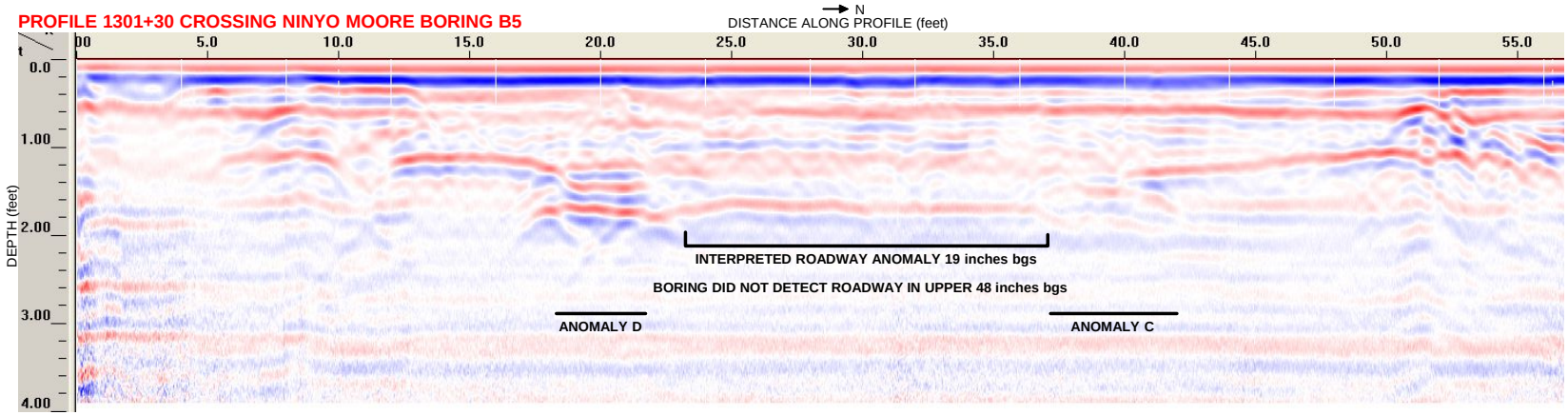
fax 602-864-1899





Refer to Sheets A thru K, GPR Results Map for the location of this example radar data record. Records obtained September 3, 2012.

Ground Penetrating Radar Survey
Locate Buried Concrete Pavement Section
MC 85, 75th Avenue to 107th Avenue, Phoenix, AZ
Example Radar Data Record - Buried Pavement
Figure 2

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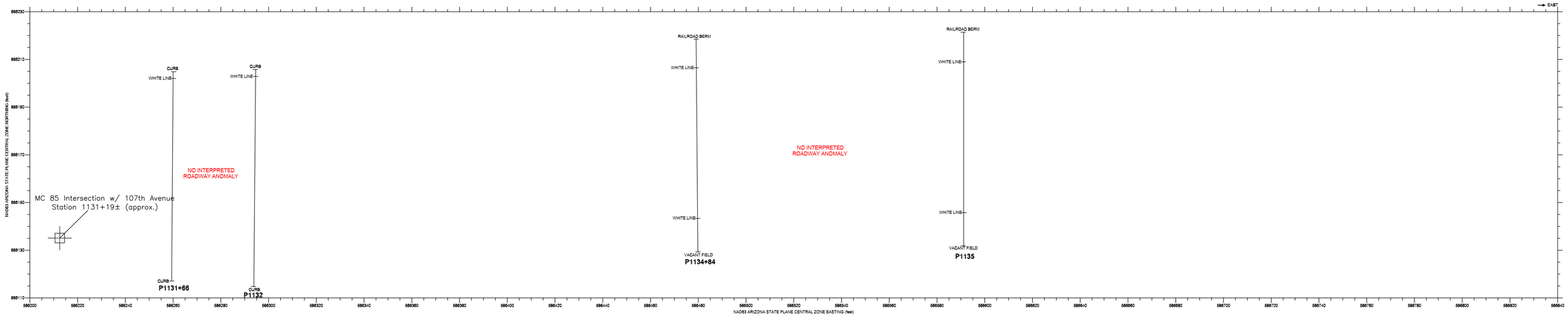
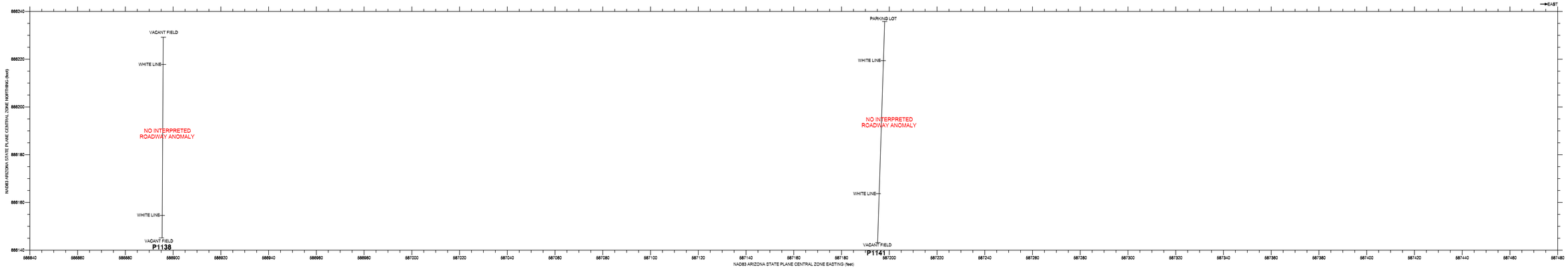
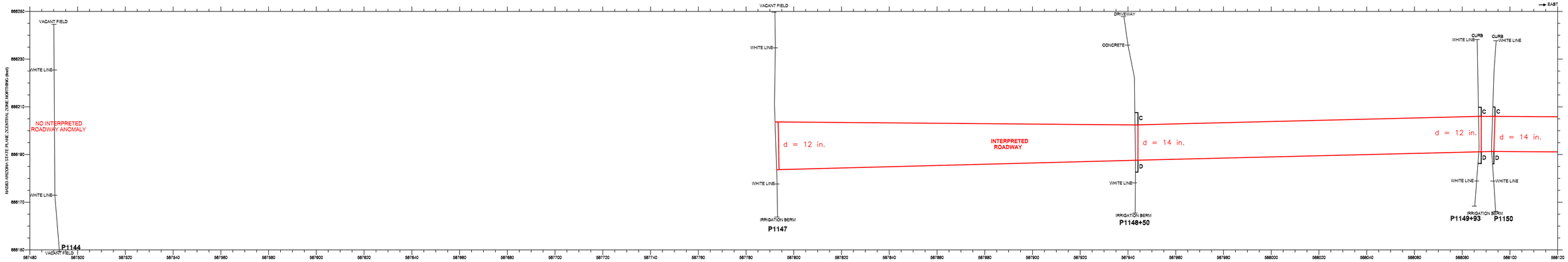
RADAR SURVEY RESULTS

SHEETS A-1 thru K-1







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EXP. 09-30-2014

REGISTERED GEOPHYSICIST
GP-888
Kerry Hanson
Date 10/5/12
State of California
EXPIRES 07/31/13

REVISIONS				
NO.	BY	DATE	CKD	REMARKS

DES KH
DWN KE
CKD

EXPLANATION:

GPR ANOMALY A:
Interpreted Buried Roadway Pavement
d = Depth to PCCP (inches)

]c GPR Secondary Anomalies C, or D

P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search MC 85 (Buckeye Road), Phoenix, AZ

107th Avenue to 99st Avenue
Stations 1131+19± to 1150+00

GCI PROJECT NO 2010-126

DATE: October 15, 2012

SHEET A-1

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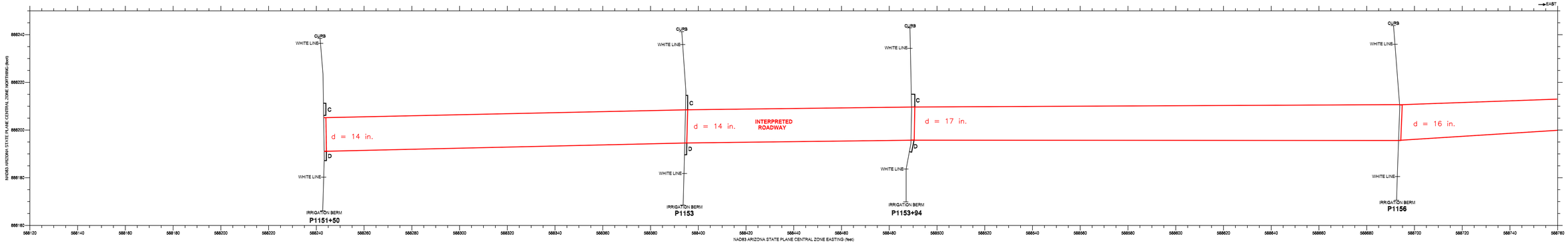

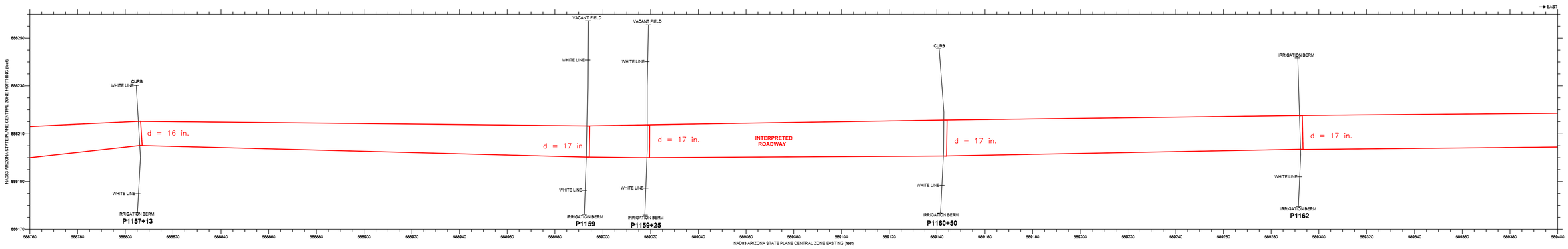

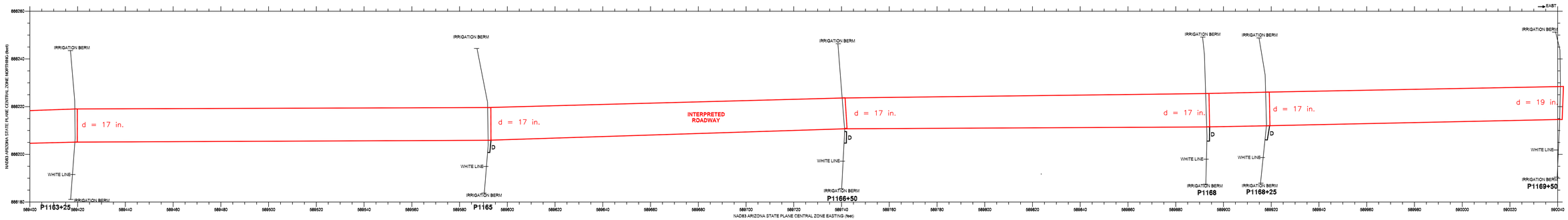

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WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ

107th Avenue to 99st Avenue
Stations 1150+00 to 1169+50±

GCI PROJECT NO 2010-126

DATE: October 15, 2012

SHEET B-1

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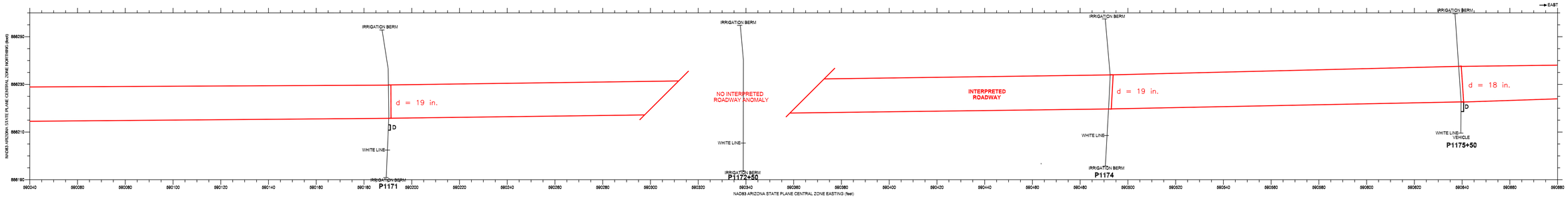

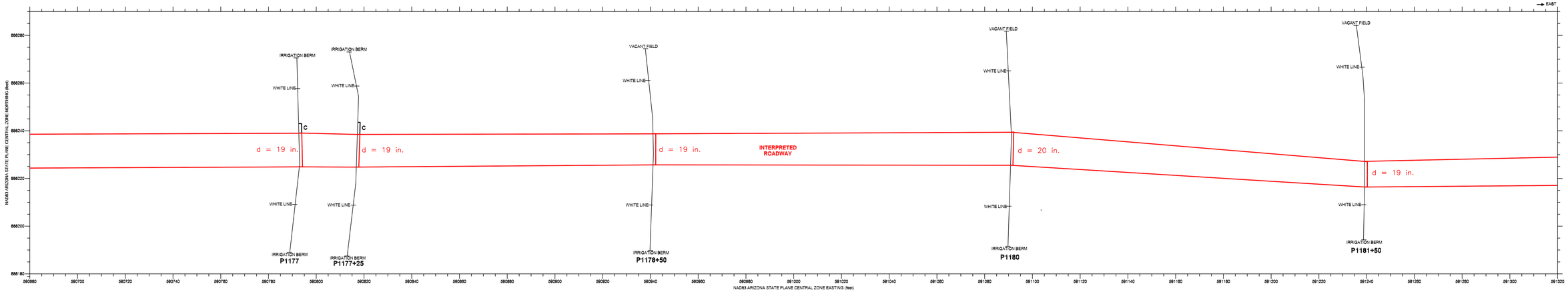

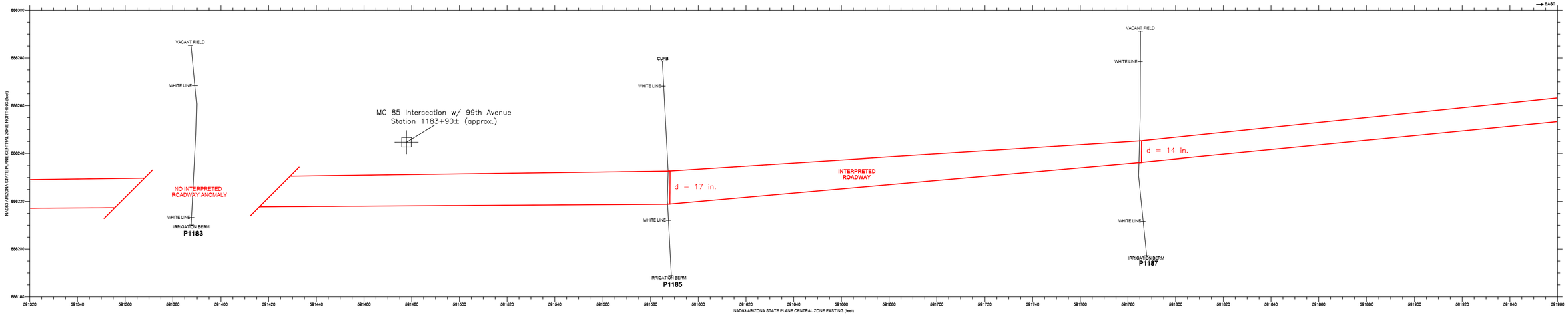

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P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
107th Avenue to 99th Avenue
Stations 1169+50 to 1183+90±
99th Avenue to 91st Avenue
1183+90 to 1188+74±

GCI PROJECT NO 2010-126

DATE: October 15, 2012

SHEET C-1

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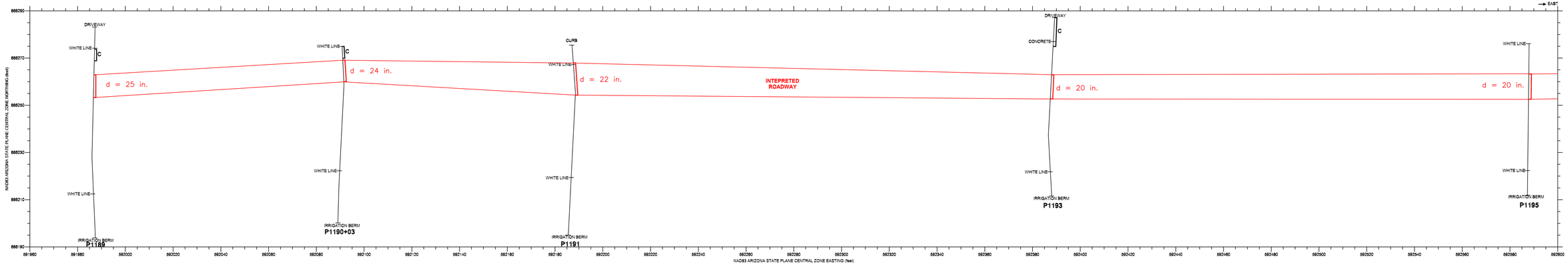

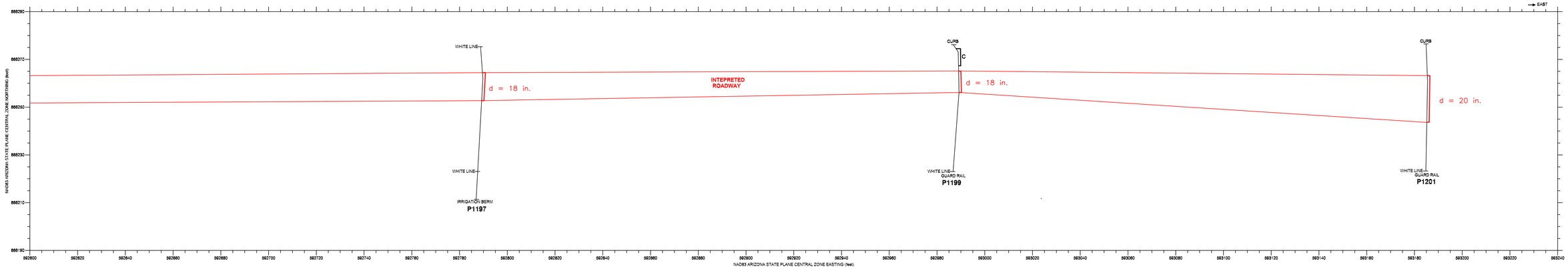

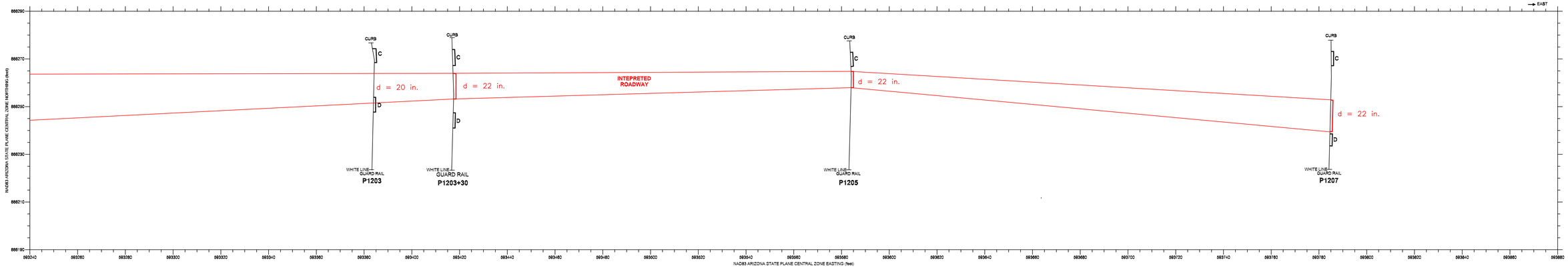

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Registered Geophysicist GP-888 Kerry Hannon Date 10/5/12 State of California EXPIRES 07/31/13

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GPR ANOMALY A: Interpreted Buried Roadway Pavement
d = Depth to PCCP (inches)

C GPR Secondary Anomalies C, or D

P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search MC 85 (Buckeye Road), Phoenix, AZ

99th Avenue to 91st Avenue
Stations 1183+90 to 1207+00

GCI PROJECT NO 2010-126

DATE: October 3, 2012

SHEET D-1

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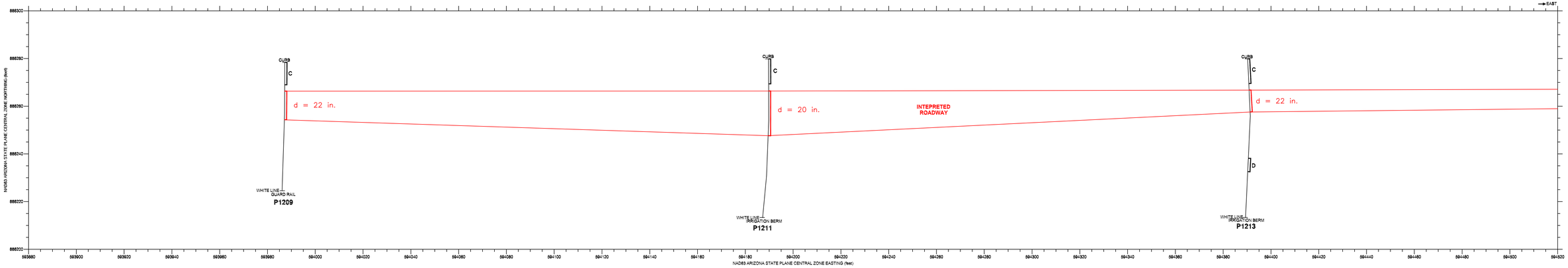

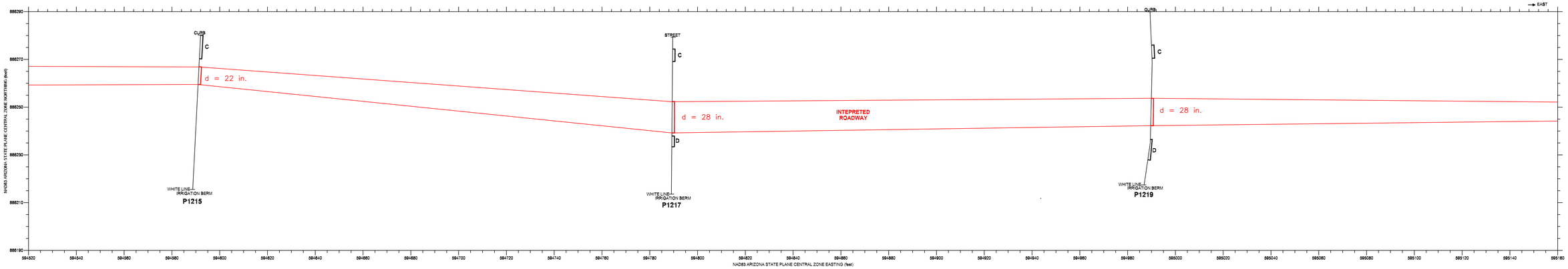

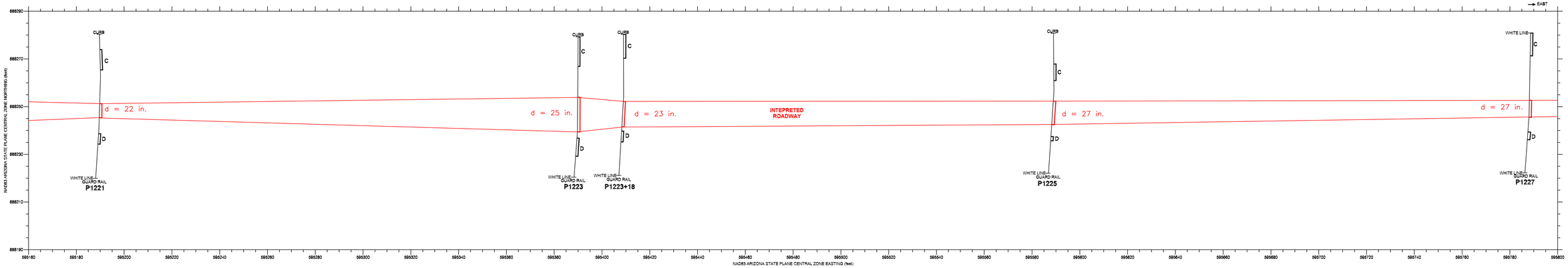

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REGISTERED GEOPHYSICIST GP-888 Kerry Hanson Date 10/9/12 STATE OF ARIZONA EXPIRES 07/31/13

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EXPLANATION:

GPR ANOMALY A:
Interpreted Buried Roadway Pavement
d = Depth to PCCP (inches)

C GPR Secondary Anomalies C, or D

P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search MC 85 (Buckeye Road), Phoenix, AZ

99th Avenue to 91st Avenue
Stations 1207+00 to 1227+00

GCI PROJECT NO 2010-126

DATE: October 2, 2012

SHEET E-1

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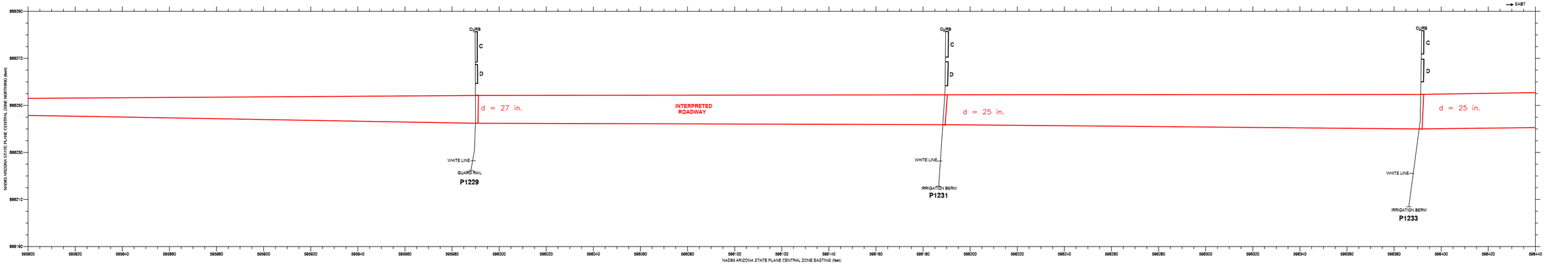

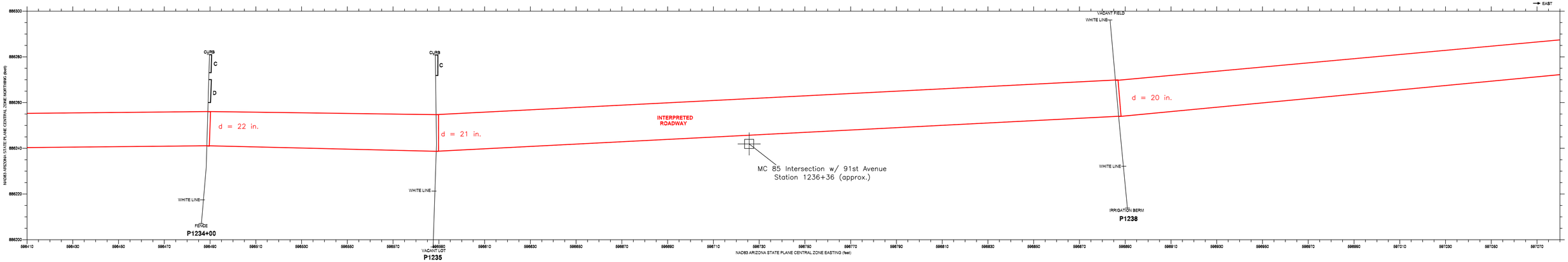

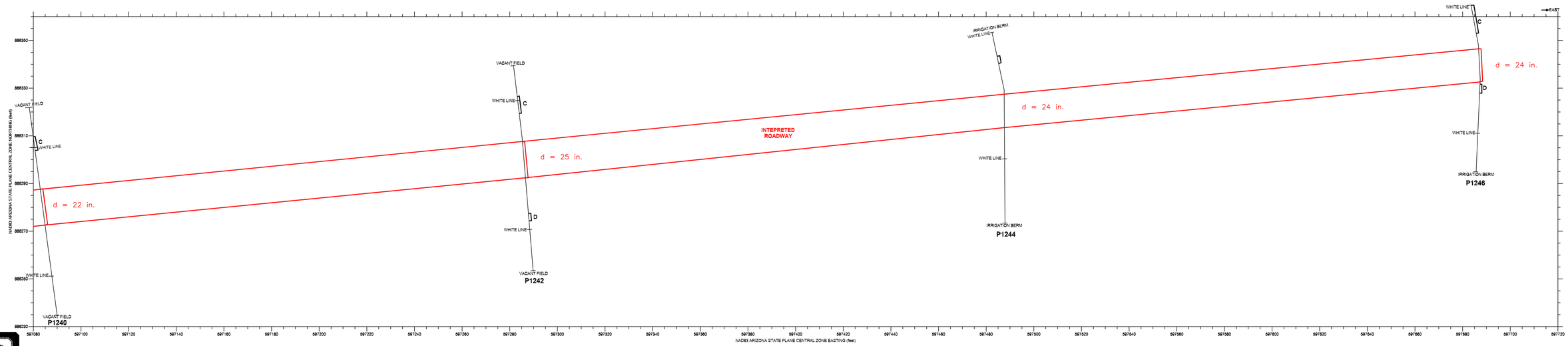

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P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
99th Avenue to 91st Avenue
Stations 1207+00 to 1236+36±
91st Avenue to 83rd Avenue
1236+36± to 1246+00

GCI PROJECT NO 2010-126

DATE: October 8, 2012

SHEET F-1

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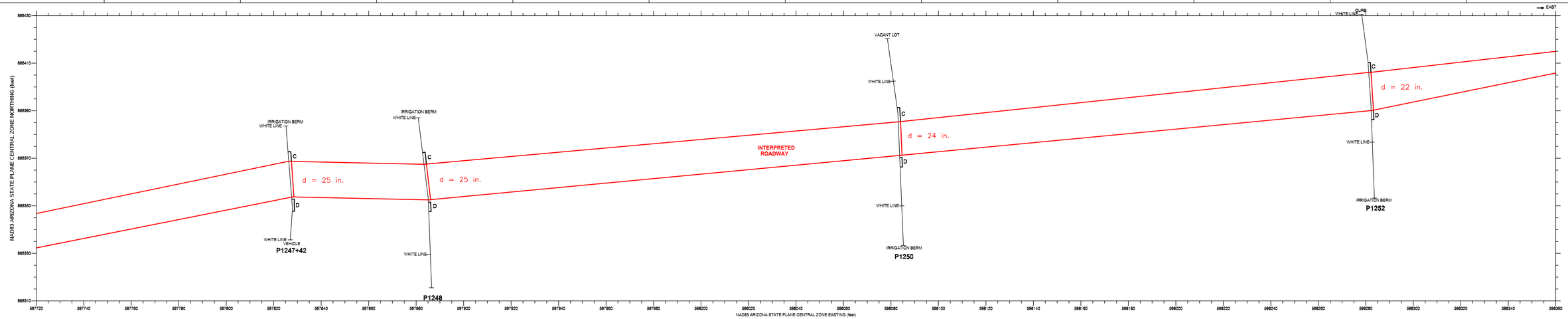

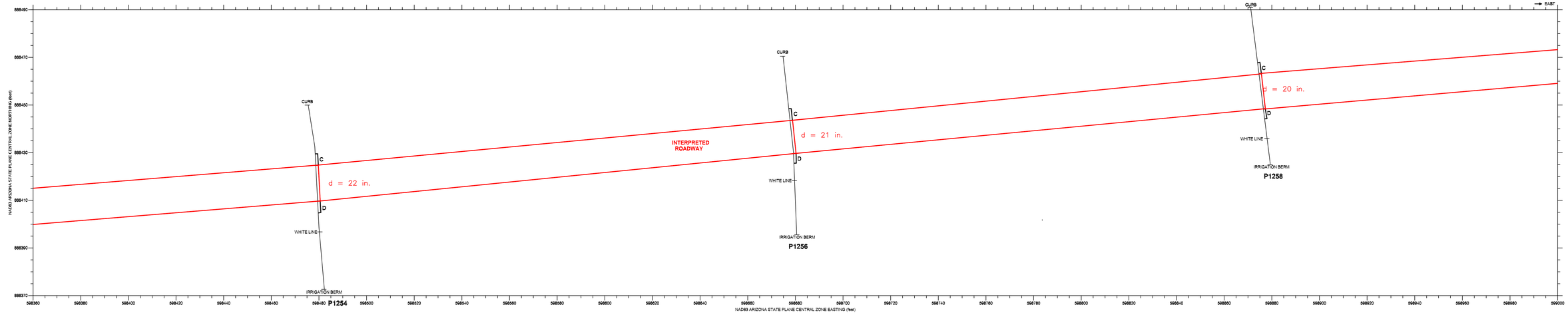

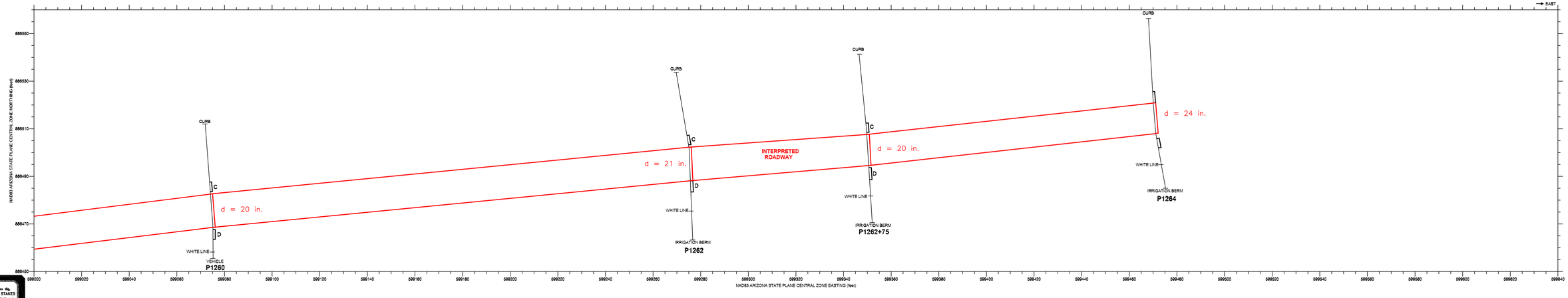

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[c GPR Secondary Anomalies C, or D

P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
91st Avenue to 83rd Avenue
Stations 1246+00 to 1264+00±

GCI PROJECT NO 2010-126

DATE: October 12, 2012

SHEET G-1

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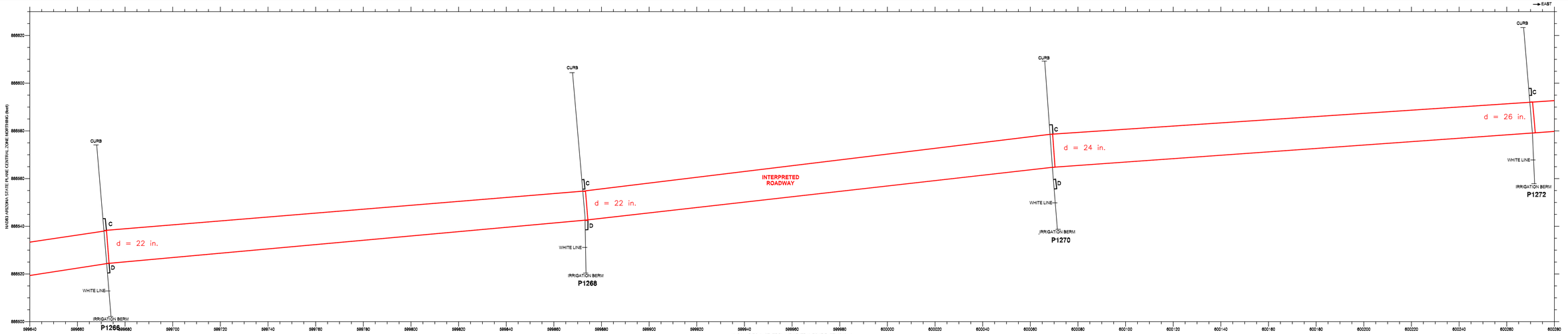

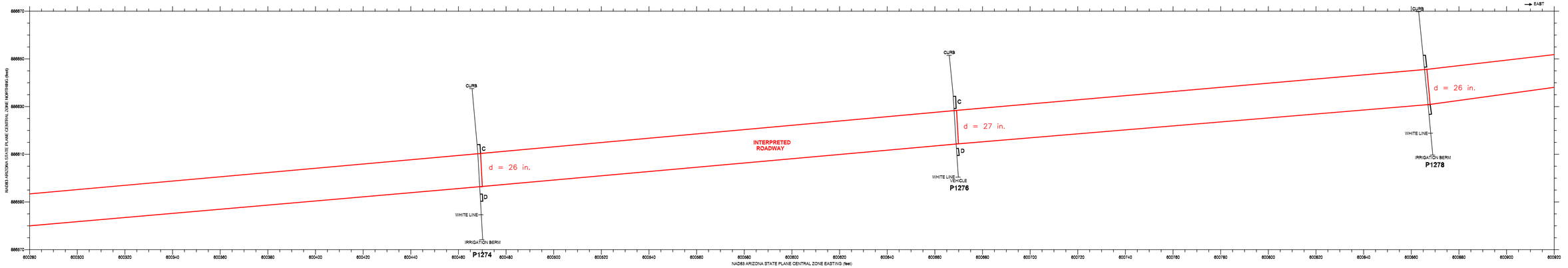

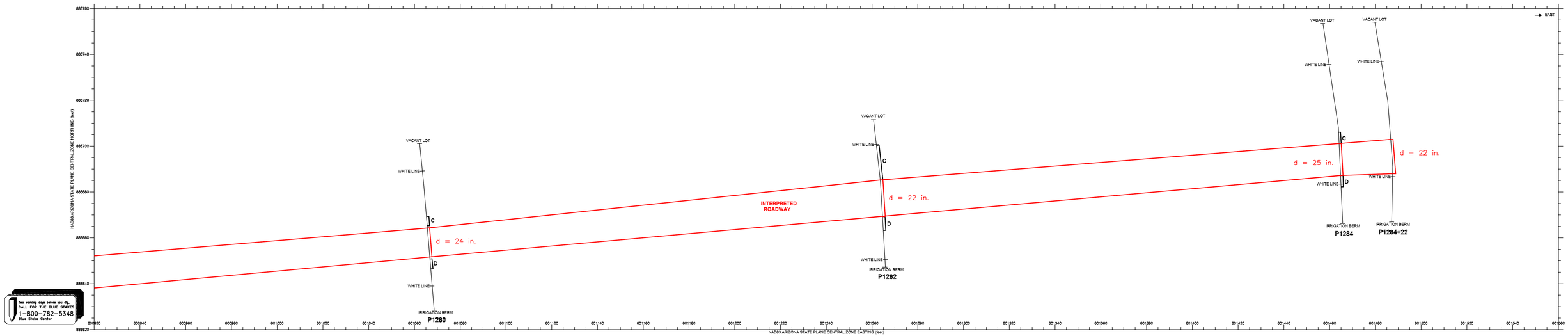

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d = Depth to PCCP (inches)

]c GPR Secondary Anomalies C, or D

P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
91st Avenue to 83rd Avenue
Stations 1264+00 to 1284+22±

GCI PROJECT NO 2010-126

DATE: October 12, 2012

SHEET H-1

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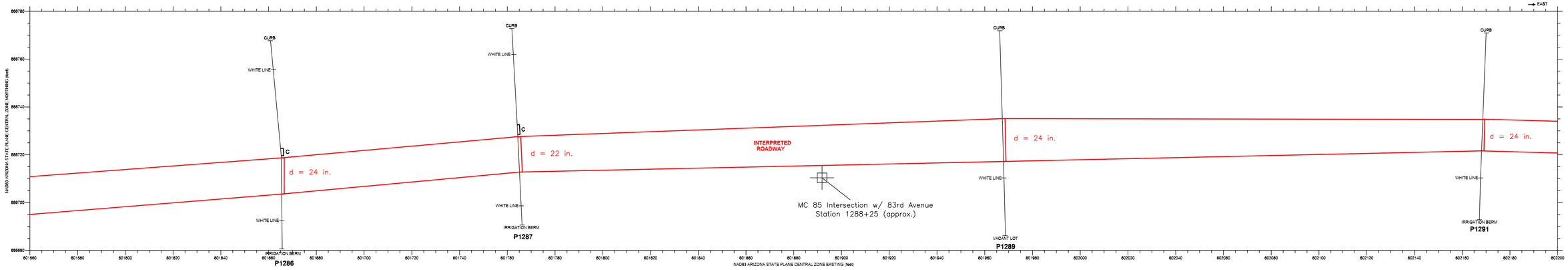

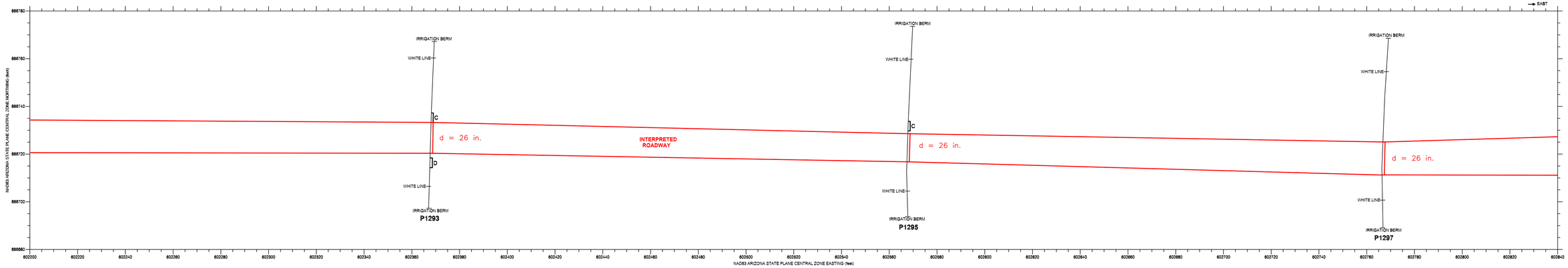

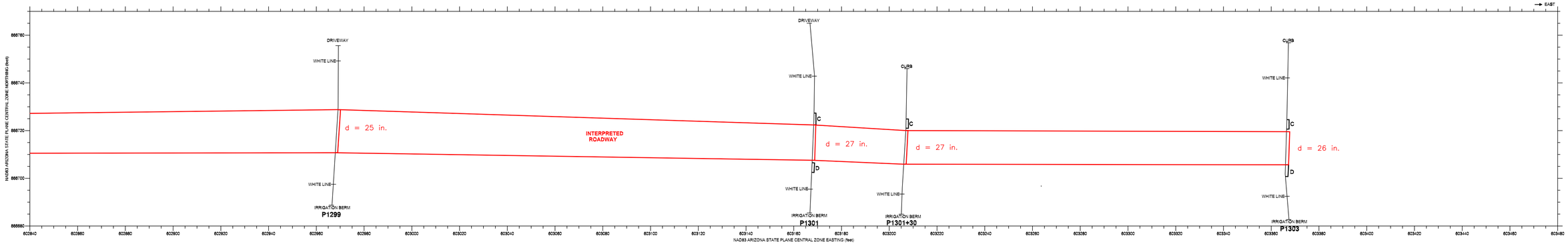

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Registration No.
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Date 10/5/12
State of California
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P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search

MC 85 (Buckeye Road), Phoenix, AZ
91st Avenue to 83rd Avenue
Stations 1284+22 to 1288+25±
83rd Avenue to 75th Avenue
1288+25± to 1303+00±

GCI PROJECT NO 2010-126

DATE: October 13, 2012

SHEET 1-1

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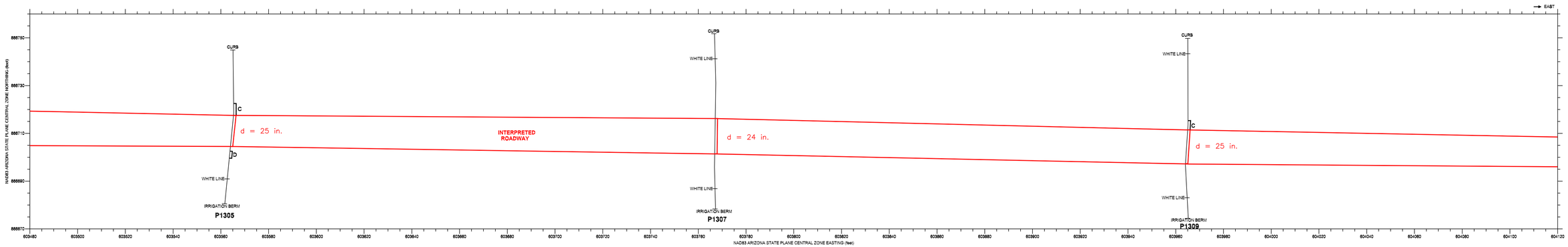

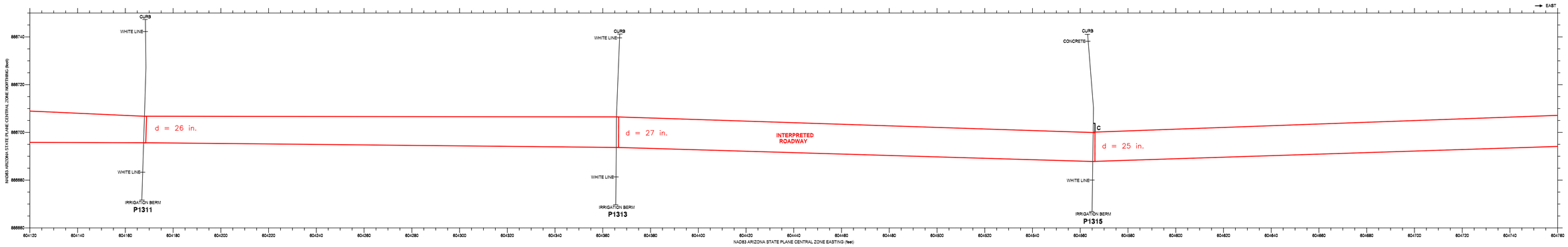

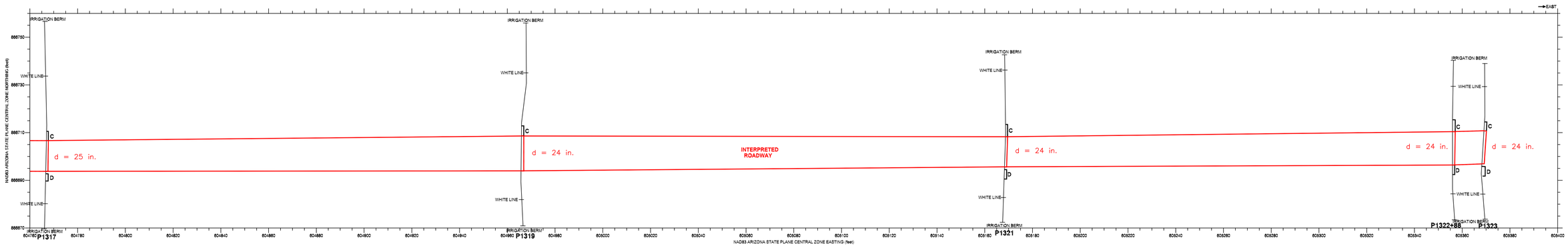

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P1203+30 GPR Profile w/ Centerline Station (approximate)

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Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
83rd Avenue to 75th Avenue
Stations 1303+00 to 1323+00

GCI PROJECT NO 2010-126

DATE: October 13, 2012

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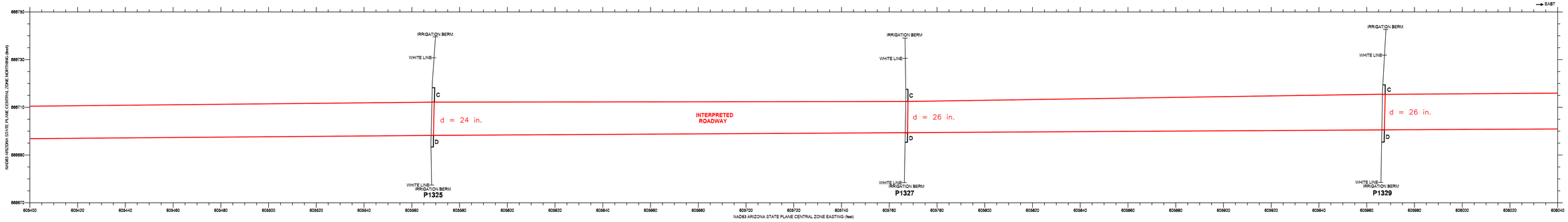

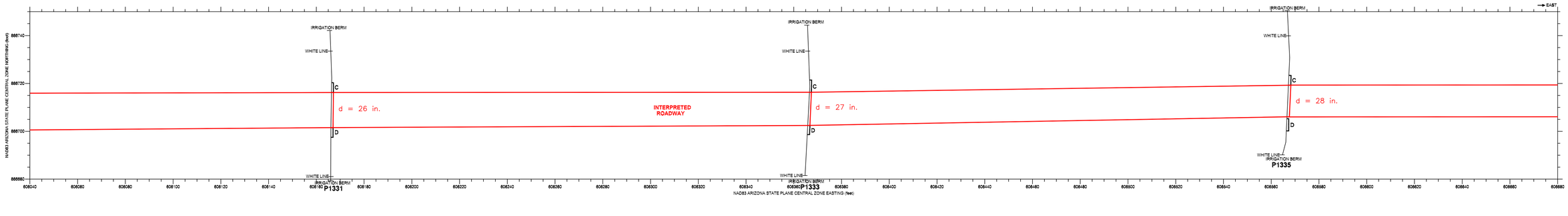

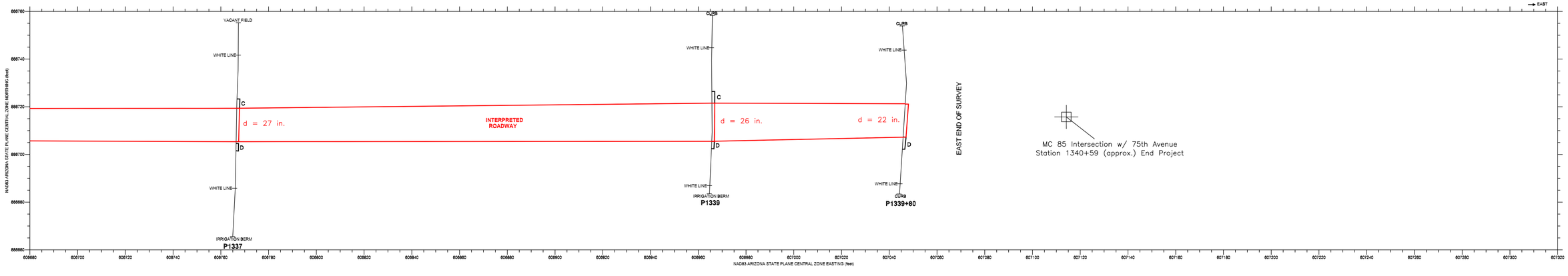

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(Kerry Hanson)
Date 10/5/12
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EXPIRES 07/31/13

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d = Depth to PCCP (inches)

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P1203+30 GPR Profile w/ Centerline Station (approximate)

WHITE LINE— Travel Lane Outside Stripe/Edge of Pavement

Ground Penetrating Radar (GPR) Survey: Buried Concrete Pavement Search
MC 85 (Buckeye Road), Phoenix, AZ
83rd Avenue to 75th Avenue
Stations 1323+00 to 1340+59 End Project

GCI PROJECT NO 2010-126
DATE: October 14, 2012
SHEET K-1
CAD FILE:

SECTION 4

PAVEMENT CORING EXPLORATION

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FIGURES

APPENDIX C-A

APPENDIX C-B

Excerpts from MACTEC Report
(Mactec Project No. 4975-03-1401, dated June 17, 2003 and revised on October 23, 2003)

APPENDIX C-C

Excerpts from the DMJM Harris/AECOM Report
(DMJM Harris/AECOM Project No. 6490.0000, dated April 25, 2006)

4 PAVEMENT CORING EXPLORATION

4.1 GENERAL

Kleinfelder performed coring through the asphalt concrete (AC) pavement at selected ground penetrating radar (GPR) survey areas across the MC-85 roadway in select areas of the project. The coring explorations across the site were performed in an effort to confirm GPR interpreted anomalies of the buried Portland cement concrete pavement (PCCP, "A" anomaly). Kleinfelder also performed coring on the roadway at selected secondary anomaly ("B and C") areas.

In addition, DMJM Harris/AECOM and MACTEC previously performed field explorations across portions of the site and prepared reports summarizing their services. The reports reviewed by Kleinfelder for this portion of the project included:

- *MACTEC Report of (Preliminary) Geotechnical Evaluation, MC85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona* (MACTEC Project No. 4975-03-1401, dated June 17, 2003 and revised October 23, 2003).
- *DMJM Harris/AECOM Pavement Design Report, MC 85, 107th Avenue to 91st Avenue, Maricopa County, Arizona* (DMJM Harris Project No. 6490.0000, dated April 25, 2006).

Excerpts of these previous reports regarding the buried Portland cement concrete pavement (PCCP) are included as an appendix to this section. These two previous reports in their entirety are included as an appendix in the subsequent Pavement Structure Design Section of this report.

4.2 SUMMARY OF PREVIOUS PAVEMENT EXPLORATIONS

In 2003, MACTEC performed a preliminary geotechnical exploration on MC-85 (Buckeye Road) from 107th Avenue to 91st Avenue (western 2 miles of the site). MACTEC's exploration included 12 borings drilled using hollow-stem auger (HSA) with a truck-mounted drill rig and 4 borings drilled with a hand auger. MACTEC's HSA borings were designated B-1 through B-11 with the exception that B-8 was drilled twice due to auger refusal and the borings were designated B-8A and B-8B. MACTEC's hand auger borings were designated HA-1 through HA-4. The buried PCCP was noted to have been encountered at the location of MACTEC Boring Nos. B-5, B-8A, B-8B and B-9. The MACTEC Boring Log No. B-11 indicates an approximate

18-inch thick layer of cemented material from approximately 4 to 5.5 feet below the top of pavement, but the notes indicate it was not conclusive to determine if the material was the PCCP.

In 2006, DMJM Harris/AECOM (AECOM) performed a geotechnical exploration also on the western 2 miles of the site, on MC-85 (Buckeye Road) extending from 107th Avenue to 91st Avenue. AECOM's field work included 16 explorations (designated as C1 through C16) using a portable core drill with 6-inch and 3-inch core barrels. The buried PCCP was noted to have been encountered at the location of AECOM Core Nos. C3 through C7, C9, C11, and C13 through C16.

The approximate location of the previous core explorations and borings that encountered the PCCP are shown on Figures C-1 and C-2 included in this section. AECOM prepared a table summarizing their core information and also including MACTEC's boring information (which is presented on Page 8 of the AECOM report). The following is the AECOM summary table:

Table 4.2-1 AECOM Summary Table

MC 85, 107th Avenue to 91st Avenue
Maricopa County, AZ — Pavement Design Report

Table 1 – Summary of Existing MC 85 Pavement Conditions Based on Preliminary Test Drilling and Final Investigation Pavement Cores

Final Investigation (DMJM Harris, 2005)						Preliminary Investigation (Mactec, 2003)					
Core ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)	Bore ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)
C1	1136+00	7' Lt	12.1	12.0	-	B-11	1133+80	20' Lt	5.0	19.0	-
C2	1144+00	2.5' Lt	5.0	7.0[2]	-	B-10	1143+70	10' Lt	6.0	12.0	-
C3	1150+00	2.5' Rt	4.0	5.0[2]	7.0	HA-4	1143+65	35' Rt	-	-	-
C4	1156+00	3' Lt	9.0	7.0	6.0	B-9	1152+75	10' Rt	4.0	6.0	12.0
C5	1163+00	2.5'Rt	8.0	9.0	7.0	B-8B	1163+45	5' Lt	5.0	5.0	12.0
C6	1170+00	3' Lt	10.0	9.0	6.0	B-8A	1163+45	5' Lt	5.0	5.0	12.0
C7	1177+00	3' Rt	11.0	11.0	6.0	HA-3	1173+25	25' Rt	-	-	-
C8	1183+00	8' Lt	13.0	13.0	-	B-7	1173+50	20' Rt	5.0	12.0	-
C9	1190+00	2.5' Lt	12.0	12.0	7.0	HA-2	1185+90	45' Lt	-	-	-
C10	1197+00	14' Lt	9.5	26.5	-	B-6	1185+75	30' Lt	3.0	12.0	-
C11	1203+00	6.5' Rt	10.0	14.0	7.0	B-5	1196+00	5' Rt	5.0	25.0	6.0
C12	1209+00	3' Lt	12.0	5.0	-[3]	B-4	1206+30	15' Lt	7.0	11.0	-
C13	1217+00	2.5' Rt	9.0	11.0	7.0	B-3	1216+40	15' Rt	5.0	25.0	-
C14	1220+00	3' Rt	9.0	12.0	6.0	B-2	1225+20	30' Lt	5.0	25.0	-
C15	1227+00	6.5' Rt	8.0	13.0	6.0	HA-1	1233+60	30' Rt	-	-	-
C16	1234+00	3' Rt	12.0	6.0	6.0	B-1	1233+40	15' Rt	3.0	21.0	-

[1]: MC 85 Existing Centerline (Section Line)
[2]: 4-inch AC encountered underlying AB
[3]: Clay soil encountered underlying AB to a depth of 3.2' (38")

4.3 PAVEMENT CORING FIELD EXPLORATION

Prior to the coring field exploration, Kleinfelder marked the core locations, cleared the work areas with the Arizona Blue Stake Center, obtained a MCDOT right-of-way permit (Tracking No. TC20120646), and subcontracted Highway Technologies, Inc. (HT) to submit a traffic control plan to MCDOT. The traffic control plan for the GPR survey work was approved by MCDOT on October 9, 2012 (and re-approved for additional coring on November 29, 2012). We notified a MCDOT inspector 24 hours prior to our field work. Traffic control for the project was provided by HT in general accordance with the approved traffic control plan.

The exploratory cores were performed by Kleinfelder on October 15th through the 20th and on December 3rd through the 6th, 2012. The coring work was performed at night between the hours of 8:00 P.M. to 5:00 A.M. Anomaly areas previously identified by the GPR survey at 17 selected locations were explored by coring through the AC, manually removing the aggregate base course (ABC), coring the underlying PCCP (if present), and hand-augering the underlying subgrade materials. The 17 core explorations performed across the site were designated C1 through C17. The approximate core exploration locations are shown on Figures C-1 through C-4 (Coring Exploration Site Plans).

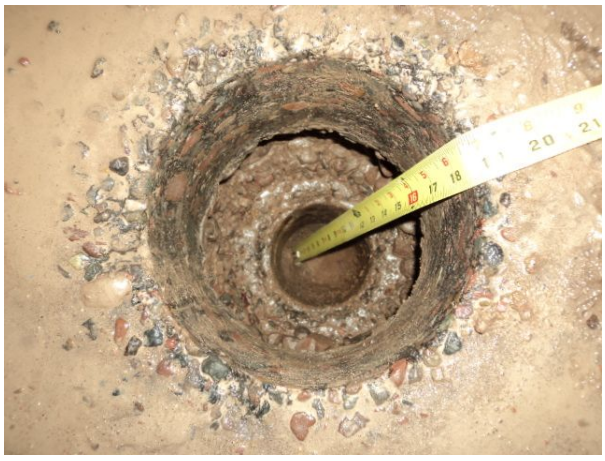
The coring was performed using a Milwaukee (Cat. No. 4094) drill on an MK-Manta III Stand (Model No. 158644). The AC was cored using a 6-inch diameter core barrel, the ABC was manually removed, and where encountered the PCCP was cored using a 4-inch diameter core barrel. A subgrade sample was generally obtained from the core locations using a 3-inch diameter hand auger. The core holes were backfilled to approximately the bottom elevation of the AC with quick-setting concrete mixed with the previously removed ABC. After sufficient setting of the concrete and ABC, the core hole was backfilled to the surface with (Quality Pavement Repair, QPR) asphalt cold patch. The cold patch materials were placed in approximately 2 inch loose lifts and compacted with a Marshall hammer, and the pavement surface lift was also compacted with an 8-inch square manual tamper.

Picture 1 – Core Exploration at C2

Picture 2 – AC and PCCP Cores Obtained at C4

At the core locations, the AC thicknesses encountered ranged between 5.5 and 14 inches; the ABC thicknesses ranged between 4 and 19 inches, and the lower portion of the ABC generally included oversized rock (cobbles); and where encountered, the PCCP thicknesses ranged between 6 and 7 inches. The following section includes a table providing detailed information on our observations at each core location.

Picture 3 – Core Exploration at C8



Picture 4 – Close-up of Picture 3

Picture 5 – AC and PCCP Cores Obtained at C9. Oversized rock (cobbles) were encountered in the lower portion of the ABC. The top of the PCCP included a roughly ¼-inch thick layer of AC.

4.4 PAVEMENT CORING FIELD EXPLORATION RESULTS

Seventeen pavement core explorations designated C1 through C17 were performed by Kleinfelder across the site. The pavement explorations were cored and hand excavated to depths ranging between 16 and 48 inches below the AC pavement surface. The following table provides a summary of our observations at the core exploration locations.

Table 4.4-1 Kleinfelder Core Results

Core ID	GPR Anomaly and Line	AC Thickness (inches)	ABC Thickness (inches)	PCCP Thickness (inches)	Subgrade Soils (USCS)
C1	"A" / P1150	9.5	4.5	6	Not Sampled
C2	"B" / P1168	9	8	N/E Note 1	Sampled, but not tested
C3	"C" / P1168	9	9	N/E Note 1	Lean Clay with Sand (CL)
C4	"A" / P1207	10	6	6.5	Lean Clay with Sand (CL)
C5	"B" / P1207	10	10	N/E Note 1	Sandy Clay (CL)
C6	"A" / P1242	14	5	7 Note 2, 3	Sampled, but not tested
C7	"A" / P1256	5.5	6	6	Sampled, but not tested
C8	"A" / P1260	6	4	6 Note 2, 3	Sandy Clay (CL)
C9	"A" / P1270	5.5	11	6 Note 2	Lean Clay with Sand (CL)
C10	"A" / P1282	7.5	6	6.5 Note 2	Sampled, but not tested
C11	"C" / P1293	7.5	19	N/E Note 1	Sampled, but not tested
C12	"A" / P1293	11.5	13	N/E Note 1	Sampled, but not tested
C13	"D" / P1293	12	11	N/E Note 1	Sampled, but not tested
C14	"A" / P1297	9	15	N/E Note 1	Sampled, but not tested
C15	"A" / P1307	6	10	6 Note 2, 4	Not Sampled
C16	"A" / P1319	6	11	7	Sampled, but not tested
C17	"A" / P1331	6	17	6	Sampled, but not tested

Note 1 - PCCP not encountered in core exploration.
Note 2 - Top of PCCP core included roughly ¼- to ½-inch thick AC layer.
Note 3 - The PCCP was underlain by approximately 4 inches of ABC.
Note 4 - PCCP encountered, but unable to obtain core - PCCP thickness estimated at 6 inches.

Table 4.4-2 Kleinfelder Core Location Information

Core ID	Approximate Station	Core Location Traffic Lane	Approximate GPS Coordinates (degrees)	
			Latitude	Longitude
C1	1150+00	East-Bound; High-Speed	33.43555	-112.28350
C2	1168+00	East-Bound; Slow-Speed	33.43560	-112.27763
C3	1168+00	West-Bound; Slow-Speed	33.43568	-112.27762
C4	1207+00	Center Turn Lane	33.43573	-112.26484
C5	1207+00	East-Bound; Slow-Speed	33.43570	-112.26484
C6	1242+00	East-Bound; High-Speed	33.43592	-112.25339
C7	1256+00	East-Bound; High-Speed	33.43629	-112.24883
C8	1260+00	East-Bound; High-Speed	33.43639	-112.24751
C9	1270+00	East-Bound; High-Speed	33.43669	-112.24424
C10	1282+00	East-Bound; High-Speed	33.43699	-112.24034
C11	1293+00	West-Bound; Slow-Speed	33.43722	-112.23672
C12	1293+00	West-Bound; High-Speed	33.43717	-112.23672
C13	1293+00	Center Turn Lane	33.43718	-112.23671
C14	1297+00	West-Bound; High-Speed	33.43716	-112.23543
C15	1307+00	East-Bound; High-Speed	33.43710	-112.23212
C16	1319+00	East-Bound; High Speed	33.43707	-112.22820
C17	1331+00	East-Bound; High-Speed	33.43713	-112.22427

4.4.1 SUBGRADE CONDITIONS

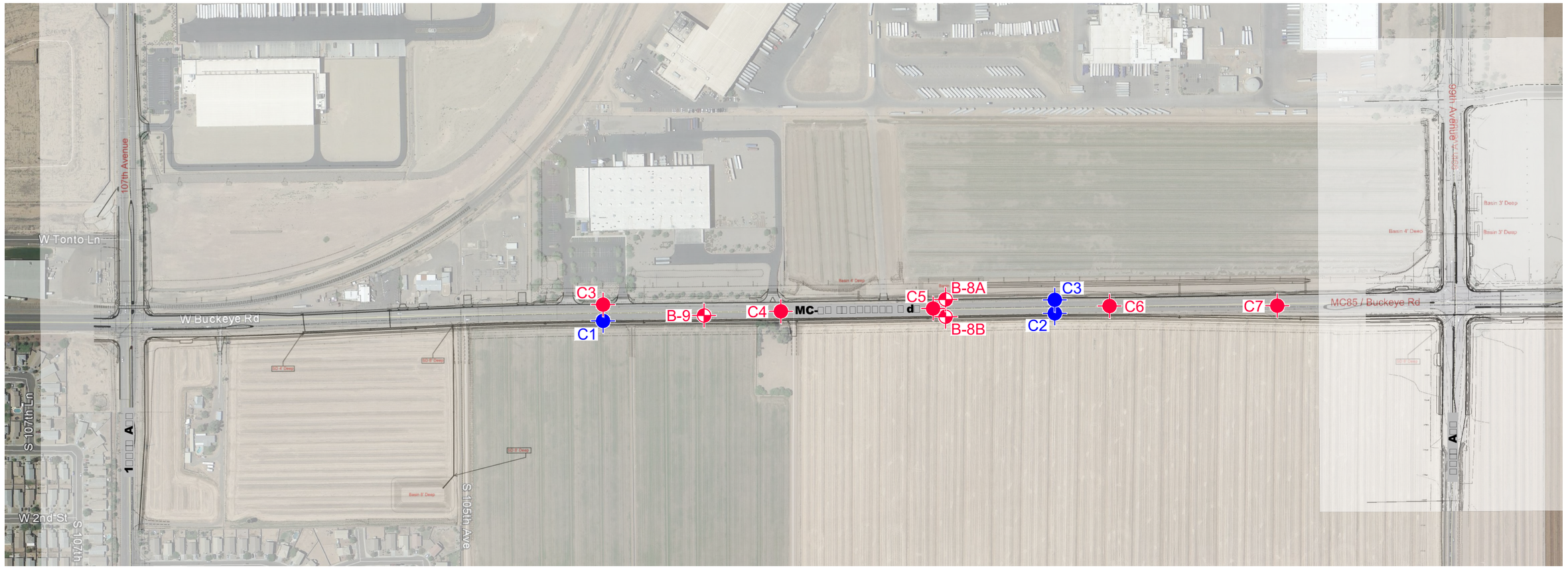
A sample of the soils underlying the pavement structure was obtained at the core locations, with the exception of Core Locations C1 and C15. The depth of the subgrade samples ranged from approximately 18 to 48 inches below the finished pavement elevation. We performed laboratory grain size analyses and Atterberg limits testing in order to classify the subgrade soils on the subgrade samples obtained from Core Locations C3, C4, C5, C8 and C9. The results indicated the subgrade soils consisted of lean clay with sand (CL) and sandy lean clay (CL). The results of the laboratory testing performed on the subgrade samples indicated the fines content (percent passing the Sieve No. 200) ranged from approximately 51 to 83 percent and the plastic

indices ranged from approximately 17 to 29. The results of laboratory tests are presented on the laboratory test data sheets in Appendix C-A.

4.4.2 PAVEMENT CORING AND GPR COMPARISONS

As previously described in the Ground Penetrating Radar Survey Section, a total of 124 ground penetrating radar (GPR) survey lines were performed at approximate 200 feet (or less) spacings across the 4 mile long project. Seventeen pavement core explorations designated C1 through C17 were performed by Kleinfelder at selected GPR survey lines in an effort to verify the interpreted GPR survey anomalies. The GPR Survey Report designated the interpreted buried PCCP as an "A" anomaly, and 12 pavement core explorations were performed at "A" anomaly areas. With the exception of Core Locations C12 and C14, the coring explorations performed at "A" anomaly GPR survey locations encountered the buried PCCP. The coring explorations performed at secondary GPR survey anomaly areas, designated as "B, C or D" anomalies, did not encounter the buried PCCP. At secondary GPR anomaly areas, oversized rock (cobbles) was generally encountered in the lower portion of the ABC, followed by the subgrade soils. The subgrade soils were excavated with a 3-inch diameter hand-auger to depths of approximately 3 to 4 feet below the finished pavement elevation at select locations. Based on the data obtained in the core explorations and the GPR surveys, it appears that "A" anomalies generally correspond to areas where PCCP is present, and "B, C and D" anomalies correspond to oversized rock in the lower portion of the ABC. A limited number of GPR surveys and core explorations were performed. It is possible that conditions could vary between or beyond the data evaluated.

FIGURES



N

0 200 400 800

APPROXIMATE SCALE (feet)

E□P□ANATI□N

- APPROXIMATE KLEINFELDER CORE LOCATION
- APPROXIMATE PREVIOUS DMJM/AECOM CORE LOCATION
- APPROXIMATE PREVIOUS MACTEC BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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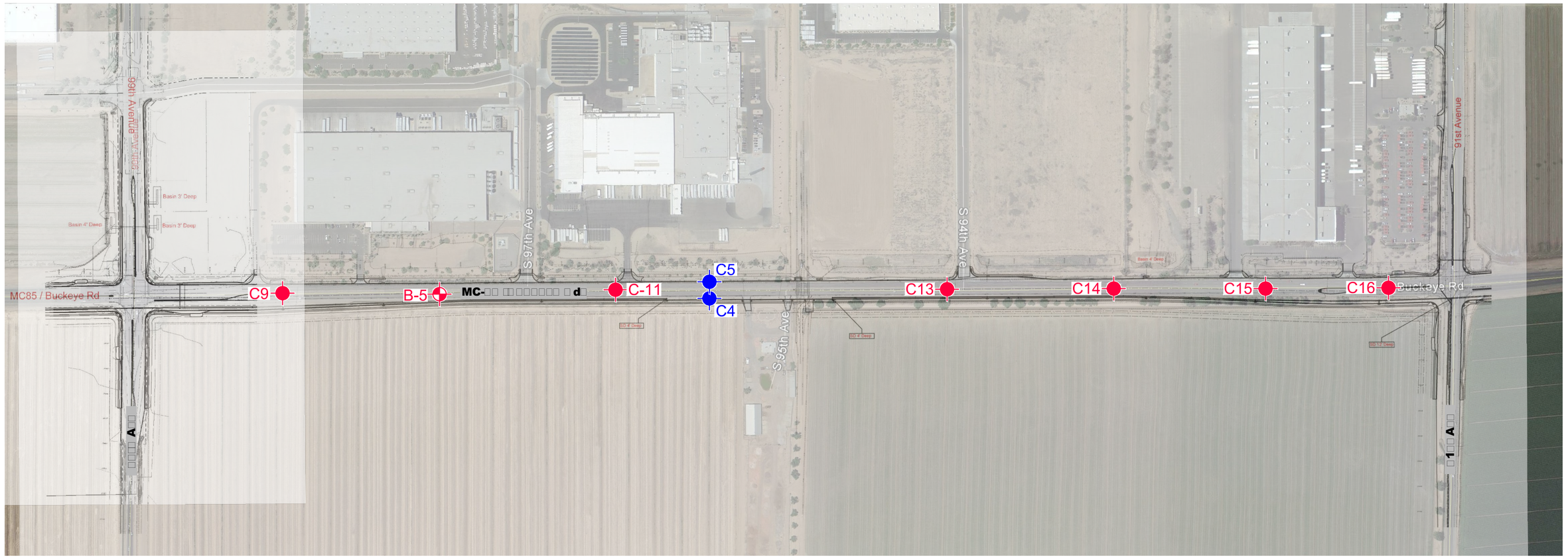
PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigC-1 to C-4.dwg

C□□IN□ E□P□□□ATI□N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 107TH TO 99TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
C-1



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0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

- APPROXIMATE KLEINFELDER CORE LOCATION
- APPROXIMATE PREVIOUS DMJM/AECOM CORE LOCATION
- APPROXIMATE PREVIOUS MACTEC BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigC-1 to C-4.dwg

C□□IN□ E□ P□□□ATI□ N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 99TH TO 91ST AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE

C-□

N

0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

APPROXIMATE KLEINFELDER CORE LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigC-1 to C-4.dwg

C□□IN□ E□ P□□□ATI□ N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 91ST AVENUE TO 83RD AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
C-□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg
ATTACHED XREFS:
LONG BEACH, CA
CAD FILE: L:\CADD\2012\129067\CoringExplor-SP_11-2012\ LAYOUT: C-3 PLOTTED: 06 Dec 2012, 3:37pm, mgriffin

N

0 200 400 800

APPROXIMATE SCALE (feet)

E P ANATI N

APPROXIMATE KLEINFELDER CORE LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigC-1 to C-4.dwg

C IN E P ATI N SITE P AN

MC-85 (BUCKEYE ROAD)
FROM 83RD AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
C-

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_75th.jpg
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CAD FILE: L:\CADD\2012\129067\CoringExplor-SP_11-2012\ LAYOUT: C-4 PLOTTED: 06 Dec 2012, 3:37pm, mgriffin

APPENDIX C-A

Laboratory Test Results

SAMPLE LOCATION	GRAIN SIZE ANALYSIS				ATTERBERG LIMITS			UNIFIED SOIL CLASSIFICATION (USCS)
	COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	LL	PL	PI	
C3 @ 18-38"	0	2	27	72	35	15	20	LEAN CLAY with SAND (CL)
C4 @ 24-36"	0	1	16	83	42	19	23	LEAN CLAY with SAND (CL)
C5 @ 20-36"	0	1	48	51	47	18	29	SANDY LEAN CLAY (CL)
C8 @ 20-36"	0	0	38	62	32	15	17	SANDY LEAN CLAY (CL)
C9 @ 24-42"	0	1	26	72	35	14	21	LEAN CLAY with SAND (CL)

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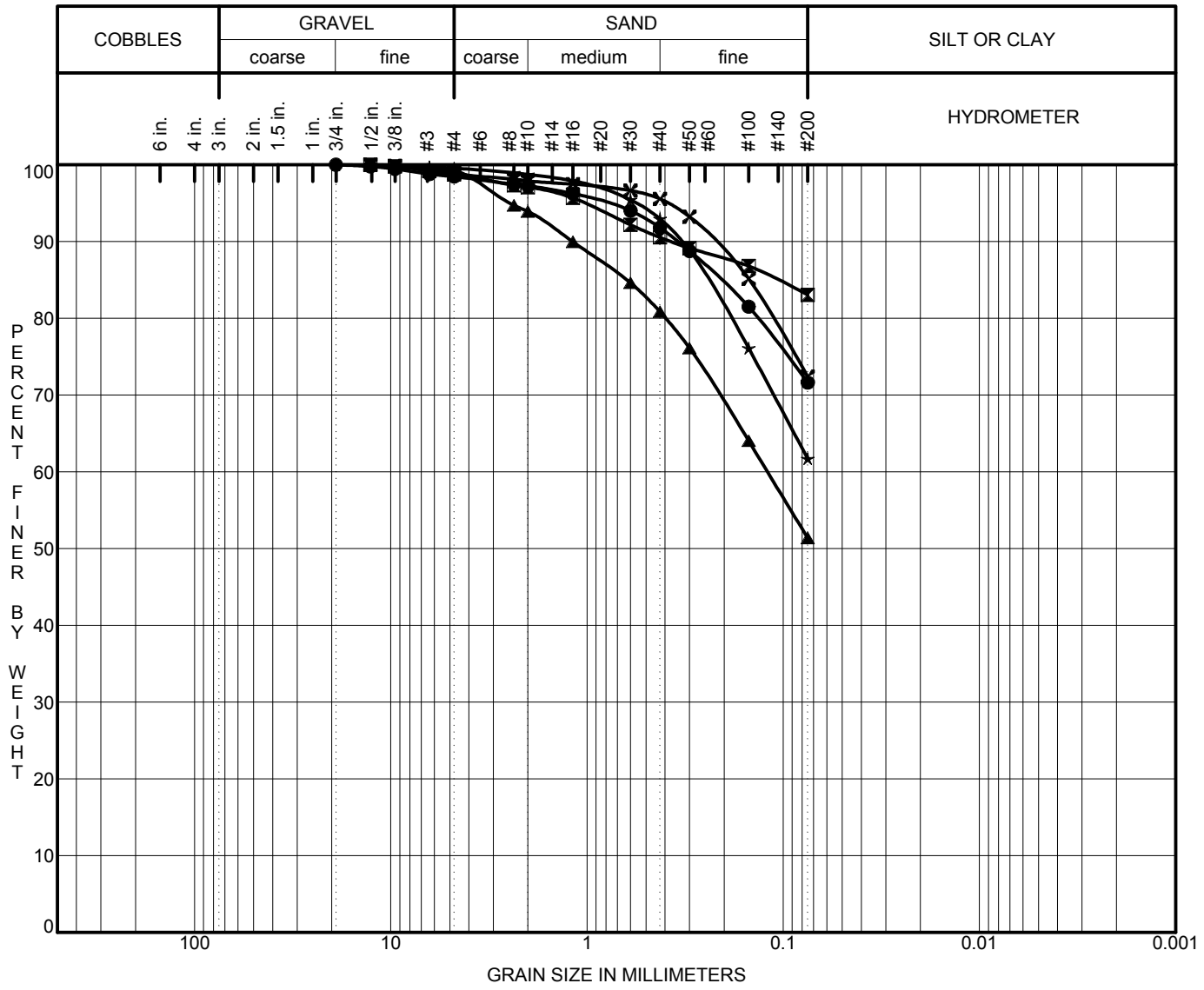
Report Date:	Project Number:
Dec 2012	129067

SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
C-A1



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	C3	18.0 - 38.0	0	2	27	72				
⊠	C4	24.0 - 36.0	0	1	16	83				
▲	C5	20.0 - 36.0	0	1	48	51		0.1		
★	C8	20.0 - 36.0	0	0	38	62				
✕	C9	24.0 - 42.0	0	1	26	72				

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	C3	18.0 - 38.0	LEAN CLAY with SAND (CL)	35	15	20		
⊠	C4	24.0 - 36.0	LEAN CLAY with SAND (CL)	42	19	23		
▲	C5	20.0 - 36.0	SANDY LEAN CLAY (CL)	47	18	29		
★	C8	20.0 - 36.0	SANDY LEAN CLAY (CL)	32	15	17		
✕	C9	24.0 - 42.0	LEAN CLAY with SAND (CL)	35	14	21		

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Report Date: December 2012

Project Number: 129067

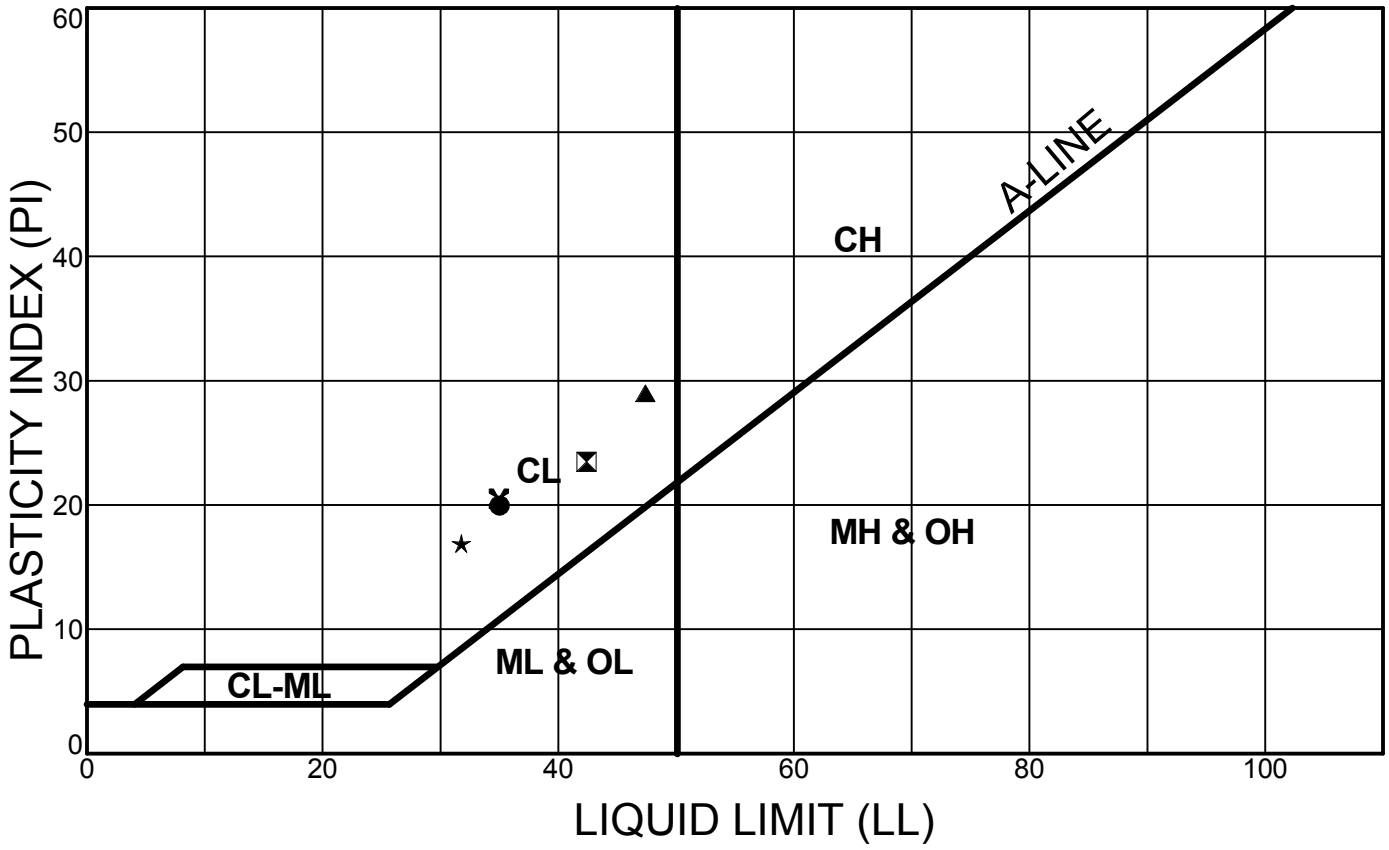
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

C-A2

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/06/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	C3	18.0 - 38.0	35	15	20
⊠	C4	24.0 - 36.0	42	19	23
▲	C5	20.0 - 36.0	47	18	29
★	C8	20.0 - 36.0	32	15	17
✕	C9	24.0 - 42.0	35	14	21

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Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
C-A3

ATTPLOT 129067 MC-85.GPJ 12/06/12

APPENDIX C-B

Excerpts from MACTEC Report

REPORT OF
GEOTECHNICAL EVALUATION

MACTEC Project No. 4975-03-1401

MC85 (BUCKEYE ROAD)

107TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA
JOB NO. 40069024

Prepared for:

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION
PHOENIX, ARIZONA

Prepared by:

MACTEC ENGINEERING AND CONSULTING, INC.
PHOENIX, ARIZONA

June 17, 2003
Revised October 23, 2003

MACTEC

MACTEC

June 17, 2003

Mr. Joseph A. Phillips, P.E.
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Subject: **Preliminary Geotechnical Evaluation – Revised October 23, 2003**
MC85 (Buckeye Road)
107th Avenue to 91st Avenue
Maricopa County, Arizona
Job No. 40069024
MCDOT Contract No. CY 2003-03
MACTEC Project No. 4975-03-1401

Dear Mr. Phillips:

MACTEC Engineering and Consulting, Inc. (MACTEC) has completed the preliminary geotechnical evaluation for the proposed reconstruction of MC85 (Buckeye Road) between 107th Avenue and 91st Avenue. This work was performed in general accordance with our proposal for Preliminary Geotechnical Evaluation, dated January 24, 2003. The results of our evaluation, along with the boring location map, laboratory test results, and recommendations are attached.

In addition to the Preliminary Geotechnical Evaluation, the scope of the above referenced work order included review and commentary for the Draft Pavement Design Guide for MCDOT. The results of our review and the associated comments are presented under separate cover.

We at MACTEC are committed to providing quality engineering services combined with client satisfaction in order to achieve a continuing relationship with our clients. We appreciate the opportunity to provide these services for you. If you have any questions regarding any of the other engineering and testing services MACTEC provides, please do not hesitate to contact us.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

Registered Professional Engineer (Civil) CERTIFICATE NO. 34607 JODI WINNEY Date Signed 10/23/03 ARIZONA, U.S.A.

Jodi Winney, P.E.
Geotechnical Engineer

Marshall Lew

Marshall Lew, Ph.D.
Senior Principal by MW with permission

JW:ML:adm

(projects\4975\4975-03-1401\deliverables\prelim geotech report revised)

MACTEC Engineering and Consulting
3630 East Wier Avenue • Phoenix, AZ 85040
602-437-0250 • Fax: 602-437-3675

TABLE OF CONTENTS

1.0 PURPOSE

Included in this report are the results of our evaluation of existing pavement subgrade soils that will be used to support the reconstruction of 2 miles of MC85 (Buckeye Road). Consistent with the *Maricopa County Department of Transportation Draft Pavement Design Guide*, this geotechnical evaluation provides preliminary engineering recommendations and information to address the following aspects of this phase of the project:

- Existing site and subgrade soil conditions;
- Geological considerations;
- Groundwater conditions;
- Preliminary percolation rates;
- Excavation conditions for underground utilities;
- Corrosivity to corrugated metal pipe (CMP);
- Earthwork recommendations for pavement subgrade;
- Suitability of site soils as fill;
- Recommended specifications for imported fill;
- Recommended alternative pavement sections; and,
- Discussion of economics for pavement design alternatives.

This report does not address any environmental issues related to the site or the project. If you have any questions concerning environmental aspects of this project please contact us and we can discuss additional services with you.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for Maricopa County Department of Transportation for the design of the project described herein. This report has not been prepared for any other parties, and may not contain sufficient information for purposes of other parties. If any of the project information described in Section 2.0 of this report has changed, we should be notified so that we may amend our recommendations as necessary.

2.0 PROJECT INFORMATION

Based on the Corridor Improvement Study dated July 21, 1998, and information you provided, this project consists of the reconstruction of 2 miles of MC85 between 107th Avenue and 91st Avenue. We understand that the preferred improvement level for this roadway is the Full Cost Alternative consisting of a 6-lane asphalt paved divided roadway with a 16 foot wide raised median, as indicated in the Corridor Improvement Study. As part of this project, reconstruction of pavements and other associated improvements will be made at intersections included in the subject segment of MC85. Currently, the roadway consists of a 4 travel lane arterial road with a continuous center turn lane.

We understand that the pavement elevations for this segment of MC85 have not yet been finalized, however it is anticipated that they will be at or slightly above existing pavement elevations. Corrugated metal pipe (CMP) may be utilized to manage flows, although the precise locations of these drainage features have also not yet been determined.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

MACTEC advanced 11 borings to a depth of 10 feet below pavement surface within the left and right travel lanes of both the east and west directions of the existing MC85 alignment. During drilling of these borings, many of the in-place subgrade soils became contaminated with asphalt and aggregate base material when bulk soil sampling was attempted. Therefore, for the purposes of this preliminary evaluation, hand augered subgrade samples were obtained outside the existing asphalt pavement but within the shoulder of MC85. Classification tests performed indicate that the hand auger samples obtained from the shoulder are representative of the types of materials encountered below the paved areas. Preliminary percolation testing was performed within 6 of the drilled boreholes. Results of these tests are presented later in this report.

The approximate locations of these borings are shown on the Boring Location Map attached. The soils encountered at each location were visually classified and recorded on a field log using the Unified Soil Classification System (USCS). Bulk and undisturbed samples of the soils were

retrieved for laboratory testing which aided in providing the final soil classifications presented in the boring logs attached in Appendix A.

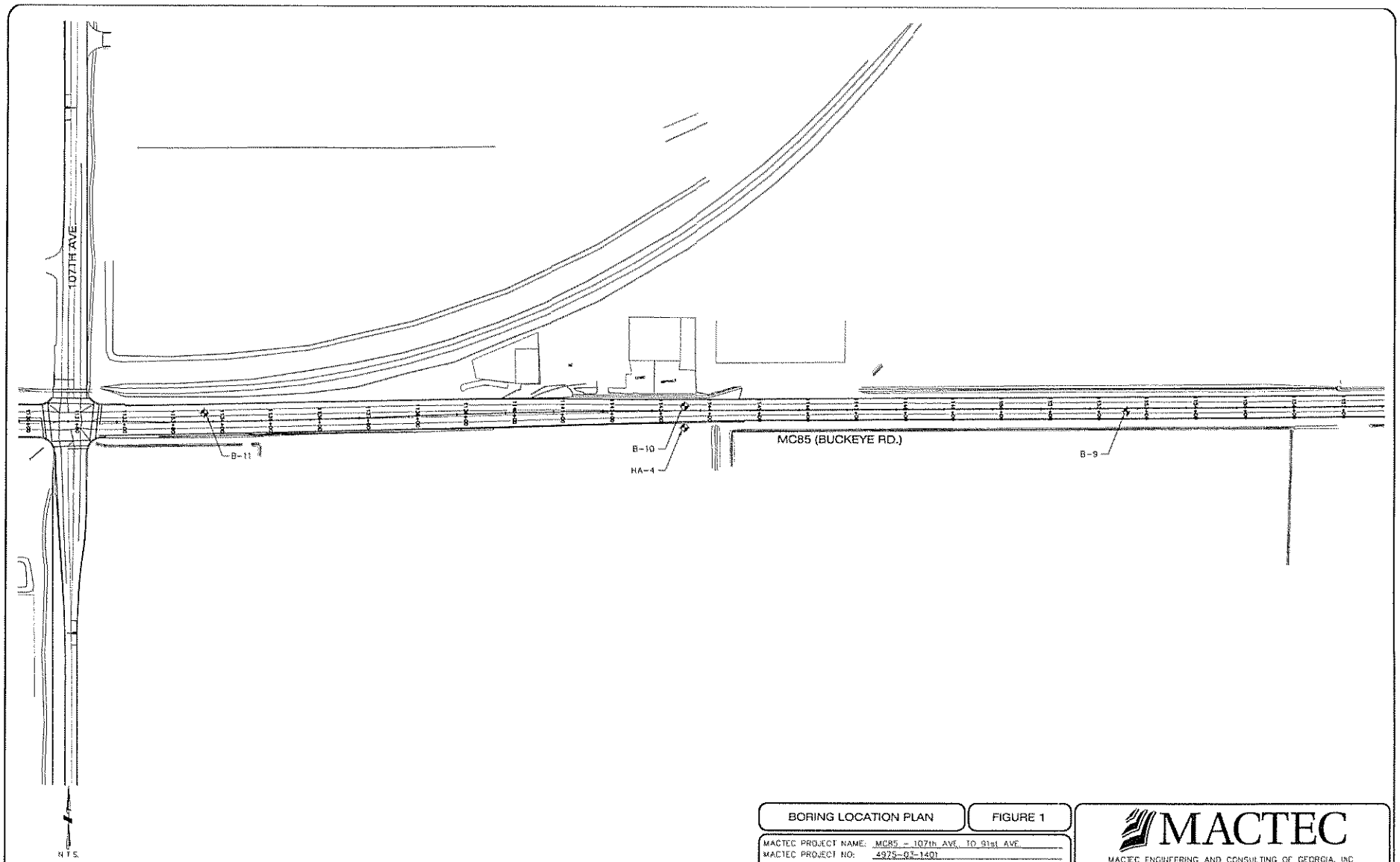
Exposed pavement sections measured within the boring locations indicate that the existing pavement consists of approximately 3 to 7 inches of asphalt concrete pavement, averaging just under 6 inches. Observed aggregate base sections within the borings measured between 11 to 24 inches. The actual pavement section thicknesses measured within the borings are presented on the attached boring logs.

The materials encountered in Borings 8A and 8B indicate the presence of portland cement concrete below the asphalt and aggregate base sections. Refusal to auger drilling was encountered in the first and second attempts at borings in this area. Based on visual inspection of the area near Borings 8A and 8B, concrete associated with either a gated concrete irrigation culvert or underground irrigation/drainage pipes may have been encountered in these borings. A portland cement concrete like material was also encountered in Borings 9 and 11, however these cemented layers did not result in drilling refusal nor was there any visual indication of underground concrete pavement or structures. We were unable to determine or even estimate the lateral extent of these concrete or cemented areas. During the final design, additional field exploration, possibly including potholing, should be scheduled to more precisely determine the extent of this existing concrete section since removal of this concrete may prove costly.

Overall the general condition of the pavement along the subject portion of MC85 was observed to be in a good condition with only minor transverse cracking at the roadway edge and slight intermittent depressions. Alligator cracking along the roadway was observed to a light to moderate degree in the center turn lane, becoming more prominent toward 107th Avenue.

Within the borings, sandy clay soils were encountered from below the asphalt pavement section extending to the full depth of exploration, except in a couple of borings where silty and clayey sand soils were encountered at depth. The soil conditions in the borings ranged from stiff to hard with varying levels of cementation and low to medium plasticity. Surface soils at pavement subgrade level were tested for expansion and exhibited expansion potentials ranging from moderate to high.

FIGURES

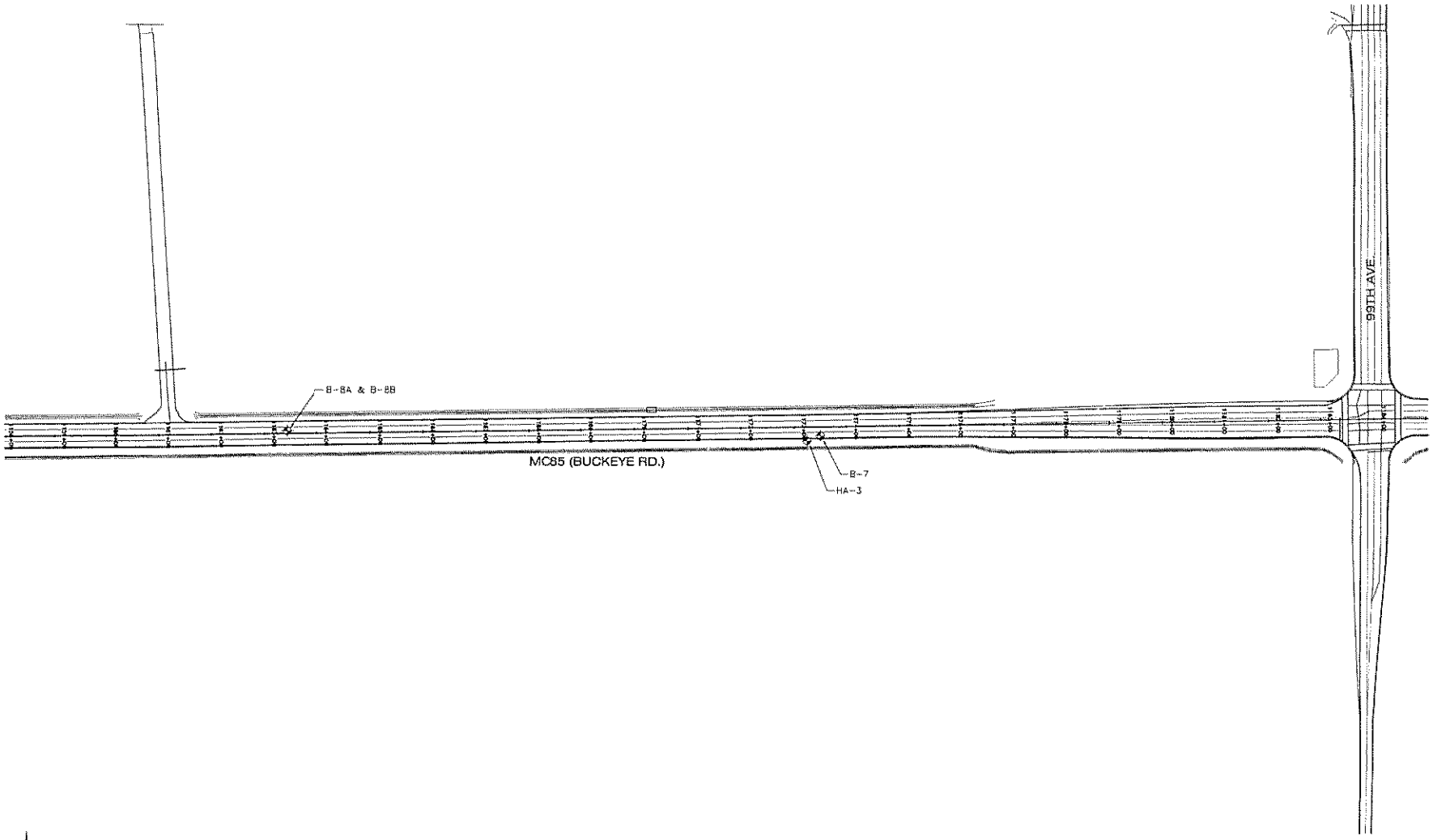


BORING LOCATION PLAN	FIGURE 1

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE 05/29/03 E-FILE: DRAWING 4
DRAWN BY: BWF CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC
3630 E. WER AVE.; PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3675



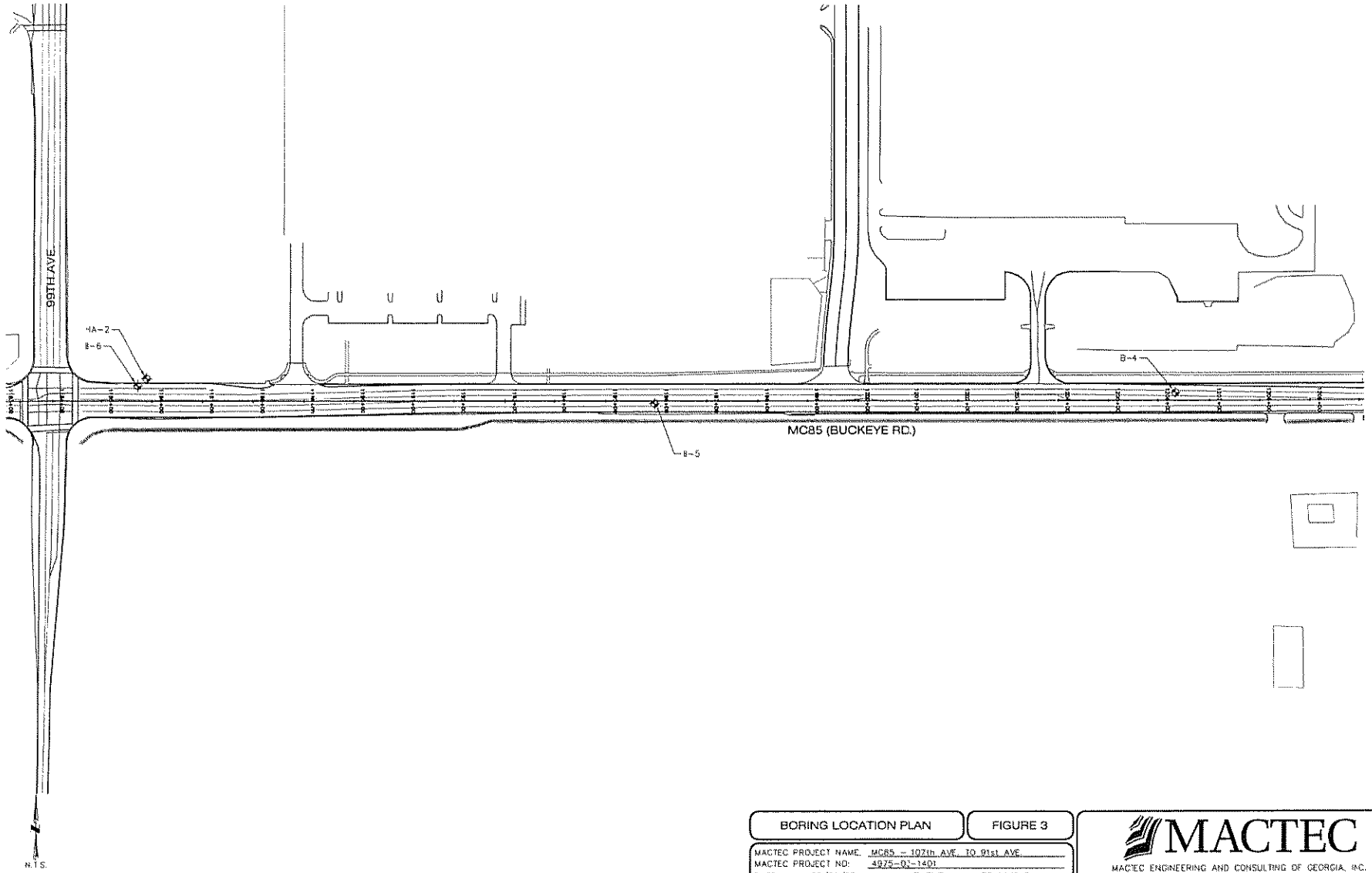
N.T.S.

BORING LOCATION PLAN | FIGURE 2

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 3
DRAWN BY: BWT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WIER AVE., PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3575

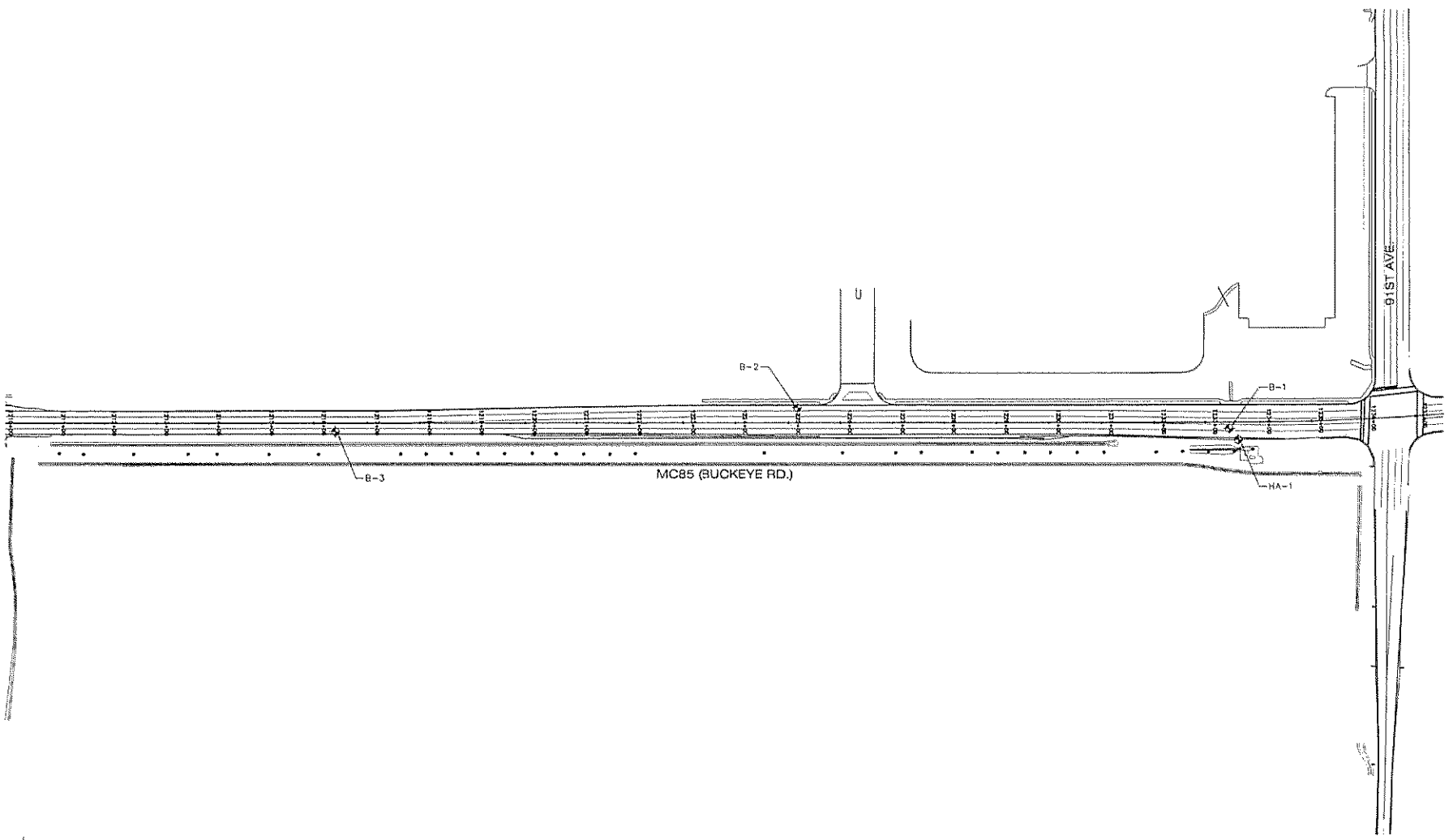


BORING LOCATION PLAN | FIGURE 3

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 2
DRAWN BY: BWT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WEER AVE.; PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3675



BORING LOCATION PLAN | FIGURE 4

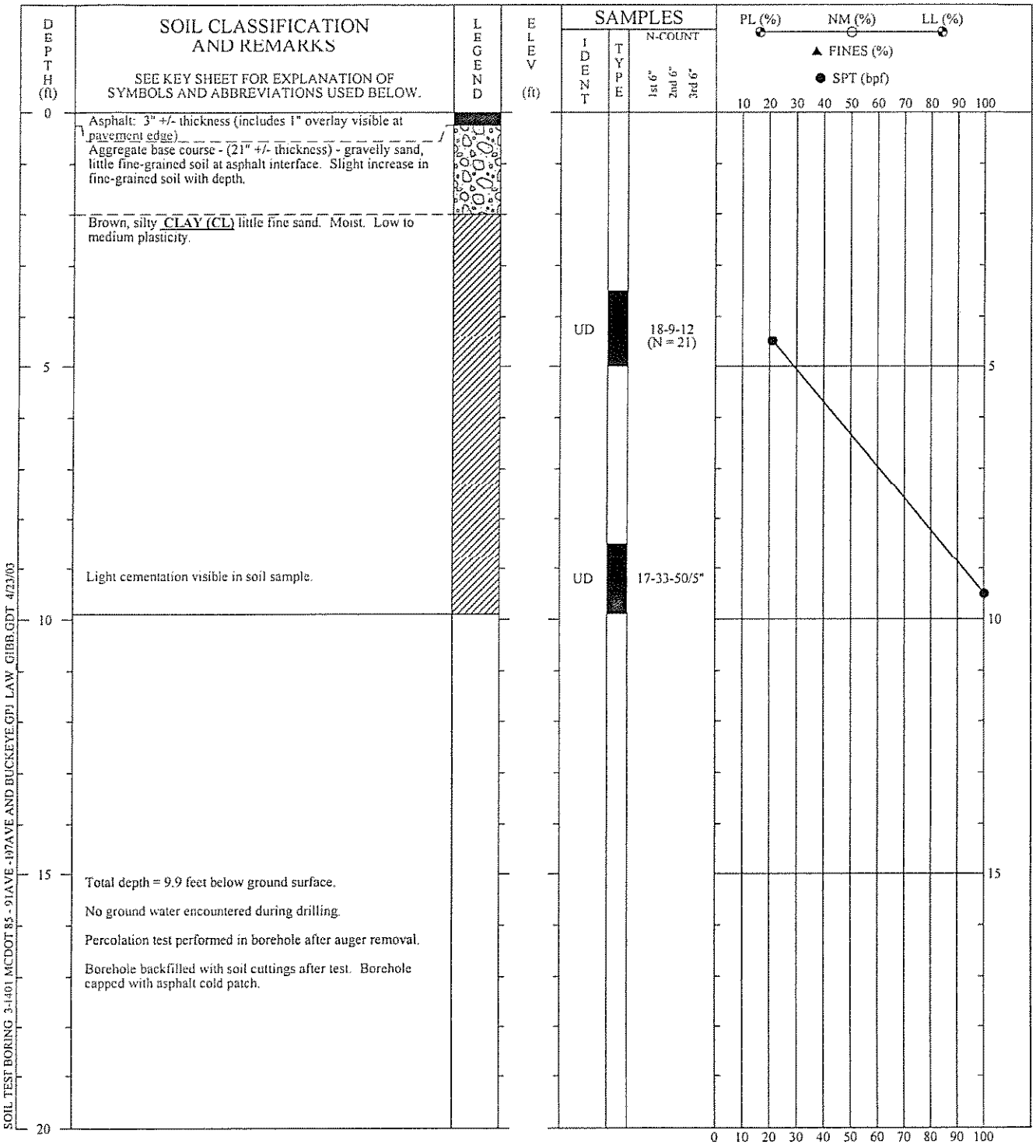
MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 1
DRAWN BY: BMT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WIER AVE.; PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3575

APPENDICES

APPENDIX A



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE - 107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

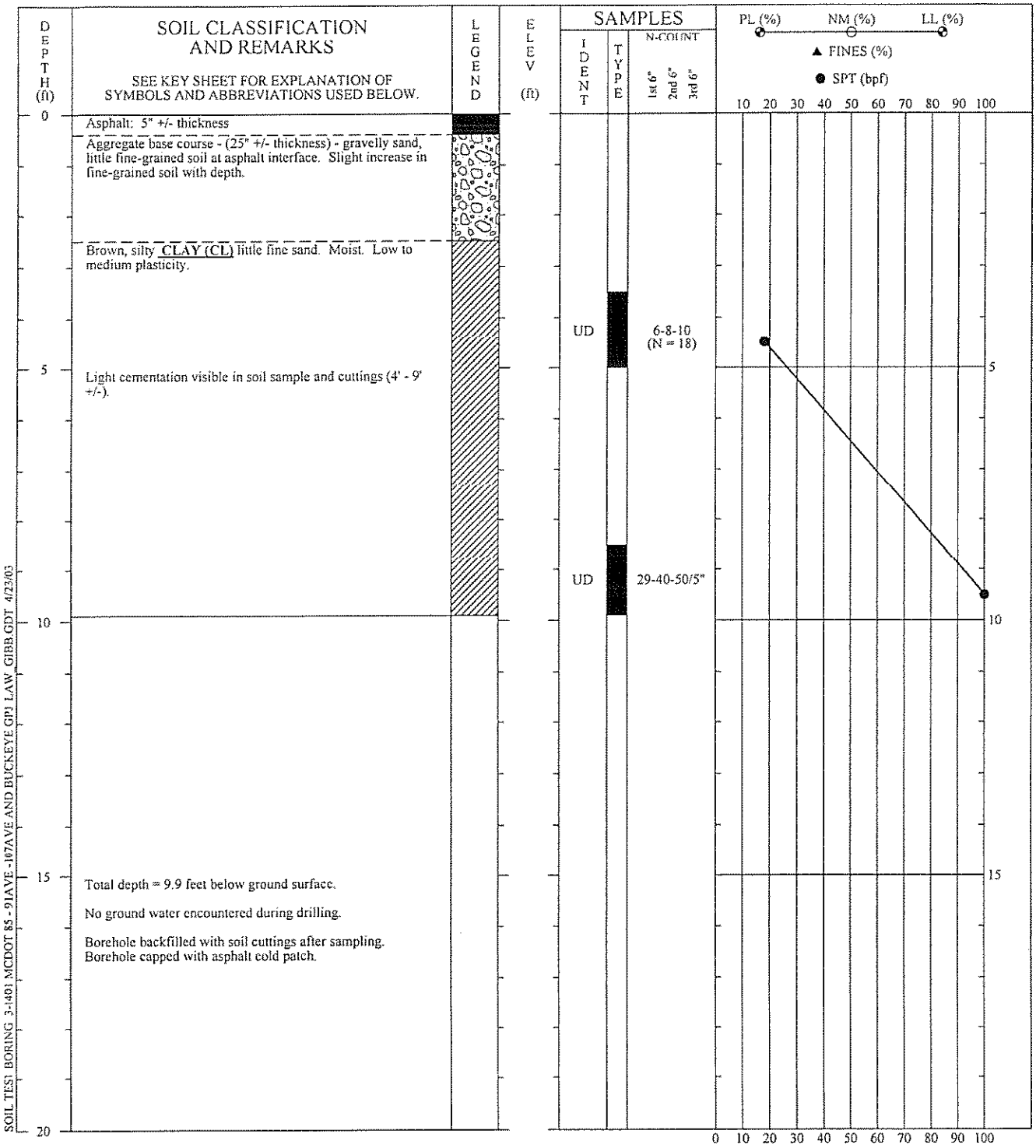
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-1
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

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SOIL TEST BORING RECORD

BORING NO.: B-2
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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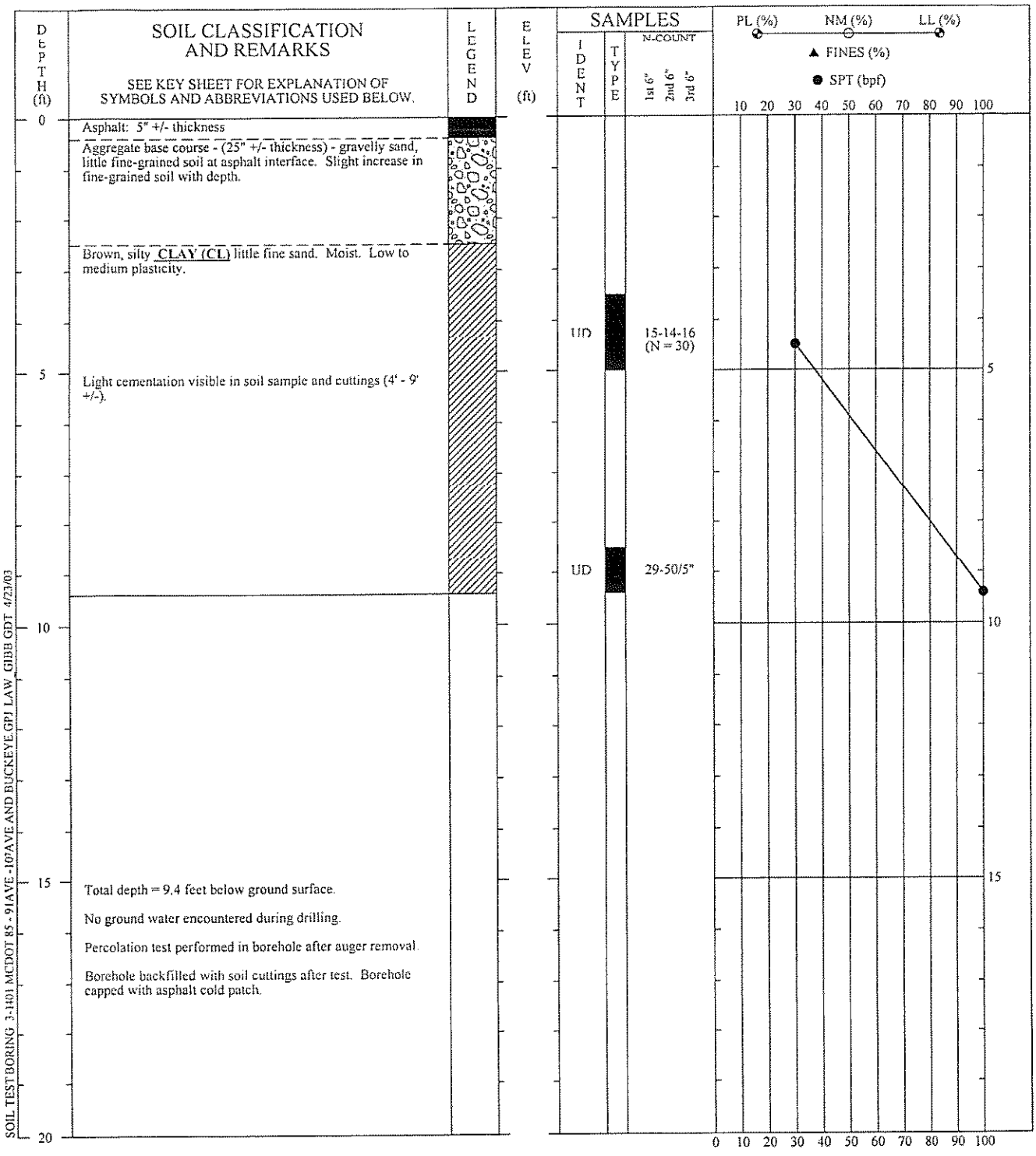

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-3
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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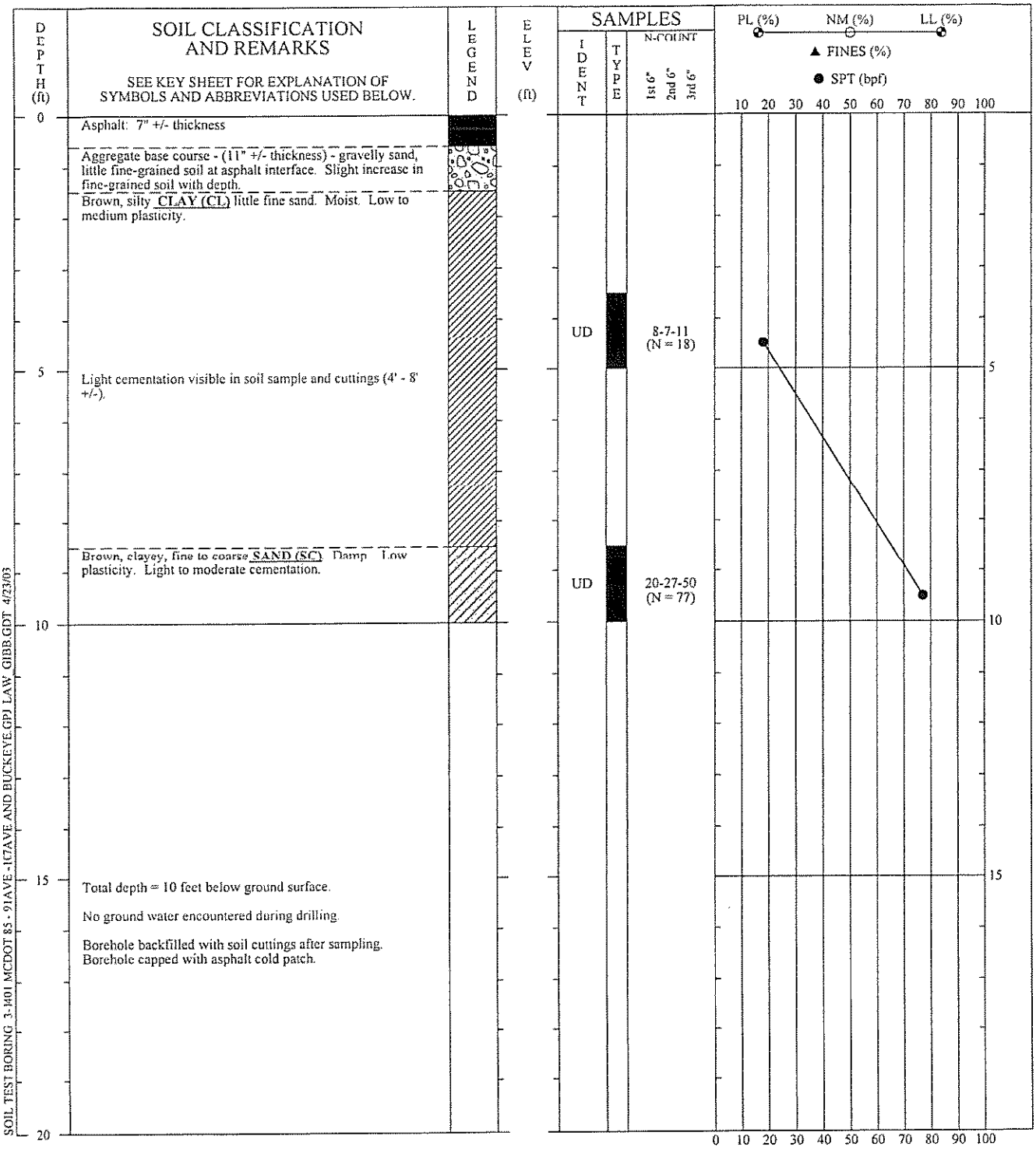

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

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SOIL TEST BORING RECORD

BORING NO.:	B-4
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

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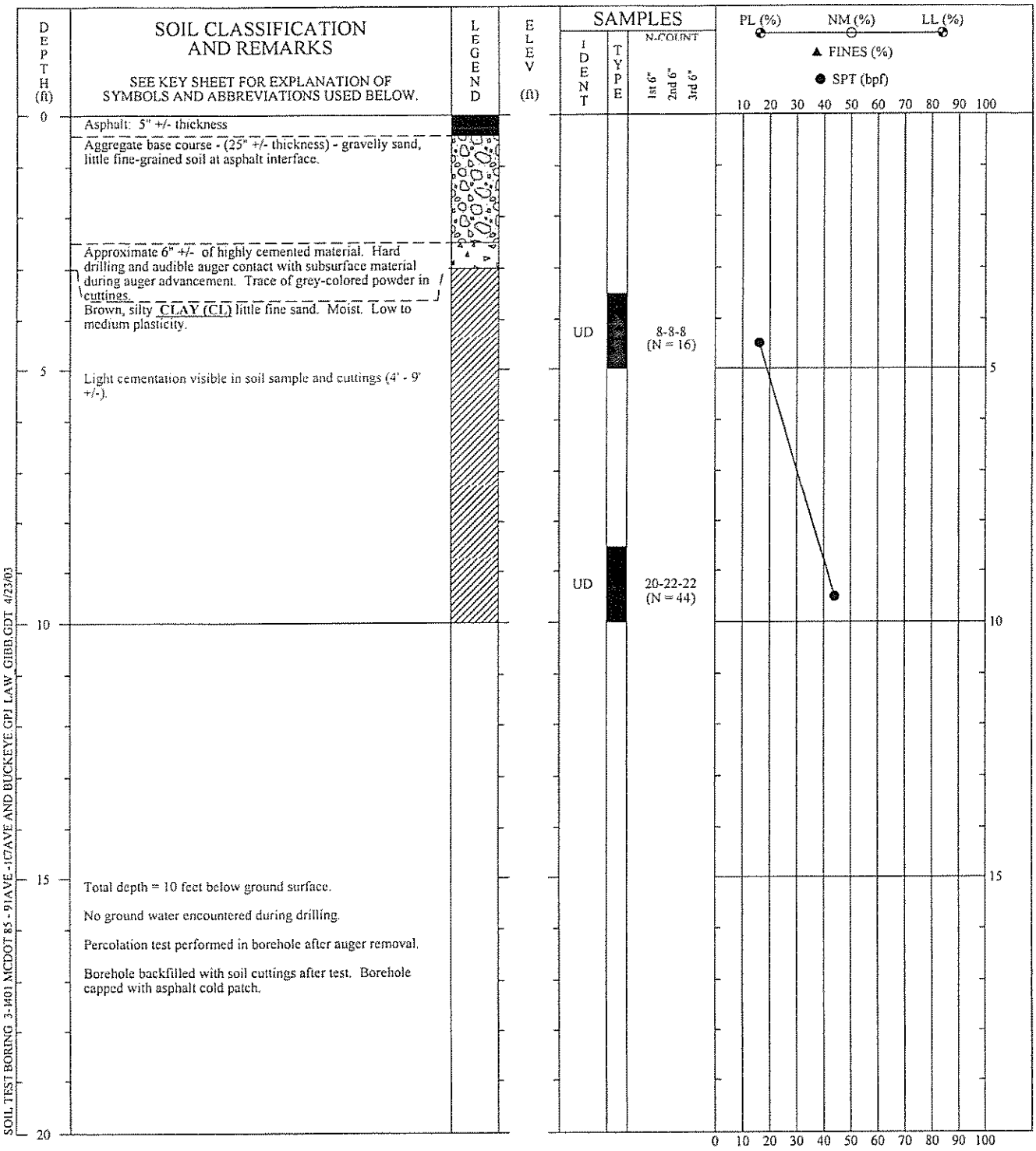

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

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SOIL TEST BORING RECORD

BORING NO.: B-5
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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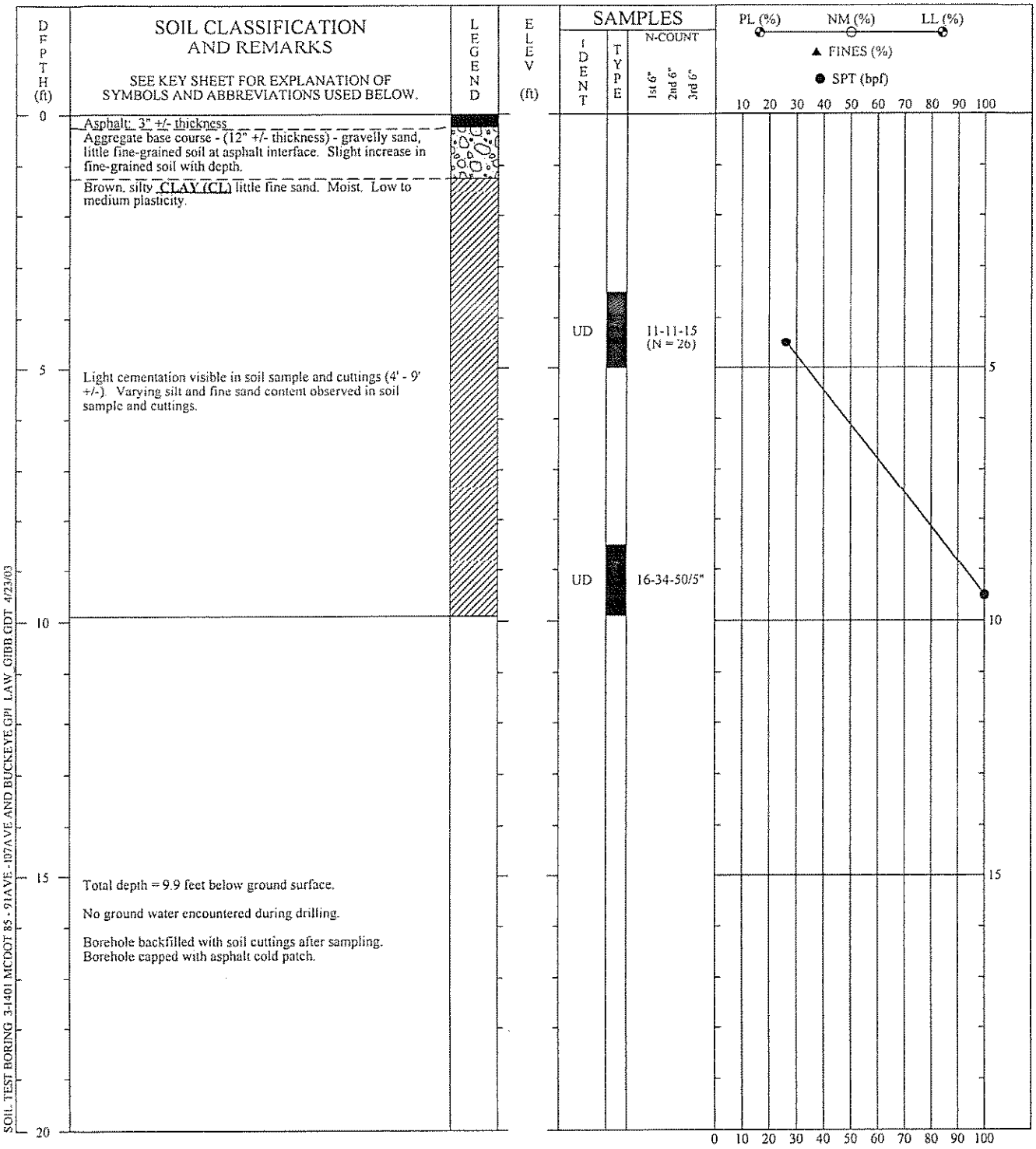

SOIL_TEST BORING_3-1401 MCDOT 85 - 91AVE - 107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	B-6
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

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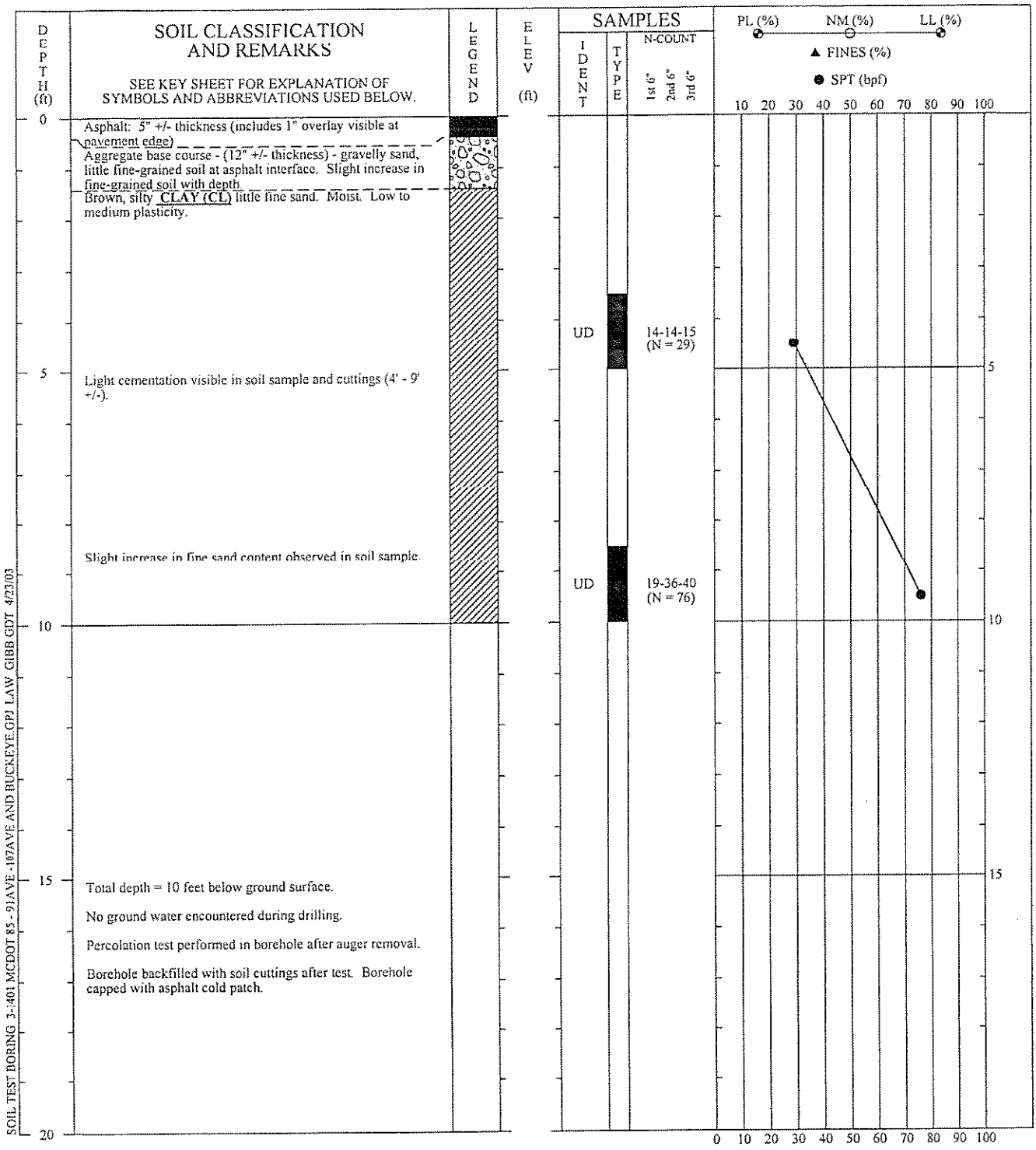

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-7
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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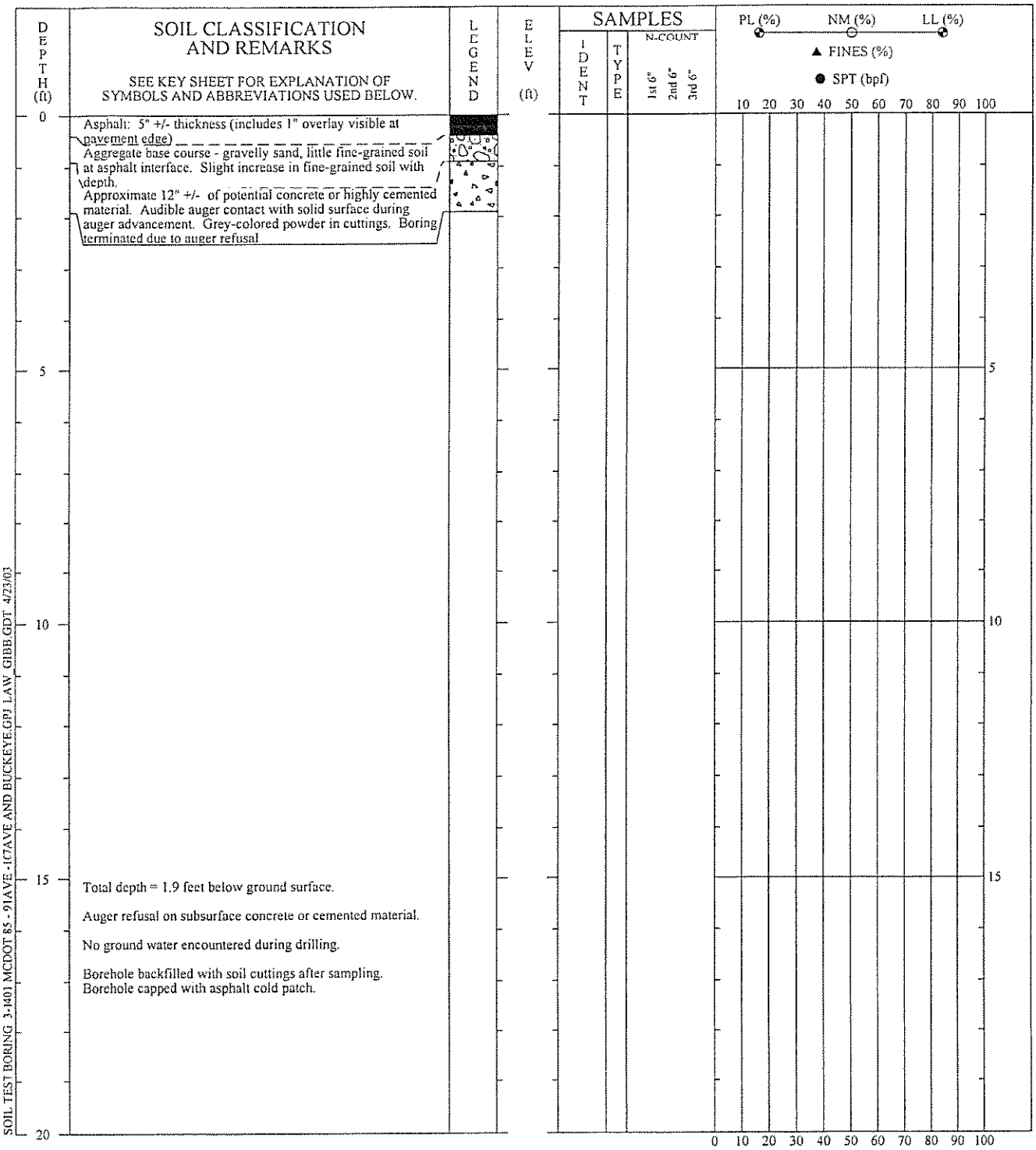

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

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SOIL TEST BORING RECORD

BORING NO.: B-8A
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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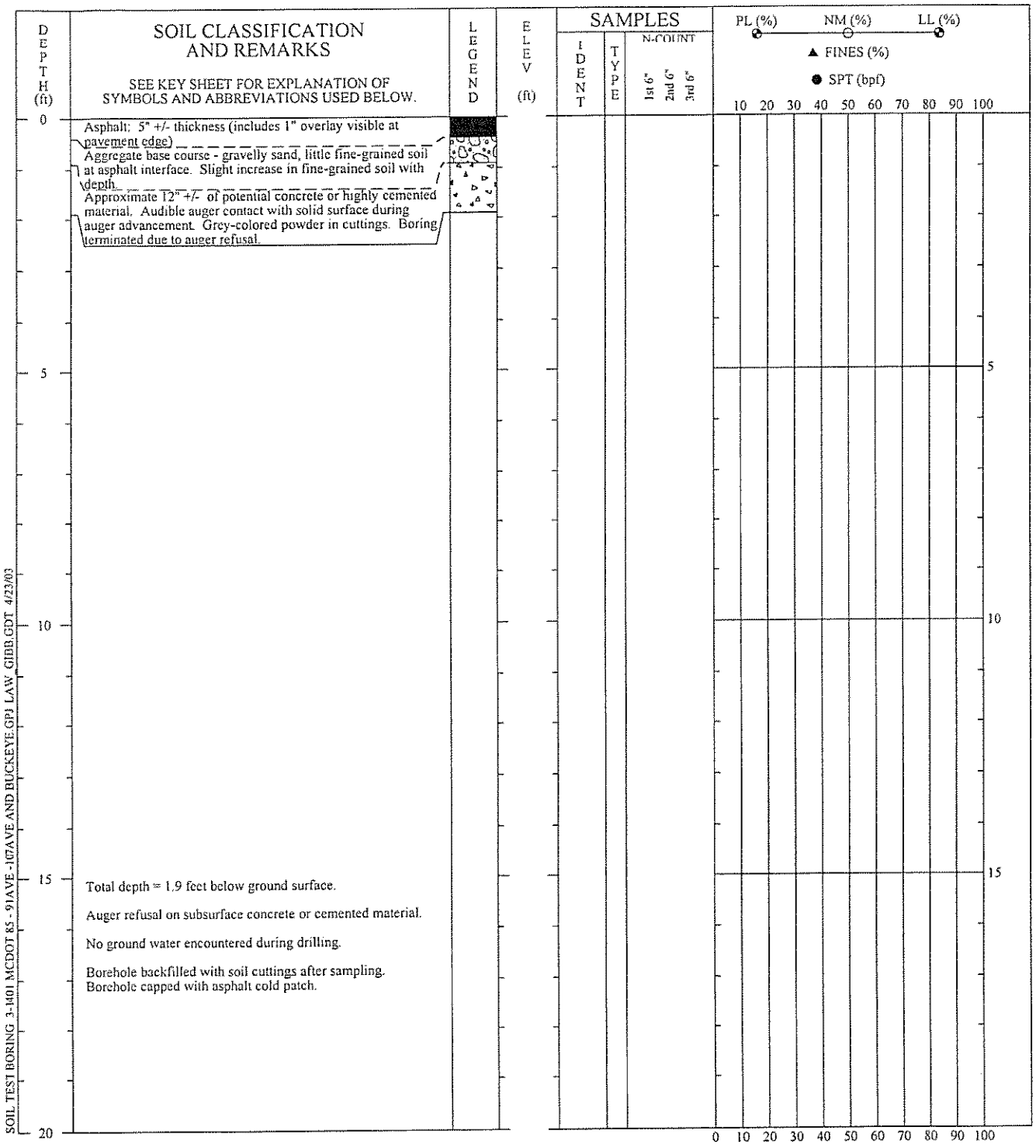

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-8B
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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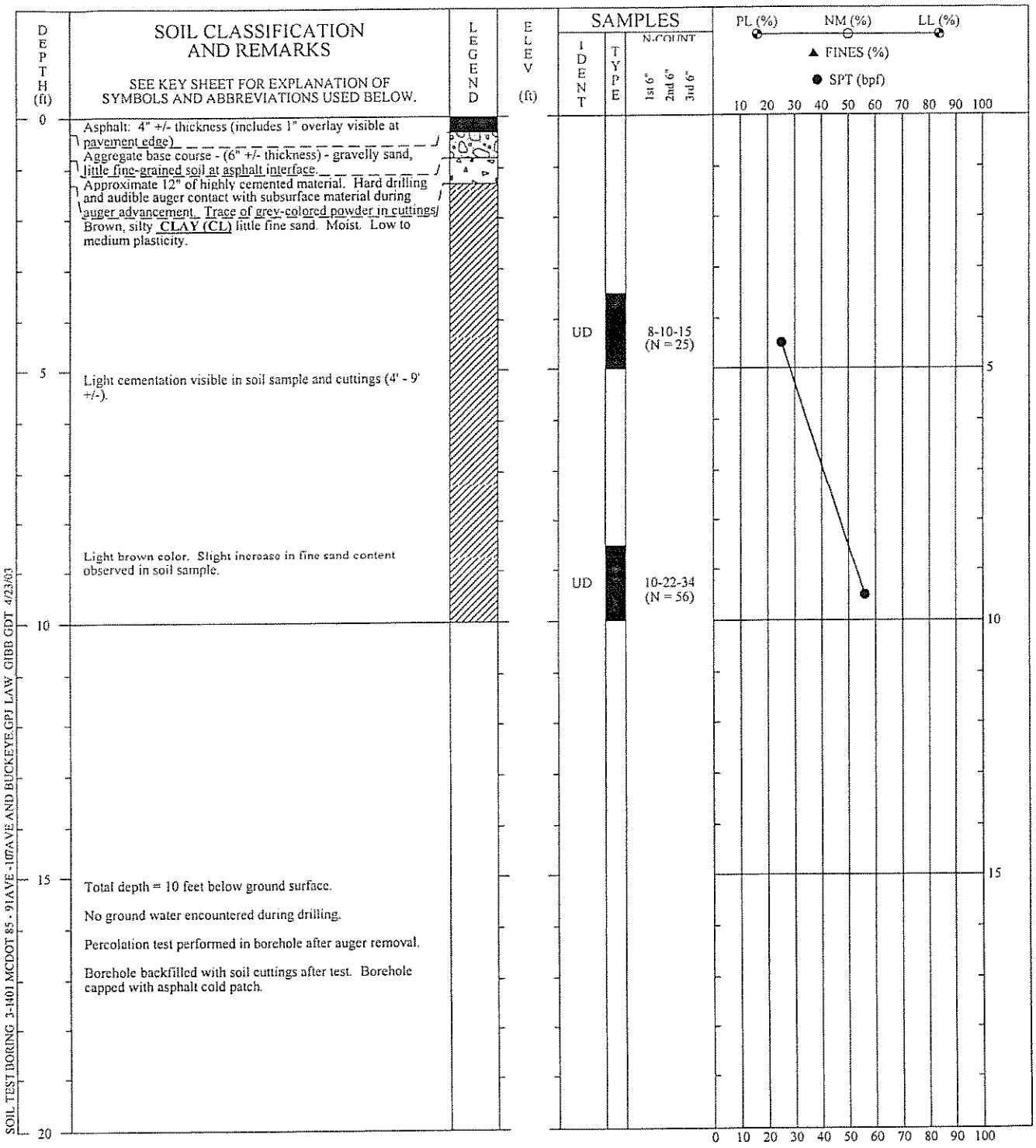

SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	B-9
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

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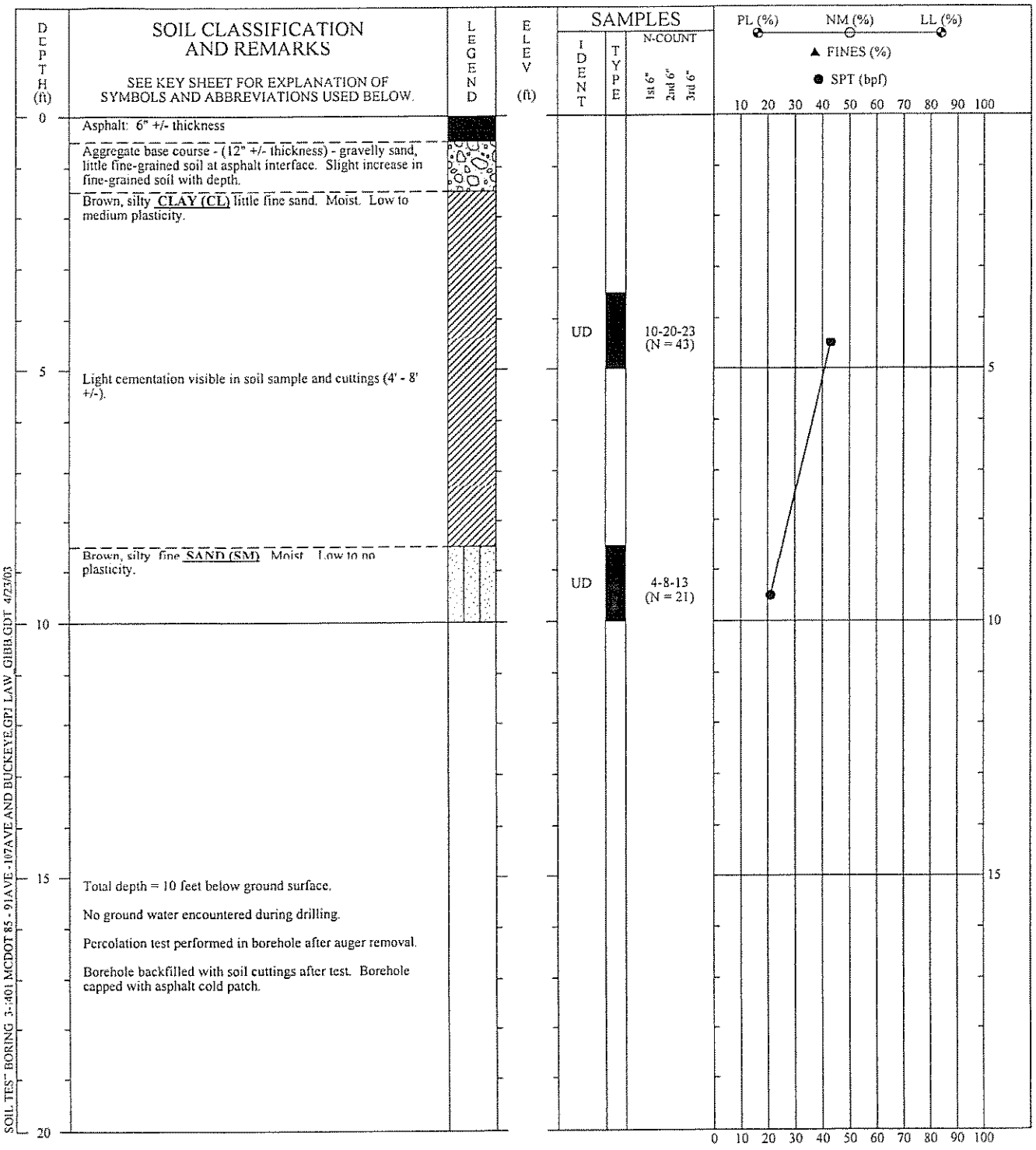

DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-10
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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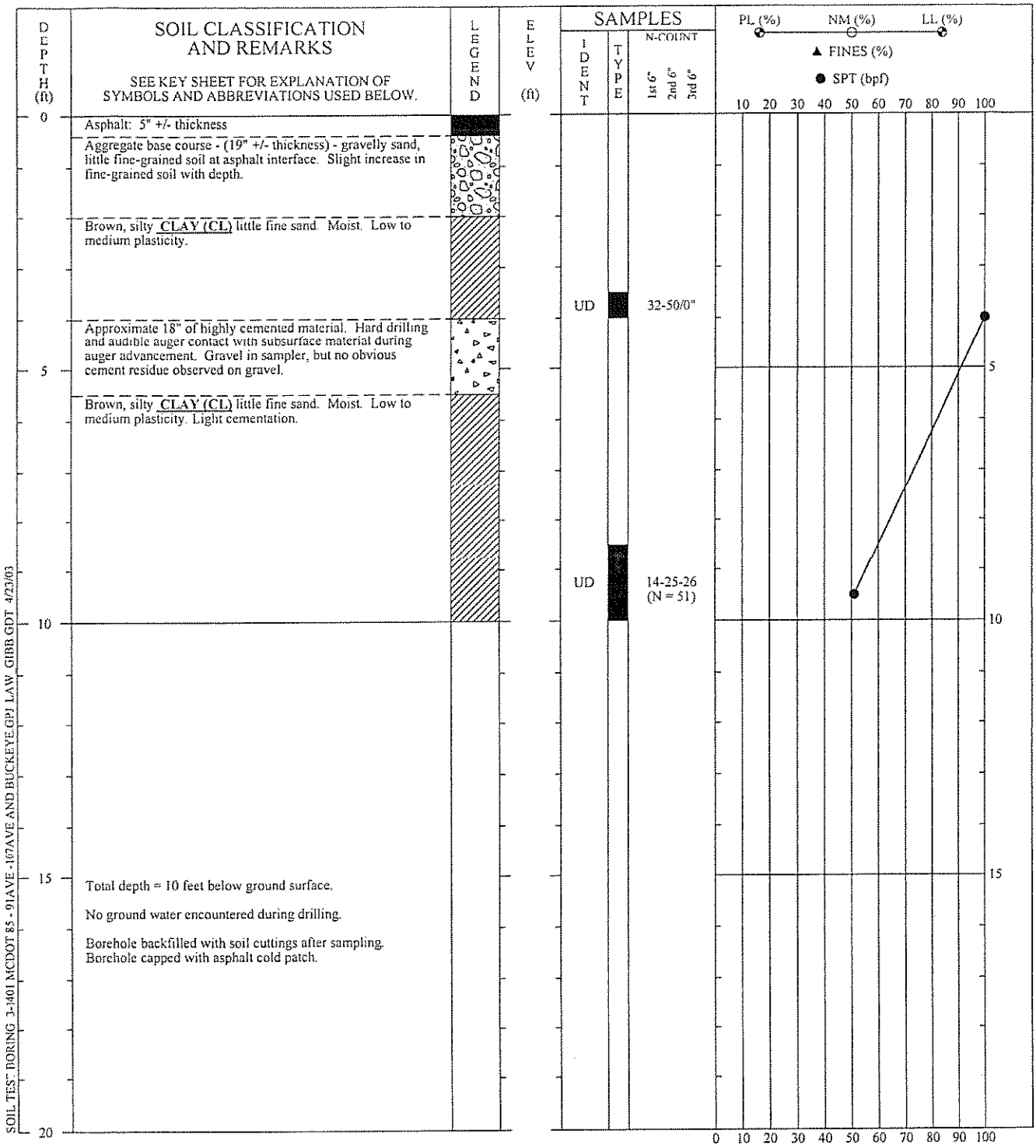


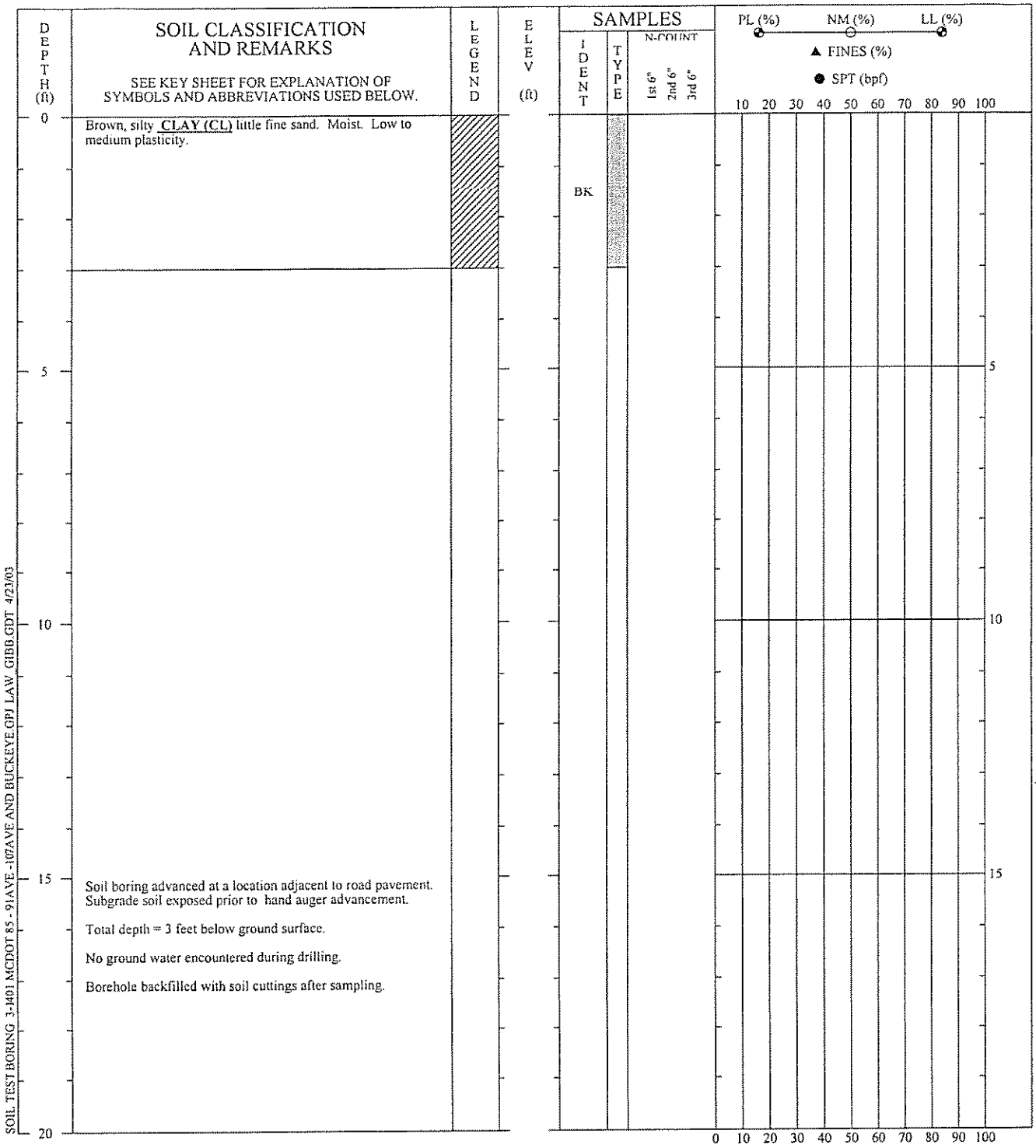
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-11
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-1
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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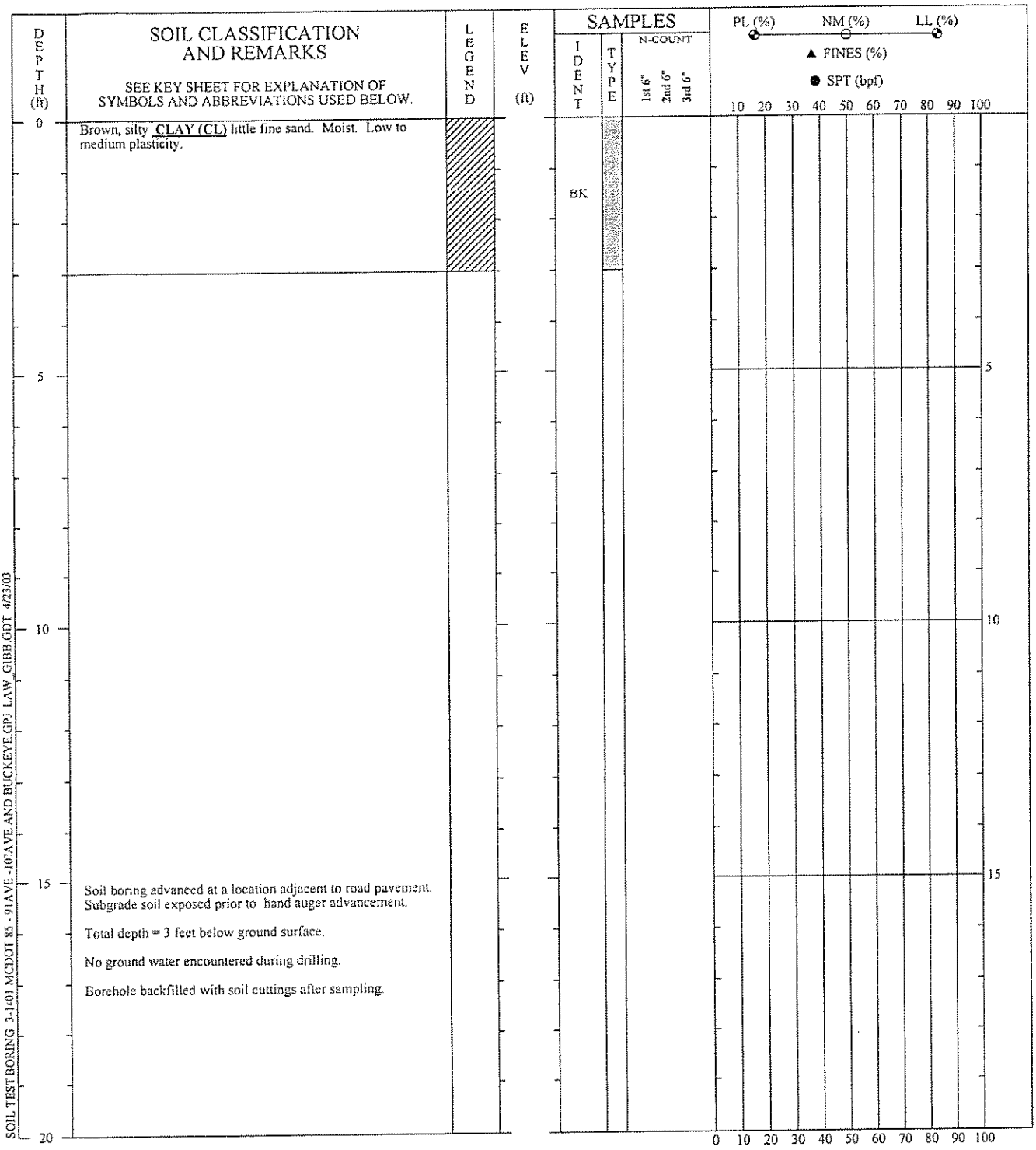

SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-2
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

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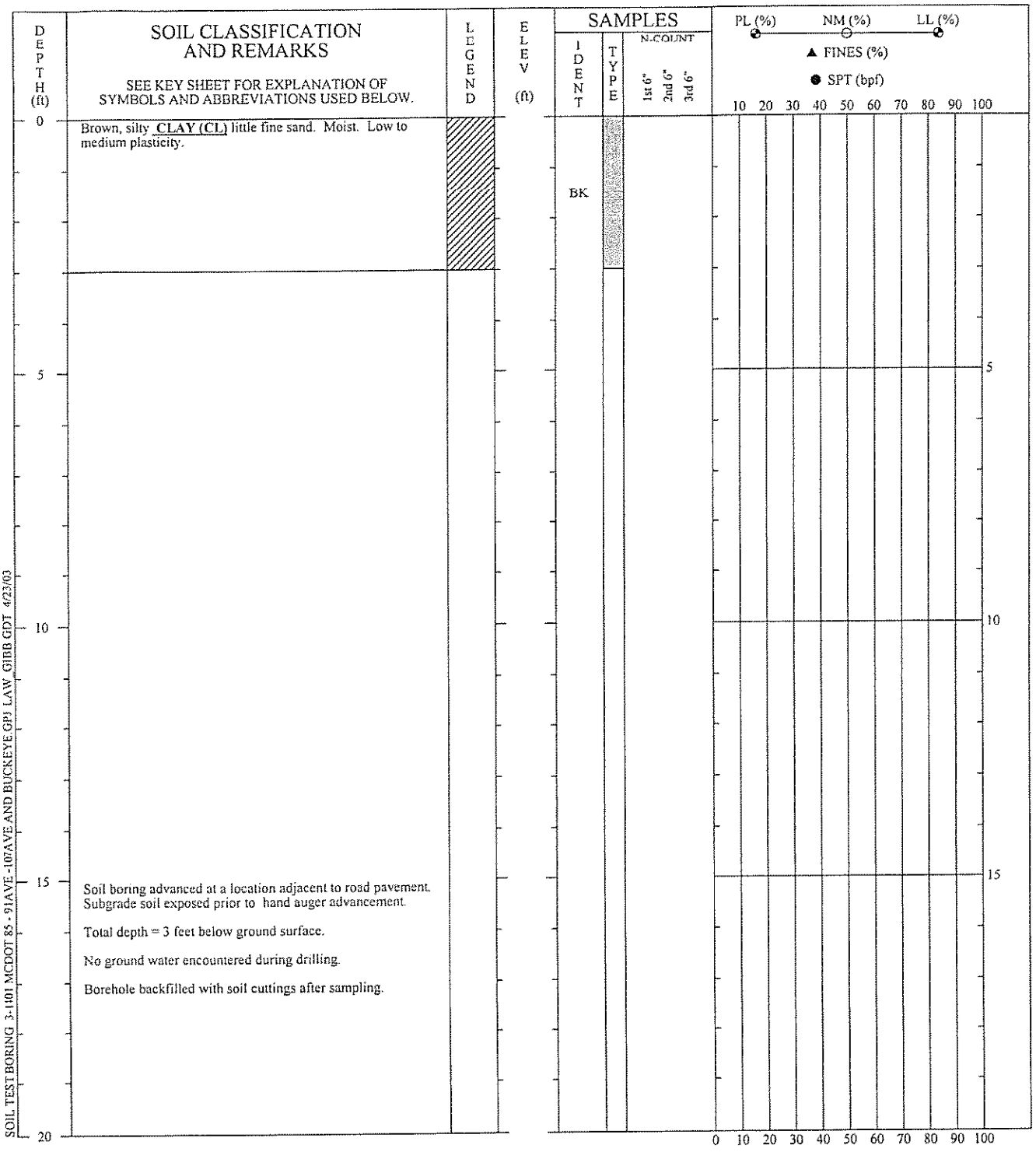

SOIL TEST BORING 3-1101 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GINB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	HA-3
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 20, 2003
PROJECT NO.:	4975-03-1401.01

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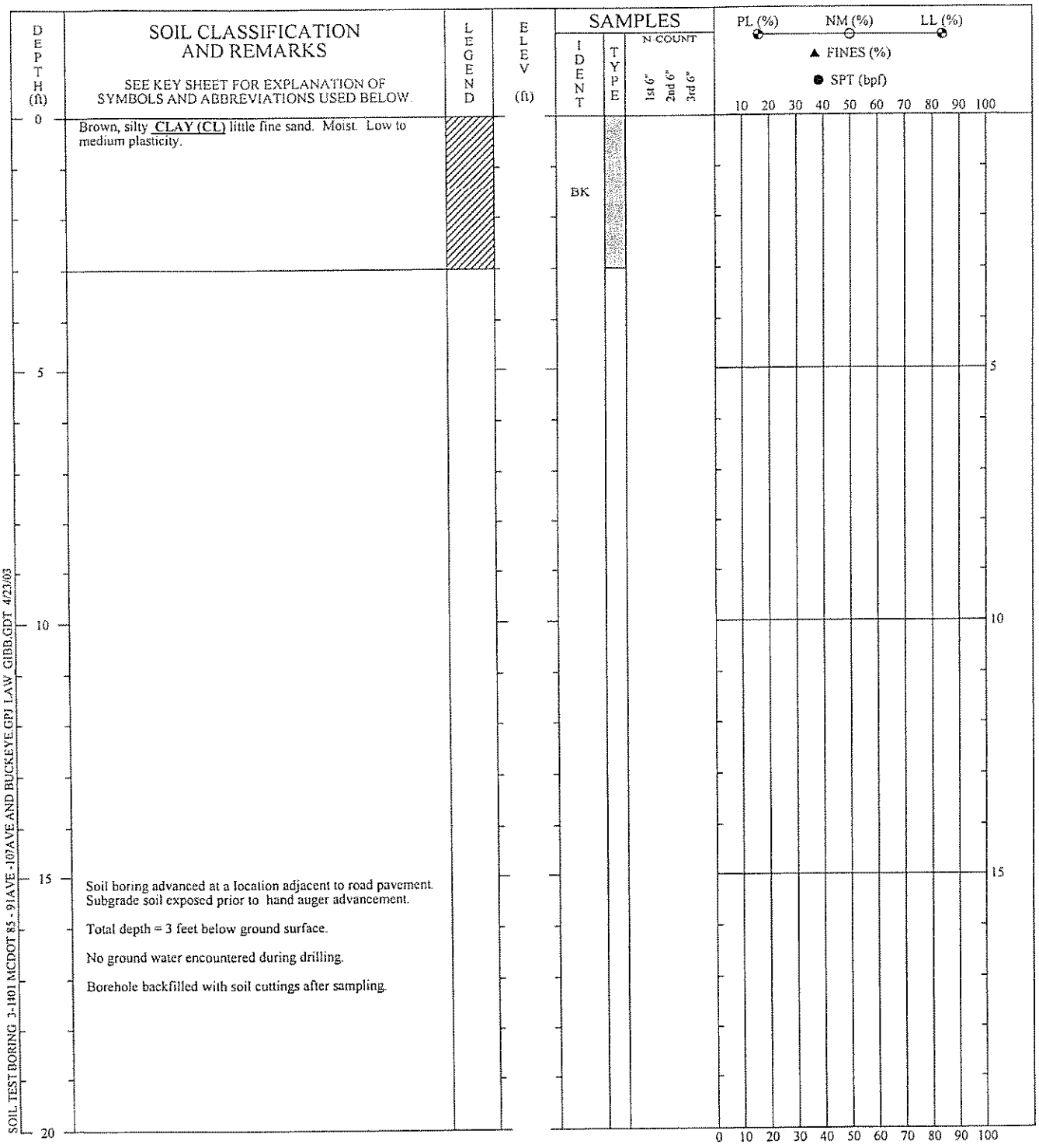


SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-4
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC

APPENDIX C-C

Excerpts from the DMJM Harris/AECOM Report

MC 85, 107TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA

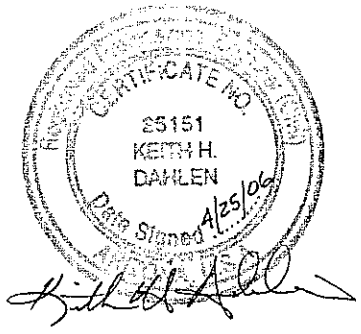
PAVEMENT DESIGN REPORT

Prepared for:

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

By

DMJM HARRIS | AECOM
2777 E. Camelback Road, Suite 200
Phoenix, AZ 85016



April 2006

DMJM Harris
2777 East Camelback Road, Suite 200, Phoenix, AZ 85016
T 602.337.2777 F 602.337.2620 www.dmjmharris.com

April 25, 2006

Mr. Sami Ayoub
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Re: Pavement Design Report
MC 85 (Buckeye Road), 107th Avenue to 91st Avenue
Maricopa County, Arizona
MCDOT Work Order 69024
DMJM Harris Project No. 6490.0000

Dear Mr. Ayoub:

DMJM Harris is pleased to present this Pavement Design Report to the Maricopa County Department of Transportation (MCDOT) for the above referenced project. This report details our scope of work, and includes the results of our investigation, design and test data obtained as part of the preliminary geotechnical investigation (Mactec, 2003) as well as recommendations for the design of pavements based on life cycle cost analyses of various alternatives for the section of MC 85 (Buckeye Road) between 107th Avenue and 91st Avenue and in Maricopa County, Arizona.

We appreciate the opportunity to provide geotechnical services to the MCDOT on this project. Should you have any questions concerning this report, please contact Keith Dahlen of our office at (602) 337-2596.

Sincerely,
DMJM Harris

Francisco J. Garza

Francisco Garza, E.I.T.

Reviewed by:

CERTIFICATE NO. 25151 KEITH H. DAHLEN Date Signed 4/25/06 ARIZONA, U.S.A.

Keith Dahlen, P.E.
Senior Geotechnical Engineer

cc: 6490.0005 505

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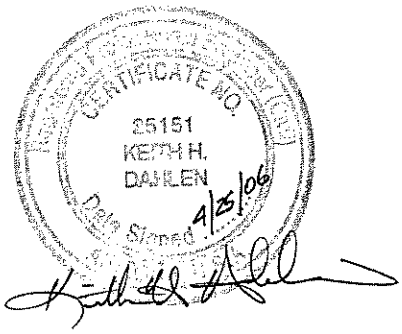
APPENDICES



1.0 INTRODUCTION

This Pavement Design Report is submitted subsequent to a subsurface investigation performed by DMJM Harris for the planned widening and improvement of a two-mile segment of MC 85, extending from 107th Avenue to 91st Avenue, and located within Maricopa County, Arizona. The Project Site Vicinity Map is shown in Figure 1. It is our understanding that the existing four-lane roadway with an intermittent center turn lane will be widened to a 6-lane road with a raised median. Given the existing roadway geometry, the majority of new construction will occur along the south side of MC 85 and along the widened edges of the cross-road pavements while reconstruction will take place along the existing MC 85 roadway and portions of the main cross roads to meet new pavement design sections and site profiles. Based on current design plans (DMJM Harris, 2005), the new profile of MC 85 will generally extend from 0 to 2 feet above existing pavement grades, with the low points located at or near the intersections at 107th, 99th and 91st avenue.

2.0 REVIEW OF EXISTING DATA

The pavement design recommendations presented herein are based in part on results from the *Preliminary Report of Geotechnical Evaluation*, (Mactec, Revised October 2003). DMJM Harris has conducted a review of this report and determined that it generally meets the specified MCDOT requirements for final design, relative to the field investigation and laboratory testing.

As-Built Plans were also reviewed as part of this investigation. The primary focus of the review was to determine the location of a 16-foot wide section of Portland cement concrete pavement (PCCP) that is known to underlie a portion of the MC85 asphaltic concrete (AC). MCDOT has considered leaving the PCCP in–place if it does not adversely impact the design or construction of the new MC 85. MCDOT requested that DMJM Harris perform additional coring through the existing MC 85 pavement to better define the location and condition of the existing PCCP.

3.0 PAVEMENT CORE INVESTIGATION

The pavement core investigation was supervised by Ammi Osorio, P.E., and Pancho Garza, E.I.T., of DMJM Harris. A total of sixteen pavement cores (C1 through C16) were advanced to depths ranging from 1.4 feet (17") to 3.2 feet (38") below ground surface using a Milwaukee 480 portable drill with 6-inch and 3-inch bits. The coring equipment is owned and operated by Concrete Coring Company, Inc. The coring was performed through the Asphalt Concrete (AC) layer using a 6-inch drill bit and the underlying PCCP layer, where encountered, using a 3-inch diameter bit. The majority of coring encountered Aggregate Base (AB) materials below the AC layer. Clay soil was encountered below the AB in Core C12. The AB material and clayey materials were excavated using hand tools. The thickness of each pavement layer was measured and the PCCP cores were sampled and stored. After the coring operation, each hole was backfilled with excess cuttings and the AC core replaced with cold patch.

The preliminary investigation (MACTEC, 2003) included advancing a total of eleven test borings to depths of 10 feet along the existing MC 85 alignment. A Site Plan (three sheets), which indicates the DMJM Harris pavement core locations and Mactec test boring locations is included in Appendix A.

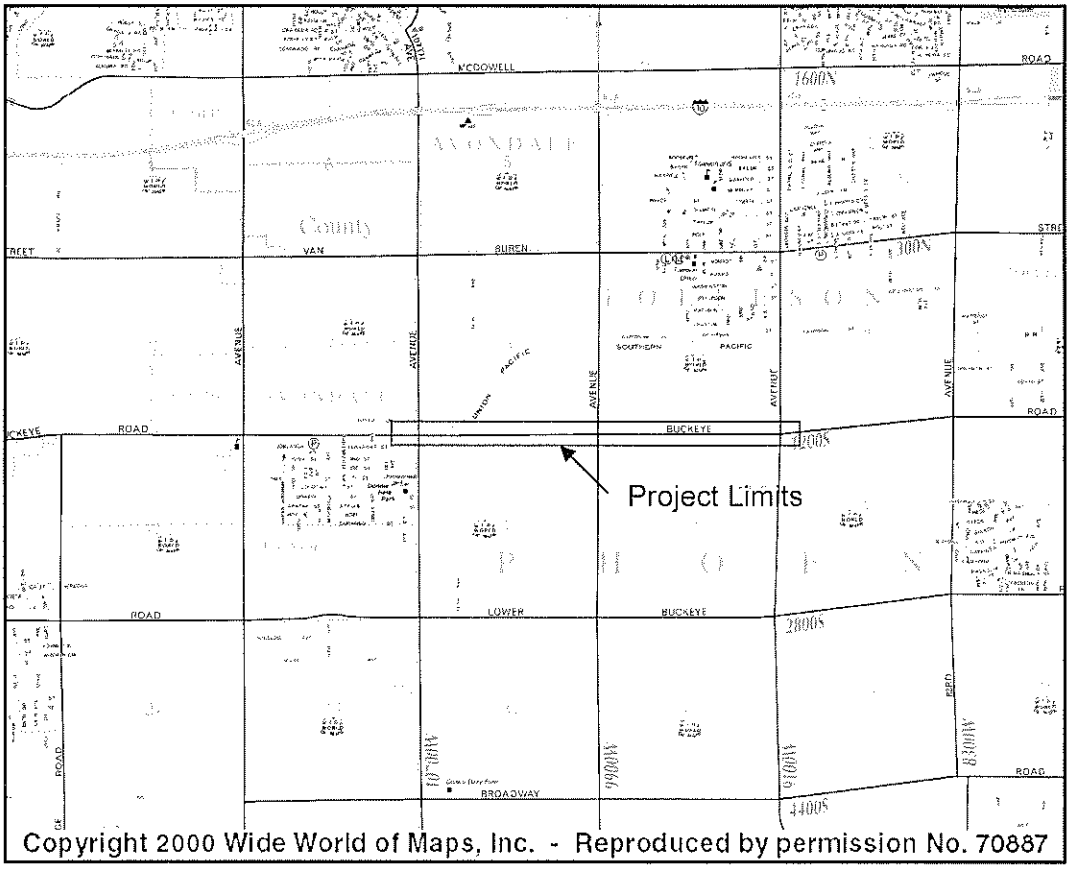


Figure 1: Project Vicinity Map

North

4.0 SITE DESCRIPTION

Development within the vicinity of the MC 85 roadway is a mixture of newer warehouse buildings to the north, and residential use mixed with agricultural farm land to the south. The area has historically been primarily agricultural. The area is generally flat with a gentle regional slope to the southwest. The MC 85 pavement surface is sloped such that drainage is directed toward the shoulders.

Within the project limits, MC 85 (Buckeye Road) consists primarily of two 12-foot wide travel lanes in each direction with 8- to 12-foot wide gravel shoulders and a 12-foot wide center turn lane at various locations. At the time of the field investigation, the existing pavement section appeared to be in fair to good condition. Some light, generally widely spaced cracking was noted and occasional potholes were observed in the roadway.

Major intersections are located at 107th Avenue, 99th Avenue and 91st Avenue within the project limits. Currently, each intersection consists of two lanes in each direction with a left turn lane. Projected traffic data indicates a large increase in traffic volume after the year 2015 due to a planned I-10 reliever to the south of MC 85. The increased traffic volume will result in the 99th Avenue intersection expanding to 3 lanes at the intersection.

5.0 EXISTING MC 85 PAVEMENT SECTION CONDITIONS

The 16-foot wide PCCP section, centered approximately on the existing Section Line, was encountered below the existing roadway in all but five of the core holes (C1, C2, C8, C10 and C12). The field investigation indicated that the AC pavement section varies from 4 inches to 12 inches, with an average depth of 10 inches. The aggregate base (AB) material underlying the AC ranges in thickness from 5 inches to 14 inches. The underlying PCCP ranges in thickness from 6 inches to 7 inches. In Cores C2 and C3, a 4-inch AC layer was encountered under the AB layer. A summary of the pavement sections encountered within the DMJM Harris cores and MACTEC borings is included as Table 1.

Based on the preliminary test borings, the site is generally underlain by finer-grained clayey soils. This medium to highly plastic and moderately expansive material was encountered in all the test borings advanced during the preliminary investigation.

**Table 1 – Summary of Existing MC 85 Pavement Conditions
Based on Preliminary Test Drilling and Final Investigation Pavement Cores**

Final Investigation (DMJM Harris, 2005)						Preliminary Investigation (Mactec, 2003)					
Core ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)	Bore ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)
C1	1136+00	7' Lt	12.1	12.0	-	B-11	1133+80	20' Lt	5.0	19.0	-
C2	1144+00	2.5' Lt	5.0	7.0[2]	-	B-10	1143+70	10' Lt	6.0	12.0	-
C3	1150+00	2.5' Rt	4.0	5.0[2]	7.0	HA-4	1143+65	35' Rt	-	-	-
C4	1156+00	3' Lt	9.0	7.0	6.0	B-9	1152+75	10' Rt	4.0	6.0	12.0
C5	1163+00	2.5'Rt	8.0	9.0	7.0	B-8B	1163+45	5' Lt	5.0	5.0	12.0
C6	1170+00	3' Lt	10.0	9.0	6.0	B-8A	1163+45	5' Lt	5.0	5.0	12.0
C7	1177+00	3' Rt	11.0	11.0	6.0	HA-3	1173+25	25' Rt	-	-	-
C8	1183+00	8' Lt	13.0	13.0	-	B-7	1173+50	20' Rt	5.0	12.0	-
C9	1190+00	2.5' Lt	12.0	12.0	7.0	HA-2	1185+90	45' Lt	-	-	-
C10	1197+00	14' Lt	9.5	26.5	-	B-6	1185+75	30' Lt	3.0	12.0	-
C11	1203+00	6.5' Rt	10.0	14.0	7.0	B-5	1196+00	5' Rt	5.0	25.0	6.0
C12	1209+00	3' Lt	12.0	5.0	-[3]	B-4	1206+30	15' Lt	7.0	11.0	-
C13	1217+00	2.5' Rt	9.0	11.0	7.0	B-3	1216+40	15' Rt	5.0	25.0	-
C14	1220+00	3' Rt	9.0	12.0	6.0	B-2	1225+20	30' Lt	5.0	25.0	-
C15	1227+00	6.5' Rt	8.0	13.0	6.0	HA-1	1233+60	30' Rt	-	-	-
C16	1234+00	3' Rt	12.0	6.0	6.0	B-1	1233+40	15' Rt	3.0	21.0	-

[1]: MC 85 Existing Centerline (Section Line)
[2]: 4-inch AC encountered underlying AB
[3]: Clay soil encountered underlying AB to a depth of 3.2' (38")

6.0 PAVEMENT SECTION ANALYSIS AND RECOMMENDATIONS

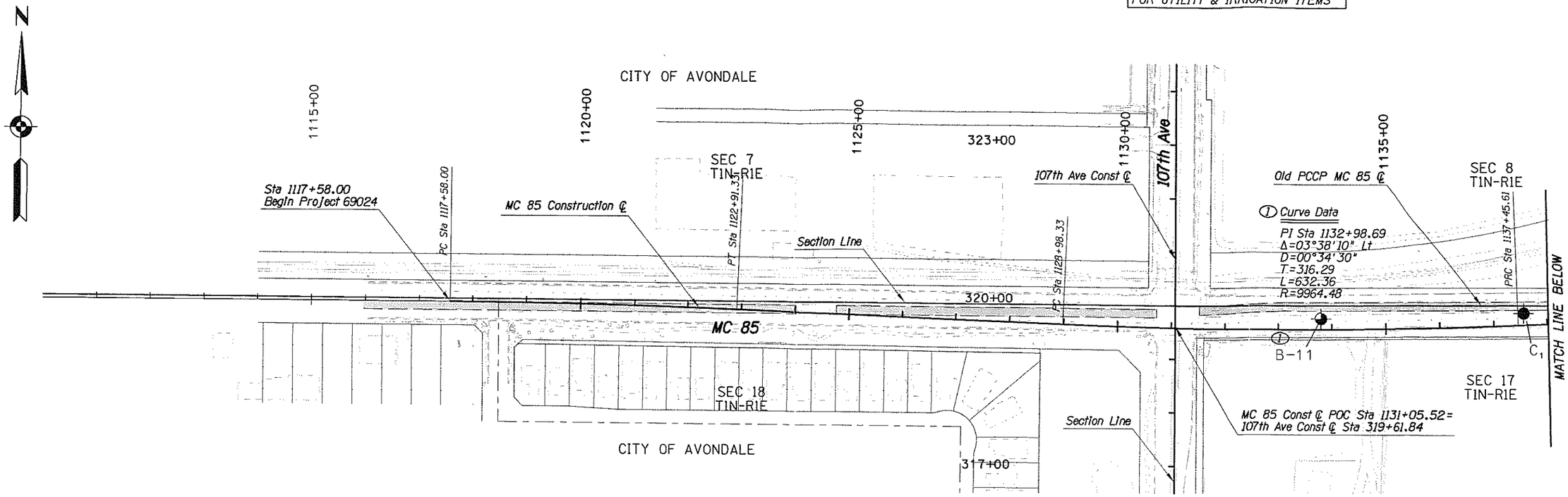
6.1 SUBGRADE MODULUS

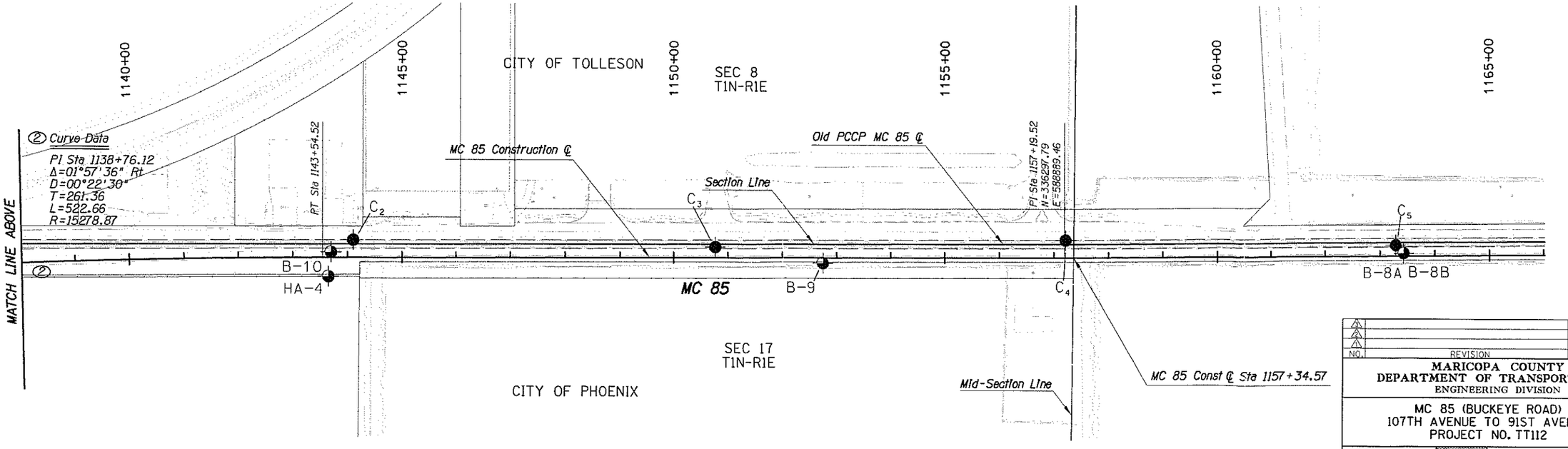
The pavement section analysis was performed using the *MCDOT Pavement Design Guide* (2004). This design method utilizes the American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures (1993) as the design standard for asphalt pavement structures in Maricopa County. A combination of laboratory correlated R-values and actual R-values are used for the determination of the subgrade modulus.

Laboratory testing for this project was performed by MACTEC (2003). The testing included grain-size analysis, and Atterberg limits testing (plasticity index) for calculation of correlated R-values (in accordance with Table 202.02-3 of ADOT, 1993) and actual R-value tests. Actual R-value tests were performed on four near-surface bulk samples. Grain-size analysis and Atterberg limits (plasticity index) tests, for determination of correlated R-values were performed on near surface samples as well. Based on the average correlated and actual test R-values indicated above and respective standard deviation values of 4.9 and 5.7, a design R_{mean} value of 15.6 is determined. The R_{mean} value, based on Figure 202.02-2, and a Seasonal Variation Factor (SVF) of 1.0 (determined for Phoenix, Arizona from Table 202.02-4), provides the maximum limiting value for resilient modulus (M_r) of 9,830 pounds per square inch (psi).

APPENDIX A – SITE PLAN

SEE UTILITY & IRRIGATION SHEETS
FOR UTILITY & IRRIGATION ITEMS





Legend

- DMJM Harris Coring (April/May 2005)
- Mactec Boring (March 2003)

SCALE: Horz 1"=100'

100 0 100 200

SCALE IN FEET

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. TT112

PRELIMINARY
90%
Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGNED	CCD/BWS	4/06
DRAWN	RPG	4/06
CHECKED	RLB	4/06

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 1 OF 3

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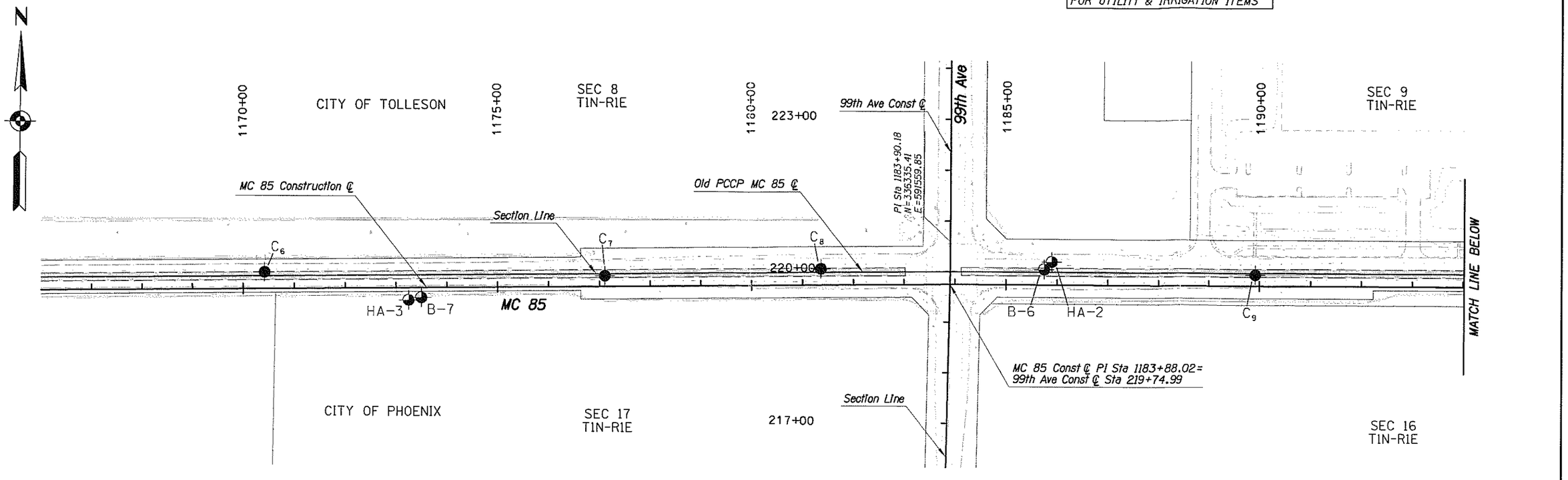
SEE UTILITY & IRRIGATION SHEETS FOR UTILITY & IRRIGATION ITEMS



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- DMJM Harris Coring (April/May 2005)
- Mactec Boring (March 2003)

SCALE: Hor=1"=100'

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SCALE IN FEET

NO.	REVISION	BY	DATE

MARICOPA COUNTY
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DESIGNED	CCD/BWS	4/06
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DMJM HARRIS | AECOM
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PHOENIX, AZ. 85016-4302
(602) 337-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 2 OF 3

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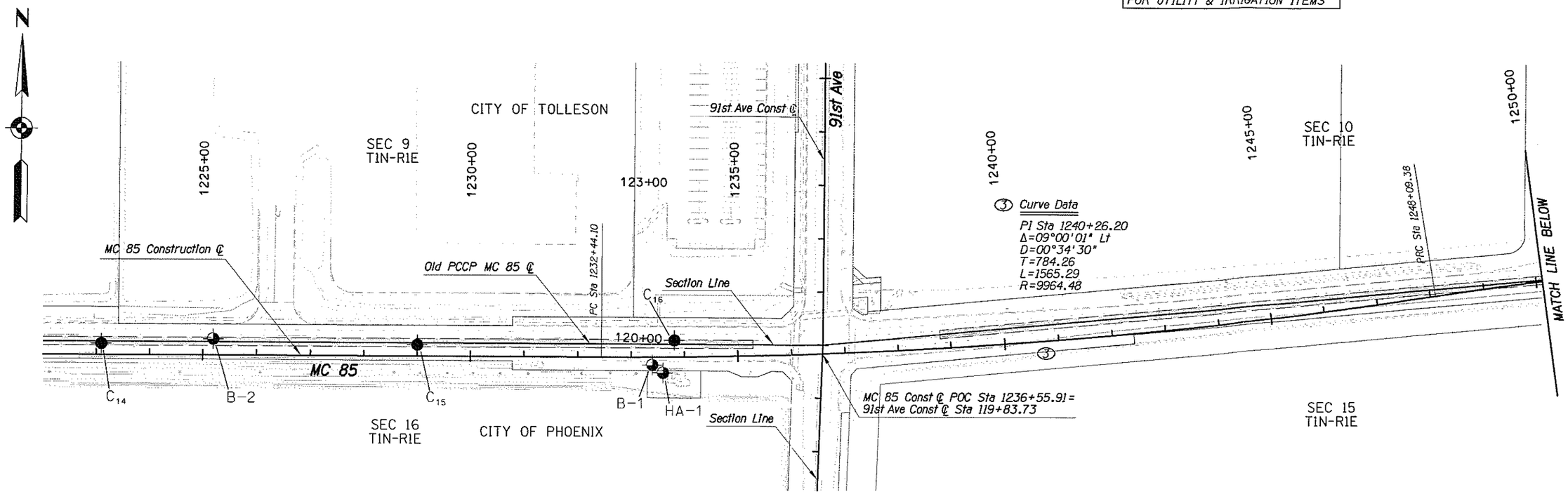
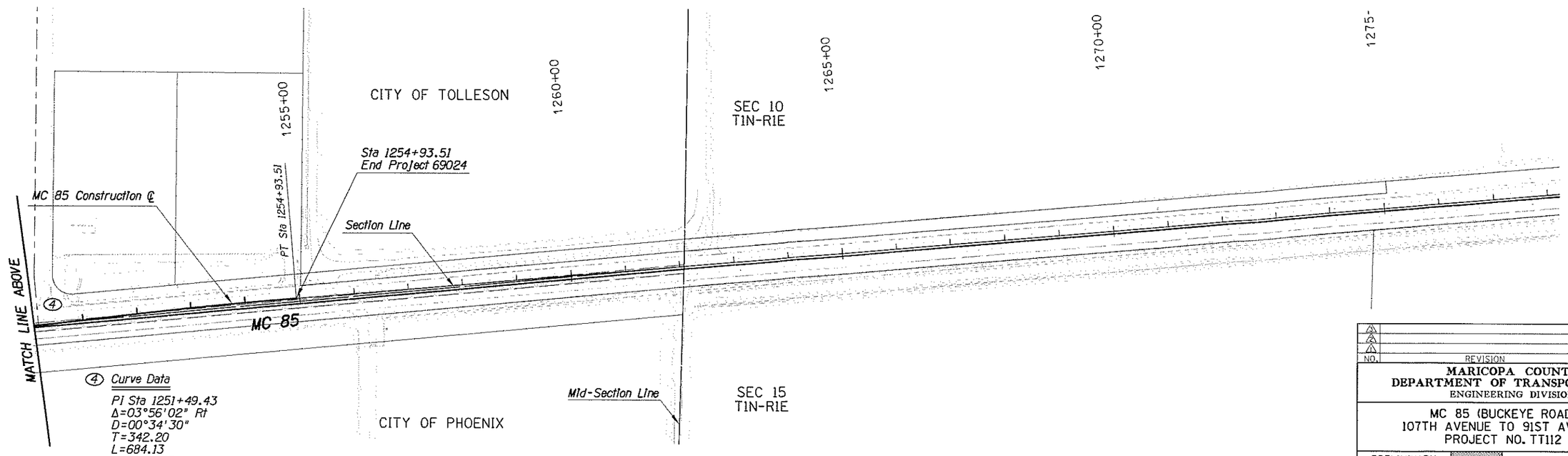
SEE UTILITY & IRRIGATION SHEETS
FOR UTILITY & IRRIGATION ITEMS





Legend

- DMJM Harris Coring (April/May 2005)
- Mactec Boring (March 2003)

SCALE: Hor=1"=100'

100 0 100 200

SCALE IN FEET

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. TT112

PRELIMINARY
90%
Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGNED	CCD/BWS	4/06
DRAWN	RPG	4/06
CHECKED	RLB	4/06

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
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(602) 331-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 3 OF 3

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SECTION 5

STORM DRAIN EXPLORATION

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APPENDIX SD-B

5 STORM DRAIN EXPLORATION

5.1 GENERAL

A storm drain line is proposed at the site generally located along the southern portion of the eastbound lanes. The site plans indicate the storm drain line extends along MC-85 at depths ranging from 4 to 12 feet along the southern portion of the roadway alignment. The storm drain line is anticipated to be generally located under future eastbound travel lanes or the eastbound shoulder areas. Kleinfelder performed a geotechnical exploration in general accordance with Section 6.4.5 (Soils Investigation for Storm Drains) of the City of Phoenix Storm (COP) Water Policies and Standards (April 2011). Based on meetings between MCDOT and COP and due to previous work performed at the site, the frequency of the borings for the storm-drain line was reduced to one boring every ¼-mile. The Kleinfelder field exploration included 18 borings to depths generally ranging from approximately 10 to 15 feet with occasional practical refusals at shallower depths. We understand the proposed storm-water line will exclude metal piping; therefore, our field exploration excluded field electrical resistivity testing.

The previous work performed at the site includes the following reports:

- *MACTEC Report of (Preliminary) Geotechnical Evaluation, MC85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona* (MACTEC Project No. 4975-03-1401, dated June 17, 2003 and revised October 23, 2003).

- *Ninyo and Moore (N&M), Geotechnical Evaluation, MC-85 Roadway Improvements, 75th Avenue to 91st Avenue, Maricopa, Arizona* (N&M Project No. 601301002, report dated September 28, 2010).

These two previous reports in their entirety are included as an appendix in the subsequent Pavement Structure Design Section of this report. These previous reports include additional information such as subsurface condition descriptions, boring logs, and soil corrosion characteristics. The data in these previous reports should be used to supplement the information presented in this section.

5.2 FIELD EXPLORATION

Prior to our field exploration, Kleinfelder staked the boring locations, cleared work areas with the Arizona Bluestake Center, obtained a MCDOT right-of-way permit (Tracking No. TC20120646), and subcontracted Highway Technologies, Inc. (HT) to submit a traffic control plan to MCDOT for borings located less than 20 feet away from the edge of pavement. The traffic control plan was approved by MCDOT on October 30, 2012. We notified a MCDOT inspector 24 hours prior to our field work. Traffic control for the project was provided by HT in general accordance with the approved traffic control plan.

The exploratory borings were supervised from October 30th to November 1st, 2012 by Rollina Katako, E.I.T. of Kleinfelder. The subsurface soil conditions at the site were explored by drilling a total of 18 borings (designated as SD1 through SD13, SD15 through SD17, and F1 and F2). The borings were drilled along the southern portion of the existing MC-85 alignment, on either the adjacent agricultural land or on the roadway eastbound shoulder. Due to constraints of existing utilities and private property access restrictions, Boring SD14 was excluded from our field work. The approximate locations of the borings are shown on Figures SD-1 through SD-4 (Storm Drain Exploration Site Plans).

The borings were drilled with a truck-mounted D-120 drill-rig and crew supplied by D&S Drilling, Inc. The borings were drilled using 8-inch outer diameter (OD) hollow-stem augers to depths generally ranging from about 10 to 15 feet below the existing ground surface (bgs). As an exception, practical auger refusals were encountered at depths of approximately 5 feet bgs at the location of Borings SD12 and SD15.

During the field exploration, the soils encountered were visually classified, logged, and sampled by Kleinfelder's field engineer. Relatively undisturbed samples of the subsurface materials were obtained using a ring sampler with a 2.42-inch inside diameter (ID) and 3-inch OD. Disturbed samples of soils were obtained using a standard penetration test (SPT) split spoon sampler with a 1.375-inch ID and 2-inch OD. Bulk samples of drill cuttings were also collected at selected depths from the borings. The SPT and ring samplers were driven 18 and 12 inches, respectively, using a hydraulic actuated 140-pound hammer free falling 30 inches. Unless noted otherwise on the boring logs, the sample driving resistance was recorded as number of blows per six inches of penetration. The penetration results are presented on the borings logs adjacent to each sample. The recovered soil samples were removed from the sampler, sealed

to reduce moisture loss and submitted to the laboratory. The borings were backfilled with auger cuttings. The logs of the exploratory borings are presented in Appendix SD-A.

5.3 LABORATORY TESTING

Selected laboratory tests were performed on representative samples recovered from the field exploration to support our field classification and to provide information regarding engineering characteristics and properties of the subsurface soils. The laboratory testing program consisted of the following:

Table 5.3-1 Laboratory Testing Program

Laboratory Test	Sample Type	Number of Tests	Purpose of Test
Sieve Analysis (ASTM C136)	Bulk	20	Soil Classification
Atterberg Limits (ASTM D4318)	Bulk	20	Soil Classification
R-Value (ASTM D2844)	Bulk	6	Subgrade Support Characteristics
Standard Proctor (ASTM D698)	Bulk	7	Compaction Characteristics
Remolded Swell (ASTM D4546)	Bulk	7	Expansion Potential of On-Site Soils
Sulfates and Chlorides (Ariz 733/736)	Bulk	34	Soil Corrosion Characteristics
Moisture/Density* (ASTM D2216/D2937)	Ring	22	In-Situ Density and/or Moisture Conditions

* Dry density and moisture content information is presented on the boring logs.

The results of the laboratory tests are presented on the laboratory test data sheets in Appendix SD-B. The laboratory test results are also summarized on the boring logs in Appendix SD-A.

5.4 GENERAL SITE CONDITIONS

5.4.1 SURFACE CONDITIONS

At the time of our field exploration along MC-85, the site consisted of an asphalt concrete (AC) paved roadway divided into 2 travel lanes each way with graded dirt shoulders and occasional developed areas with curb, gutter, sidewalks and landscaping. The lanes along the site alternated between 5 lanes (2 lanes each way with a center median/turn lane) and 4 lanes (2

lanes each way) with the center median/turn lane transitioning from a full width center turn lane to just a stripe dividing the east and west travel lanes. The following are two pictures of MC-85 (Buckeye Road) taken at each end of the site facing east and west along the south side of the roadway.

Picture 1 – Near 107th Ave.; Facing East

Picture 2 – Near 75th Ave.; Facing West

5.4.2 SUBSURFACE CONDITIONS

The subsurface profiles encountered at the boring locations were found to be relatively similar. Individual boring logs with detailed descriptions are presented in Appendix SD-A of this report.

At the location of Borings SD1, SD3 through SD11, SD17, F1 and F2, the surface and/or near surface soils consisted of native deposits of fine-grained soils that included sandy lean clays (CL), lean clay with sand (CL), or (at the location of Boring F2) fat clay (CH). These soils generally exhibited plasticities in the medium to high ranges with relative firmness in the soft to very firm range (generally increasing with depth), and they contained no to weak calcium carbonate cementation (caliche). Beginning at depths ranging from approximately 5 to 13 feet bgs and extending to the final depths of exploration (about 10 to 15.5 feet bgs), the clay soils were generally underlain by deposits of silty sand (SM), clayey sand (SC), silty clayey sand (SC-SM), and sandy silt (ML). These subsurface coarser materials exhibited plasticities in the no to low range with relative densities generally in the loose to medium dense range, and contained no to weak cementation. At the location of Borings SD8 through SD11 and F2, clayey sand (SC) or clayey gravel (GC) fill soils were encountered in the upper roughly 1 to 5 feet bgs.

At the location of SD2, SD13 and SD16, the surface and/or near surface soils consisted of native deposits of clayey sand (SC). These soils exhibited low plasticity, loose relative densities, and contained no to weak cementation. Beginning at depths ranging from approximately 4 to 5 feet bgs and extending to the final depths of exploration (about 10 to 15.5 feet bgs), the clayey sands were underlain by: silty clayey sand (SC-SM) followed by poorly graded sand (SP-SM) at Boring SD2; lean clay (CL) followed by sandy clayey silt (CL-ML) and clayey sand (SC) at Boring SD13; and sandy lean clay (CL) at Boring SD16. These subsurface materials exhibited plasticities in the no to medium range, had relative densities generally in the loose to very dense range (coarse-grained soils), had relative firmness in the soft to firm range (fine-grained soils), and contained no to weak cementation. At the location of Boring SD13, silty sand (SM) fill soils were encountered in the upper roughly 2 feet bgs.

At the location of Borings SD12 and SD15, sandy lean clay (CL) and clayey sand (SC) fill soils were encountered to depths of about 5 feet bgs, where the borings were terminated prematurely due to practical auger refusals on very dense/hard materials. These subsurface fill materials exhibited plasticities in the medium range, had relative firmness in the firm to hard range (fine-grained soils), and had relative densities generally in the medium dense to very dense range (coarse-grained soils).

As previously mentioned, Boring SD14 was not drilled due to constraints of existing utilities and private property access restrictions.

Groundwater was not encountered within the borings to the depths explored. It is possible that variations in groundwater elevations may occur due to seasonal changes, run-off, precipitation, perching, and irrigation and/or construction activities. In general, it is not expected that groundwater would impact construction of this project.

5.5 EXCAVATION CHARACTERISTICS

The following general comments regarding excavation conditions are based on boring data. Based on the subsurface conditions encountered, excavations within the upper roughly 4 to 12 feet bgs should be possible using conventional earth excavating equipment. At the location of Borings SD12 and SD15, practical auger refusal occurred at depths of about 5 feet bgs; therefore, areas across the site may require heavier excavating equipment. We recommend that the

earthwork contractor make his own assessment to satisfy himself as to the type of equipment required to excavate through these deposits.

Based on our field observations and test results, temporary excavations in native soils may be cut at an inclination no steeper than 1.5:1 (horizontal:vertical). All excavations should be planned and executed in accordance with current OSHA recommendations for a Type C soil (Federal Register 29 CFR Part 1926) and applicable local governing agency standards and procedures. Slopes may need to be further flattened or shored based on conditions encountered during construction. All parties should understand that safety of construction personnel is the sole responsibility of the Contractor. If trench shoring is used, the Engineer of Record should review shoring designs and soil parameters utilized by the shoring designer.

All construction surcharge loads and traffic loads should be kept a distance equal to the depth of the excavation away from the edge of the trench excavations, unless specifically designed for in the shoring design.

5.6 PRELIMINARY SOIL CORROSION CHARACTERISTICS

Corrosivity levels of selected samples were evaluated by laboratory methods including sulfate and chloride contents. The corrosivity tests were performed by Kleinfelder's subcontracted laboratory, Motzz Laboratories, Inc. (Motzz) of Phoenix, Arizona. Results of laboratory tests performed on selected samples are presented in Appendix SD-B.

Based on the laboratory results, sulfate (SO_4) contents range from 28 to 1,098 ppm (or 0.0028 to 0.1098 percent). According to the 2009 Edition of the IBC, which refers to provisions in the American Concrete Institute (ACI) 318, Sections 4.2 and 4.3, results less than 0.1 percent indicate a negligible level of sulfate exposure; and results between 0.1 and 0.2 percent indicate a moderate level of sulfate exposure. Based on these results, concrete in contact with site soils with similar sulfate concentrations should be formulated to resist a moderate sulfate exposure as defined by ACI 318, which recommends Type II Portland cement. Laboratory test results show chloride contents range from 15 to 512 parts per million (ppm).

We recommend that the results of our laboratory testing be reviewed by a person or firm experienced in corrosion protection designs for the actual construction at the site,

and/or by the appropriate pipe or material manufacturer. A corrosion specialist should be consulted if a detailed evaluation is necessary, and/or if corrosion protection recommendations are needed.

The laboratory test results presented in this section are based on limited data obtained from borings sampled at the time of our field exploration. It is possible that conditions could vary between or beyond the data evaluated. These results are general in nature and may not be representative of overall site conditions, particularly the actual backfill conditions.

5.7 PIPE BEDDING

The clay site soils contain a significant amount of fines and are not suitable for use as pipe bedding. Therefore, pipe bedding that may be required at the site will likely consist of imported granular materials. Where pipe bedding is comprised of open graded gravels (e.g., crushed rock, pea gravel or similar), a filter fabric may be required between the bedding and the backfill soils to prevent the migration of fines into the bedding materials. Pipe bedding should meet the specifications of the storm drain pipe manufacturer.

5.8 ENGINEERED FILL

Engineered (compacted) fill used to backfill the storm-drain excavation areas should be inorganic soils (site derived or imported) with equal or better support characteristics than those materials which were encountered by Kleinfelder. The on-site soils encountered at the storm drain borings generally consisted of lean sandy clays and clayey sands with medium plasticities, which are suitable to be used as engineered fill for the storm drain line backfill. On-site soils excavated from the storm drain excavation areas may be used as engineered fill as approved by the geotechnical engineer provided the engineered fill soils are free of vegetation, organics, debris, and contain no rocks or clumps larger than 4 inches nominal diameter.

5.9 SITE GRADING

The following site grading recommendations are intended to provide support for roadway structures overlying the storm drain line at the site. Therefore, the grading activities at the site should be performed under observation and testing directed by the geotechnical engineer.

Trash, debris, vegetation (including roots) and other organics, any existing spread fill, any unstable (soft, loose, disturbed, water softened, etc.) soils, and other deleterious materials should be removed from proposed storm drain areas prior to construction. All areas of excavation should be observed and approved by a representative of the geotechnical engineer after clearing and before any filling operations begin at the site.

The storm drain excavations should extend completely through any existing fill, backfill, disturbed soils, or other unsuitable material. Excavations or irregular terrain should be widened to accommodate compaction equipment and provide a level base for placing fill. The exposed native soils at the base of the excavation should be proof-rolled under the direct supervision of the geotechnical engineer. Following the approval of the geotechnical engineer, the cleared or over-excavated area should be backfilled with approved on-site or imported structural fill soils compacted as recommended in the following section. Fill placed on existing structural fill or natural slopes steeper than 5H:1V should be keyed and benched into the existing slope.

5.10 FILL PLACEMENT AND COMPACTION

Moisture conditioned on-site or imported structural fill materials should be placed in 6 to 8-inch thick loose lifts and compacted to elevate the site to specified finished grade. The materials should be uniform with respect to material type and moisture content. The moisture content should be maintained until covered by the placement of the next lift. Care should be taken to avoid damaging the storm drain pipe during compaction efforts.

In proposed storm drain excavation areas, the lifts of approved on-site or imported engineered fill soils placed at depths greater than 5 feet below finished subgrade should be moisture conditioned within 2 percent of optimum moisture content, and uniformly compacted to a minimum of 100 percent of their maximum dry density as determined by ASTM D698. Engineered fill soils placed within the upper 5 feet below finished subgrade should be moisture conditioned within 2 percentage points from their optimum moisture content, and be uniformly compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D698.

Observation and testing should be performed as necessary in order to meet the project requirements and the recommendations presented in this report.

FIGURES

N

0 200 400 800

APPROXIMATE SCALE (feet)

EXPLANATION

APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

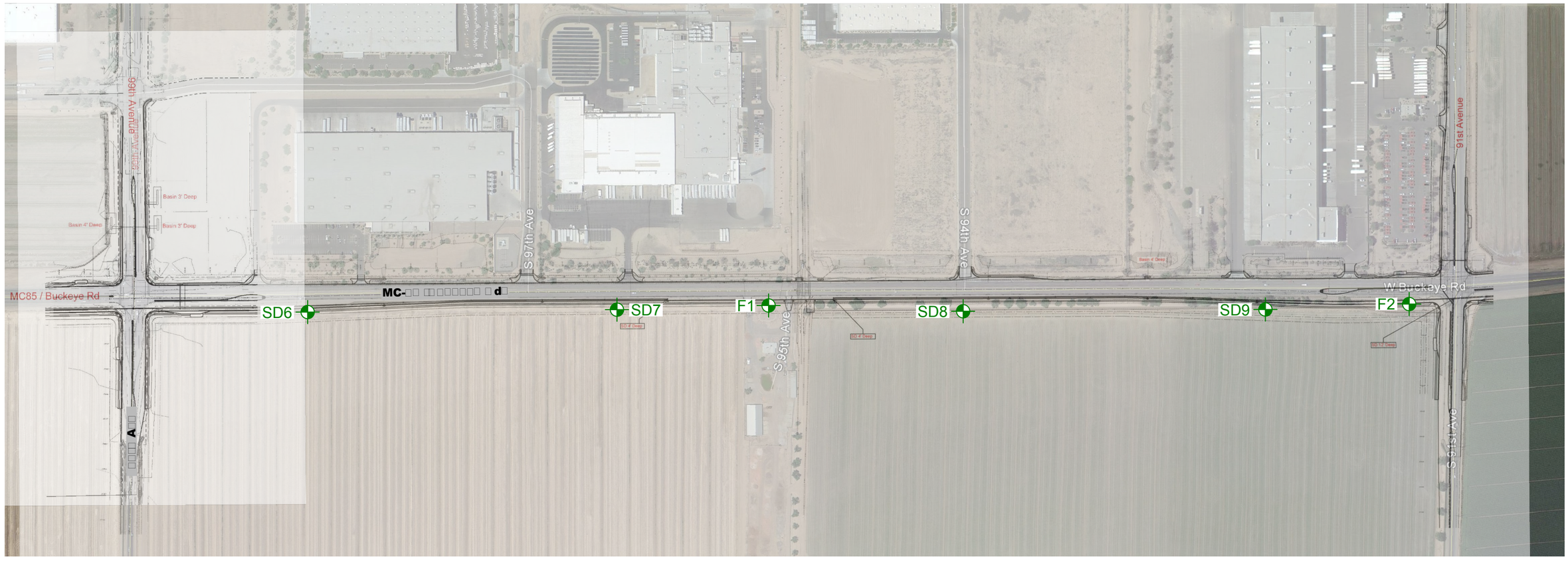
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigSD-1 to SD-4.dwg

STORM DRAIN EXPLORATION SITE PLAN

MC-85 (BUCKEYE ROAD)
FROM 107TH TO 99TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
SD-1



N

0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigSD-1 to SD-4.dwg

ST□ □M □□AIN E□ P□□□ATI□ N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 99TH TO 91ST AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
S□ -□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images
ATTACHED XREFS:
LONG BEACH, CA
CAD FILE: L:\CADD\2012\129067\StormDrainExplor-SP_11-2012\ LAYOUT: SD-2 PLOTTED: 03 Dec 2012, 1:38pm, MGriffin

N

0 200 400 800

APPROXIMATE SCALE (feet)

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E□ P□ANATI□ N

APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigSD-1 to SD-4.dwg

ST□ □M □□AIN E□ P□□ □ATI□ N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 91ST AVENUE TO 83RD AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
S□ -□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images
ATTACHED XREFS:
LONG BEACH, CA
CAD FILE: L:\CADD\2012\129067\StormDrainExplor-SP_11-2012\ LAYOUT: SD-3 PLOTTED: 03 Dec 2012, 1:39pm, MGriffin

N

0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	11/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigSD-1 to SD-4.dwg

ST□ M □□AIN E□ P□□ □ATI□ N SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 83RD AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
S□ -□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_75th.jpg
ATTACHED XREFS:
LONG BEACH, CA
CAD FILE: L:\CADD\2012\129067\StormDrainExplor-SP_11-2012\ LAYOUT: SD-4 PLOTTED: 04 Dec 2012, 10:46am, mgriffin

APPENDIX SD-A

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LESS THAN 5% PASSING NO. 200 SIEVE	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LESS THAN 5% PASSING NO. 200 SIEVE	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing No. 200 sieve require dual USCS symbols. (See KEY A3 if provided)

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Report Date:	Project Number:
December 2012	129067

UNIFIED SOIL CLASSIFICATION SYSTEM

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A1

GEO-KEY_A1_SOIL 129067 MC-85.GPJ 12/06/12

LOG SYMBOLS

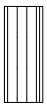
BULK / GRAB SAMPLE

MODIFIED CALIFORNIA SAMPLER
(2 inch inside diameter)

RING (PORTER) SAMPLER
(2-1/2 inch inside diameter)

STANDARD PENETRATION
SPLIT SPOON SAMPLER
(1.4 inch inside diameter)

SHELBY TUBE
(3 inch outside diameter)



HQ-3 SIZE CORE BARREL
(2.4 inch inside diameter)

WATER LEVEL
(level after completion)

WATER LEVEL
(level where first encountered)

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.
5. NA = Not Analyzed

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Report Date:	Project Number:
December 2012	129067

LOG KEY

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

A2

GEO-KEY_A2_LOG 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.4353° Longitude: -112.28745°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.5 feet Agricultural field - alfalfa
			18/12		109	13	39	22	99	68	Max Dry Dens = 113.8pcf Opt Moist = 15.6% Swell = 1.4% R-value = 17 Sulfates = 77 ppm Chlorides = 216 ppm		CL	**SANDY LEAN CLAY:** brown to light brown, firm, medium plasticity, no cementation, trace gravel, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
	5		3-4-4								Sulfates = 75 ppm Chlorides = 96 ppm			Note: soft to moderately firm below about 5 feet.
			4-4-4										SM	**SILTY SAND:** brown, loose, non-plastic, no cementation, slightly damp to damp.
	10													Stopped drilling at 9.0 feet. Stopped sampling at 10.5 feet. No groundwater encountered in test boring. Cave-in to 6.0 feet.
	15													
	20													

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LOG OF BORING SD1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A3

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43534° Longitude: -112.28551°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet
														Graded dirt shoulder - Buckeye Road
			3-3-3	7 6 7			23	8	97	47			SC	**CLAYEY SAND:** brown to light brown, loose, low plasticity, no cementation, slightly damp to damp, upper roughly 12 inches disturbed by previous grading.
	5		3-3-3	6 7 6							Sulfates = 207 ppm Chlorides = 129 ppm Sulfates = 156 ppm Chlorides = 201 ppm		SC-SM	**SILTY, CLAYEY SAND:** brown, loose, low plasticity, no cementation, trace gravel, damp.
			25/12	9 8 11	108	8	26	6	98	32	Sulfates = 81 ppm Chlorides = 54 ppm			Note: medium dense and fine to coarse grained below about 9 feet.
	10												SP-SM	**POORLY GRADED SAND with SILT:** brown to light brown, medium dense, non-plastic, no cementation, trace gravel, slightly damp to damp.
	15		7-8-10											Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING SD2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A4

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43546° Longitude: -112.28084°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.5 feet Agricultural field - cut corn
			4-4-6	8 9 13 14 15			45	28	98	66			CL	**SANDY LEAN CLAY:** brown to light brown, moderately firm, medium to high plasticity, no cementation, trace gravel, slightly damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
5			29/12	11 11 15 20	111	13					Sulfates = 73 ppm Chlorides = 118 ppm		SC	**CLAYEY SAND:** light brown to tan, medium dense, low plasticity, no to weak cementation, slightly damp, with calcareous veins.
10			3-4-4										SM	**SILTY SAND:** brown to light brown, loose, non-plastic, no cementation, slightly damp.
15														Stopped drilling at 9.0 feet. Stopped sampling at 10.5 feet. No groundwater encountered in test boring. Cave-in to 7.0 feet.
20														

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LOG OF BORING SD3

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A5

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43549° Longitude: -112.27753°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	14.3

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 14.3 feet
														Agricultural field - cut corn
				9			44	28	100	82	Max Dry Dens = 104.2pcf Opt Moist = 19.7% Swell = 3.4% R-value < 5		CL	**LEAN CLAY with SAND:** brown, moderately firm, medium plasticity, no cementation, slightly damp to damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
				8										
			15/12	7	98	17								
				8										
	5			9										
			5-8-9	16							Sulfates = 88 ppm Chlorides = 59 ppm Sulfates = 97 ppm Chlorides = 99 ppm			Note: firm and with calcareous veins below about 5 feet.
				15										
				16										
				17										
			5-5-6										SC-SM	**SILTY, CLAYEY SAND:** brown to light brown, medium dense, low plasticity, no cementation, slightly damp.
	10													
			50/4			11								Note: brown and gray very dense, and stratified with thin layers of angular fine clayey gravel below about 14 feet.
	15													Stopped drilling at 14.0 feet. Sampler refusal at 14.3 feet. No groundwater encountered in test boring. Cave-in to 10.8 feet.
	20													

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LOG OF BORING SD4

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A6

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.4355° Longitude: -112.27369°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.0 feet Agricultural field - cut corn
			4-5-5	7 11 11			46	28	99	72			CL	**LEAN CLAY with SAND:** brown to light brown, moderately firm, medium to high plasticity, no to weak cementation, trace gravel, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
5			3-3-2	12 11 18							Sulfates = 73 ppm Chlorides = 103 ppm		CL	**SANDY CLAY:** brown, soft, medium plasticity, no cementation, slightly damp to damp.
				13 16 20										
10			22/12		104	11							SM	**SILTY SAND:** light brown, medium dense, non-plastic, no cementation, damp.
														Stopped drilling at 9.0 feet. Stopped sampling at 10.0 feet. No groundwater encountered in test boring. Cave-in to 7.6 feet.
15														
20														

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LOG OF BORING SD5

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A7

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43556° Longitude: -112.27006°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.0 feet
														Agricultural field - alfalfa
			2-2-2	10 6 4			44	27	100	75			CL	**LEAN CLAY with SAND:** brown, soft, medium plasticity, no cementation, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
	5		3-3-4	5 6 6 7							Sulfates = 69 ppm Chlorides = 134 ppm Sulfates = 71 ppm Chlorides = 140 ppm			
			45/12	9 16	104	16							ML	**SANDY SILT:** brown to light brown, dense, non-plastic, no cementation, slightly damp.
	10													Stopped drilling at 9.0 feet. Stopped sampling at 10.0 feet. No groundwater encountered in test boring. Cave-in to 8.0 feet.
	15													
	20													

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LOG OF BORING SD6

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A8

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.4356° Longitude: -112.26602°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.5 feet
														Agricultural field - alfalfa
							44	26	100	85	Sulfates = 153 ppm Chlorides = 222 ppm		CL	**LEAN CLAY with SAND:** brown, soft to moderately firm, medium plasticity, no cementation, moist, upper roughly 12 to 18 inches disturbed by agricultural plowing.
			8/12		92	24								
	5		17/12		100	22					Sulfates = 60 ppm Chlorides = 79 ppm			Note: firm below about 5 feet.
			7-9-13										SC	**CLAYEY SAND:** light brown to tan, medium dense, low plasticity, weak cementation, trace gravel, slightly damp.
	10													Stopped drilling at 9.0 feet. Stopped sampling at 10.5 feet. No groundwater encountered in test boring. Cave-in to 6.5 feet.
	15													
	20													

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LOG OF BORING SD7

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A9

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.4356° Longitude: -112.26408°		
Groundwater (ft):	No Groundwater Encountered		
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger
Hammer Type:	Automatic	Elevation (ft):	N/A

Date Started:	10/30/2012
Date Completed:	10/30/2012
Logged By:	R. Katako
Total Depth (ft):	15.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.0 feet Graded landscaped area, developed parcel
				8			49	30	99	77	Sulfates = 631 ppm Chlorides = 512 ppm		CL	**LEAN CLAY with SAND:** brown, soft, medium to high plasticity, no cementation, trace gravel, moist, upper roughly 12 inches disturbed by previous grading.
			2-3-3	7										
				3										
				4										
	5			8										
			24/12	10	102	19								Note: brown to light brown, firm, weak cementation, and vesicular below about 5 feet.
				11										
				18										
				20										
			11-13-11											
	10												SM	**SILTY SAND:** brown to light brown, medium dense, non-plastic, no cementation, slightly damp.
			24/12		104	6								Note: trace fine gravel below about 14 feet.
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.0 feet. No groundwater encountered. Cave-in to 12.0 feet.
	20													

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LOG OF BORING F1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A10

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43567° Longitude: -112.26157°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION (0.0 to 10.5 feet)
														Graded dirt shoulder - Buckeye Road
				15									FILL	**FILL: CLAYEY SAND:** brown and gray, low plasticity, with gravel, slightly damp, upper roughly 12 inches disturbed by previous grading.
				7			33	18	85	57	Max Dry Dens = 112.1pcf Opt Moist = 14.0% Swell = 3.2% R-value = 8		CL	
			18/12	6	108	13								**NATIVE: SANDY LEAN CLAY:** brown, firm, medium plasticity, no cementation, with gravel, damp.
				7										
	5			9										
			3-6-8	12							Sulfates = 168 ppm Chlorides = 111 ppm Sulfates = 166 ppm Chlorides = 178 ppm			Note: brown to light brown, moderately firm, and weak cementation below 5 feet.
				15										
				15										
				19										
			5-7-7											Note: stratified with thin layers of sandy clay below about 9 feet.
	10													
														Stopped drilling at 9.0 feet. Stopped sampling at 10.5 feet. No groundwater encountered in test boring. Cave-in to 7.5 feet.
	15													
	20													

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Report Date:	Project Number:
December 2012	129067

LOG OF BORING SD8

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A11

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43561° Longitude: -112.25769°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.0 feet Graded dirt shoulder - Buckeye Road
													FILL	**FILL: CLAYEY GRAVEL:** brown and gray, low plasticity, with cobbles and gravel, with sand, slightly damp.
							49	32	94	78			CL	**NATIVE: LEAN CLAY with SAND:** brown, soft, medium to high plasticity, no cementation, trace gravel, moist.
			3-4-4											
	5		13/12		92	22					Sulfates = 413 ppm Chlorides = 348 ppm			Note: brown to light brown, moderately firm, and weak cementation below about 5 feet.
			6-9-13								Sulfates = 116 ppm Chlorides = 76 ppm			
	10													
													SC	**CLAYEY SAND:** brown, medium dense, low plasticity, no to weak cementation, damp.
			27/12		110	16								
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.0 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING SD9

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A12

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43561° Longitude: -112.25579°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet Graded dirt shoulder - Buckeye Road
				12									FILL	**FILL: CLAYEY SAND:** brown, low plasticity, trace gravel, slightly damp.
				6									CH	**NATIVE: FAT CLAY with SAND:** brown to light brown, moderately firm, high plasticity, weak cementation, trace gravel, damp.
			15/12	5	95	17								
				6										
	5			6										
			4-5-5	6			50	32	99	79	Sulfates = 60 ppm Chlorides = 57 ppm			
				9										
				12										
				14										
			34/12		106	8							CL	**SANDY CLAY:** brown to light brown, very firm, low to medium plasticity, weak cementation, slightly damp.
	10													
			11-11-25								Sulfates = 46 ppm Chlorides = 219 ppm			Note: stratified with thin layers of clayey sand below about 14 feet.
	15													
														Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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Report Date:	Project Number:
December 2012	129067

LOG OF BORING F2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A13

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43587° Longitude: -112.25272°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet
														Graded dirt shoulder - Buckeye Road
				13									FILL	**FILL: CLAYEY SAND:** brown and gray, low plasticity, some gravel, slightly damp.
				17			42	26	96	72	Max Dry Dens = 106.2pcf Opt Moist = 16.4% Swell = 2.9% R-value = 8		CL	**NATIVE: LEAN CLAY with SAND:** brown to light brown, firm, medium plasticity, no cementation, trace gravel, damp.
			10-13-15	20										
				17										
	5		13-13-17	14							Sulfates = 116 ppm Chlorides = 18 ppm			
				15										
				15										
				15										
				12										
	10		23/12		101	21					Sulfates = 126 ppm Chlorides = 59 ppm			Note: moist and stratified with thin layers of sandy silt (ML) at about 9 feet.
													SM	**SILTY SAND:** brown to light brown, medium dense, non-plastic, weak cementation, slightly damp to damp.
	15		7-8-11											
														Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING SD10

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A14

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43632° Longitude: -112.24815°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet Graded dirt shoulder - Buckeye Road
			9/12		104	15	28	12	80	34			FILL	**FILL: CLAYEY SAND with GRAVEL:** brown, low plasticity, slightly damp.
	5		7-10-12								Sulfates = 625 ppm Chlorides = 53 ppm		CL	**NATIVE: SANDY CLAY:** brown, firm, medium plasticity, no cementation, trace gravel, slightly damp to damp.
			16/12											
	10		8-8-10								Sulfates = 1,098 ppm Chlorides = 191 ppm			
			14-18-30										SC	**CLAYEY SAND:** brown to light brown, dense, low plasticity, no cementation, trace gravel, slightly damp to damp.
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 5.0 feet.
	20													

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LOG OF BORING SD11

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A15

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43654° Longitude: -112.24486°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	5.4

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 5.4 feet Graded dirt shoulder - Buckeye Road
			12-12-12				41	26	90	56	Max Dry Dens = 117.8pcf Opt Moist = 13.8% Swell = 3.1% R-value = 5		FILL	**FILL: SANDY LEAN CLAY:** brown and gray, firm, medium plasticity, no cementation, some gravel, slightly damp.
	5		50/5											Note: hard at 5 feet.
														Auger refusal at 5.0 feet. Sampler refusal at 5.4 feet. No groundwater encountered in test boring.
	10													
	15													
	20													

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Report Date:	Project Number:
December 2012	129067

LOG OF BORING SD12

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A16

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43694° Longitude: -112.24062°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.0 feet
														Graded dirt shoulder - Buckeye Road
													FILL	**FILL: SILTY SAND:** brown, non-plastic, slightly damp.
			4-6-3										SC	**NATIVE: CLAYEY SAND:** brown, loose, low plasticity, weak cementation, trace gravel, slightly damp.
							40	23	97	75			CL	**LEAN CLAY with SAND:** light brown, firm, medium plasticity, weak cementation, trace gravel, damp.
	5		16/12		105	15					Sulfates = 51 ppm Chlorides = 15 ppm			
			7-10-14								Sulfates = 28 ppm Chlorides = 33 ppm		CL-ML	**SANDY, CLAYEY SILT:** light brown, firm, low plasticity, weak cementation, slightly damp.
	10												SC	**CLAYEY SAND:** light brown, very dense, low plasticity, weak cementation, damp.
			62/12		103	19								
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 10.7 feet.
	20													

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LOG OF BORING SD13

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A17

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43705° Longitude: -112.2328°			Date Started:	11/1/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/1/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	5.3

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 5.3 feet Graded dirt shoulder - Buckeye Road
			15-8-7	18			29	14	81	38	Max Dry Dens = 122.9pcf Opt Moist = 11.1% Swell = 1.3% Sulfates = 233 ppm Chlorides = 362 ppm		FILL	**FILL: CLAYEY SAND with GRAVEL:** brown and gray, medium dense, medium plasticity, slightly damp.
				13										
				13										
				7										
5			50/4	6										Note: very dense with cobbles below about 5 feet.
				17										Auger refusal at 5.0 feet. Sampler refusal at 5.3 feet. No groundwater encountered in test boring.
				20										
				21										
				20										
10														
15														
20														

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LOG OF BORING SD15

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A18

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43692° Longitude: -112.22885°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.0

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.0 feet
														Agricultural field - alfalfa
				4			26	11	99	45	Sulfates = 122 ppm Chlorides = 233 ppm		SC	**CLAYEY SAND:** brown, loose, low plasticity, no cementation, trace gravel, damp, upper roughly 12 to 18 inches disturbed by agricultrual plowing.
			2-3-3	5										
				5										
				7										
				8										
	5		3-3-3	14			33	18	100	64	Sulfates = 138 ppm Chlorides = 366 ppm Sulfates = 164 ppm Chlorides = 459 ppm		CL	**SANDY LEAN CLAY:** brown, soft, medium plasticity, no cementation, slightly damp.
				18										
				19										
				14										
			16/12		100	5								Note: firm and stratified with thin layers of silty sand (SM) below about 9 feet.
	10													Stopped drilling at 9.0 feet. Stopped sampling at 10.0 feet. No groundwater encountered in test boring. Cave-in to 8.5 feet.
	15													
	20													

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LOG OF BORING SD16

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A19

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

Boring Location:	Latitude: 33.43695° Longitude: -112.22426°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	10.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 10.5 feet
														Agricultural field - alfalfa
			2-2-2	3 3 3			37	21	100	74	Max Dry Dens = 108.3pcf Opt Moist = 15.3% Swell = 3.5% R-value = 14 Sulfates = 69 ppm Chlorides = 103 ppm Sulfates = 54 ppm Chlorides = 58 ppm		CL	**LEAN CLAY with SAND:** brown, very soft, medium plasticity, no cementation, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
5			19/12	5 7 8	98	20					Sulfates = 60 ppm Chlorides = 66 ppm			Note: brown to light brown, firm, medium plasticity, no to weak cementation, and moist below about 5 feet.
				8 8 14									ML	**SANDY SILT:** brown, loose, no to low plasticity, no cementation, damp, stratified with thin layers of fine sand.
			3-3-4											
10														Stopped drilling at 9.0 feet. Stopped sampling at 10.0 feet. No groundwater encountered in test boring. Cave-in to 7.5 feet.
15														
20														

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Report Date:	Project Number:
December 2012	129067

LOG OF BORING SD17

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A20

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/28/12

APPENDIX SD-B

Laboratory Test Results

SAMPLE LOCATION	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			OTHER TESTS[1]	UNIFIED SOIL CLASSIFICATION (USCS)
			GRAVEL (%)	SAND (%)	FINES (%)	LL	PL	PI		
SD1 @ 0-5'			1	31	68	39	17	22	MDD / OMC = 113.8 / 15.6 S = 1.4 R = 17 SULF = 77 CHLO = 216	SANDY LEAN CLAY (CL)
SD1 @ 2-3'	13.1	109.0								
SD1 @ 5-9'									SULF = 75 CHLO = 96	
SD2 @ 0-5'			3	50	47	23	15	8		CLAYEY SAND (SC)
SD2 @ 5-8'									SULF = 156 CHLO = 201	
SD2 @ 5-6.5'									SULF = 207 CHLO = 129	
SD2 @ 8-13'			2	66	32	26	20	6	SULF = 81 CHLO = 54	SILTY, CLAYEY SAND (SC-SM)
SD2 @ 9-10'	7.9	107.9								
SD3 @ 0-5'			2	32	66	45	17	28		SANDY LEAN CLAY (CL)
SD3 @ 5-9'									SULF = 73 CHLO = 118	
SD3 @ 5-6'	12.7	110.9								
SD4 @ 0-5'			0	17	82	44	16	28	MDD / OMC = 104.2 / 19.7 S = 3.4 R < 5	LEAN CLAY with SAND (CL)
SD4 @ 2-3'	16.9	97.7								
SD4 @ 5-9'									SULF = 97 CHLO = 99	
SD4 @ 5-6.5'									SULF = 88 CHLO = 59	
SD4 @ 14-15'	11.1									
SD5 @ 0-5'			1	28	72	46	18	28		LEAN CLAY with SAND (CL)
SD5 @ 5-9'									SULF = 73 CHLO = 103	
SD5 @ 9-10'	10.8	103.9								

NOTES

(1) MDD / OMC = Maximum Dry Density (pcf) / Optimum Moisture Content (%), as determined by a standard (D698) proctor
S = Swell (%)
R = *R*-value
SULF = Sulfates (ppm)
CHLO = Chlorides (ppm)

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SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B1

Report Date:	Project Number:
Dec 2012	129067

SAMPLE LOCATION	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			OTHER TESTS[1]	UNIFIED SOIL CLASSIFICATION (USCS)
			GRAVEL (%)	SAND (%)	FINES (%)	LL	PL	PI		
SD6 @ 0-5'			0	25	75	44	17	27		LEAN CLAY with SAND (CL)
SD6 @ 5-9'									SULF = 71 CHLO = 140	
SD6 @ 5-6.5'									SULF = 69 CHLO = 134	
SD6 @ 9-10'	16.4	104.4								
SD7 @ 0-5'			0	15	85	44	18	26	SULF = 153 CHLO = 222	LEAN CLAY with SAND (CL)
SD7 @ 2-3'	24.3	91.6								
SD7 @ 5-9'									SULF = 60 CHLO = 79	
SD7 @ 5-6'	22.1	99.8								
F1 @ 0-5'			1	22	77	49	19	30	SULF = 631 CHLO = 512	LEAN CLAY with SAND (CL)
F1 @ 5-6'	19.4	102.4								
F1 @ 14-15'	5.7	103.8								
SD8 @ 1-5'			15	28	57	33	15	18	MDD / OMC = 112.1 / 14.0 S = 3.2 R = 8	SANDY LEAN CLAY with GRAVEL (CL)
SD8 @ 2-3'	13.2	107.9								
SD8 @ 5-9'									SULF = 166 CHLO = 178	
SD8 @ 5-6.5'									SULF = 168 CHLO = 111	
SD9 @ 1.5-5'			6	16	78	49	17	32		LEAN CLAY with SAND (CL)
SD9 @ 5-9'									SULF = 413 CHLO = 348	
SD9 @ 5-6'	21.5	91.5								
SD9 @ 9-10.5'									SULF = 116 CHLO = 76	
SD9 @ 14-15'	15.5	110.3								

NOTES

(1) MDD / OMC = Maximum Dry Density (pcf) / Optimum Moisture Content (%), as determined by a standard (D698) proctor
S = Swell (%)
R = *R*-value
SULF = Sulfates (ppm)
CHLO = Chlorides (ppm)

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SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B1

Report Date:	Project Number:
Dec 2012	129067

SAMPLE LOCATION	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			OTHER TESTS[1]	UNIFIED SOIL CLASSIFICATION (USCS)
			GRAVEL (%)	SAND (%)	FINES (%)	LL	PL	PI		
F2 @ 2-3'	17.4	95.4								
F2 @ 5-9'			1	20	79	50	18	32	SULF = 60 CHLO = 57	FAT CLAY with SAND (CH)
F2 @ 9-10'	8.2	105.9								
F2 @ 14-15.5'									SULF = 46 CHLO = 219	
SD10 @ 1-5'			4	24	72	42	16	26	MDD / OMC = 106.2 / 16.4 S = 2.9 R = 8	LEAN CLAY with SAND (CL)
SD10 @ 5-9'									SULF = 116 CHLO = 18	
SD10 @ 9-13'									SULF = 126 CHLO = 59	
SD10 @ 9-10'	20.6	100.8								
SD11 @ 0-5'			20	45	34	28	16	12		CLAYEY SAND with GRAVEL (SC)
SD11 @ 2-3'	14.8	103.6								
SD11 @ 5-9'									SULF = 625 CHLO = 53	
SD11 @ 10-11.5'									SULF = 1,098 CHLO = 191	
SD12 @ 0-4'			10	35	56	41	15	26	MDD / OMC = 117.8 / 13.8 S = 3.1 R = 5	SANDY LEAN CLAY (CL)
SD13 @ 5-9'			3	22	75	40	17	23	SULF = 51 CHLO = 15	LEAN CLAY with SAND (CL)
SD13 @ 5-6'	15.2	105.4								
SD13 @ 9-10.5'									SULF = 28 CHLO = 33	
SD13 @ 14-15'	19.3	102.6								
SD15 @ 0-5'			19	44	38	29	15	14	MDD / OMC = 122.9 / 11.1 S = 1.3 SULF = 233 CHLO = 362	CLAYEY SAND with GRAVEL (SC)

NOTES

(1) MDD / OMC = Maximum Dry Density (pcf) / Optimum Moisture Content (%), as determined by a standard (D698) proctor
S = Swell (%)
R = *R*-value
SULF = Sulfates (ppm)
CHLO = Chlorides (ppm)

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SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B1

Report Date:	Project Number:
Dec 2012	129067

SAMPLE LOCATION	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			OTHER TESTS[1]	UNIFIED SOIL CLASSIFICATION (USCS)
			GRAVEL (%)	SAND (%)	FINES (%)	LL	PL	PI		
SD16 @ 0-5'			1	54	45	26	15	11	SULF = 122 CHLO = 233	CLAYEY SAND (SC)
SD16 @ 5-9'			0	36	64	33	15	18	SULF = 164 CHLO = 459	SANDY LEAN CLAY (CL)
SD16 @ 5-6.5'									SULF = 138 CHLO = 366	
SD16 @ 9-10'	5.3	99.8								
SD17 @ 0-5'			0	26	74	37	16	21	MDD / OMC = 108.3 / 15.3 S = 3.5 R = 14 SULF = 69 CHLO = 103	LEAN CLAY with SAND (CL)
SD17 @ 2-3.5'									SULF = 54 CHLO = 58	
SD17 @ 5-8'									SULF = 60 CHLO = 66	
SD17 @ 5-6'	20.1	98.1								

NOTES

(1) MDD / OMC = Maximum Dry Density (pcf) / Optimum Moisture Content (%), as determined by a standard (D698) proctor
S = Swell (%)
R = *R*-value
SULF = Sulfates (ppm)
CHLO = Chlorides (ppm)

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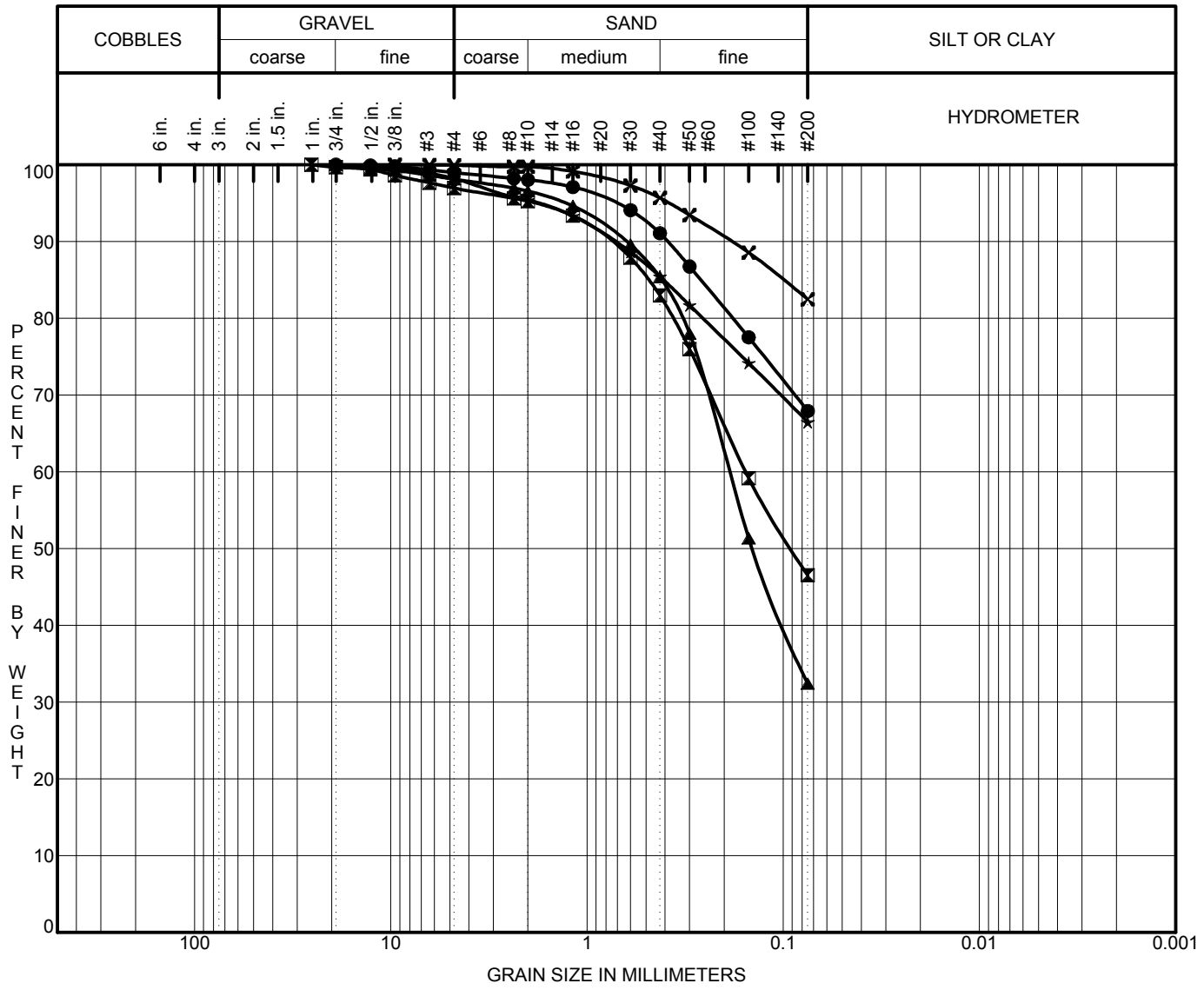
SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B1

Report Date:	Project Number:
Dec 2012	129067



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	SD1	0.0 - 5.0	0	1	31	68				
⊠	SD2	0.0 - 5.0	0	3	50	47		0.2		
▲	SD2	8.0 - 13.0	0	2	66	32		0.2		
★	SD3	0.0 - 5.0	0	2	32	66				
✕	SD4	0.0 - 5.0	0	0	17	82				

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	SD1	0.0 - 5.0	SANDY LEAN CLAY (CL)	39	17	22		
⊠	SD2	0.0 - 5.0	CLAYEY SAND (SC)	23	15	8		
▲	SD2	8.0 - 13.0	SILTY, CLAYEY SAND (SC-SM)	26	20	6		
★	SD3	0.0 - 5.0	SANDY LEAN CLAY (CL)	45	17	28		
✕	SD4	0.0 - 5.0	LEAN CLAY with SAND (CL)	44	16	28		

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Report Date: December 2012

Project Number: 129067

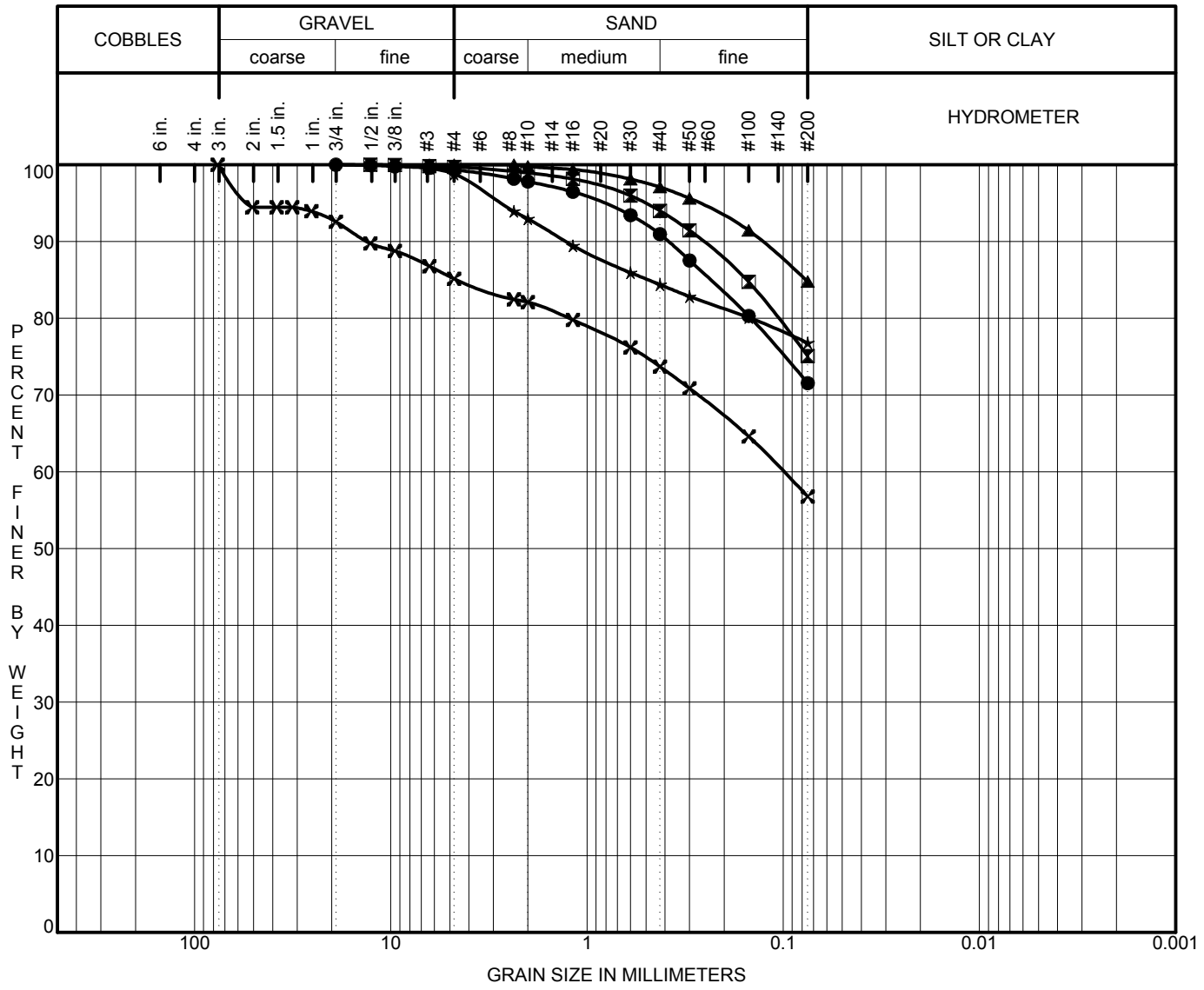
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B2

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/03/12



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	SD5	0.0 - 5.0	0	1	28	72				
⊠	SD6	0.0 - 5.0	0	0	25	75				
▲	SD7	0.0 - 5.0	0	0	15	85				
★	F1	0.0 - 5.0	0	1	22	77				
✕	SD8	1.0 - 5.0	0	15	28	57		0.1		

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	SD5	0.0 - 5.0	LEAN CLAY with SAND (CL)	46	18	28		
⊠	SD6	0.0 - 5.0	LEAN CLAY with SAND (CL)	44	17	27		
▲	SD7	0.0 - 5.0	LEAN CLAY with SAND (CL)	44	18	26		
★	F1	0.0 - 5.0	LEAN CLAY with SAND (CL)	49	19	30		
✕	SD8	1.0 - 5.0	SANDY LEAN CLAY (CL)	33	15	18		

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Report Date: December 2012

Project Number: 129067

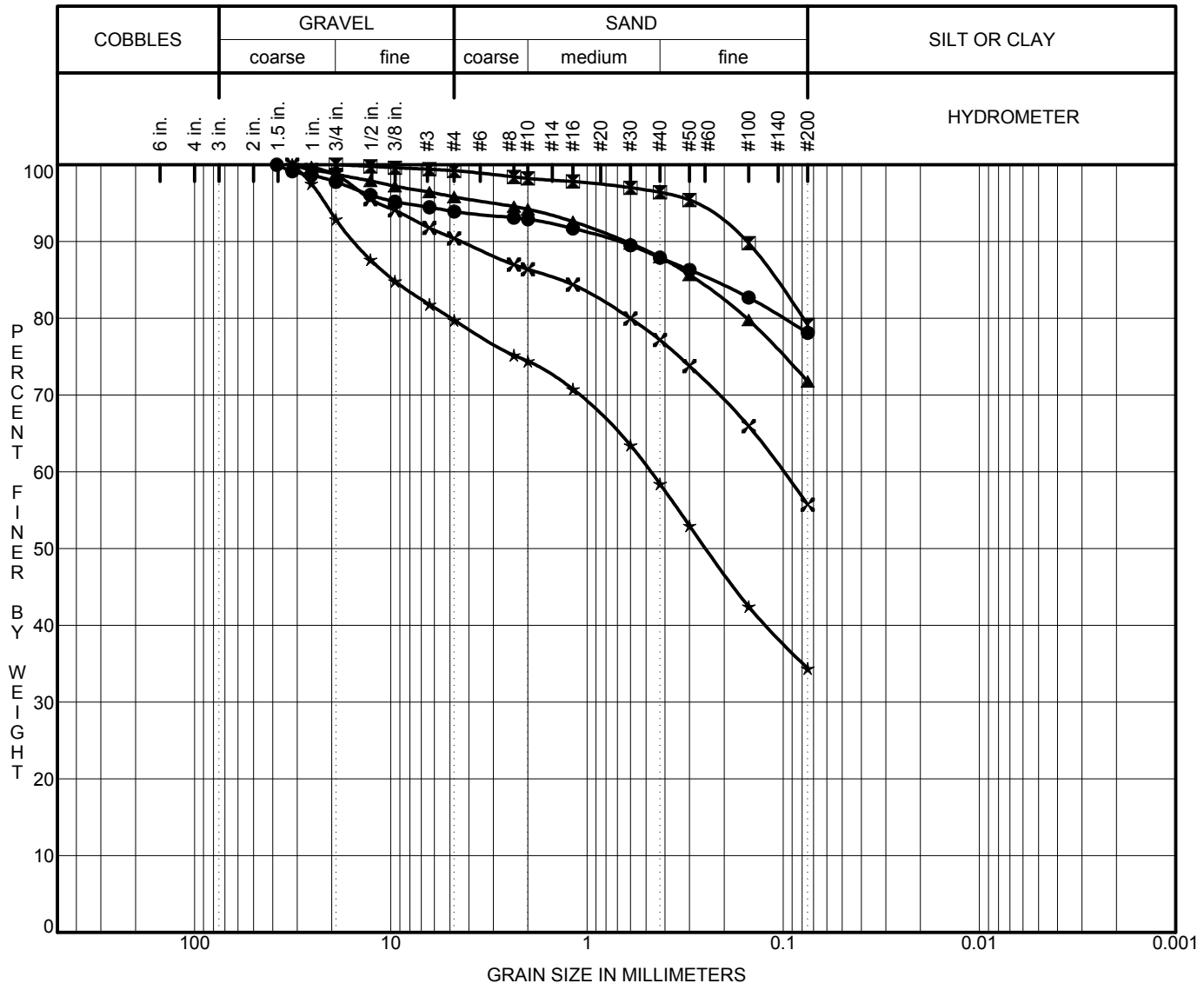
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B3

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/03/12



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	SD9	1.5 - 5.0	0	6	16	78				
⊠	F2	5.0 - 6.5	0	1	20	79				
▲	SD10	1.0 - 5.0	0	4	24	72				
★	SD11	0.0 - 5.0	0	20	45	34		0.5		
✕	SD12	0.0 - 4.0	0	10	35	56		0.1		

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	SD9	1.5 - 5.0	LEAN CLAY with SAND (CL)	49	17	32		
⊠	F2	5.0 - 6.5	FAT CLAY with SAND (CH)	50	18	32		
▲	SD10	1.0 - 5.0	LEAN CLAY with SAND (CL)	42	16	26		
★	SD11	0.0 - 5.0	CLAYEY SAND with GRAVEL (SC)	28	16	12		
✕	SD12	0.0 - 4.0	SANDY LEAN CLAY (CL)	41	15	26		

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Report Date:	Project Number:
December 2012	129067

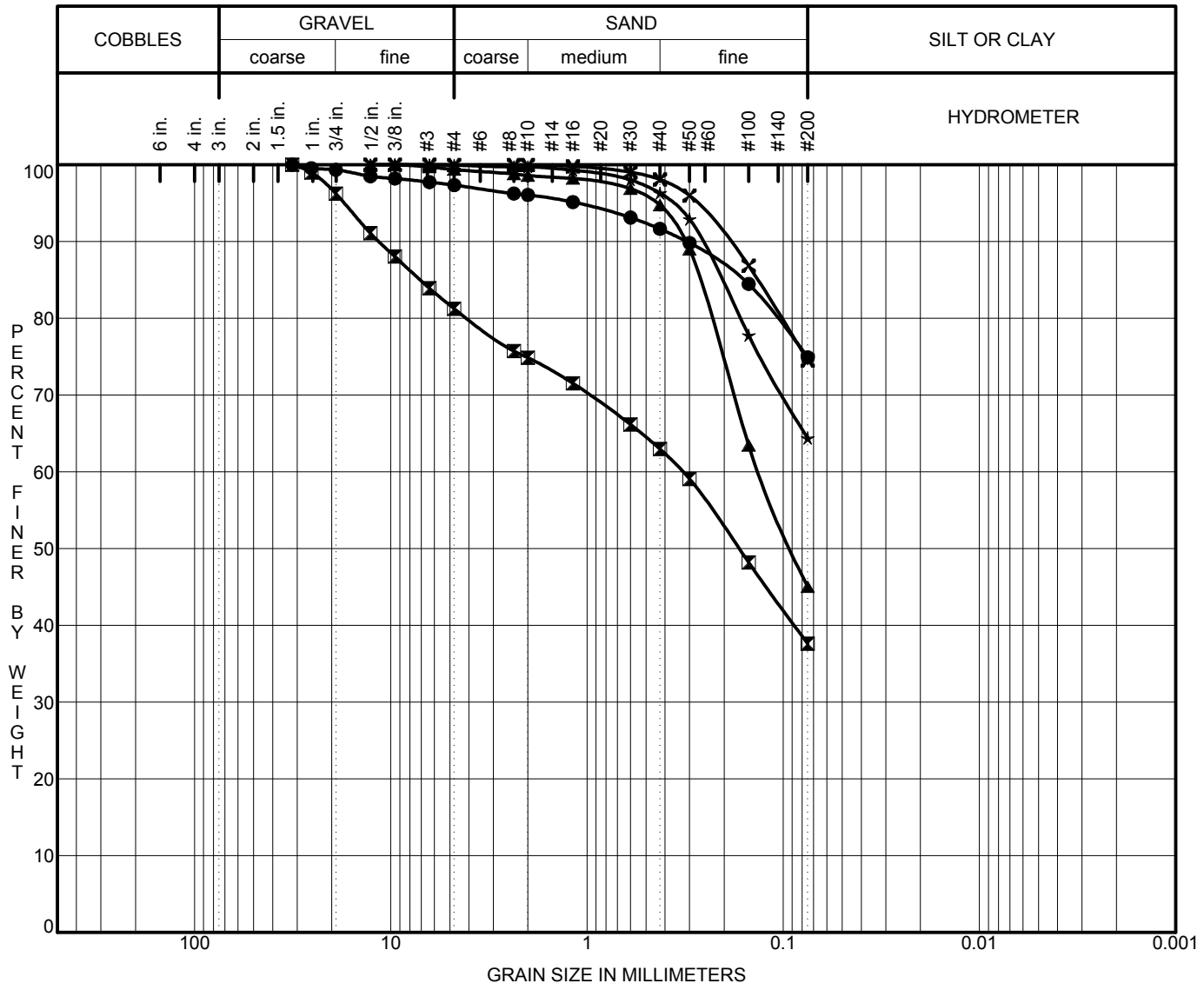
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B4

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/03/12



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	SD13	4.0 - 9.0	0	3	22	75				
⊠	SD15	0.0 - 5.0	0	19	44	38		0.3		
▲	SD16	0.0 - 5.0	0	1	54	45		0.1		
★	SD16	5.0 - 6.5	0	0	36	64				
✕	SD17	0.0 - 5.0	0	0	26	74				

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	SD13	4.0 - 9.0	LEAN CLAY with SAND (CL)	40	17	23		
⊠	SD15	0.0 - 5.0	CLAYEY SAND with GRAVEL (SC)	29	15	14		
▲	SD16	0.0 - 5.0	CLAYEY SAND (SC)	26	15	11		
★	SD16	5.0 - 6.5	SANDY LEAN CLAY (CL)	33	15	18		
✕	SD17	0.0 - 5.0	LEAN CLAY with SAND (CL)	37	16	21		

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Report Date: December 2012

Project Number: 129067

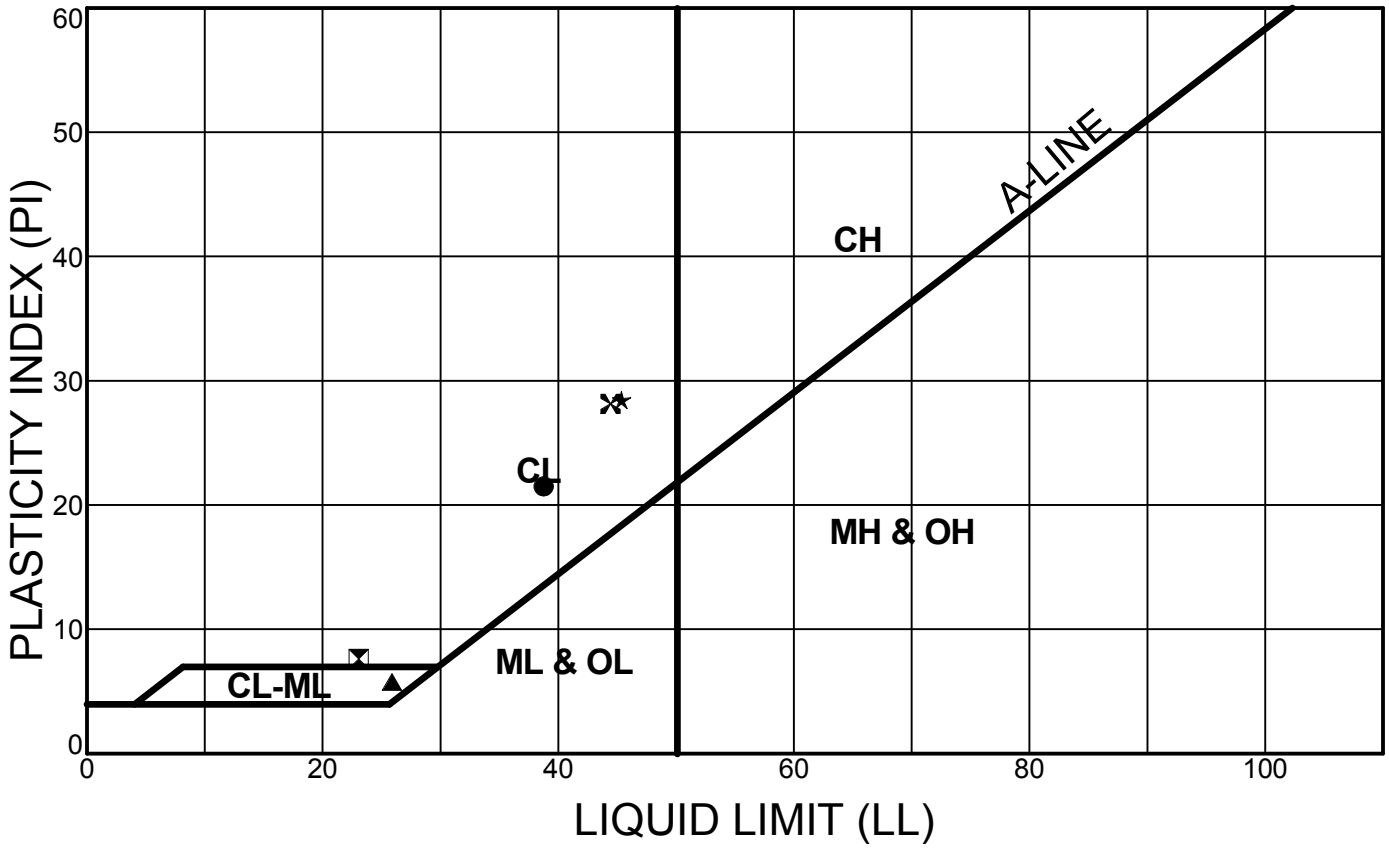
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B5

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/03/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	SD1	0.0 - 5.0	39	17	22
⊠	SD2	0.0 - 5.0	23	15	8
▲	SD2	8.0 - 13.0	26	20	6
★	SD3	0.0 - 5.0	45	17	28
✕	SD4	0.0 - 5.0	44	16	28

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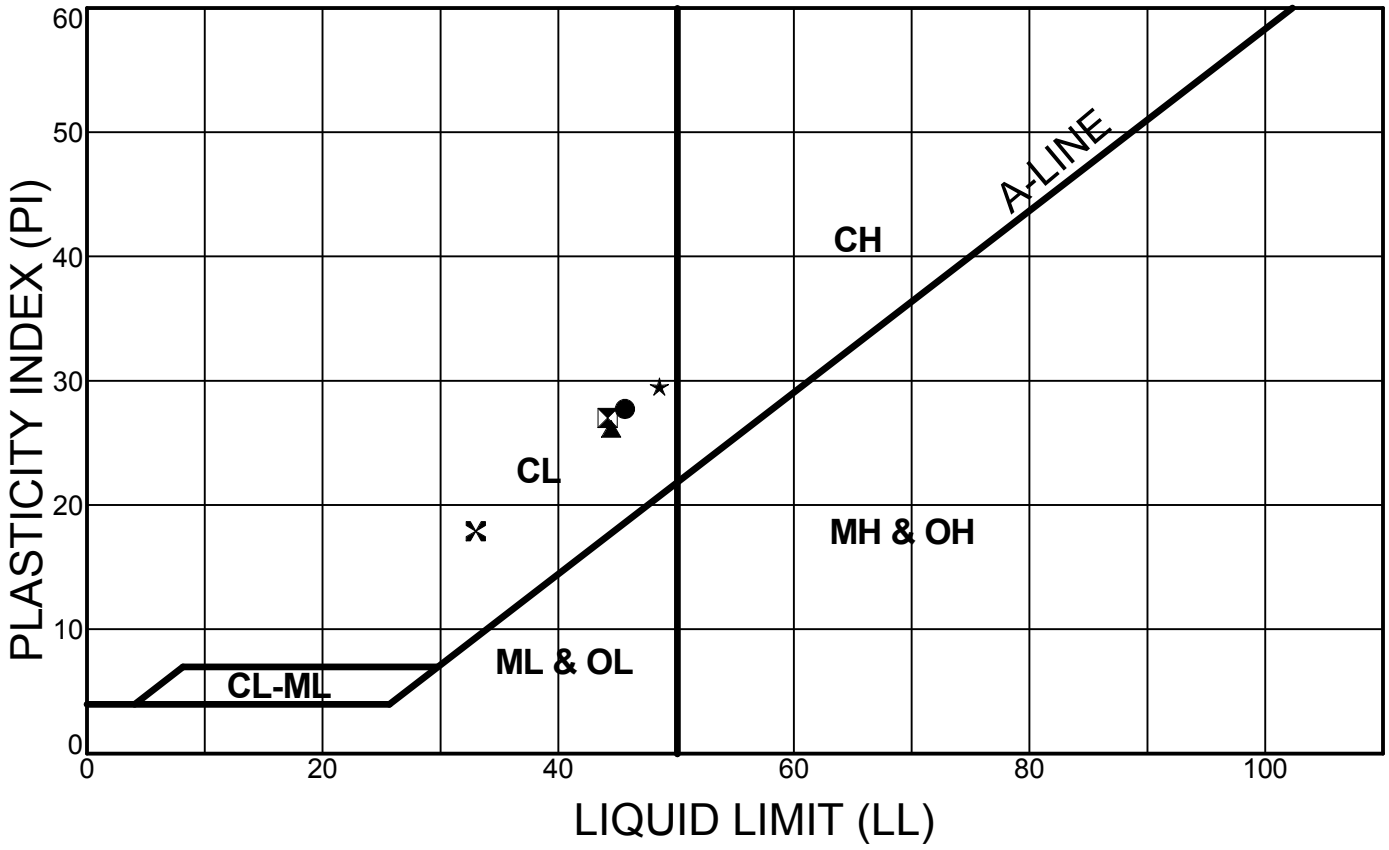
Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B6

ATTPLOT 129067 MC-85.GPJ 12/03/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	SD5	0.0 - 5.0	46	18	28
⧓	SD6	0.0 - 5.0	44	17	27
▲	SD7	0.0 - 5.0	44	18	26
★	F1	0.0 - 5.0	49	19	30
✕	SD8	1.0 - 5.0	33	15	18

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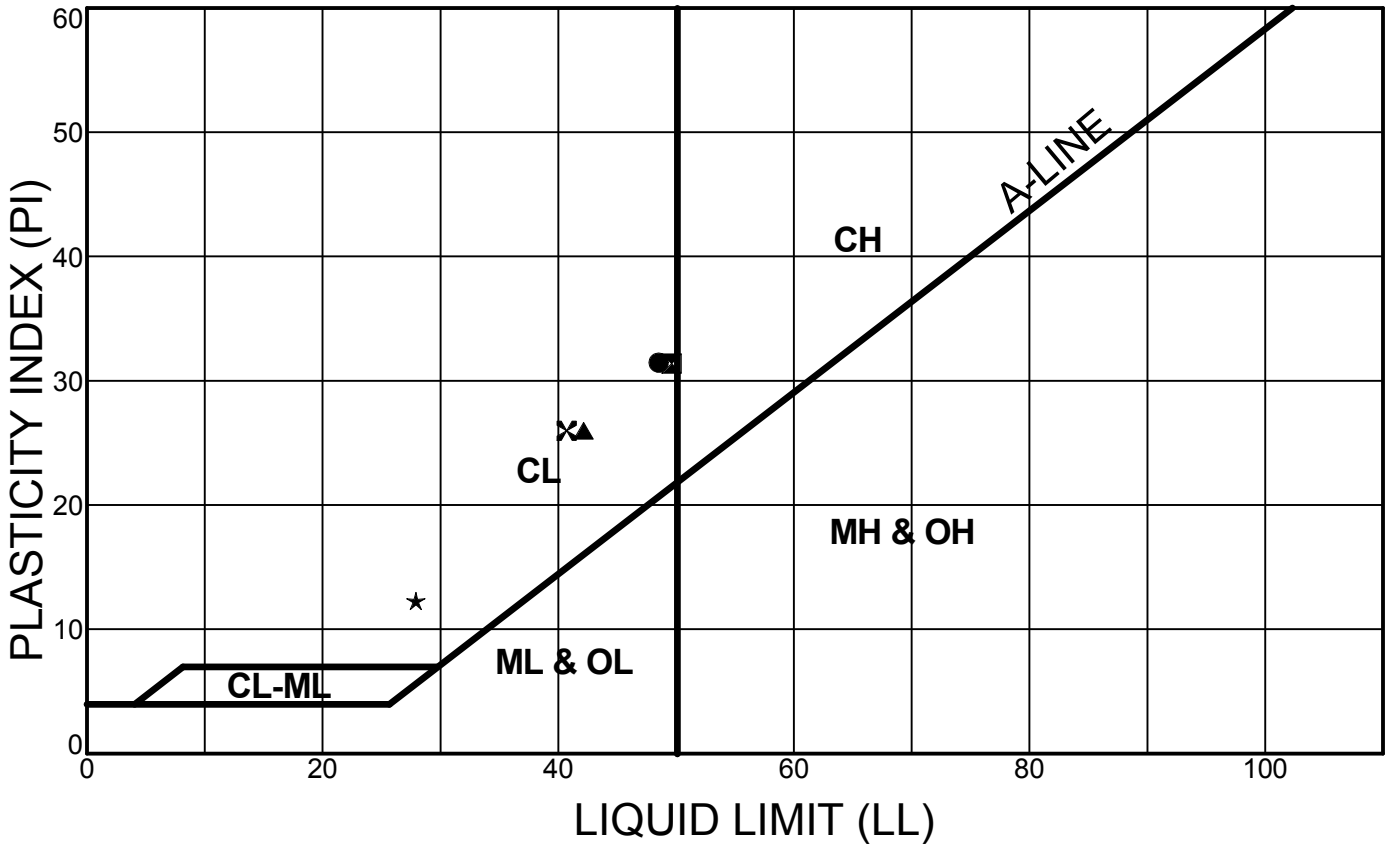
Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B7

ATTPLOT 129067 MC-85.GPJ 12/03/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	SD9	1.5 - 5.0	49	17	32
⊠	F2	5.0 - 6.5	50	18	32
▲	SD10	1.0 - 5.0	42	16	26
★	SD11	0.0 - 5.0	28	16	12
✕	SD12	0.0 - 4.0	41	15	26

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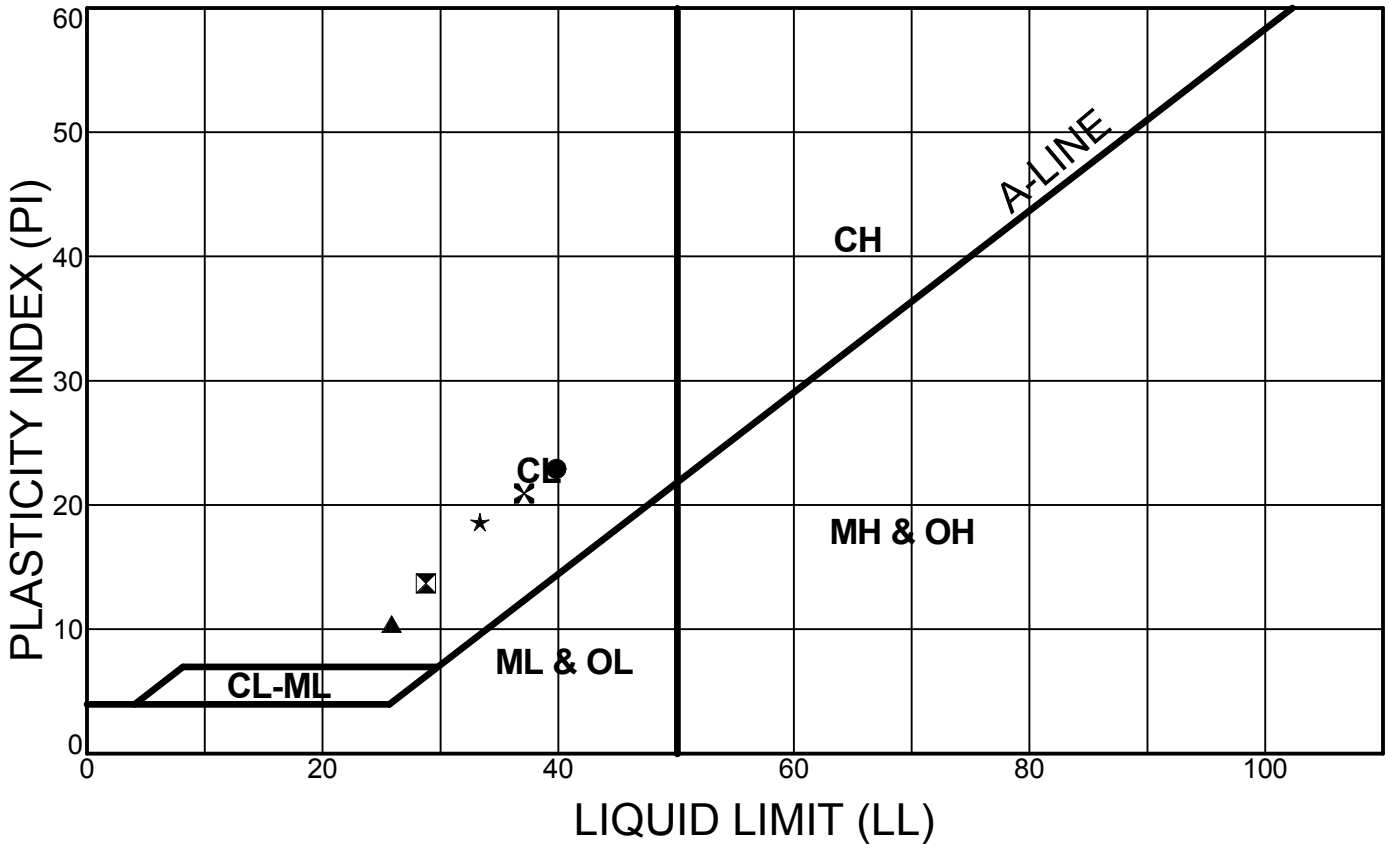
Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B8

ATTPLOT 129067 MC-85.GPJ 12/03/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	SD13	4.0 - 9.0	40	17	23
⧓	SD15	0.0 - 5.0	29	15	14
▲	SD16	0.0 - 5.0	26	15	11
★	SD16	5.0 - 6.5	33	15	18
✕	SD17	0.0 - 5.0	37	16	21

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Report Date:	Project Number:
December 2012	129067

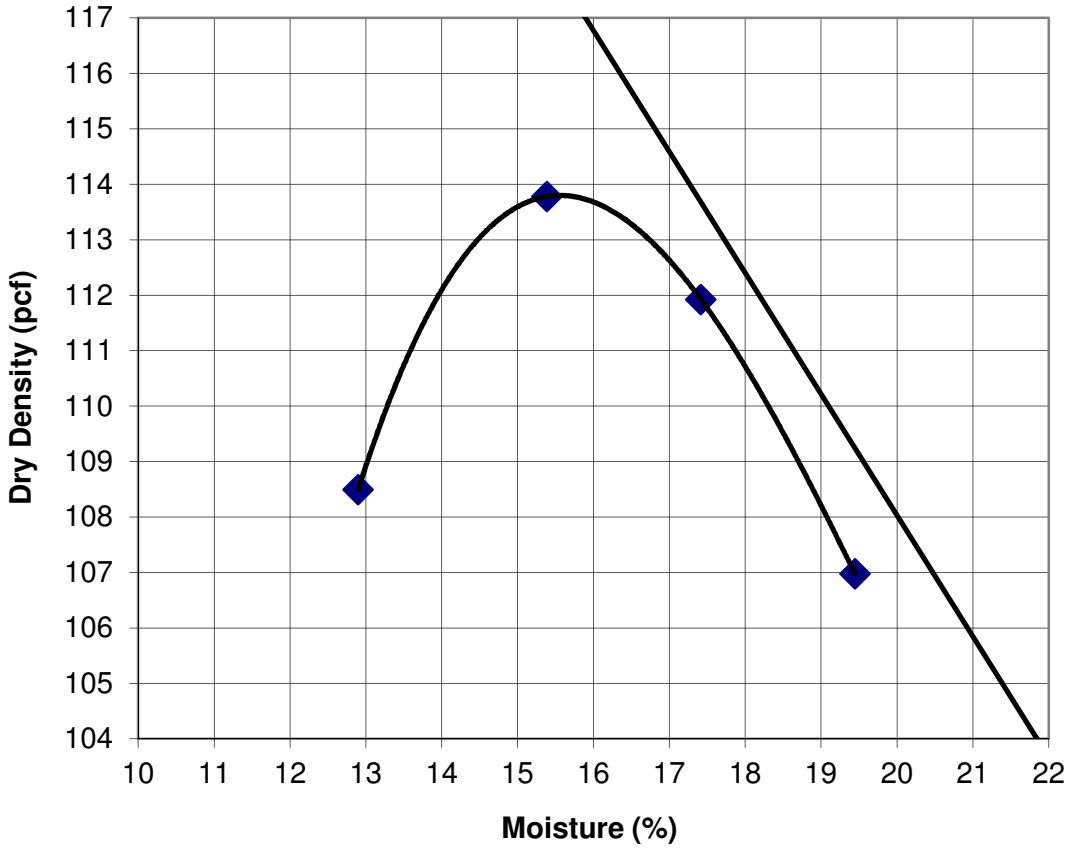
ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B9

ATTPLOT 129067 MC-85.GPJ 12/03/12

SAMPLE SOURCE: **SD1 @ 0-5'**
USCS: SANDY LEAN CLAY (CL)

Maximum Dry Density: **113.8 pcf**
Optimum Moisture Content: **15.6 %**



The zero air void curve represents an assumed specific gravity of 2.65

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STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B10

Report Date:	Project Number:
November 2012	129067

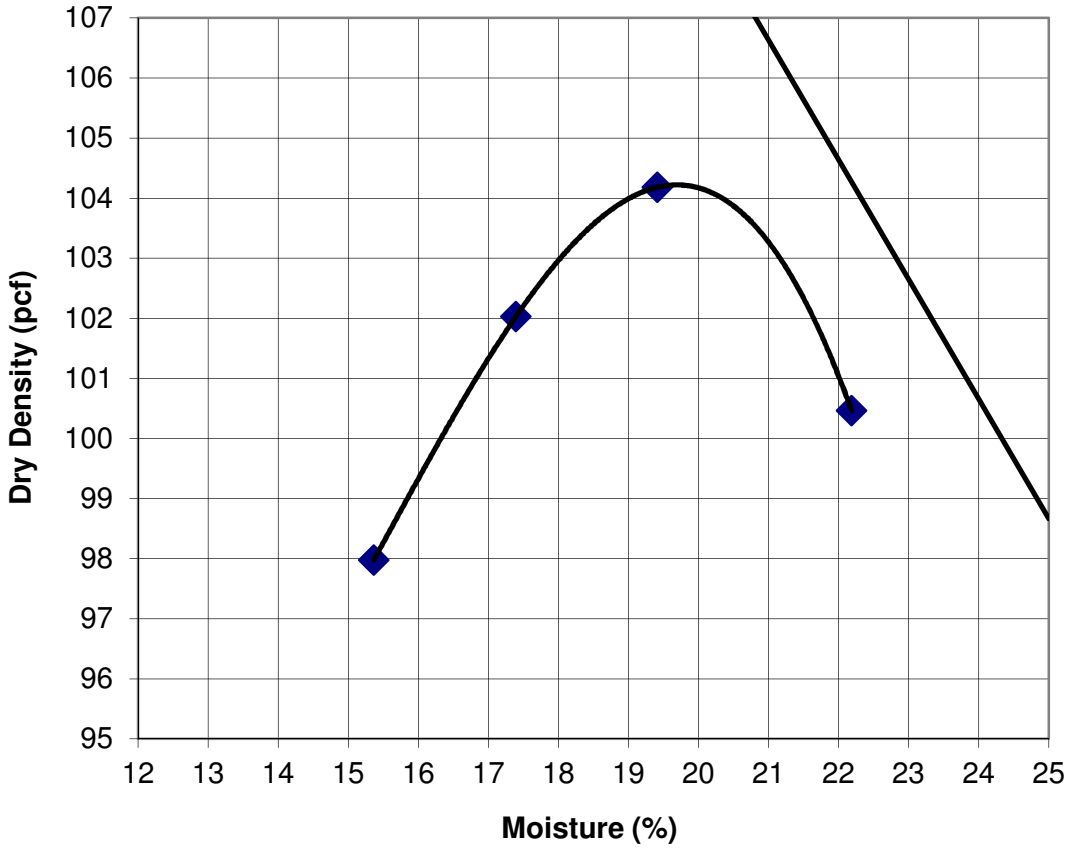
12294-36

SAMPLE SOURCE: **SD4 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

Maximum Dry Density: **104.2 pcf**

Optimum Moisture Content: **19.7 %**



The zero air void curve represents an assumed specific gravity of 2.65

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Report Date:	Project Number:
November 2012	129067

STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B11

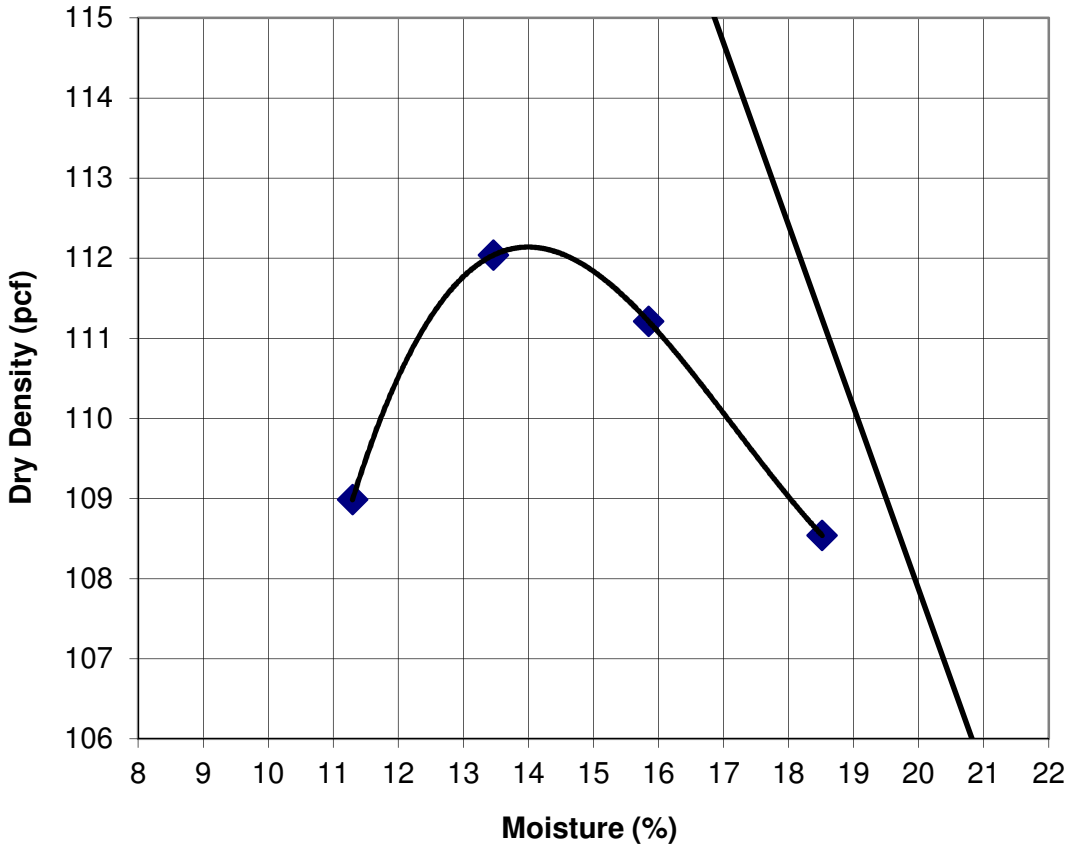
12294-40

SAMPLE SOURCE: **SD8 @ 1-5'**

USCS: SANDY LEAN CLAY with GRAVEL (CL)

Maximum Dry Density: **112.1 pcf**

Optimum Moisture Content: **14.0 %**



The zero air void curve represents an assumed specific gravity of 2.65

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STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B12

Report Date:	Project Number:
November 2012	129067

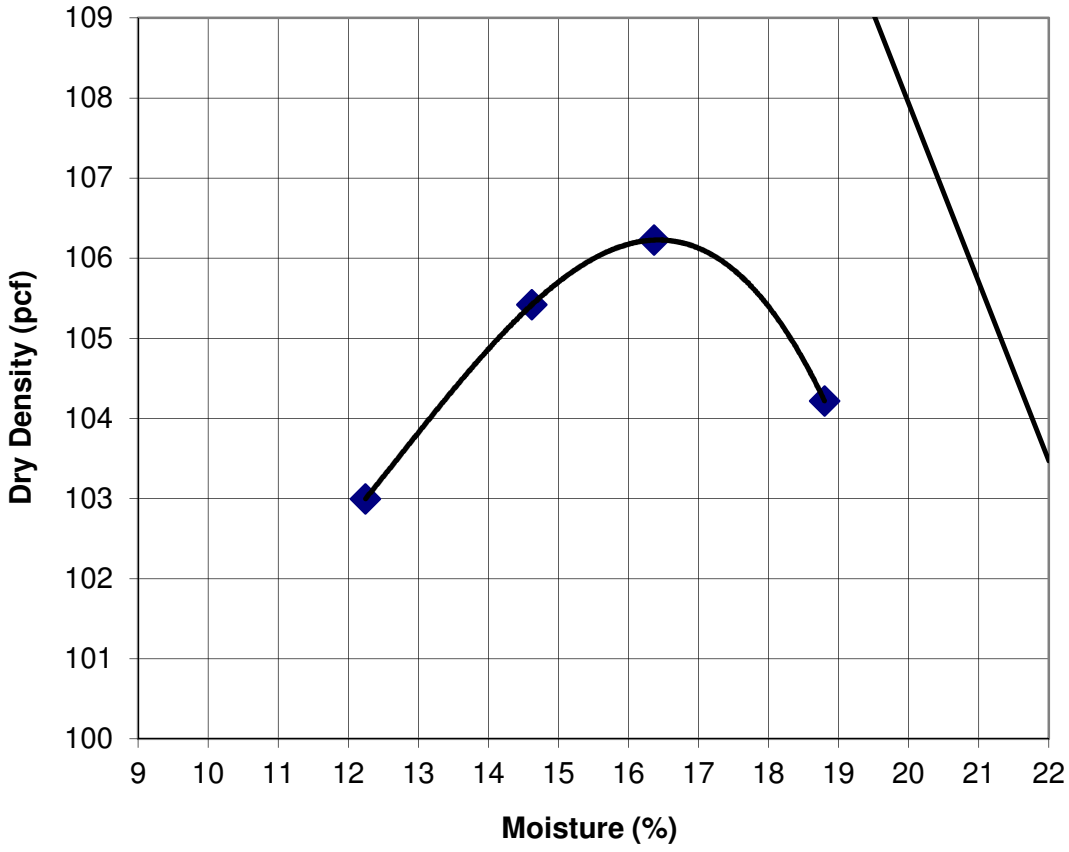
12294-45

SAMPLE SOURCE: **SD10 @ 1-5'**

USCS: LEAN CLAY with SAND (CL)

Maximum Dry Density: **106.2 pcf**

Optimum Moisture Content: **16.4 %**



The zero air void curve represents an assumed specific gravity of 2.65

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Report Date:	Project Number:
November 2012	129067

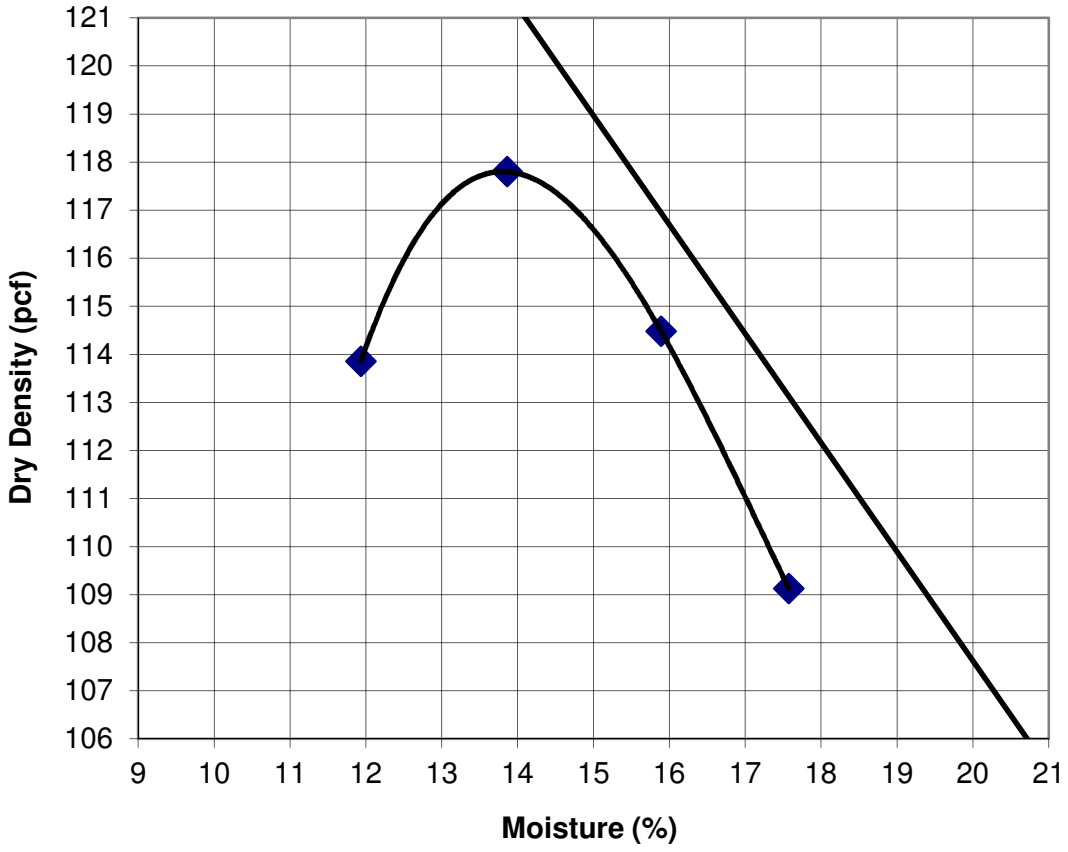
STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B13

12294-48

SAMPLE SOURCE: **SD12 @ 0-4'**
USCS: SANDY LEAN CLAY (CL)

Maximum Dry Density: **117.8 pcf**
Optimum Moisture Content: **13.8 %**



The zero air void curve represents an assumed specific gravity of 2.65

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Report Date:	Project Number:
November 2012	129067

STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B14

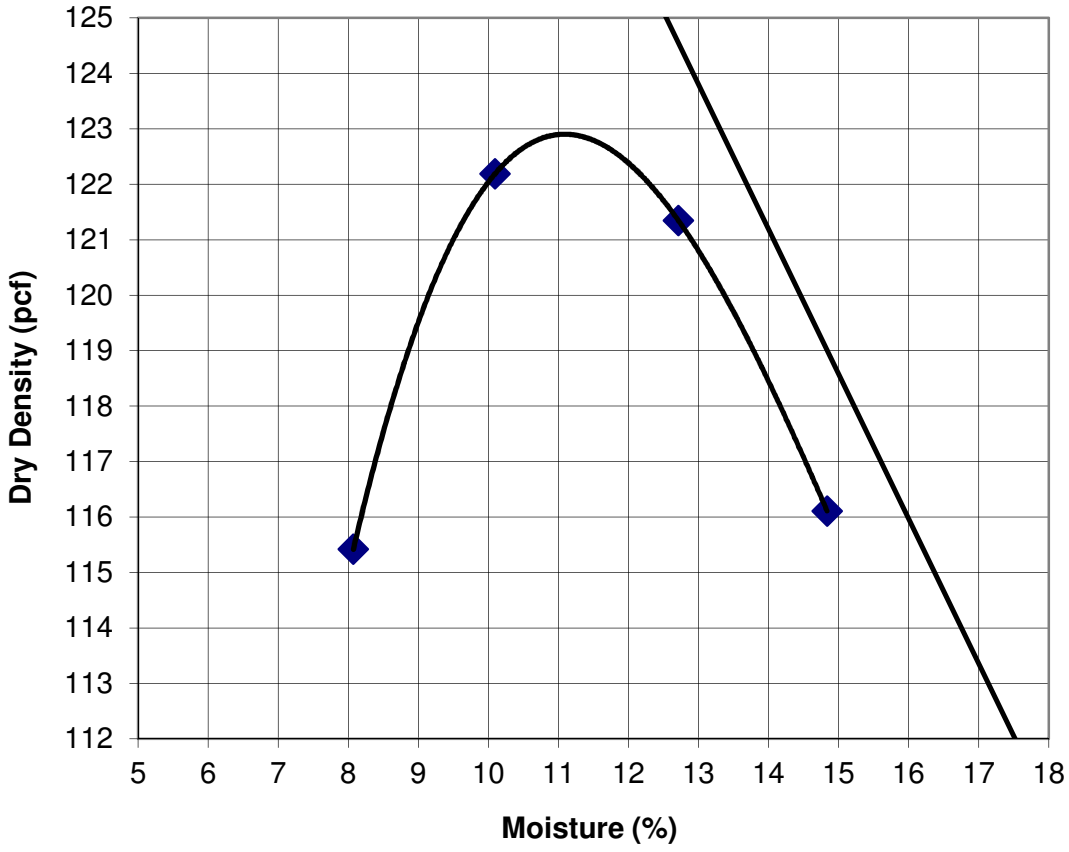
12294-50

SAMPLE SOURCE: **SD15 @ 0-5'**

USCS: CLAYEY SAND with GRAVEL (SC)

Maximum Dry Density: **122.9 pcf**

Optimum Moisture Content: **11.1 %**



The zero air void curve represents an assumed specific gravity of 2.65

KLEINFELDER
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Report Date:	Project Number:
November 2012	129067

STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B15

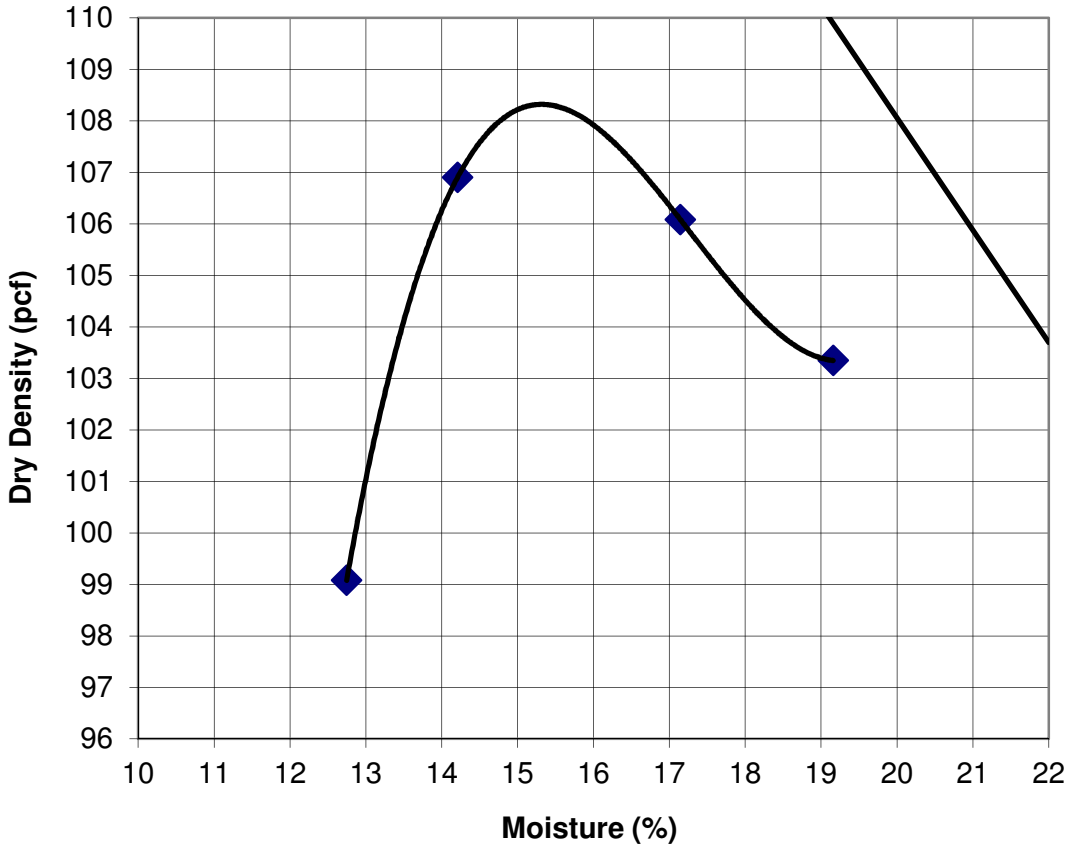
12294-52

SAMPLE SOURCE: **SD17 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

Maximum Dry Density: **108.3 pcf**

Optimum Moisture Content: **15.3 %**



The zero air void curve represents an assumed specific gravity of 2.65

KLEINFELDER
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Report Date:	Project Number:
November 2012	129067

STANDARD PROCTOR (ASTM D698 A)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B16

12294-55

SAMPLE SOURCE: **SD1 @ 0-5'**

USCS: SANDY LEAN CLAY (CL)

Moisture Content (%):	12.6
Dry Density (pcf):	108.2
Initial Degree of Saturation (%):	62.8
Maximum Dry Density (pcf):	113.8
Optimum Moisture (%):	15.6

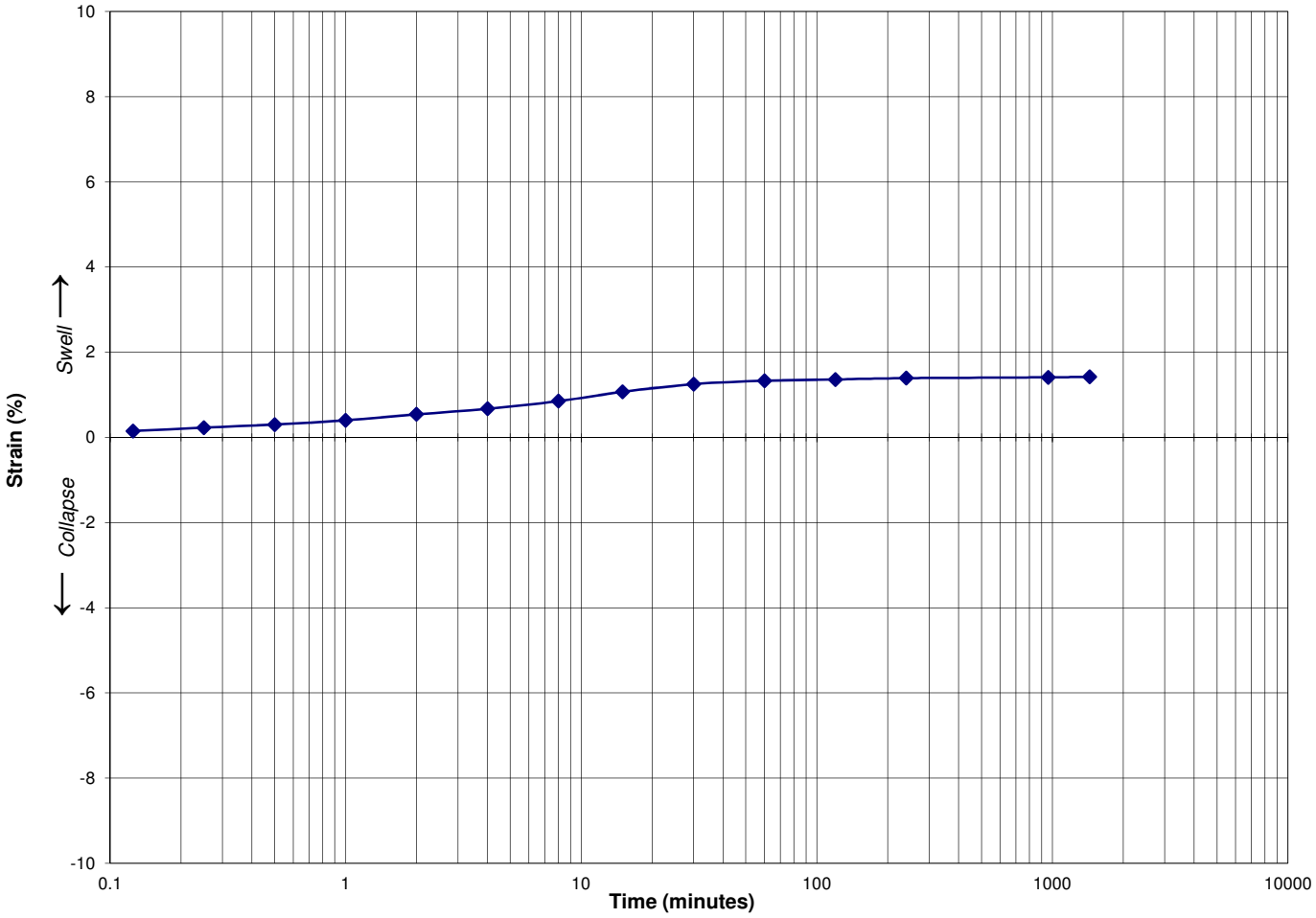
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

1.4% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B17

Report Date:	Project Number:
November 2012	129067

12294-36

SAMPLE SOURCE: **SD4 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

Moisture Content (%):	16.7
Dry Density (pcf):	99.0
Initial Degree of Saturation (%):	65.8
Maximum Dry Density (pcf):	104.2
Optimum Moisture (%):	19.7

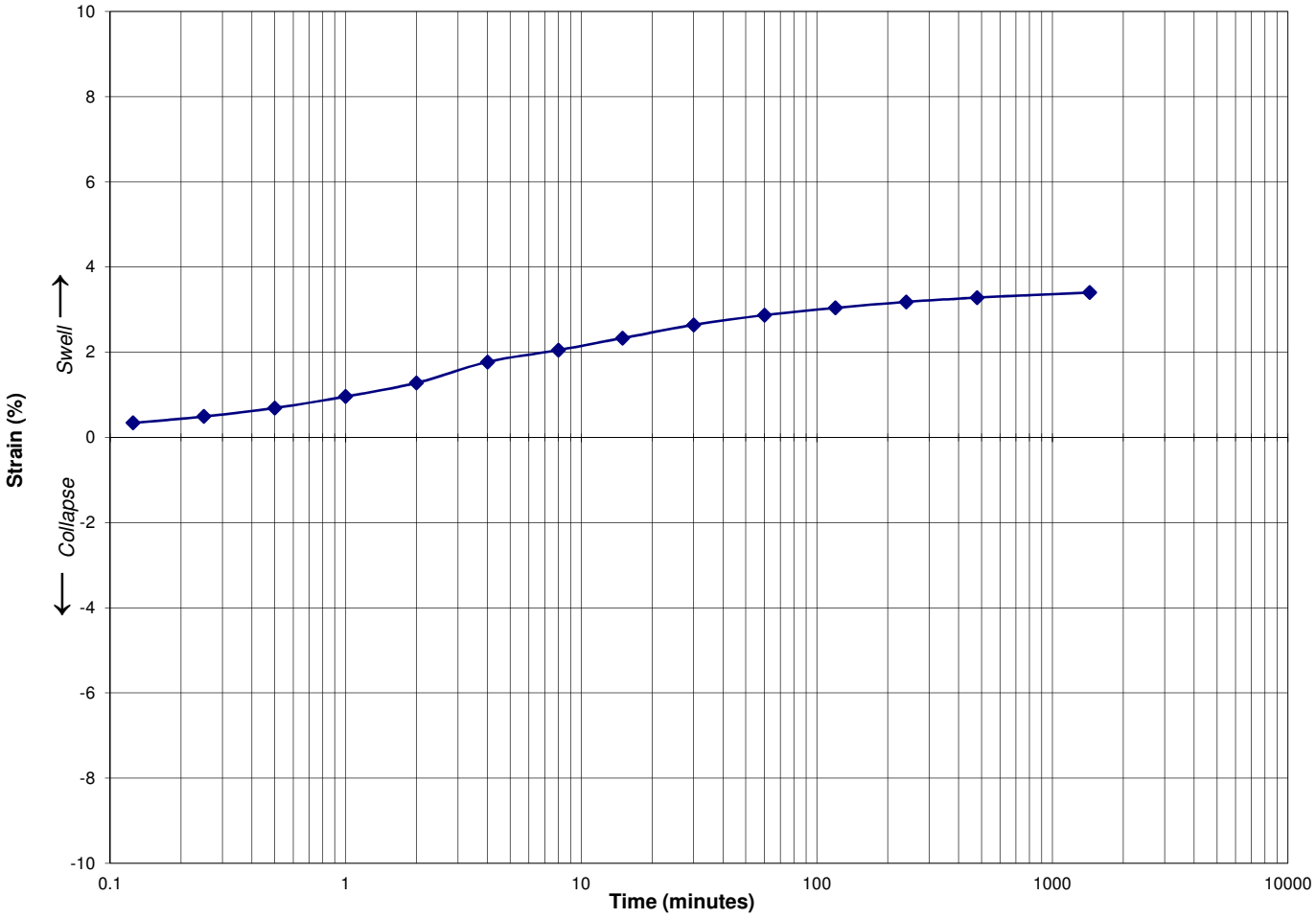
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

3.4% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B18

Report Date:	Project Number:
November 2012	129067

12294-40

SAMPLE SOURCE: **SD8 @ 1-5'**

USCS: SANDY LEAN CLAY with GRAVEL (CL)

Moisture Content (%):	11.1
Dry Density (pcf):	106.5
Initial Degree of Saturation (%):	53.0
Maximum Dry Density (pcf):	112.1
Optimum Moisture (%):	14.0

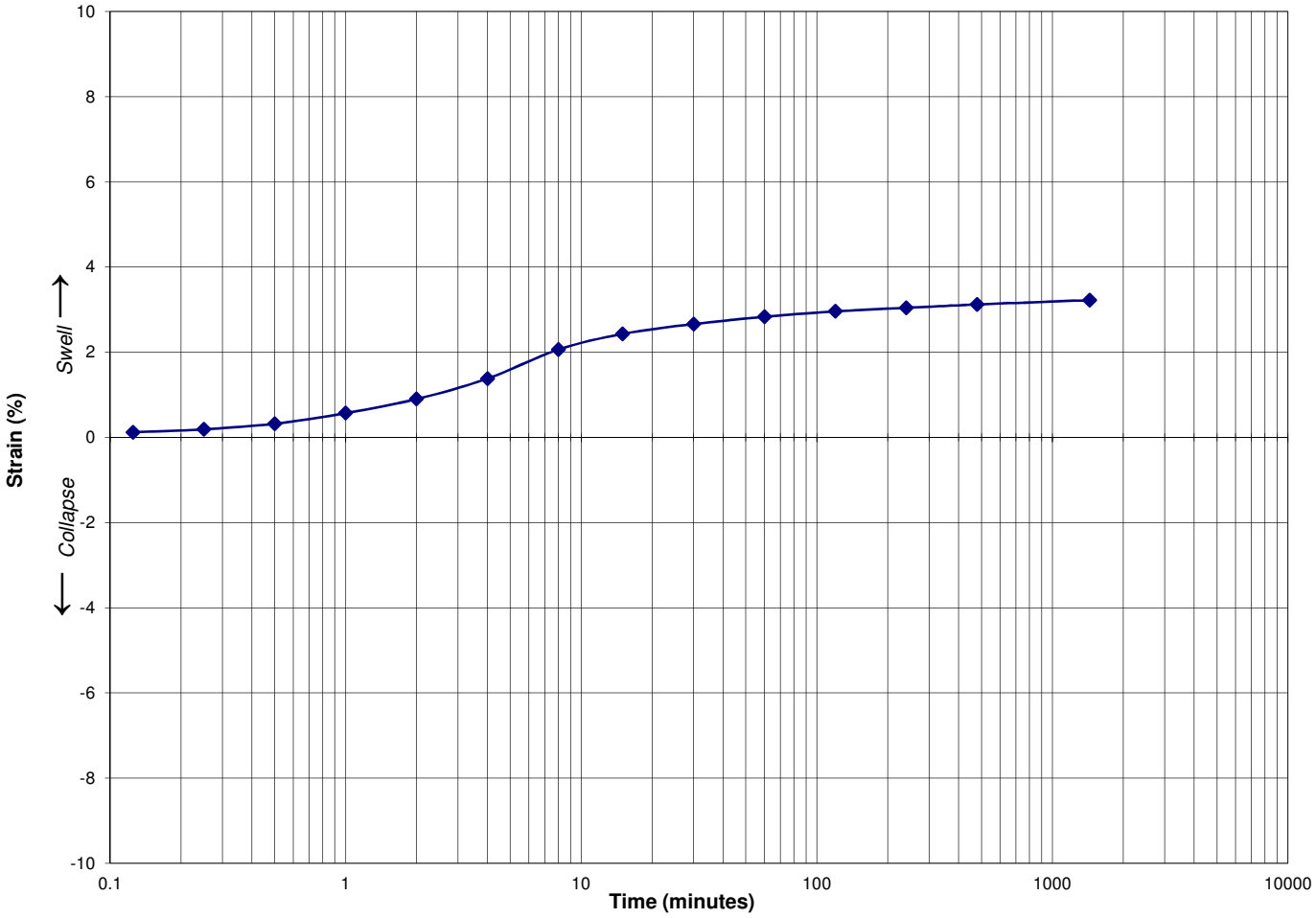
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

3.2% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B19

Report Date:	Project Number:
November 2012	129067

12294-45

SAMPLE SOURCE: **SD10 @ 1-5'**

USCS: LEAN CLAY with SAND (CL)

Moisture Content (%):	13.4
Dry Density (pcf):	101.0
Initial Degree of Saturation (%):	55.6
Maximum Dry Density (pcf):	106.2
Optimum Moisture (%):	16.4

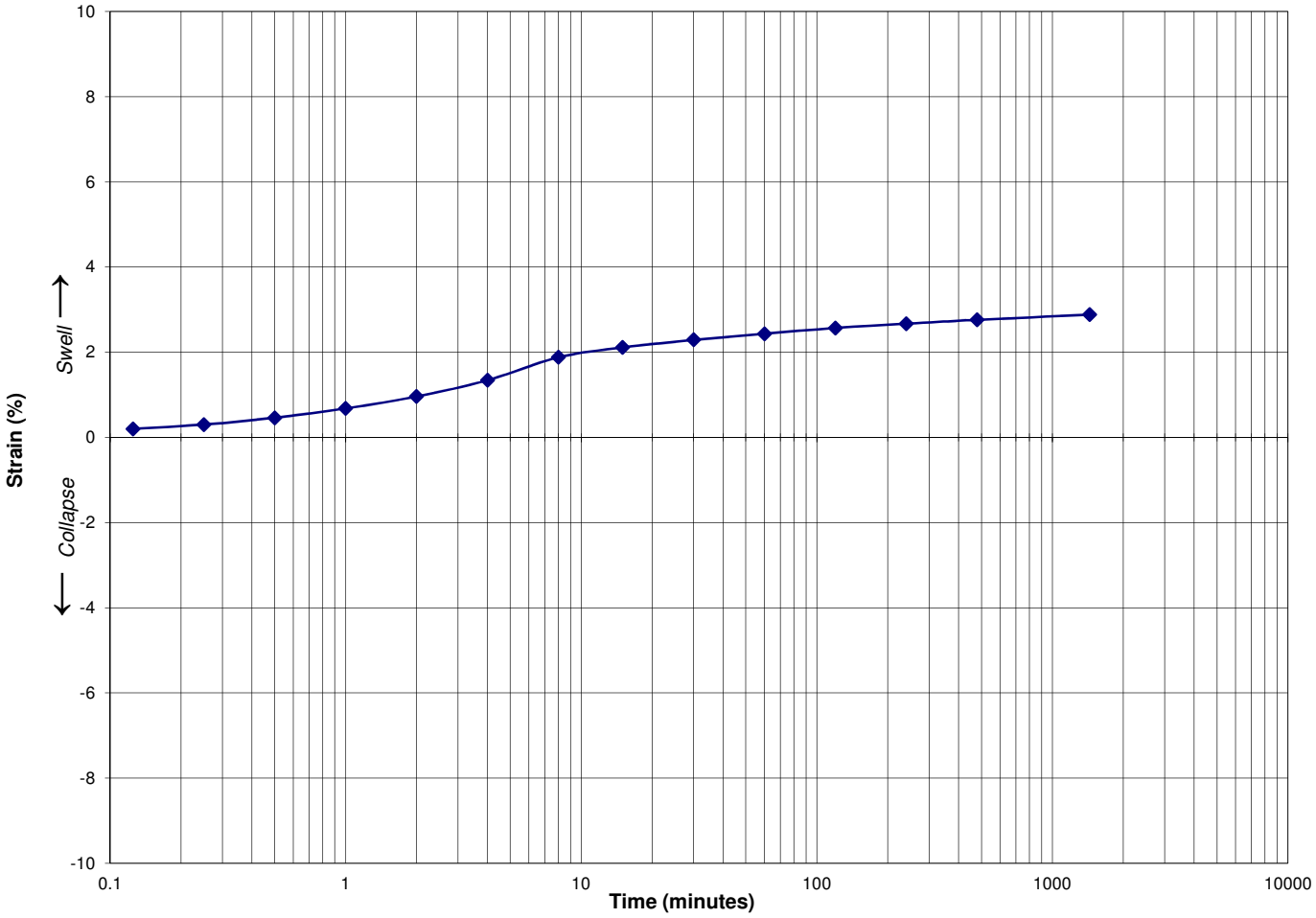
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

2.9% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B20

Report Date:	Project Number:
November 2012	129067

12294-48

SAMPLE SOURCE: **SD12 @ 0-4'**

USCS: SANDY LEAN CLAY (CL)

Moisture Content (%):	10.7
Dry Density (pcf):	112.0
Initial Degree of Saturation (%):	59.7
Maximum Dry Density (pcf):	117.8
Optimum Moisture (%):	13.8

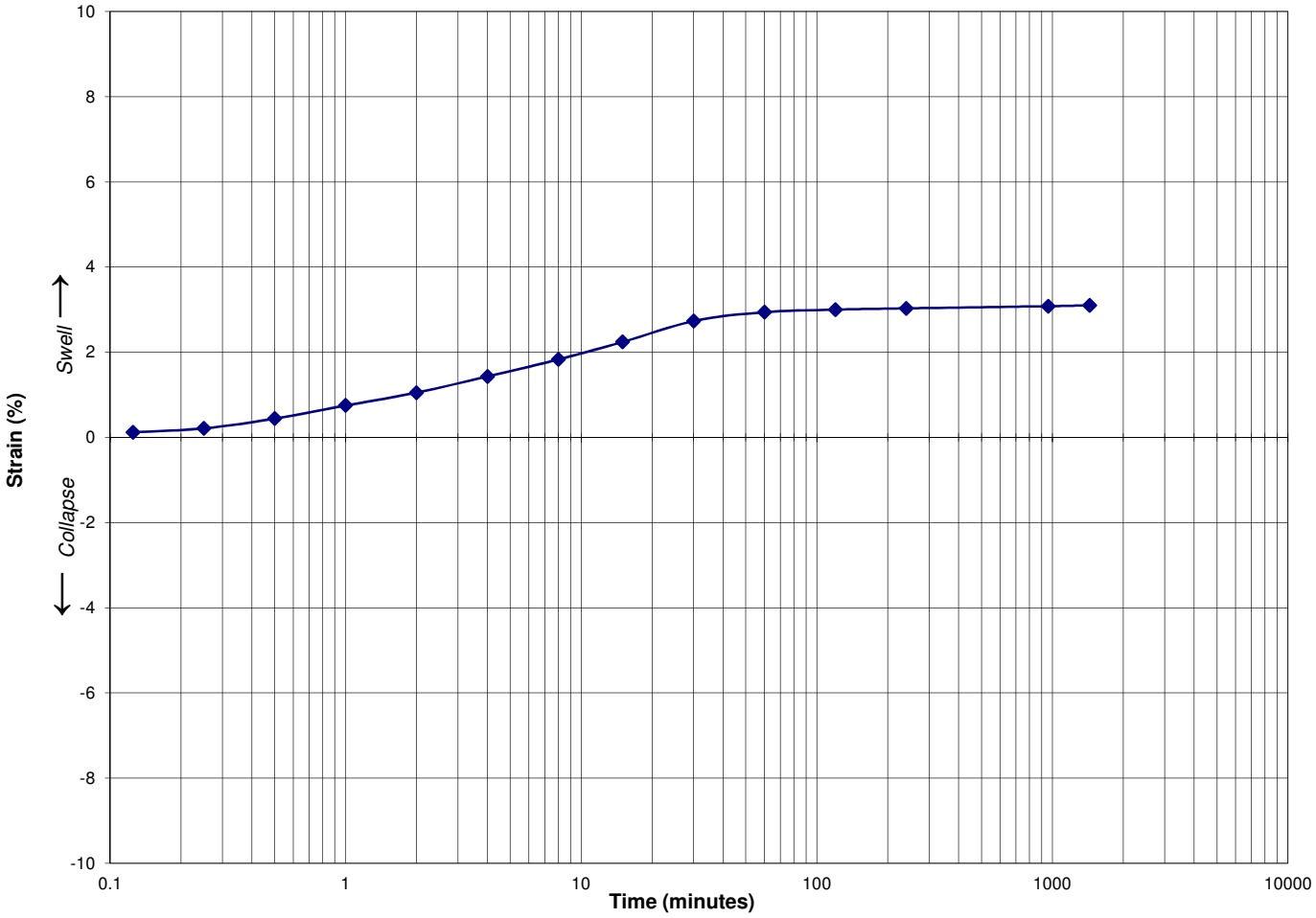
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

3.1% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B21

Report Date:	Project Number:
November 2012	129067

12294-50

SAMPLE SOURCE: **SD12 @ 0-4'**

USCS: SANDY LEAN CLAY (CL)

Moisture Content (%):	10.7
Dry Density (pcf):	112.0
Initial Degree of Saturation (%):	59.7
Maximum Dry Density (pcf):	117.8
Optimum Moisture (%):	13.8

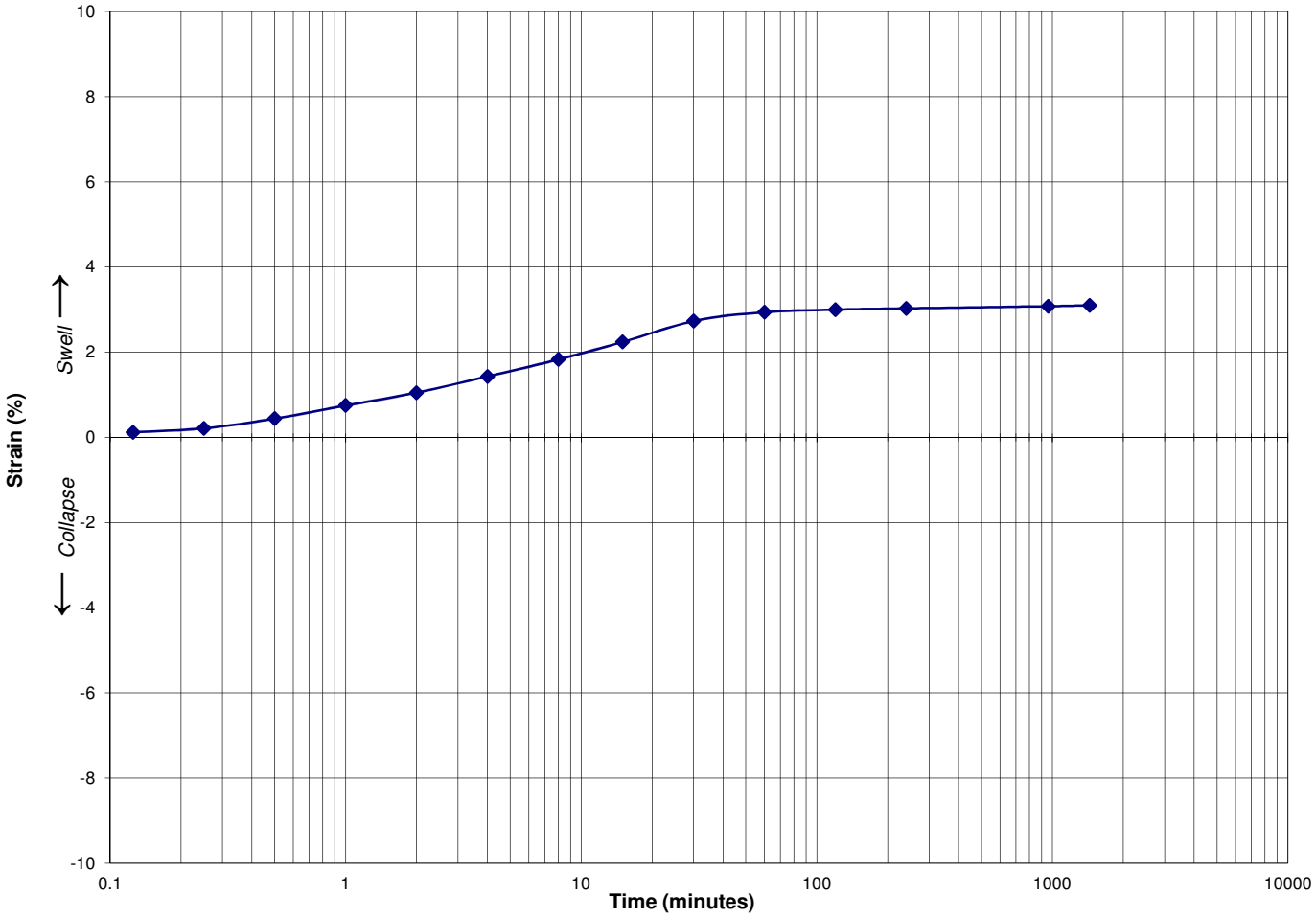
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

3.1% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B21

Report Date:	Project Number:
November 2012	129067

12294-50

SAMPLE SOURCE: **SD15 @ 0-5'**

USCS: CLAYEY SAND with GRAVEL (SC)

Moisture Content (%):	8.1
Dry Density (pcf):	116.8
Initial Degree of Saturation (%):	51.3
Maximum Dry Density (pcf):	122.9
Optimum Moisture (%):	11.1

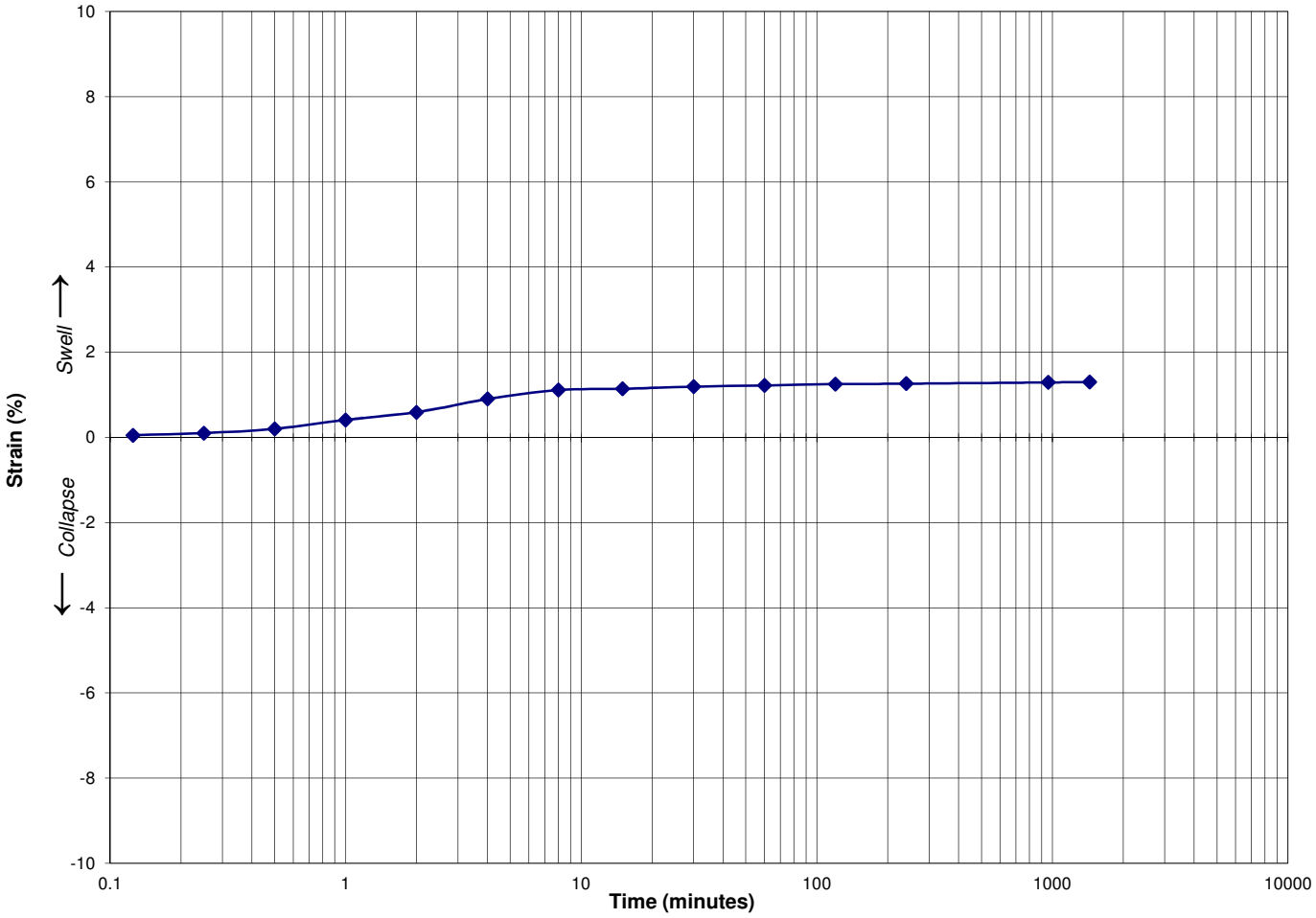
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

1.3% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B22

Report Date:	Project Number:
November 2012	129067

12294-52

SAMPLE SOURCE: **SD17 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

Moisture Content (%):	12.3
Dry Density (pcf):	102.8
Initial Degree of Saturation (%):	53.8
Maximum Dry Density (pcf):	108.3
Optimum Moisture (%):	15.3

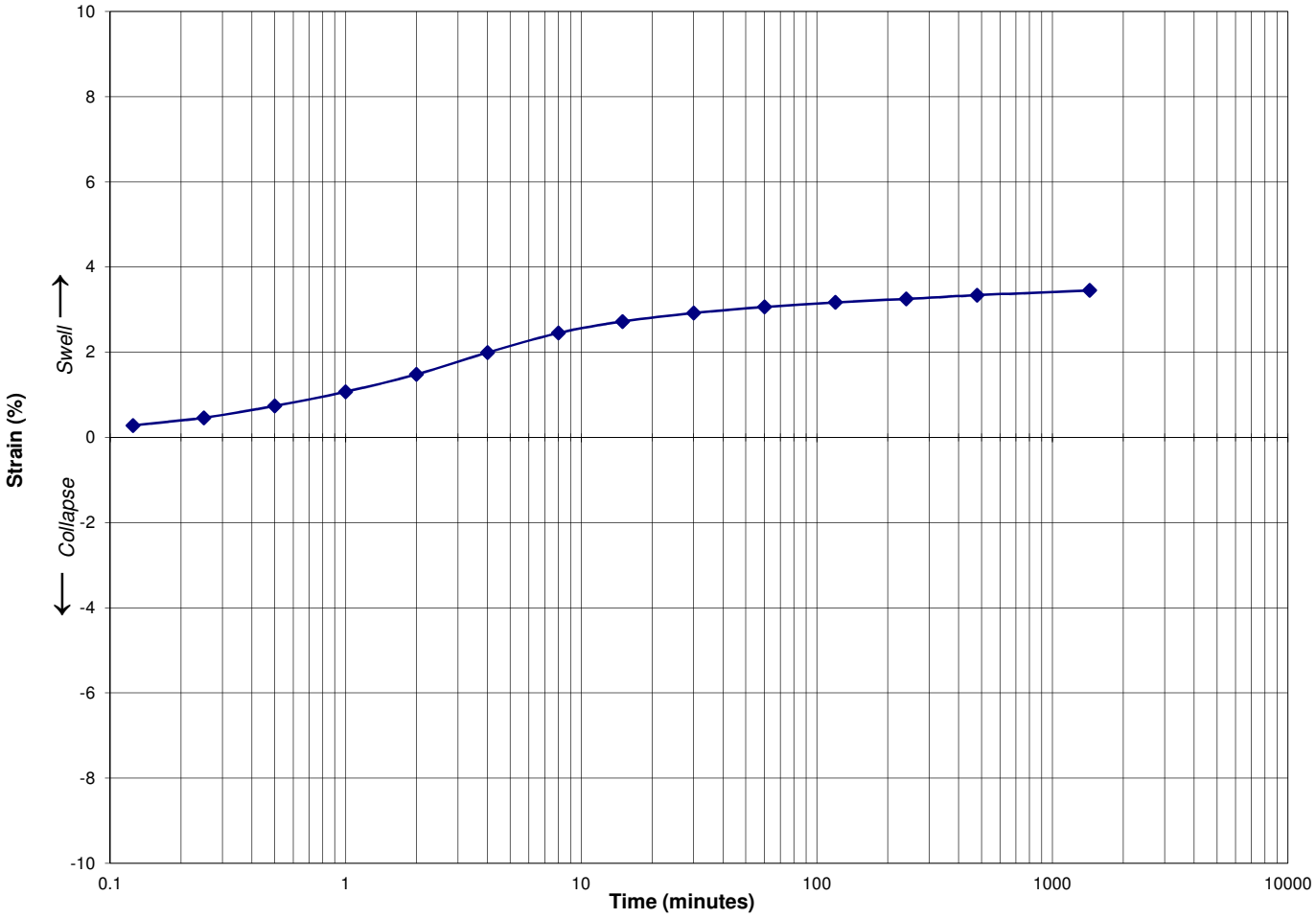
SPECIFIC GRAVITY: 2.65 (estimated)

APPLIED STRESS: 144 psf

SEATING PRESSURE: 100 psf

TEST PREPARATION: Specimen remolded to approximately 95% of maximum dry density at approximately 3% below optimum moisture, as determined by a standard proctor (ASTM D698).

3.5% Swell



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ONE-DIMENSIONAL FREE SWELL (ASTM D 4546)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B23

Report Date:	Project Number:
November 2012	129067

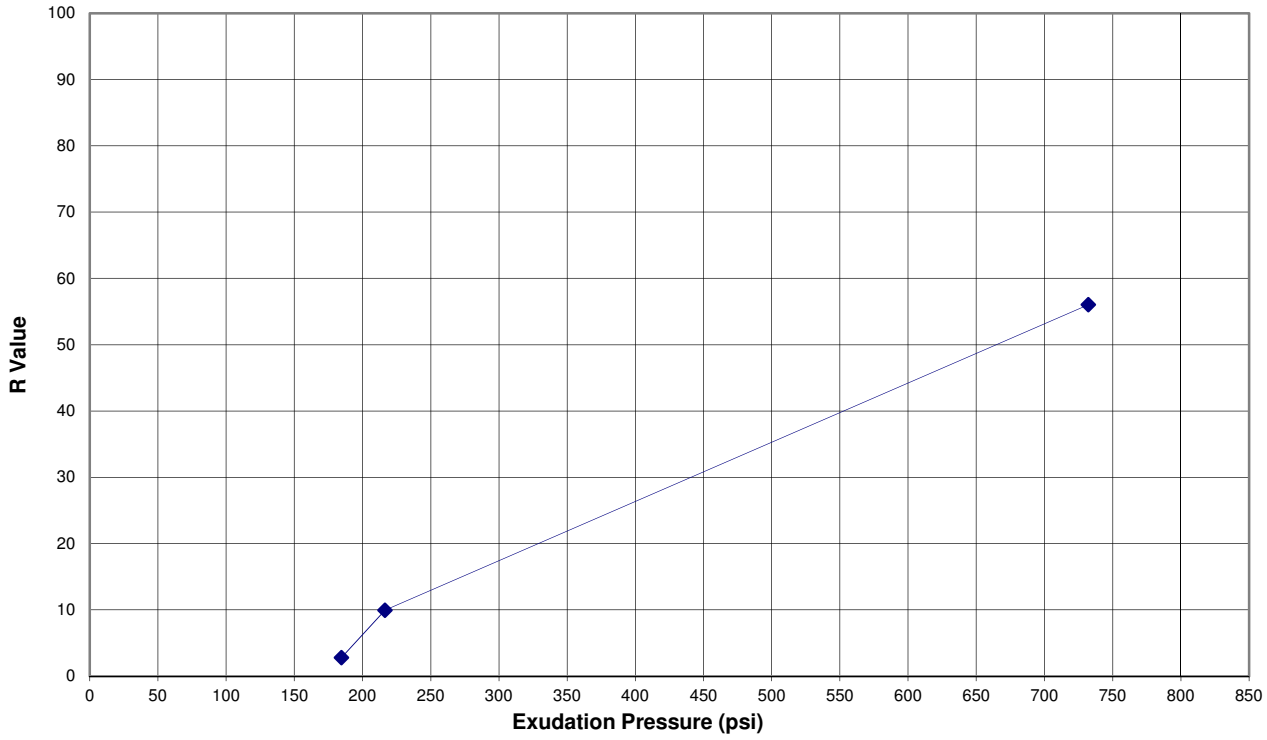
12294-55

SAMPLE SOURCE: **SD1 @ 0-5'**

USCS: SANDY LEAN CLAY (CL)

SPECIMEN	A	B	C
Moisture Content (%)	18.6	15.8	13.0
Compaction Pressure (psi)	*Hand Tamped*	125	350
Specimen Height (in)	2.52	2.52	2.46
Dry Density (pcf)	105.6	110.1	117.8
Horizontal Pressure @ 1000lbs (psi)	64	59	19
Horizontal Pressure @ 2000lbs (psi)	*Exceeded 140*	132	53
Displacement	5.77	4.79	3.96
Expansion Pressure (psi)	0.3	0.0	6.4
Exudation Pressure (psi)	185	216	732
R-Value	3	10	56

Interpolated R-Value at 300 psi = 17



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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B24

12294-36

SAMPLE SOURCE: **SD4 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

SPECIMEN	A	B	C
Moisture Content (%)	23.9	26.8	22.0
Compaction Pressure (psi)	*Hand Tamped*	*Hand Tamped*	75
Specimen Height (in)	2.63	2.49	2.54
Dry Density (pcf)	97.6	95.9	100.9
Horizontal Pressure @ 1000lbs (psi)	66	72	60
Horizontal Pressure @ 2000lbs (psi)	*Exceeded 140*	*Exceeded 140*	138
Displacement	5.85	6.19	5.26
Expansion Pressure (psi)	0.3	0.0	6.4
Exudation Pressure (psi)	320	216	732
R- Value	3	3	7

R - VALUE IS LESS THAN 5
SAMPLE EXTRUDED FROM BOTTOM OF MOLD

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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B25

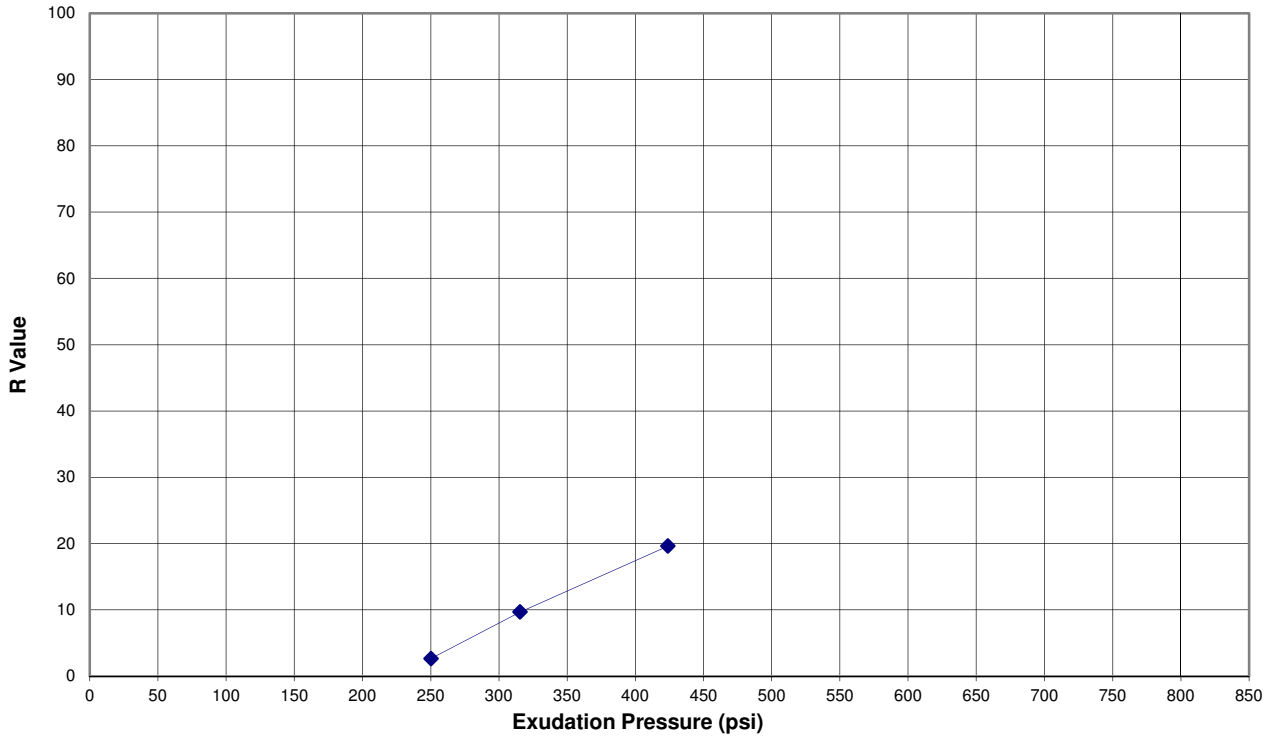
12294-40

SAMPLE SOURCE: **SD8 @ 1-5'**

USCS: SANDY LEAN CLAY with GRAVEL (CL)

SPECIMEN	A	B	C
Moisture Content (%)	16.8	14.1	15.4
Compaction Pressure (psi)	*Hand Tamped*	175	75
Specimen Height (in)	2.47	2.51	2.57
Dry Density (pcf)	113.4	116.6	113.0
Horizontal Pressure @ 1000lbs (psi)	64	44	61
Horizontal Pressure @ 2000lbs (psi)	*Exceeded 140*	114	134
Displacement	6.04	4.13	4.84
Expansion Pressure (psi)	0.0	0.3	0.0
Exudation Pressure (psi)	250	424	316
R-Value	3	20	10

Interpolated R-Value at 300 psi = 8



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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B26

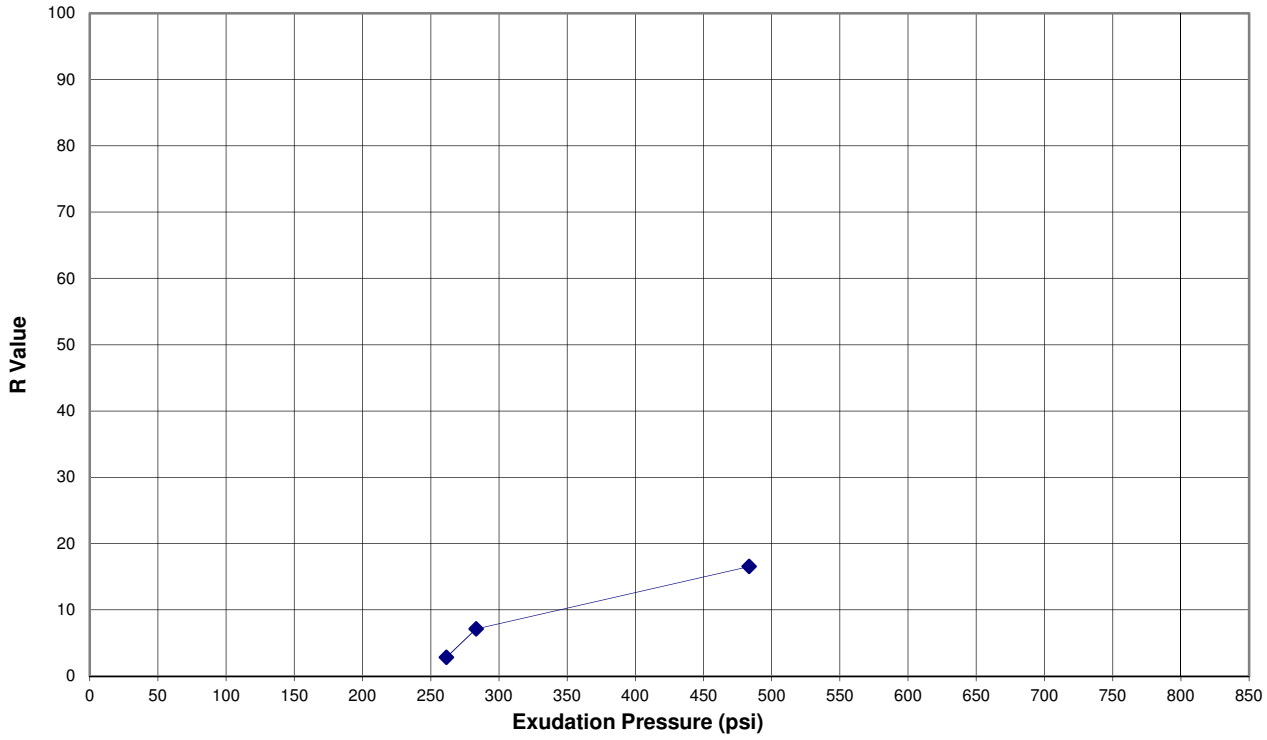
12294-45

SAMPLE SOURCE: **SD10 @ 1-5'**

USCS: LEAN CLAY with SAND (CL)

SPECIMEN	A	B	C
Moisture Content (%)	19.9	17.2	22.7
Compaction Pressure (psi)	*Hand Tamped*	150	*Hand Tamped*
Specimen Height (in)	2.56	2.46	2.61
Dry Density (pcf)	103.3	109.4	98.3
Horizontal Pressure @ 1000lbs (psi)	62	48	69
Horizontal Pressure @ 2000lbs (psi)	139	118	*Exceeded 140*
Displacement	5.20	4.49	6.30
Expansion Pressure (psi)	0.0	1.6	0.0
Exudation Pressure (psi)	283	483	261
R-Value	7	17	3

Interpolated R-Value at 300 psi = 8



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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B27

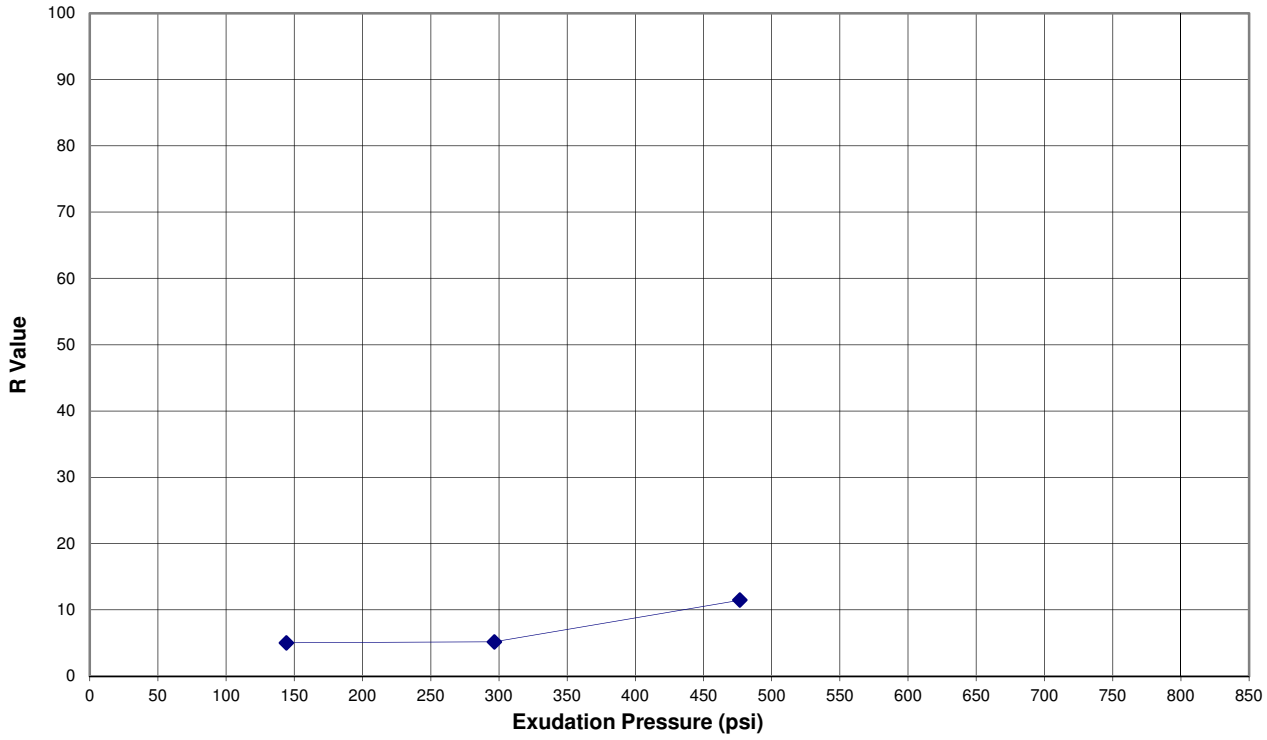
12294-48

SAMPLE SOURCE: **SD12 @ 0-4'**

USCS: SANDY LEAN CLAY (CL)

SPECIMEN	A	B	C
Moisture Content (%)	17.0	19.7	14.3
Compaction Pressure (psi)	*Hand Tamped*	*Hand Tamped*	100
Specimen Height (in)	2.41	2.52	2.38
Dry Density (pcf)	109.8	104.1	116.1
Horizontal Pressure @ 1000lbs (psi)	67	75	54
Horizontal Pressure @ 2000lbs (psi)	*Exceeded 140*	*Exceeded 140*	128
Displacement	5.62	6.36	4.25
Expansion Pressure (psi)	0.0	0.0	0.5
Exudation Pressure (psi)	297	144	477
R-Value	5	5	11

Interpolated R-Value at 300 psi = 5



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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B28

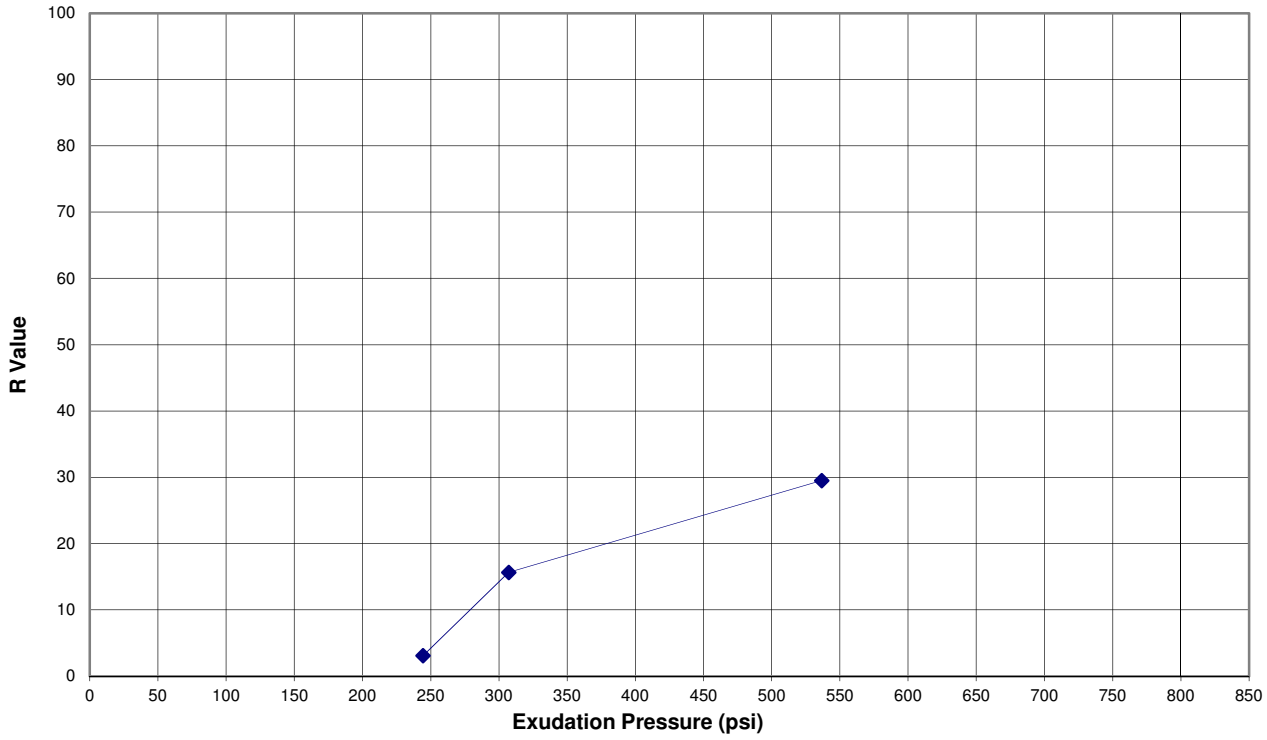
12294-50

SAMPLE SOURCE: **SD17 @ 0-5'**

USCS: LEAN CLAY with SAND (CL)

SPECIMEN	A	B	C
Moisture Content (%)	19.7	17.0	15.6
Compaction Pressure (psi)	*Hand Tamped*	150	200
Specimen Height (in)	2.59	2.45	2.48
Dry Density (pcf)	103.5	109.8	113.4
Horizontal Pressure @ 1000lbs (psi)	64	48	37
Horizontal Pressure @ 2000lbs (psi)	*Exceeded 140*	120	99
Displacement	5.70	4.49	3.68
Expansion Pressure (psi)	0.0	1.6	7.6
Exudation Pressure (psi)	244	307	537
R-Value	3	16	30

Interpolated R-Value at 300 psi = 14



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Report Date:	Project Number:
November 2012	129067

***R*-VALUE (ASTM D2844)**
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B29

12294-55

TEST METHOD:	ARIZ 733**	ARIZ 736**
SAMPLE LOCATION	Sulfates (ppm)	Chlorides (ppm)
SD1 @ 0-5'	77	216
SD1 @ 5-9'	75	96
SD2 @ 5-8'	156	201
SD2 @ 5-6.5'	207	129
SD2 @ 8-13'	81	54
SD3 @ 5-9'	73	118
SD3 @ 5-9' (duplicate)	73	114
SD4 @ 5-9'	97	99
SD4 @ 5-6.5'	88	59
SD5 @ 5-9'	73	103
SD6 @ 5-9'	71	140
SD6 @ 5-6.5'	69	134
SD7 @ 0-5'	153	222
SD7 @ 5-9'	60	79
F1 @ 0-5'	631	512
SD8 @ 5-9'	166	178
SD8 @ 5-6.5'	168	111

*** Testing performed by MotZZ Laboratory, Inc.*

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ADDITIONAL LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B30

Report Date: December 2012
Project Number: 129067

TEST METHOD:	ARIZ 733**	ARIZ 736**
SAMPLE LOCATION	Sulfates (ppm)	Chlorides (ppm)
SD9 @ 5-9'	413	348
SD9 @ 9-10.5'	116	76
F2 @ 5-9'	60	57
F2 @ 14-15.5'	46	219
SD10 @ 5-9'	116	18
SD10 @ 9-13'	126	59
SD11 @ 5-9'	625	53
SD11 @ 10-11.5'	1,098	191
SD13 @ 5-9'	51	15
SD13 @ 9-10.5'	28	33
SD15 @ 0-5'	233	362
SD16 @ 0-5'	122	233
SD16 @ 5-9'	164	459
SD16 @ 5-6.5'	138	366
SD17 @ 0-5'	69	103
SD17 @ 2-3.5'	54	58
SD17 @ 5-8'	60	66

*** Testing performed by MotZZ Laboratory, Inc.*

SECTION 6

PERCOLATION TESTING

TABLE OF CONTENTS

6 PERCOLATION TESTING

6.1 GENERAL

Eleven storm-water retention basins are proposed at multiple locations across the site. The planned depths for the proposed storm-water retention basins will range between 3 and 10 feet. Kleinfelder performed a geotechnical exploration for the proposed storm-water retention basins, which included percolation tests and borings. The geotechnical exploration for the proposed storm-water retention basins at the site was performed in general accordance with the Flood Control District of Maricopa County (FCDMC) requirements (Method 2 of the FCDMC Drainage Design [Hydraulics] Manual, 2010), which we understand also meets the City of Phoenix requirements for storm-water retention basins.

In addition, DMJM Harris/AECOM previously performed percolation tests across portions of the site and prepared a report summarizing their services. The report reviewed by Kleinfelder for this portion of the project was the following:

- *DMJM Harris/AECOM (AECOM) Stormwater Detention Basin Percolation Testing and Earthwork Factor Estimates, MC 85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona* (DMJM Harris Project No. 6490.0000, dated November 8, 2006). This previous AECOM report is included as an appendix to this section.

6.2 SUMMARY OF PREVIOUS PERCOLATION TESTING

In 2006, DMJM Harris/AECOM (AECOM) performed percolation testing for proposed storm-water retention basins along MC-85 (Buckeye Road) from 107th Avenue to 91st Avenue (western 2 miles of the site). AECOM's work included 9 percolation tests along the southern portion of the MC-85 alignment. We understand the current design (basin locations, size and depths) of the proposed storm-water retention basins was changed from the design planned at the time AECOM prepared their report.

The approximate location of the previous AECOM percolation tests are shown on Figures P-1 and P-2 included in this section. AECOM prepared a table summarizing their percolation test results, which is presented on Page 8 of the AECOM report). The following table was prepared

by AECOM (presented on Page 4 of their report), which summarizes the AECOM percolation test results:

Table 6.2-1 AECOM Percolation Test Results Summary Table

Stormwater Detention Basin Percolation Testing
and Earthwork Factor Estimates
MC 85 (Buckeye Road), 107th Avenue to 91st Avenue
MCDOT Work Order 69024
November 8, 2006
Page 4

Table 2
Percolation Test Results

ID	Station	Offset	Depth (ft)	Stabilized Percolation Rate (min/in)	Stabilized Percolation Rate ($ft^3/hr/ft^2$)
PT1	1133+00	100'R	4.25	25	0.20
PT3*	1143+00	100'R	4.25	32	0.16
PT4	1160+00	90'R	4.25	32	0.16
PT5	1177+00	100'R	4.25	38	0.14
PT6	1186+00	60'R	4.25	24	0.21
PT7	1197+00	60'R	4.25	27	0.19
PT8	1208+00	60'R	4.25	24	0.22
PT9	1219+00	75'R	4.25	52	0.09
PT10	1229+00	70'R	4.25	23	0.21
*PT2 was not investigated				Average	0.17

6.3 FIELD EXPLORATION

Prior to our field exploration, Kleinfelder staked the boring locations, cleared work areas with the Arizona Bluestake Center, and obtained a MCDOT right-of-way permit (Tracking No. TC20120646). The field work was located at distances greater than 20 feet away from the edge of pavement; therefore, a traffic control plan was not prepared for the percolation test field work. We notified a MCDOT inspector 24 hours prior to our field work.

The exploratory borings and percolation tests for the proposed storm-water retention basins were supervised between October 30th and November 9th, 2012 by Rollina Katako, E.I.T. of Kleinfelder. The basins at the site were numbered from 1 through 11, as shown on the Figures P-1 through P-4 (Percolation Testing Site Plans). Due to constraints of existing utilities and

private property access restrictions, the areas for Basin Nos. 4 and 11 were not accessible to perform borings and percolation tests. The approximate locations of the borings and percolation tests for the proposed storm-water retention basins are shown on Figures P-1 through P-4.

We were provided access to the private properties at the location of Basin Nos. 1, 3, 5 and 8; therefore, the borings and percolation tests were performed in the central portion of the proposed storm-water retention basins. We were not provided access to the private properties at the location of Basin Nos. 2, 6, 7, 9 and 10; therefore, the borings and percolation tests were performed along the edge of existing right-of-way and slightly away from the central portion of the proposed basins.

The subsurface soil conditions at the proposed basin sites were explored by drilling a total of 11 borings (designated as B1B1, B2B1, B3B1, B5B1, B5B2, B6B1, B6B2, B7B1, B7B2, B8B1, and B9B1 – the first two characters designate the basin number and the last two characters designate the boring number). The borings were drilled with a truck-mounted D-120 drill-rig and crew supplied by D&S Drilling, Inc. The borings were drilled using 8-inch outer diameter (OD) hollow-stem augers to depths generally ranging from about 15 to 20 feet below the existing ground surface (bgs).

During the field exploration, the soils encountered were visually classified, logged, and sampled by Kleinfelder's field engineer. Relatively undisturbed samples of the subsurface materials were obtained using a ring sampler with a 2.42-inch inside diameter (ID) and 3-inch OD. Disturbed samples of soils were obtained using a standard penetration test (SPT) split spoon sampler with a 1.375-inch ID and 2-inch OD. Bulk samples of drill cuttings were also collected at selected depths from the borings. The SPT and ring samplers were driven 18 and 12 inches, respectively, using a hydraulic actuated 140-pound hammer free falling 30 inches. Unless noted otherwise on the boring logs, the sample driving resistance was recorded as number of blows per six inches of penetration. The penetration results are presented on the borings logs adjacent to each sample. The recovered soil samples were removed from the sampler, sealed to reduce moisture loss and submitted to the laboratory. The borings were backfilled with auger cuttings. The logs of the exploratory borings are presented in Appendix P-A.

6.4 LABORATORY TESTING

Selected laboratory tests were performed on representative samples recovered from the field exploration to support our field classification and to provide information regarding engineering characteristics and properties of the subsurface soils. The laboratory testing program consisted of the following:

Table 6.4-1 Laboratory Testing Program

Laboratory Test	Sample Type	Number of Tests	Purpose of Test
Sieve Analysis (ASTM C136)	Bulk	12	Soil Classification
Atterberg Limits (ASTM D4318)	Bulk	12	Soil Classification
Hydrometer (ASTM D422)	Bulk	3	Silt/Clay Determination
pH and Resistivity (Ariz 236)	Bulk	8	Soil Corrosion Characteristics
Sulfates and Chlorides (Ariz 733/736)	Bulk	8	Soil Corrosion Characteristics

The results of the laboratory tests are presented on the laboratory test data sheets in Appendix P-B. The laboratory test results are also summarized on the boring logs in Appendix P-A.

6.5 GENERAL SITE CONDITIONS

6.5.1 SURFACE CONDITIONS

The proposed storm-water retention basin areas are generally located south and north of the existing MC-85 roadway. The proposed storm-water retention basins are generally located on graded shoulder areas and/or active agricultural land. The following are two pictures of MC-85 (Buckeye Road) taken at each end of the site facing east and west along the south side of the roadway.

Picture 1 – Near 107th Ave.; Facing East

Picture 2 – Near 75th Ave.; Facing West

6.5.2 SUBSURFACE CONDITIONS

The subsurface profiles encountered at the boring locations were found to be relatively similar. Individual boring logs with detailed descriptions are presented in Appendix P-A of this report.

At the boring locations, the surface and/or near surface soils generally consisted of native deposits of fine-grained soils that included sandy fat clays (CH), sandy lean clays (CL), fat clays (CH), and lean clays with sand (CL). These soils typically exhibited plasticities in the medium to high ranges with relative firmness in the soft to very firm range (generally increasing with depth), and they contained no to weak calcium carbonate cementation (caliche). At the location of B5B1, these clay soils extended to the final depth of exploration (approximately 15 feet bgs). With the exception of Boring B5B1, beginning at depths ranging from approximately 6.5 to 13 feet bgs and extending to the final depths of exploration (about 15 to 20.5 feet bgs), the clay soils were generally underlain by deposits of silty sand (SM), poorly graded sand (SP-SM), well graded sand (SW-SM), sandy silt (ML), clayey sand (SC), and sandy clayey silt (CL-ML). These subsurface coarser materials exhibited plasticities in the no to low range with relative densities in the loose to very dense range, had relative firmness in the hard range (fine-grained soils), and contained no to weak cementation. At the location of Borings B2B1, B6B2 and B9B1, silty gravel (GM), clayey sand (SC) or silty sand (SM) fill soils were encountered in the upper roughly 1 to 2 feet bgs.

As previously mentioned, Basin Nos. 4 and 11 were not accessible due to constraints of existing utilities and private property access restrictions; therefore, borings in these proposed storm-water retention basins were not drilled.

Groundwater was not encountered within the borings to the depths explored. It is possible that variations in groundwater elevations may occur due to seasonal changes, run-off, precipitation, perching, and irrigation and/or construction activities. In general, it is not expected that groundwater would impact construction of this project.

6.6 PERCOLATION TEST RESULTS

Eleven storm-water retention basins designated as Basins 1 through 11 are proposed at the site. Dependent upon the size of the proposed basin, 1 to 4 percolation tests were performed at each accessible basin. The percolation tests were designated as listed in the table below. The first two characters of the percolation test number designate the basin number and the last two characters designate the percolation test number for the basin. As part of the field exploration for the storm-water retention basins, borings were generally drilled in the central portion of the basins in an effort to explore the subsurface soil conditions. The approximate locations of the basins, borings and percolation tests are shown on Figures P-1 through P-4.

The percolation test holes were drilled between October 30th and November 9th, 2012 with a 15-inch solid stem auger to depths ranging from approximately 3 to 8 feet bgs. The test holes were manually cleaned and a 12-inch diameter PVC casing was installed in the test hole and the void in the test hole surrounding the outside perimeter of the PVC casing was backfilled with hand-tamped on-site clayey soils in an effort to direct flow to the bottom of the test hole. A gravel layer of approximately 2 inches thick was placed at the bottom of the test hole. The holes were partially filled with water (approximately 2 feet) and allowed to pre-soak for approximately 24 hours. The percolation tests were performed in general accordance with Method 2 of the FCDMC Drainage Design Manual (Hydraulics) to aid in the design of the proposed storm-water retention basins. The percolation tests were performed between October 31st and November 9th, 2012 by filling the percolation test holes with approximately 11 to 12 inches of water and measuring the rate of water drop within each test hole. Multiple water level readings were taken within the percolation test holes, and the holes were refilled with water (as needed) until a stabilized percolation rate was observed.

The following table provides the field measurements of the percolation testing to aid in the design of the proposed storm-water retention basins at the site. The field measurement rates shown in the table below (Table 6.6-1) should be de-rated based on the FCDMC Drainage

Design Manual for a 12-inch diameter test hole. Our scope of work was limited to presenting the field measurements of the percolation tests, and we understand the design of the proposed storm-water retention basins and selection of infiltration rates representative of the site conditions will be performed by others. The designers should be aware that in-situ infiltration testing provides an estimate of short-term infiltration rate that is generally representative of the infiltration rates at a specific location at the site. These tests saturate a very small amount of soil at the test location. The test results presented below may not accurately reflect the effects of interbedded fine-grained sediments and/or changes in hydraulic conductivity within the infiltration media below the tested areas. These tests are limited by the amount of material that they saturate.

Table 6.6-1 Results of Percolation Tests

Basin Number	Percolation Test	Depth of Hole bgs (feet)	Water Depth Range (inches)	Field Measurement Percolation Rate (minutes/inch)*
1	B1P1	7.9	12 to 4	10
	B1P2	8.0	12 to 6	14
2	B2P1	4.0	11 to 5	18
	B2P2	4.0	11 to 5	17
3	B3P1	4.0	12 to 6	33
	B3P2	4.1	11 to 5	23
4	No percolation testing performed due to access constraints.			
5	B5P1	4.0	11 to 5	32
	B5P2	4.0	12 to 5	49
	B5P3	4.0	11 to 5	52
6	B6P1	4.0	12 to 6	20
	B6P2	3.9	12 to 8	114
	B6P3	3.9	11 to 6	28
7	B7P1	3.8	11 to 5	56
	B7P2	3.9	11 to 5	20
	B7P3	3.8	11 to 5	22
	B7P4	4.1	12 to 5	35
8	B8P1	4.0	11 to 6	33
	B8P2	4.0	12 to 6	24
9	B9P1	3.1	12 to 6	72
10	B10P1	3.0	12 to 5	20
11	No percolation testing performed due to access constraints.			

*Note: Percolation rates shown are unfactored.

The field percolation rates measured are based on the soil conditions encountered at the particular locations of the percolation tests. If the soil conditions throughout the basin are different than those encountered, then the actual rates will likely differ, and additional percolation testing including large scale testing may be appropriate to further evaluate the basins.

6.7 EXCAVATION CHARACTERISTICS

The following general comments regarding excavation conditions are based on boring data. Based on the subsurface conditions encountered, excavations within the upper roughly 3 to 8 feet bgs should be possible using conventional earth excavating equipment. We recommend that the earthwork contractor make his own assessment to satisfy himself as to the type of equipment required to excavate through these deposits.

Based on our field observations and test results, temporary excavations in native soils may be cut at an inclination no steeper than 1.5H:1V (horizontal:vertical). All excavations should be planned and executed in accordance with current OSHA recommendations for a Type C soil (Federal Register 29 CFR Part 1926) and applicable local governing agency standards and procedures. Slopes may need to be further flattened or shored based on conditions encountered during construction. All parties should understand that safety of construction personnel is the sole responsibility of the Contractor. If trench shoring is used, the Engineer of Record should review shoring designs and soil parameters utilized by the shoring designer.

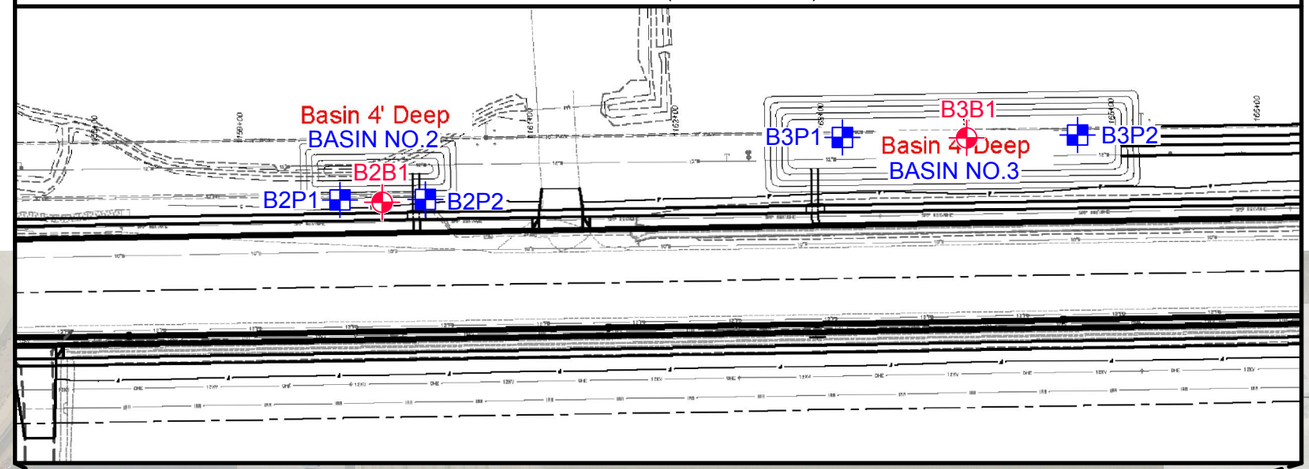
All construction surcharge loads and traffic loads should be kept a distance equal to the depth of the excavation away from the edge of the trench excavations, unless specifically designed for in the shoring design.

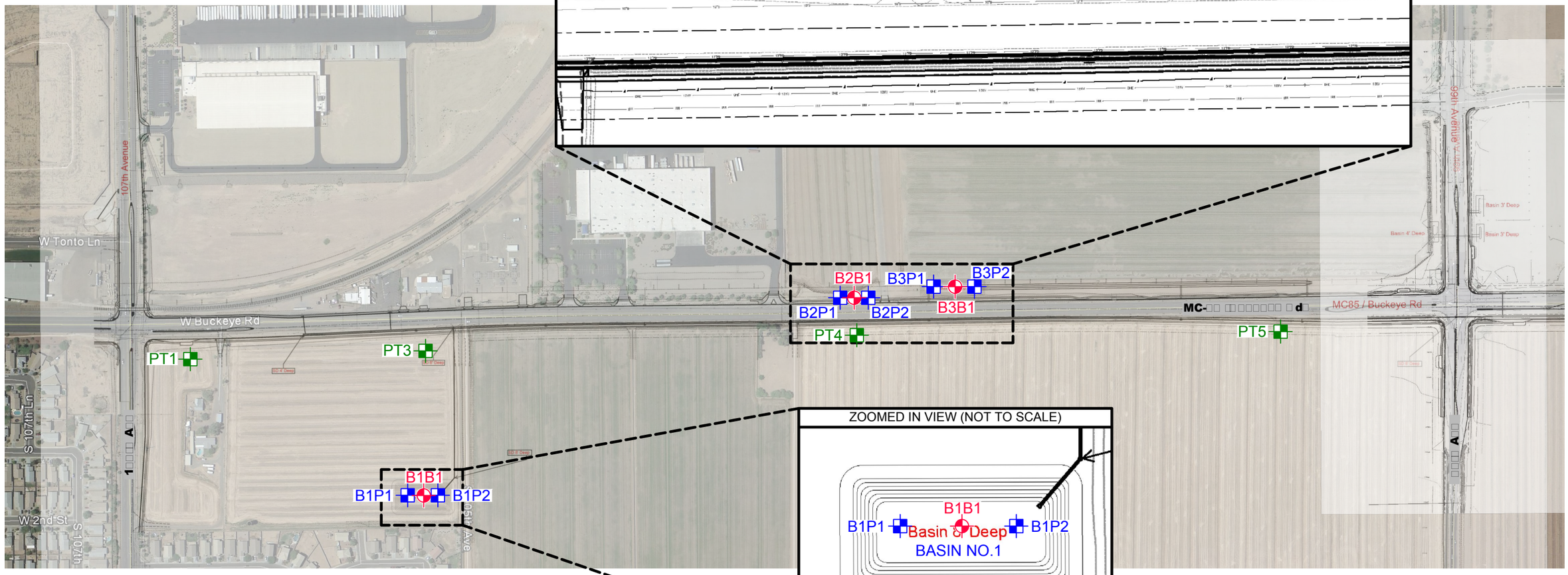
6.8 PERMANENT SLOPES

We do not anticipate the construction of permanent slopes for the basins to be greater than 10 feet in height, otherwise, Kleinfelder should be notified in order to review the slope details and determine if additional analyses is required. We recommend all cut slopes be constructed at a gradient no steeper than 2.5H:1V. Some erosion on the slopes should be anticipated, especially following storm events. Flatter slopes will be less susceptible to erosion.

FIGURES

ZOOMED IN VIEW (NOT TO SCALE)





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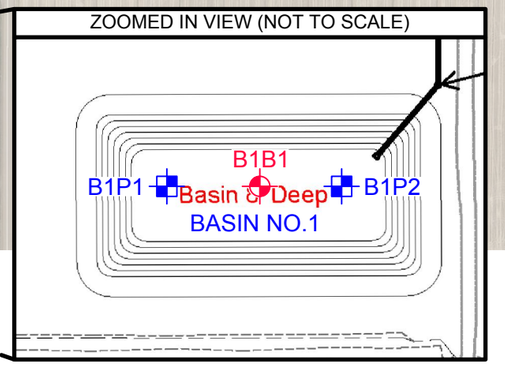

E□ P□ANATI□ N

- APPROXIMATE PERCOLATION TEST LOCATION
- APPROXIMATE KLEINFELDER BORING LOCATION
- APPROXIMATE PREVIOUS DMJM/AECOM PERCOLATION TEST LOCATION

N

0 200 400 800

APPROXIMATE SCALE (feet)

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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PROJECT NO.	129067
DRAWN:	12/2012
DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigP-1 to P-4.dwg

PE□ C□ □ATI□ N TESTIN□ SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 107TH TO 99TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
P-1

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images
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LONG BEACH, CA
CAD FILE: L:\CADD\2012\129067\PercTesting-SP_11-2012\ LAYOUT: P-1 PLOTTED: 07 Dec 2012, 8:24am, mgriffin

ZOOMED IN VIEW (NOT TO SCALE)

BASIN NO.9
Basin 3' Deep
B9P1
B9B1
B10P1
Basin 3' Deep
BASIN NO.10
BASIN NO.8
Basin 4' Deep
B8P1
B8B1
B8P2

B8P1
B8B1
B8P2
B9P1
B9B1
B10P1

99th Avenue
S 97th Ave
S 94th Ave
S 95th Ave
91st Avenue
MC85 / Buckeye Rd
W Buckeye Rd
MC-
BASIN NO.4
BASIN AREA NOT ACCESSIBLE
PT6
PT7
PT8
PT9
PT10

N

0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

- APPROXIMATE PERCOLATION TEST LOCATION
- APPROXIMATE KLEINFELDER BORING LOCATION
- APPROXIMATE PREVIOUS DMJM/AECOM PERCOLATION TEST LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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FILE NAME:	129067-FigP-1 to P-4.dwg

PE□ C□ □ATI□ N TESTIN□ SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 99TH TO 91ST AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
P-□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images
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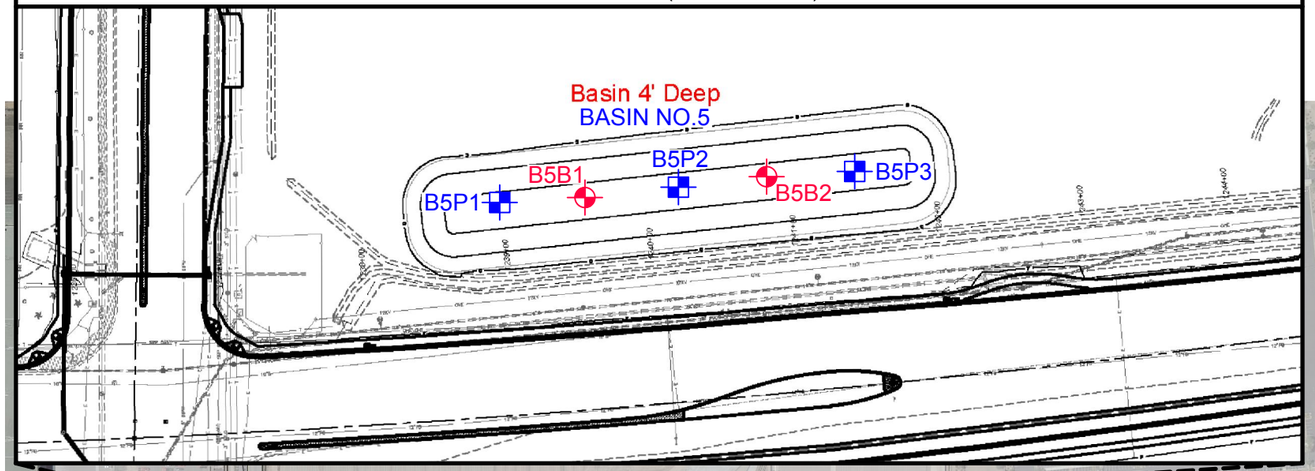

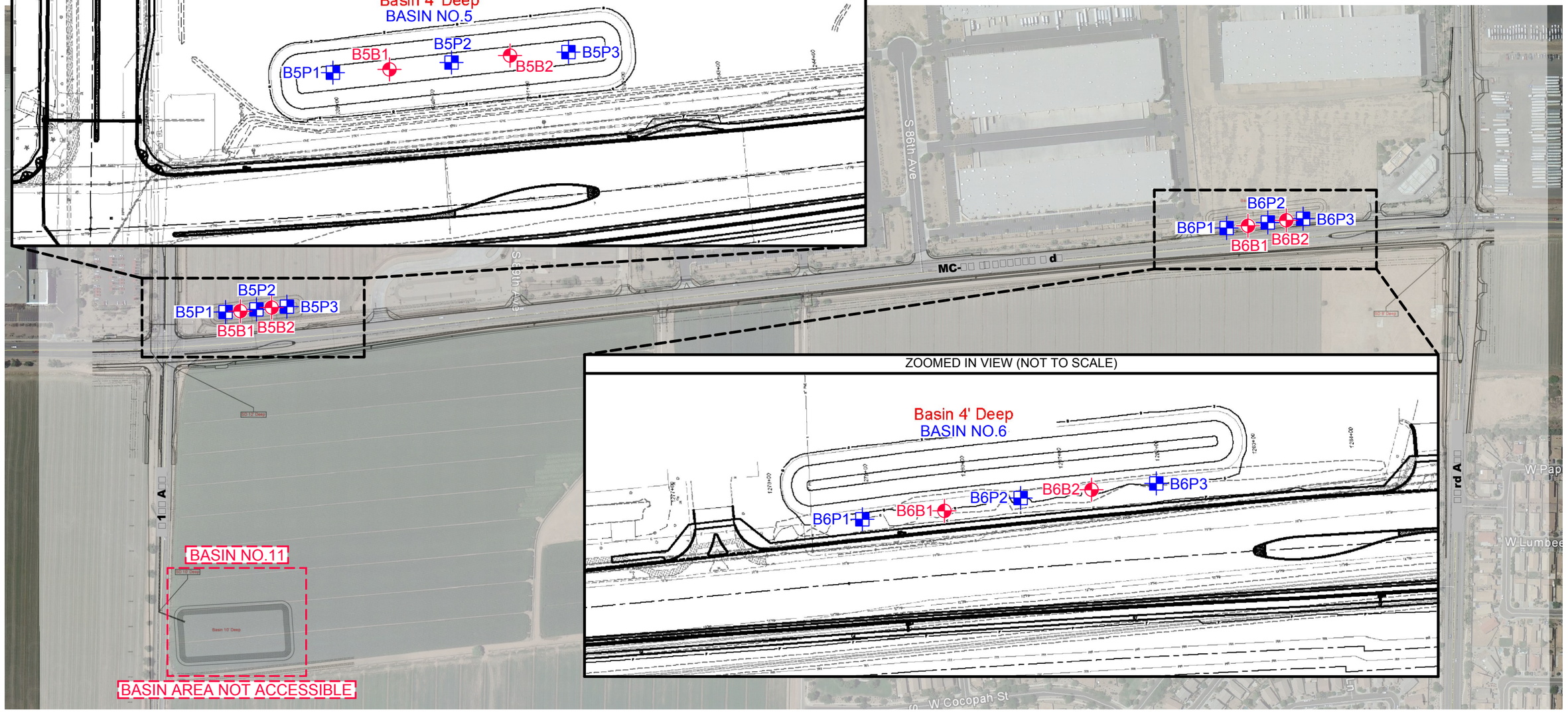

ZOOMED IN VIEW (NOT TO SCALE)

N

0 200 400 800

APPROXIMATE SCALE (feet)

E□ P□ANATI□ N

- APPROXIMATE PERCOLATION TEST LOCATION
- APPROXIMATE KLEINFELDER BORING LOCATION

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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DRAWN BY:	MRG
CHECKED BY:	RP
FILE NAME:	129067-FigP-1 to P-4.dwg

PE□ C□ □ATI□ N TESTIN□ SITE P□AN

MC-85 (BUCKEYE ROAD)
FROM 91ST AVENUE TO 83RD AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE

P-□

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images:
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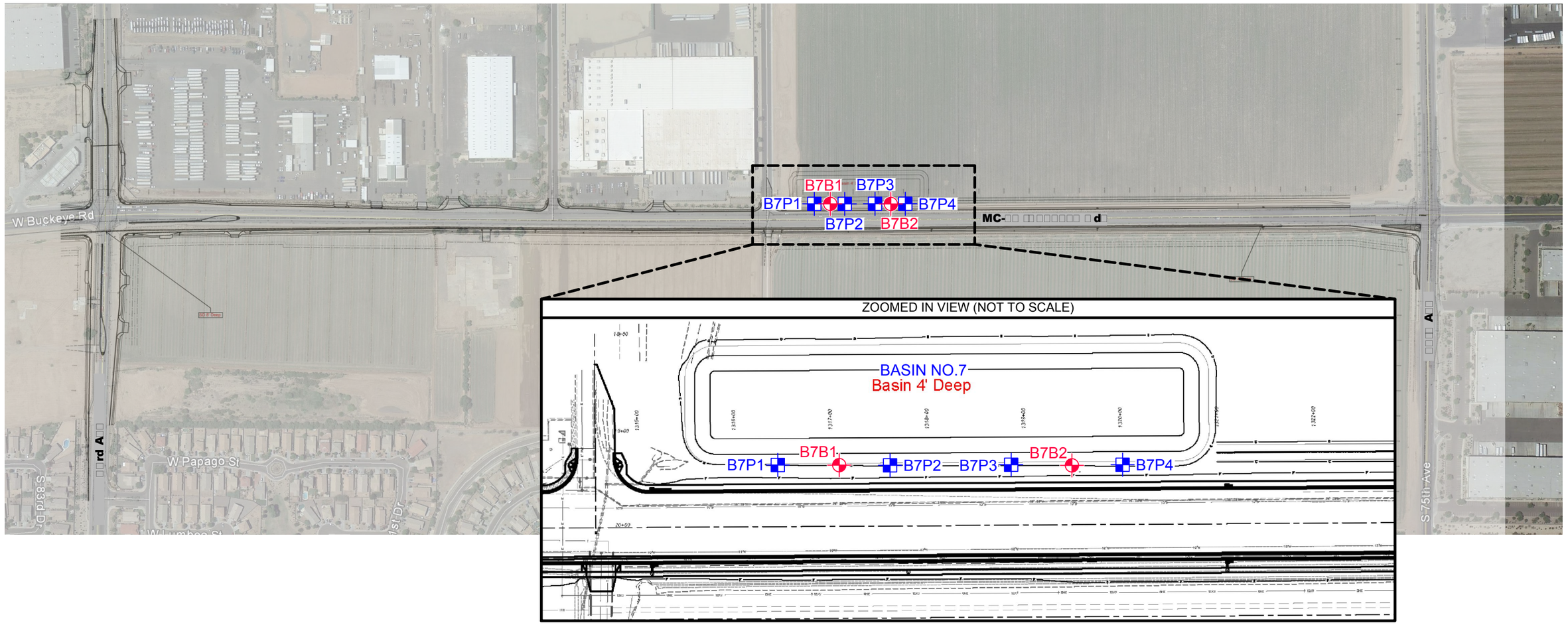
PLOTTED: 06 Dec 2012, 10:12am, mgriffin



E P ANATI N

- APPROXIMATE PERCOLATION TEST LOCATION
- APPROXIMATE KLEINFELDER BORING LOCATION

N

0 200 400 800

APPROXIMATE SCALE (feet)

SOURCE: GOOGLE EARTH PRO, 6/08/12.

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FILE NAME:	129067-FigP-1 to P-4.dwg

PE C ATI N TESTIN SITE P AN

MC-85 (BUCKEYE ROAD)
FROM 83RD AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE

P-

ATTACHED IMAGES: Images: Aerial-Image_1304_6-8-12_107th.jpg Images: Aerial-Image_1304_6-8-12_91st.jpg Images: Aerial-Image_1304_6-8-12_83rd.jpg Images: Aerial-Image_1304_6-8-12_99th.jpg Images
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APPENDIX P-A

Borings Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LESS THAN 5% PASSING NO. 200 SIEVE	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% PASSING NO. 200 SIEVE	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LESS THAN 5% PASSING NO. 200 SIEVE	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% PASSING NO. 200 SIEVE	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

Note: Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing No. 200 sieve require dual USCS symbols. (See KEY A3 if provided)

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Report Date:	Project Number:
December 2012	129067

UNIFIED SOIL CLASSIFICATION SYSTEM

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A1

GEO-KEY_A1_SOIL 129067 MC-85.GPJ 12/06/12

LOG SYMBOLS

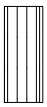
BULK / GRAB SAMPLE

MODIFIED CALIFORNIA SAMPLER
(2 inch inside diameter)

RING (PORTER) SAMPLER
(2-1/2 inch inside diameter)

STANDARD PENETRATION
SPLIT SPOON SAMPLER
(1.4 inch inside diameter)

SHELBY TUBE
(3 inch outside diameter)



HQ-3 SIZE CORE BARREL
(2.4 inch inside diameter)

WATER LEVEL
(level after completion)

WATER LEVEL
(level where first encountered)

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
3. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.
5. NA = Not Analyzed

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Report Date:	Project Number:
December 2012	129067

LOG KEY

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

A2

GEO-KEY_A2_LOG 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43361° Longitude: -112.28587°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	20.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 20.5 feet
														Agricultural field - alfalfa
			2-1-2										SC	**CLAYEY SAND:** brown, very loose, low plasticity, no cementation, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
	5		24/12										CL	**SANDY LEAN CLAY:** brown to light brown, firm, medium plasticity, no to weak cementation, damp.
			25/12				32	12	98	46	Sulfates = 47 ppm Chlorides = 63 ppm pH = 8.3 Min Resis = 1342 ohms-cm		SC	**CLAYEY SAND:** brown, medium dense, low plasticity, no cementation, trace gravel, damp, stratified with silty sand.
	10													
			10-13-15										SP-SM	**POORLY GRADED SAND, with SILT:** brown to light brown, medium dense, non-plastic, no cementation, trace gravel, damp.
	15												GM	**SILTY GRAVEL:** brown and gray, dense, non-plastic, no cementation, damp.
			17-19-17											Note: stratified with thin layers of poorly graded sand, with silt (SP-SM) below about 19 feet.
	20													Stopped drilling at 19.0 feet. Stopped sampling at 20.5 feet. No groundwater encountered in test boring. Cave-in to 15.0 feet.

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LOG OF BORING B1B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A3

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43578° Longitude: -112.28029°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet Graded dirt shoulder - Buckeye Road
				14									FILL	**FILL: SILTY GRAVEL:** brown and gray, non-plastic, damp.
				9									CH	**SANDY FAT CLAY:** brown, moderately firm, high plasticity, weak cementation, damp.
			3-4-5	7										
				5										
				9			53	34	100	68	Sulfates = 137 ppm Chlorides = 126 ppm pH = 7.9 Min Resis = 939 ohms-cm			
	5		31/12	16										Note: light brown, very firm, and weak to moderate cementation below about 5 feet.
				14										
				11										
				12									SM	**SILTY SAND:** brown, medium dense, non-plastic, no cementation, trace gravel, damp.
			5-7-9											
	10													
													SP-SM	**POORLY GRADED SAND, with SILT:** brown to light brown and gray, very dense, non-plastic, no cementation, trace gravel, slightly damp.
			11-25-37											
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING B2B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A4

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43582° Longitude: -112.27896°			Date Started:	10/30/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/30/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet
														Graded dirt shoulder - Buckeye Road
			3-3-4										CL	**SANDY LEAN CLAY:** brown, soft, medium plasticity, no to weak cementation, damp, upper roughly 12 inches disturbed by previous grading.
	5		5-7-9				44	26	98	56	Sulfates = 115 ppm Chlorides = 249 ppm pH = 7.9 Min Resis = 812 ohms-cm			Note: light brown, firm, weak to moderate cementation, and trace gravel below about 5 feet.
			4-4-4				NV	NP	90	9			SW-SM	**WELL GRADED SAND, with SILT:** brown to light brown, loose, non-plastic, no cementation, some gravel, slightly damp.
	10													
			5-5-7				NV	NP	90	9				Note: medium dense below about 14 feet.
	15													
														Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 11.0 feet.
	20													

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LOG OF BORING B3B1

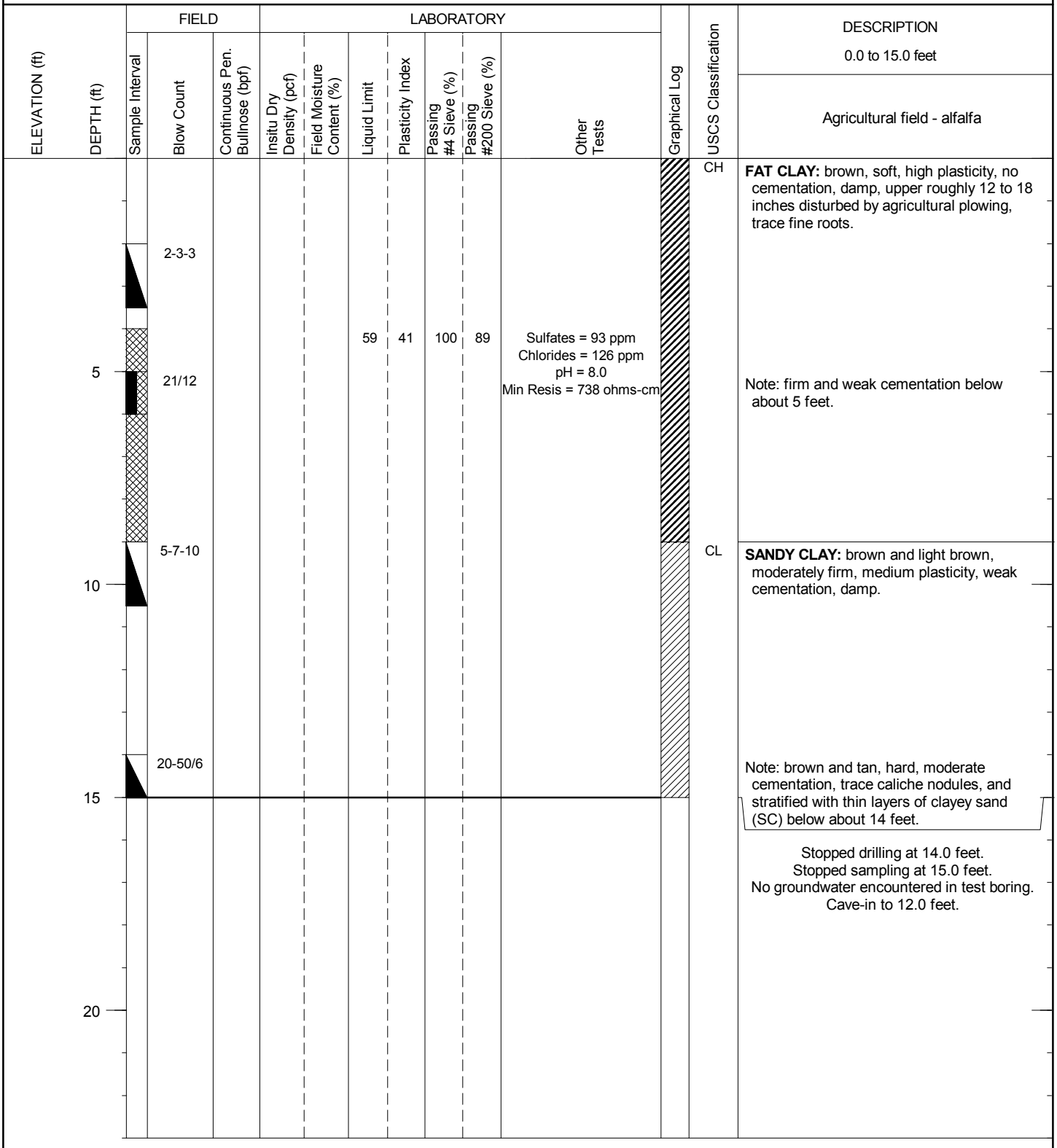
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A5

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43615° Longitude: -112.25417°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.0



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LOG OF BORING B5B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A6

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43621° Longitude: -112.25376°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet Agricultural field - alfalfa
			2-2-2				57	38	100	89			CH	**FAT CLAY:** brown, very soft, high plasticity, no cementation, damp, upper roughly 12 to 18 inches disturbed by agricultural plowing.
	5		5-7-10											Note: firm and weak cementation below about 5 feet.
	10		3-4-6										ML	**SANDY SILT:** brown, medium dense, non-plastic, no cementation, damp.
													SC	**CLAYEY SAND:** brown and light brown, very dense, low plasticity, weak cementation, with caliche nodules, slightly damp.
	15		40-28-31											Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 12.0 feet.
	20													

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LOG OF BORING B5B2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A7

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43708° Longitude: -112.24107°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 15.5 feet Graded dirt shoulder - Buckeye Road
			4-4-3										CL	**SANDY LEAN CLAY:** brown to light brown, soft, medium plasticity, weak cementation, trace gravel, slightly damp, upper roughly 12 inches disturbed by previous grading.
	5		31/12				36	19	99	70	Sulfates = 68 ppm Chlorides = 62 ppm pH = 7.9 Min Resis = 671 ohms-cm			Note: very firm below about 5 feet.
			7-8-10										ML	**SANDY SILT:** brown to light brown, medium dense, non-plastic, no cementation, slightly damp, stratified with thin layers of lean clay.
	10													
			12-15-17										SC	**CLAYEY SAND:** brown and light brown, dense, low plasticity, no cementation, slightly damp.
	15													Stopped drilling at 14.0 feet. Stopped sampling at 15.5 feet. No groundwater encountered in test boring. Cave-in to 10.0 feet.
	20													

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LOG OF BORING B6B1

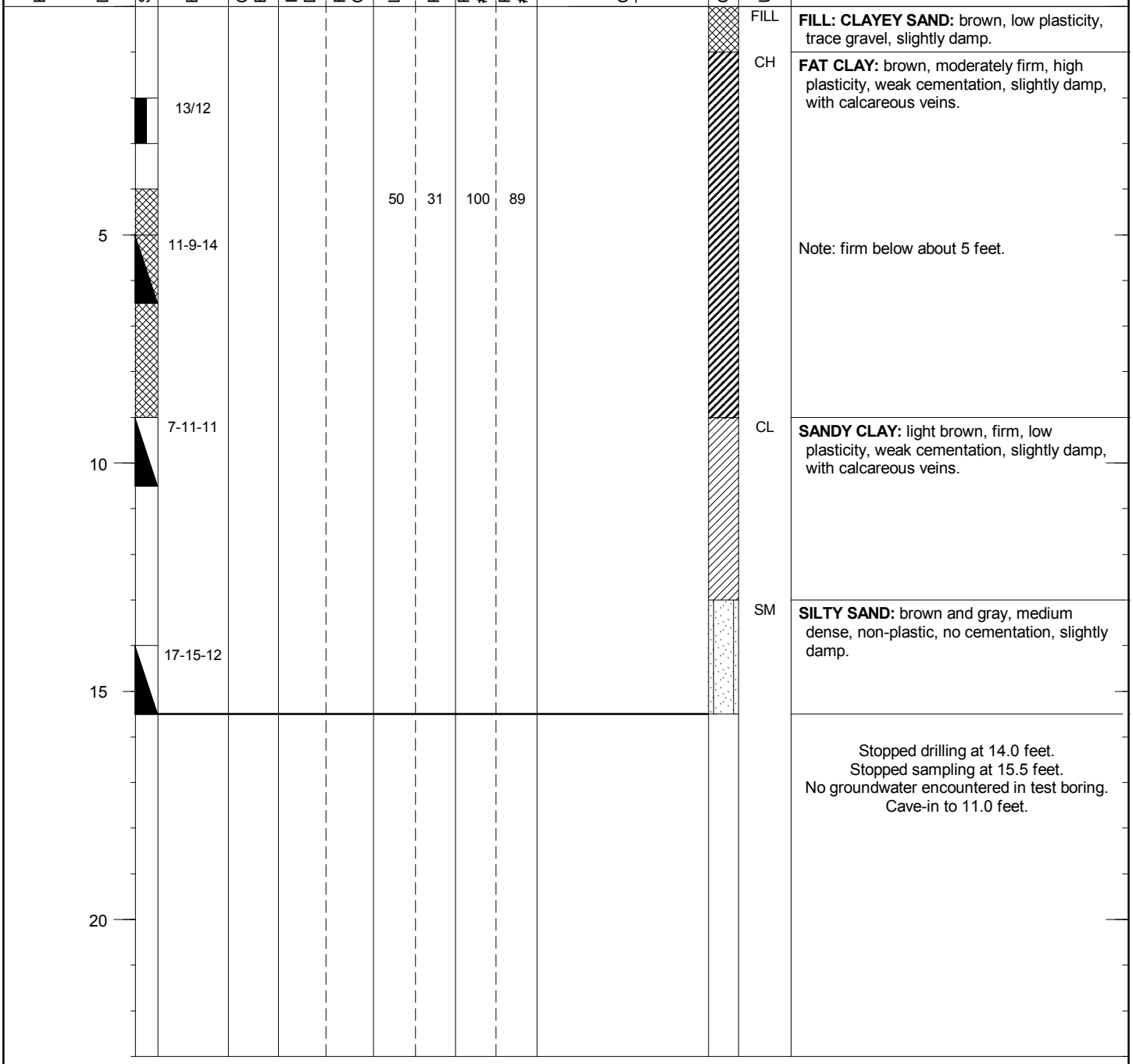
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A8

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43713° Longitude: -112.24055°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	15.5



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LOG OF BORING B6B2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A9

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43729° Longitude: -112.2288°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	20.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 20.5 feet
														Graded dirt shoulder - Buckeye Road
			2-2-2	9 4 3									CL	**LEAN CLAY, with SAND:** brown to light brown, soft, medium plasticity, weak cementation, trace gravel, slightly damp, upper roughly 12 inches disturbed by previous grading.
	5		17/12	5 8 8			42	25	100	81	Sulfates = 64 ppm Chlorides = 79 ppm pH = 7.9 Min Resis = 671 ohms-cm			Note: firm below about 5 feet.
			4-5-8	9 12 21									ML	**SANDY SILT:** brown, medium dense, non-plastic, no cementation, stratified with thin layers of silty sand.
	10													
			70/11										CL-ML	**SANDY, CLAYEY SILT:** brown to light brown, hard, low plasticity, no to weak cementation, damp, with caliche nodules.
	15													
			7-10-17										CL	**LEAN CLAY, with SAND:** brown to light brown, very firm, low plasticity, weak cementation, slightly damp, stratified with thin layers of silty sand.
	20													Stopped drilling at 19.0 feet. Stopped sampling at 20.5 feet. No groundwater encountered in test boring. Cave-in to 16.0 feet.

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LOG OF BORING B7B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A10

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43724° Longitude: -112.22809°			Date Started:	10/31/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	10/31/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	20.5

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 20.5 feet
														Graded dirt shoulder - Buckeye Road
			2-3-3										CL	**SANDY LEAN CLAY:** brown, soft, low plasticity, no cementation, damp, upper roughly 12 inches disturbed by previous grading.
	5		3-4-4				29	13	99	51				Note: moderately firm, trace gravel, and stratified with thin layers of silty sand below about 5 feet.
			7-9-12											Note: firm below about 9 feet.
	10													
													ML	**SANDY SILT:** brown, very dense, non-plastic, no cementation, slighty damp to damp.
			11-22-30											
	15													
			8-11-12											Note: brown and light brown, medium dense, and with caliche nodules below about 19 feet.
	20													
														Stopped drilling at 19.0 feet. Stopped sampling at 20.5 feet. No groundwater encountered in test boring. Cave-in to 16.0 feet.

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LOG OF BORING B7B2

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A11

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43645° Longitude: -112.27268°			Date Started:	11/2/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/2/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	14.8

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 14.8 feet
														Graded dirt shoulder - 99th Avenue
			3-4-3	12 5 5 6									CL	**SANDY LEAN CLAY:** brown to light brown, soft, medium plasticity, weak cementation, slightly damp, upper roughly 12 inches disturbed by previous grading.
	5		22/12	8 10 15 19 22			43	27	99	63	Sulfates = 244 ppm Chlorides = 579 ppm pH = 7.9 Min Resis = 470 ohms-cm			Note: firm and trace gravel below about 5 feet.
			7-11-17										SC	**CLAYEY SAND:** light brown to light yellow brown, medium dense, low plasticity, no cementation, slightly damp to damp.
	10												ML	**SANDY SILT:** brown and light brown, very dense, no to low plasticity, weak cementation, slightly damp, with caliche nodules.
			16-50/3											
	15													Stopped drilling at 14.0 feet. Sampler refusal at 14.7 feet. No groundwater encountered in test boring. Cave-in to 9.7 feet.
	20													

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LOG OF BORING B8B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A12

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

Boring Location:	Latitude: 33.43667° Longitude: -112.27218°			Date Started:	11/2/2012
Groundwater (ft):	No Groundwater Encountered			Date Completed:	11/2/2012
Drilling Company:	D & S Drilling, Inc.	Equipment:	Deidrich D-120	Logged By:	R. Katako
Hole Diameter (in):	8	Drilling Method:	Hollow Stem Auger		
Hammer Type:	Automatic	Elevation (ft):	N/A	Total Depth (ft):	20.4

ELEVATION (ft)	DEPTH (ft)	FIELD: Sample Interval	FIELD: Blow Count	FIELD: Continuous Pen. Bullnose (bpf)	LABORATORY: Insitu Dry Density (pcf)	LABORATORY: Field Moisture Content (%)	LABORATORY: Liquid Limit	LABORATORY: Plasticity Index	LABORATORY: Passing #4 Sieve (%)	LABORATORY: Passing #200 Sieve (%)	LABORATORY: Other Tests	Graphical Log	USCS Classification	DESCRIPTION
														0.0 to 20.4 feet
														Graded dirt shoulder - 99th Avenue
													FILL	**SILTY SAND:** light brown, low plasticity, with gravel, slightly damp.
			8-8-7				41	24	99	63	Sulfates = 87 ppm Chlorides = 159 ppm pH = 8.0 Min Resis = 738 ohms-cm		CL	**SANDY LEAN CLAY:** brown, moderately firm, medium plasticity, no cementation, trace gravel, slightly damp to damp.
	5		6-9-10											Note: brown, light brown, gray and firm below about 5 feet.
													SC	**CLAYEY SAND:** brown and light brown, medium dense, low plasticity, weak cementation, slightly damp to damp.
			10-14-20											Note: dense below about 9 feet.
	10													
			50/4											Note: very dense and with caliche nodules below about 14 feet.
	15													
			23-34-50/5											Note: stratified with thin layers of sandy silt below about 19 feet.
	20													
														Stopped drilling at 19.0 feet. Sampler refusal at 20.5 feet. No groundwater encountered in test boring. Cave-in to 13.0 feet.

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LOG OF BORING B9B1

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
A13

Report Date:	Project Number:
December 2012	129067

GEO_ADOT_EW/EL_R 129067 MC-85.GPJ 12/06/12

APPENDIX P-B

Laboratory Test Results

SAMPLE LOCATION	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRAIN SIZE ANALYSIS				ATTERBERG LIMITS			OTHER TESTS	UNIFIED SOIL CLASSIFICATION (USCS)
			GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)	LL	PL	PI		
B1B1 @ 8-13'			2	51	46		32	20	12	SULF = 47 CHLO = 63 pH = 8.3 RESIS = 1,342	CLAYEY SAND (SC)
B2B1 @ 4-8'			0	32	68		53	19	34	SULF = 137 CHLO = 126 pH = 7.9 RESIS = 939	SANDY FAT CLAY (CH)
B3B1 @ 4-8'			2	42	25	31	44	18	26	SULF = 115 CHLO = 249 pH = 7.9 RESIS = 812	SANDY LEAN CLAY (CL)
B3B1 @ 9' and B3B1 @ 14'			10	81	9		NV	NP	NP		WELL-GRADED SAND with SILT (SW-SM)
B5B1 @ 4-9'			0	11	38	50	59	18	41	SULF = 93 CHLO = 126 pH = 8.0 RESIS = 738	FAT CLAY (CH)
B5B2 @ 4-9'			0	11	89		57	19	38		FAT CLAY (CH)
B6B1 @ 4-9'			1	30	70		36	17	19	SULF = 68 CHLO = 62 pH = 7.9 RESIS = 671	SANDY LEAN CLAY (CL)
B6B2 @ 4-9'			0	11	44	45	50	19	31		FAT CLAY (CH)
B7B1 @ 5-9'			0	19	81		42	17	25	SULF = 64 CHLO = 79 pH = 7.9 RESIS = 671	LEAN CLAY with SAND (CL)
B7B2 @ 5-9'			1	48	51		29	16	13		SANDY LEAN CLAY (CL)
B8B1 @ 5-8'			1	36	63		43	16	27	SULF = 244 CHLO = 579 pH = 7.9 RESIS = 470	SANDY LEAN CLAY (CL)
B9B1 @ 2-6.5'			1	36	63		41	17	24	SULF = 87 CHLO = 159 pH = 8.0 RESIS = 738	SANDY LEAN CLAY (CL)

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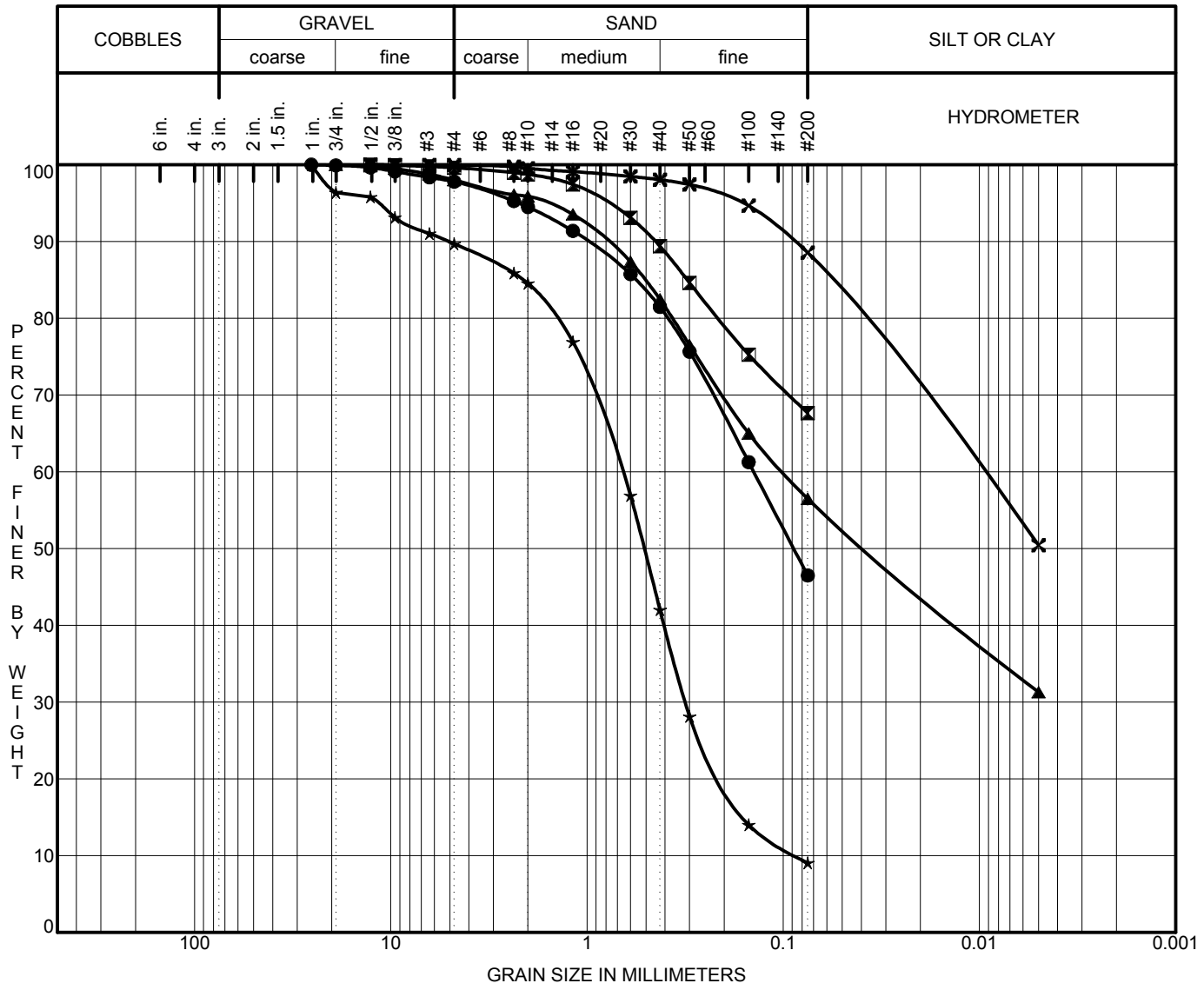
Report Date: Nov 2012

Project Number: 129067

SUMMARY OF LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B1



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	B1B1	8.0 - 13.0	0	2	51	46		0.1		
⧓	B2B1	4.0 - 8.0	0	0	32	68				
▲	B3B1	4.0 - 8.0	0	2	42	25	31	0.1		
★	B3B1	9.0 - 15.5	0	10	81	9		0.7	0.3	0.1
✕	B5B1	4.0 - 9.0	0	0	11	38	50	0.0		

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	B1B1	8.0 - 13.0	CLAYEY SAND (SC)	32	20	12		
⧓	B2B1	4.0 - 8.0	SANDY FAT CLAY (CH)	53	19	34		
▲	B3B1	4.0 - 8.0	SANDY LEAN CLAY (CL)	44	18	26		
★	B3B1	9.0 - 15.5	WELL-GRADED SAND with SILT (SW-SM)	NP	NP	NP	7.8	1.74
✕	B5B1	4.0 - 9.0	FAT CLAY (CH)	59	18	41		

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Report Date:	Project Number:
November 2012	129067

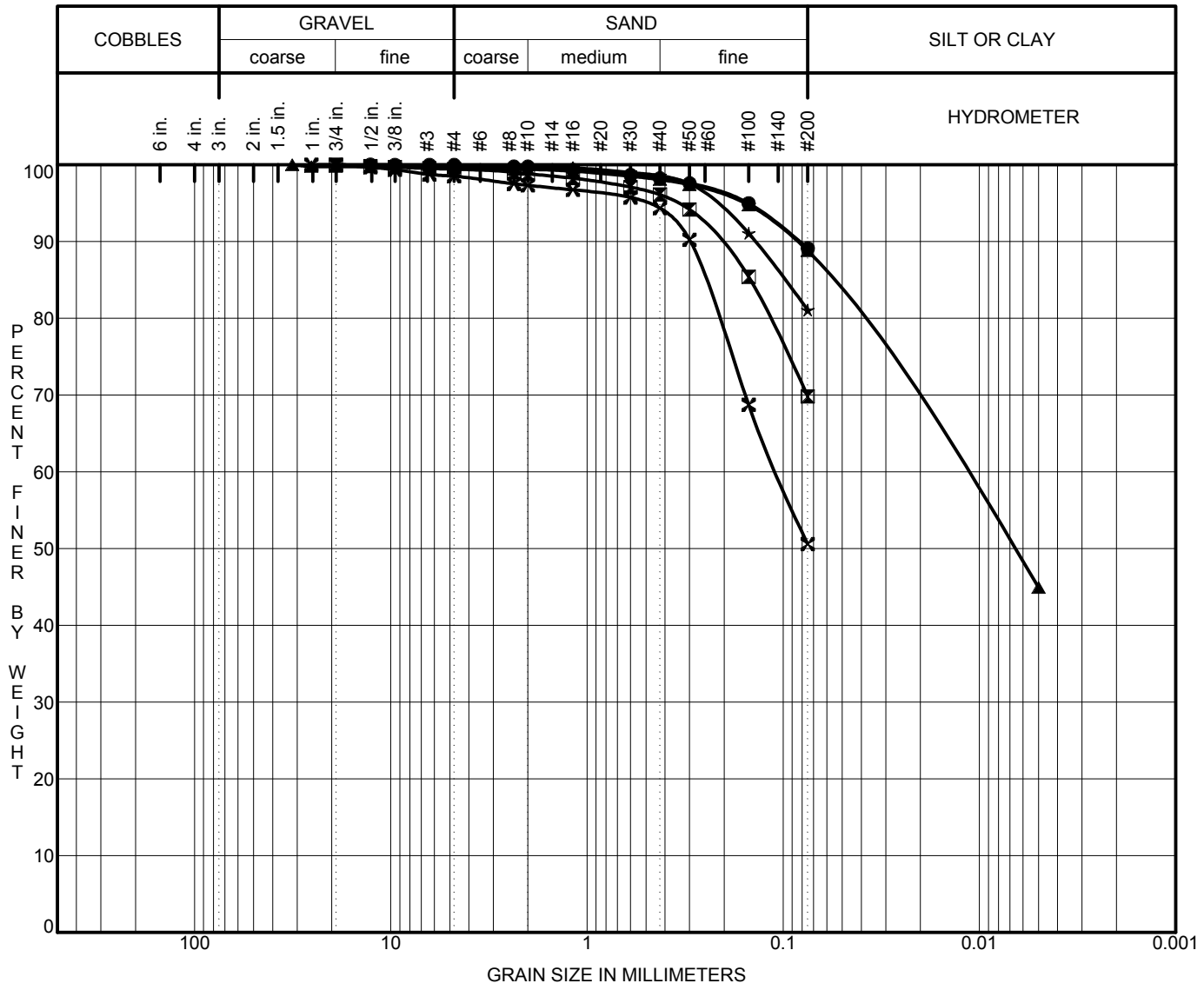
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B2

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 11/27/12



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	B5B2	4.0 - 9.0	0	0	11	89				
⧓	B6B1	4.0 - 9.0	0	1	30	70				
▲	B6B2	4.0 - 9.0	0	0	11	44	45	0.0		
★	B7B1	5.0 - 9.0	0	0	19	81				
✕	B7B2	5.0 - 9.0	0	1	48	51		0.1		

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	B5B2	4.0 - 9.0	FAT CLAY (CH)	57	19	38		
⧓	B6B1	4.0 - 9.0	SANDY LEAN CLAY (CL)	36	17	19		
▲	B6B2	4.0 - 9.0	FAT CLAY (CH)	50	19	31		
★	B7B1	5.0 - 9.0	LEAN CLAY with SAND (CL)	42	17	25		
✕	B7B2	5.0 - 9.0	SANDY LEAN CLAY (CL)	29	16	13		

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Report Date: December 2012

Project Number: 129067

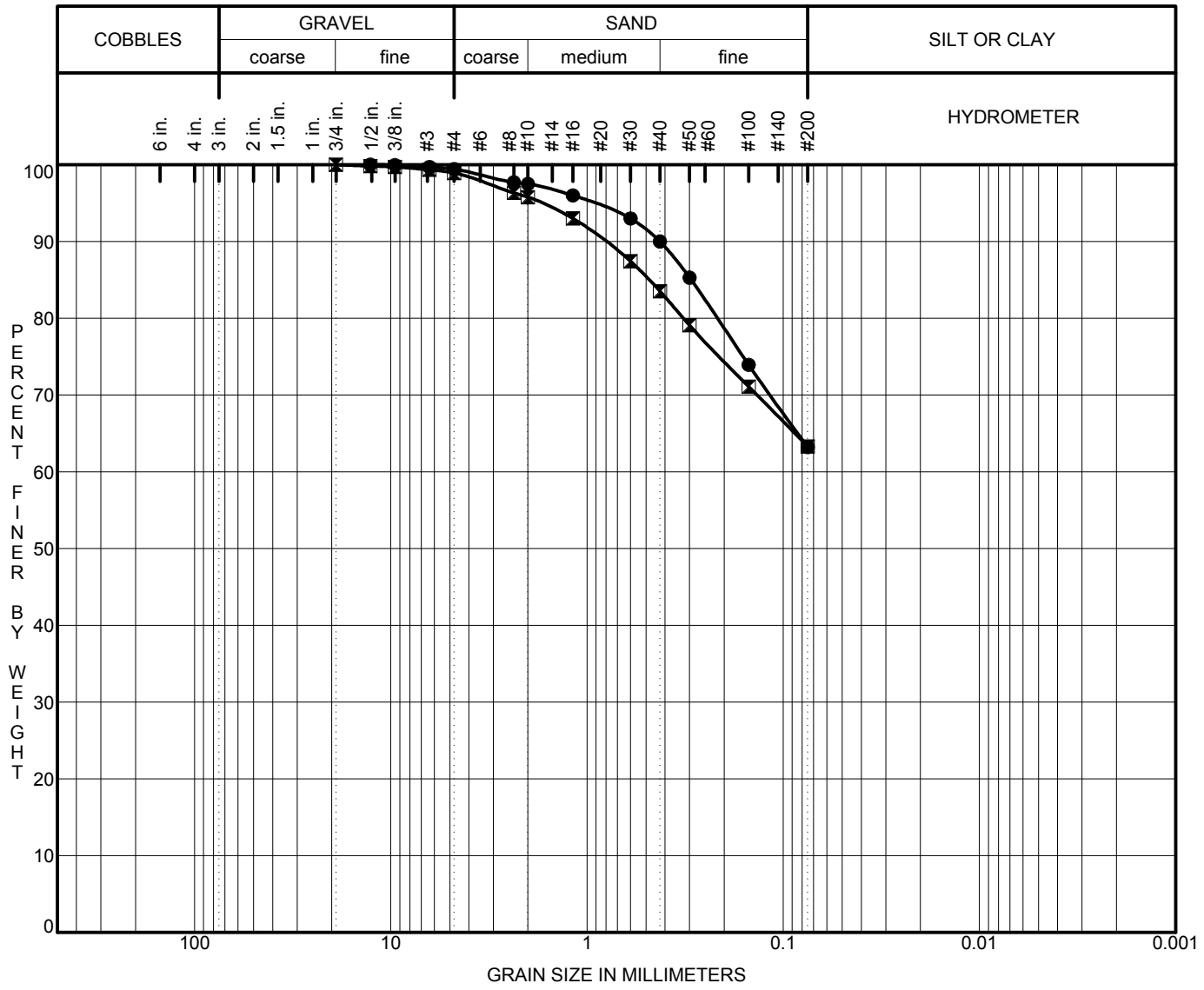
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B3

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/05/12



	Source	Depth (ft)	%Cobbles	%Gravel	%Sand	%Silt	%Clay	D60	D30	D10
●	B8B1	5.0 - 8.0	0	1	36	63				
⧓	B9B1	2.0 - 6.5	0	1	36	63				

	Source	Depth (ft)	Classification	LL	PL	PI	Cu	Cc
●	B8B1	5.0 - 8.0	SANDY LEAN CLAY (CL)	43	16	27		
⧓	B9B1	2.0 - 6.5	SANDY LEAN CLAY (CL)	41	17	24		

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Report Date:	Project Number:
December 2012	129067

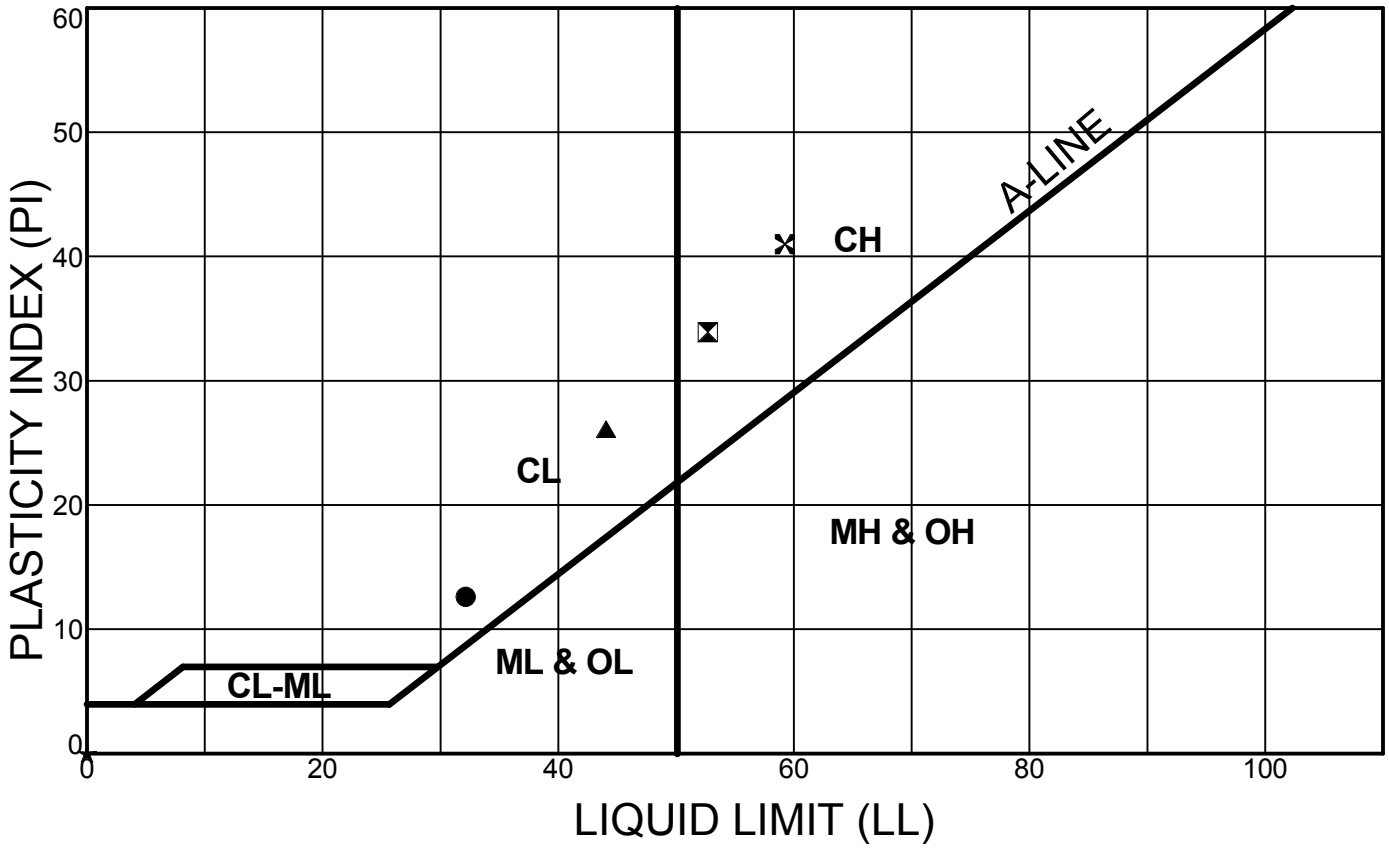
GRAIN SIZE ANALYSES (ASTM C117 and C136)

MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE

B4

123GRAINSIZECOMPLETE 129067 MC-85.GPJ 12/05/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	B1B1	8.0 - 13.0	32	20	12
⧓	B2B1	4.0 - 8.0	53	19	34
▲	B3B1	4.0 - 8.0	44	18	26
★	B3B1	9.0 - 15.5	NP	NP	NP
✕	B5B1	4.0 - 9.0	59	18	41

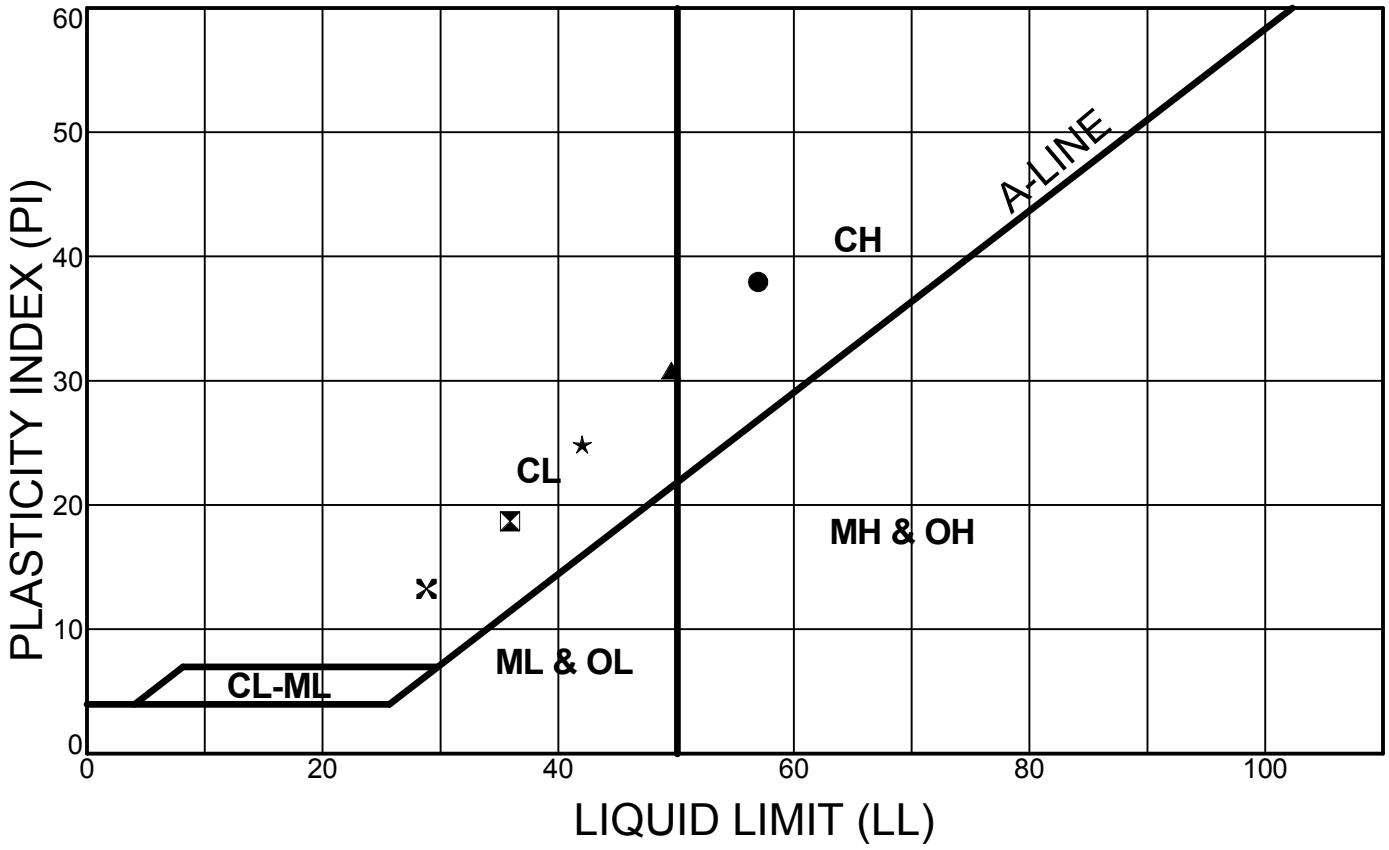
KLEINFELDER
Bright People. Right Solutions.

Report Date:	Project Number:
November 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B5

ATTPLOT 129607 MC-85.GPJ 11/27/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	B5B2	4.0 - 9.0	57	19	38
⧓	B6B1	4.0 - 9.0	36	17	19
▲	B6B2	4.0 - 9.0	50	19	31
★	B7B1	5.0 - 9.0	42	17	25
✕	B7B2	5.0 - 9.0	29	16	13

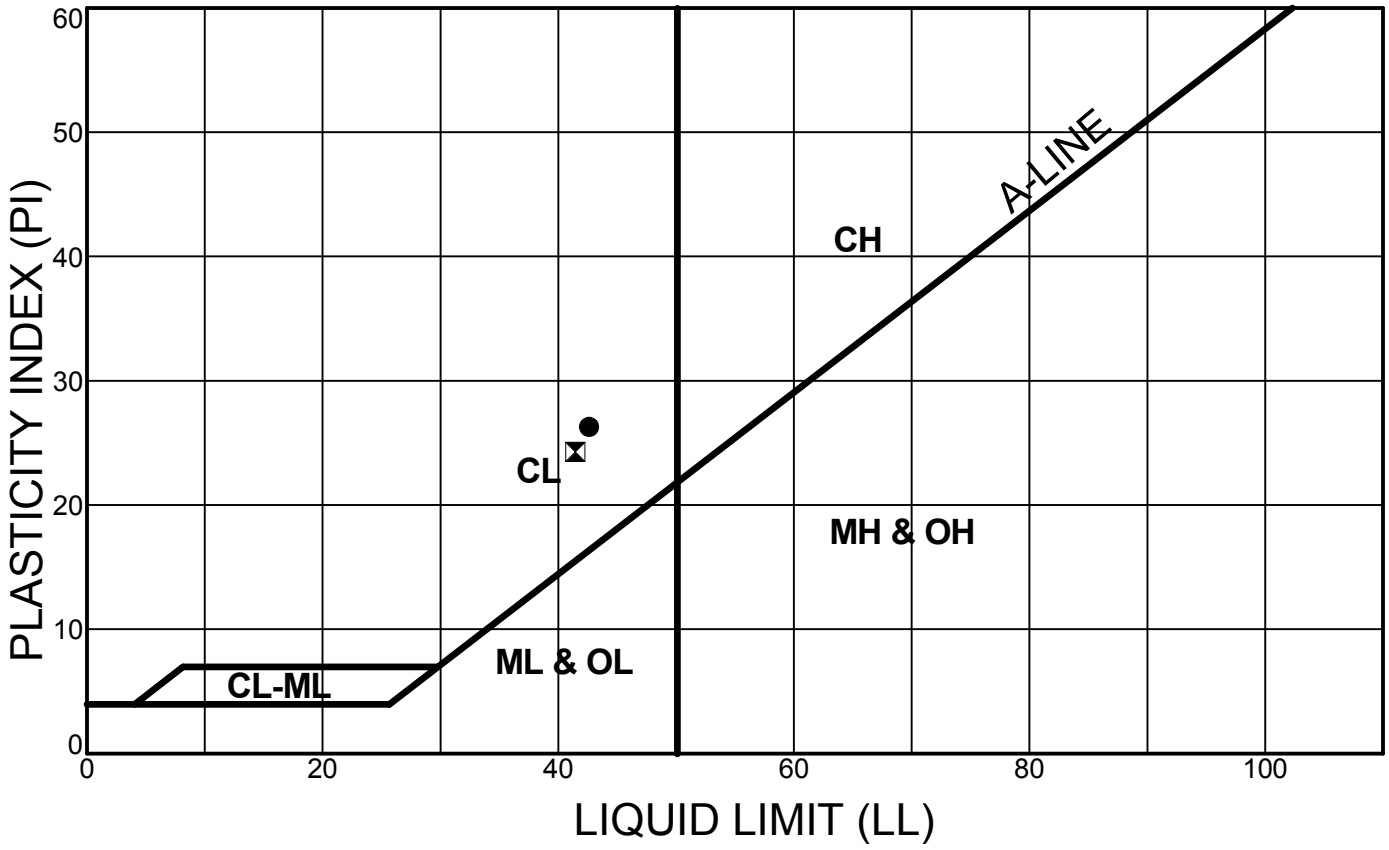
KLEINFELDER
Bright People. Right Solutions.

Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B6

ATTPLOT 129067 MC-85.GPJ 12/05/12



LEGEND	BORING	DEPTH (ft)	LL	PL	PI
●	B8B1	5.0 - 8.0	43	16	27
⧓	B9B1	2.0 - 6.5	41	17	24

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Report Date:	Project Number:
December 2012	129067

ATTERBERG LIMITS (ASTM D 4318)
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B7

ATTPLOT 129067 MC-85.GPJ 12/05/12

TEST METHOD:	ARIZ 236b	ARIZ 236b	ARIZ 733**	ARIZ 736**
SAMPLE LOCATION	pH	Minimum Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)
B1B1 @ 8-13'	8.3	1,342	47	63
B2B1 @ 4-8'	7.9	939	137	126
B3B1 @ 4-8'	7.9	812	115	249
B5B1 @ 4-9'	8.0	738	93	126
B6B1 @ 4-9'	7.9	671	68	62
B7B1 @ 5-9'	7.9	671	64	79
B8B1 @ 5-8'	7.9	470	244	579
B9B1 @ 2-6.5'	8.0	738	87	159

*** Testing performed by MotZZ Laboratory, Inc.*

KLEINFELDER
Bright People. Right Solutions.

ADDITIONAL LABORATORY TESTING
MC-85 (Buckeye Road)
From 107th Avenue to 75th Avenue
Maricopa County (Phoenix / Tolleson), Arizona

PLATE
B8

Report Date: November 2012
Project Number: 129067

APPENDIX P-C

DMJM Harris/AECOM Report

DMJM Harris
2777 East Camelback Road, Suite 200, Phoenix, AZ 85016
T 602.337.2777 F 602.337.2620 www.dmjmharris.com

November 8, 2006

Mr. Sami Ayoub
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, AZ 85009

Re: Stormwater Detention Basin Percolation Testing
and Earthwork Factor Estimates
MC 85 (Buckeye Road), 107th Avenue to 91st Avenue
Maricopa County, Arizona
MCDOT Work Order 69024
DMJM Harris Project No. 6490.0000

Dear Mr. Ayoub:

This letter presents the results of stormwater detention basin percolation testing that was performed for the above referenced project. Also included are the results of in-place density testing and laboratory classification and moisture-density testing for the development of project excavation earthwork factors.

1.0 INVESTIGATION

The field investigation included the excavation of nine backhoe test pits, each dug to a depth of four feet, using a CAT 416C backhoe with a 24-inch bucket. The backhoe is owned and operated by 4-J's Excavating, of Phoenix. In-situ nuclear gauge density tests were performed at depths of 1.0, 2.0, 3.0 and 4.0 feet within the pits by AMEC Earth and Environmental, Inc., (AMEC), as directed by DMJM Harris, using a Troxler 3440 nuclear moisture-density gauge. Falling head percolation tests were also performed within the bottom of each of the test pits by DMJM Harris. All field activities were supervised by Pancho Garza, E.I.T. of DMJM Harris.

The backhoe pit/percolation test locations were selected to be within the general limits of proposed detention basins for this project, and also on properties for which temporary entries could be obtained. Each of the test sites was located within agricultural farm land to the south side of existing MC 85. The attached site plans (six sheets) indicate the locations of the backhoe pit/percolation test locations. Also attached are logs of the test pits.

Laboratory testing was performed by AMEC on selected bulk samples that were obtained from the test pit excavations. The tests performed include sieve analysis and Atterberg limits (plasticity index), moisture content, standard Proctor (ASTM D698; Moisture-Density Relationship) and remolded one-dimensional swell. The results of all laboratory tests are attached. The swell tests utilized samples that were remolded to approximately 95 percent of the Proctor density of the particular material in order to determine potential post construction movement due to excess moisture.

2.0 RESULTS OF TESTING & DISCUSSION

In general, the soils encountered within the pits are soft to firm, medium to high plasticity, clayey sand to sandy clay (SC to CL/CH), extending to the full depth of investigation. The soils vary from uncemented to weakly cemented with calcium carbonate (lime). The in-situ moisture contents of tested samples varied from about 10 to 25 percent and the excavated soils were

visually described as moist to very moist. Table 1 presents a summary of the results of in-situ and laboratory testing for test pits PT1 through PT10.

2.1 EARTHWORK ESTIMATES

The in-situ nuclear gauge density readings were compared with the corresponding 95 percent value Proctor density in order to obtain data for use in estimation of earthwork factors. Based on the available data, there is a large variation in earthwork factors; ranging from nearly 11 percent shrink to 17 percent swell. The generally high swell values appear to be based on the high in-situ moisture contents. Most of the clay soils tested would need to be dried prior to use, as their in-situ moistures are above the optimum values needed for compaction. Both Test Pits PT1 and PT3 were excavated in a fallow field that had not been watered for some time. This area yielded the majority of shrink while a recently watered field, which included Test Pit PT9, produced the maximum estimated swells. Also, the fact that the clayey soils contain higher percentages of sand in the vicinity of Test Pits PT1 and PT3 (west end of project), would also tend to allow the soils to drain more quickly and thus have a greater capacity to loose volume (shrink) when compacted.

shrink and swell factors are related only to dry density

Based on the results, and our experience with similar soil conditions, it is anticipated that the soft to firm, generally moist to very moist, near-surface clay soils will typically vary from 0 to 5 percent swell when excavated and re-used for compacted fill on this project. It should be noted that considerable drying may be needed to get the excavated soils to at or near optimum moisture. Also, the majority of these soils will not meet the borrow acceptance criteria (R value = 30) that was recommended in the Pavement Design Report (DMJM Harris, April 2006). The correlated R-values of the nine samples tested from Test Pits PT1 through PT10 vary from 10 to 39 with a mean value of 16. Only one of the samples (Test Pit PT3) would actually meet the acceptance criteria. Based on this data, it appears that the all or the majority of soils that are excavated from within the detention basin areas (unless adequately modified by mixing with sand, lime or cement), should be wasted from the project.

2.2 POTENTIAL SWELL

One dimensional swell tests were performed on four remolded samples of clayey soils obtained from the test pits. The samples were remolded to 95 percent of the associated standard Proctor density and optimum moisture to approximate post-construction conditions. In general, the results indicate low swell percentages ranging from 0 to 2 percent. It is possible that additional swell might be observed in the field if the compacted soils are placed dry of optimum moisture, and are subsequently inundated with moisture. Testing of the swell potential of remolded soils assuming in-situ density and moisture properties was not performed. However, based on the summary of information provided in Table 1, it appears that the in-situ moisture contents are typically slightly below to well above optimum and thus large volume gains from the in-situ to optimum (or plus optimum) condition would not be anticipated.

2.3 PERCOLATION TESTS

In-situ percolation testing was performed in general accordance with the City of Chandler Standard Detail C-109 (2002 including revisions 2006). This method measures the time needed to drain a volume of water over a given area of soil. The recorded stabilized percolation rates ranged from 0.09 to 0.22 $ft^3/hr/ft^2$ and were fairly consistent throughout the two-mile segment. Table 2 presents a summary of the percolation tests completed for this investigation.

Table 1
Results of Soil Testing

ID	Depth Range (Feet)	% Passing -200 Sieve	USCS	Plasticity Index	In-Situ Moisture Content (%)	In-situ Wet Density (pcf) @ Depth	Optimum Moisture Content (%)	95% Standard Proctor Density (pcf)	% Shrink/ Swell (+/-)
PT1	1.0 – 4.0	74	CH	32	13.7	110.3 @ -1' 119.4 @ -2' 126.5 @ -3' 122.6 @ -4'	12.6	113.1	-2.5 +5.5 +11.8 +8.3
PT3*	1.0 – 4.0	46	SC	8	9.7	104.1 @ -1' 106.8 @ -2' 109.4 @ -3' 111.1 @ -4'	12.6	113.1	-8.0 -5.6 -3.3 -1.8
PT4	1.0 – 4.0	57	CL	18	13.5	91.3 @ -1' 107.3 @ -2' 108.0 @ -3' 96.7 @ -4'	18.0	102.3	-10.8 +4.9 +5.5 -5.4
PT5	1.0 – 4.0	60	CH	30	19.1	105.6 @ -1' 107.5 @ -2' 107.6 @ -3' 107.7 @ -4'	18.0	102.3	+3.2 +5.1 +7.5 +5.3
PT6	1.0 – 4.0	66	CH	34	20.4	106.0 @ -1' 104.4 @ -2' 110.1 @ -3' 111.5 @ -4'	16.0	104.7	+1.4 -0.2 +5.2 +6.5
PT7	1.0 – 4.0	72	CL	25	16.3	111.5 @ -1' 107.4 @ -2' 104.0 @ -3' 111.4 @ -4'	16.0	104.7	+6.5 +2.6 -0.7 +6.4
PT8	1.0 – 4.0	82	CL	24	20.4	106.6 @ -1' 111.9 @ -2' 119.8 @ -3' 115.0 @ -4'	16.0	104.7	+1.8 +6.9 +10.6 +9.9
PT9	1.0 – 4.0	78	CL	21	21.7	117.6 @ -1' 111.2 @ -2' 120.1 @ -3' 118.5 @ -4'	17.3	102.4	+14.9 +8.6 +17.3 +15.7
PT10	1.0 – 4.0	88	CL	25	24.5	117.9 @ -1' 111.2 @ -2' 107.0 @ -3' 106.4 @ -4'	17.3	102.4	+15.1 +8.6 +4.5 +3.9

*PT2 was not investigated

Table 2
Percolation Test Results

ID	Station	Offset	Depth (ft)	Stabilized Percolation Rate (min/in)	Stabilized Percolation Rate ($ft^3/hr/ft^2$)
PT1	1133+00	100'R	4.25	25	0.20
PT3*	1143+00	100'R	4.25	32	0.16
PT4	1160+00	90'R	4.25	32	0.16
PT5	1177+00	100'R	4.25	38	0.14
PT6	1186+00	60'R	4.25	24	0.21
PT7	1197+00	60'R	4.25	27	0.19
PT8	1208+00	60'R	4.25	24	0.22
PT9	1219+00	75'R	4.25	52	0.09
PT10	1229+00	70'R	4.25	23	0.21
*PT2 was not investigated				Average	0.17

The percolation test results need to be interpreted within the proper context as part of a complete drainage study. Other factors to consider when designing drainage features include, but are not limited to: anticipated volume and depth of water, drainage area characteristics, subsurface soils, and depth to groundwater. For this project, it is recommended that a safety factor of 2.0 be applied to the average tested percolation rate of 0.17 $ft^3/hr/ft^2$, resulting in a design value of 0.085 $ft^3/hr/ft^2$.

As the majority of soils present within the upper 8 to 10 feet along the project alignment contain high percentages (more than 50 percent) of minus No. 200 fines, the potential for adequate, long-term surface infiltration would appear to be low. Drywells may be required in combination with the basins in order to meet the surface infiltration requirements mandated by the City of Phoenix. The City of Phoenix requires that all surface basins retain water for no more than 36 hours. Based on discussions with local drywell installers, the permeable soils needed to provide adequate surface drainage are at depths which typically exceed 25 feet and that the drywells themselves, will need to be on the order of 50 feet in depth, if required. It is further understood that a typical inflow rate of 0.25 cubic feet per second (cfs) is used for drywells previously installed in the near vicinity of this project. For design, a slightly conservative value of 0.20 cfs is recommended. This value will need to be confirmed and/or adjusted by testing of an actual drywell during construction.

F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

1131+00 1132+00 1133+00 1134+00 1135+00 1136+00 1137+00 1138+00 1139+00 1140+00 1141+00 1142+00 1143+00 1144+00 1145+00

SEC 8
T1N-R1E

MC 85

Exst R/W

PT1

PT3

William A Seargeant
101-15-006D

Exst R/W

107th Ave

Property line

William A Seargeant
101-15-006F

William A Seargeant
101-15-006E

William A Seargeant
101-15-006G

SEC 17
T1N-R1E

Property line

N

LEGEND

DMJM Harris Percolation Test Location

50 0 50 100
SCALE IN FEET

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 331-2777

PERCOLATION TEST LOCATIONS

SHEET 1 OF 6

TRACS NO.

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English

F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

SEC 8
T1N-R1E

1157+00 1158+00 1159+00 1160+00 1161+00 1162+00 1163+00 1164+00 1165+00 1166+00 1167+00 1168+00 1169+00 1170+00 1171+00

MC 85

Exst R/W

PT4

Elizabeth S. Oldaker, Tr/
101-15-002

Property line

Property line

N

SEC 17
T1N-R1E

LEGEND

DMJM Harris Percolation Test Location

50 0 50 100
SCALE IN FEET

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

DMJM HARRIS | AECOM 2777 E. CAMELBACK RD SUITE 200 PHOENIX, AZ. 85016-4302 (602) 337-2777

PERCOLATION TEST LOCATIONS

SHEET 2 OF 6

TRACS NO.

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F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

SEC 8
T1N-R1E

1170+00 1171+00 1172+00 1173+00 1174+00 1175+00 1176+00 1177+00 1178+00 1179+00 1180+00 1181+00 1182+00 1183+00 1184+00

MC 85

Exst R/W

PT5

Emery E. Oldaker, Tr/
101-15-001

99th Ave

Exst R/W

Property line

N

LEGEND

DMJM Harris Percolation Test Location

SEC 17
T1N-R1E

50 0 50 100
SCALE IN FEET

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

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PERCOLATION TEST LOCATIONS

SHEET 3 OF 6

TRACS NO.

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English

F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

SEC 9
T1N-R1E

MC 85

Exst R/W

PT6

PT7

Elizabeth O. Garretson LLC
101-14-008F

Elizabeth O. Garretson LLC
101-14-008J

99th Ave

Exst R/W

Property line

N

LEGEND

DMJM Harris Percolation Test Location

SEC 16
T1N-R1E

50 0 50 100
SCALE IN FEET

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

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PERCOLATION TEST LOCATIONS

SHEET 4 OF 6

TRACS NO.

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English

F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

SEC 9
T1N-R1E

MC 85

Elizabeth O. Garretson LLC
101-14-008D

Exst R/W

PTB

Gould N Rule LLC
101-14-002B

Elizabeth O. Garretson LLC
101-14-008G

Gould N Rule LLC
101-14-002A

Property line

N

SEC 16
T1N-R1E

LEGEND

DMJM Harris Percolation Test Location

50 0 50 100
SCALE IN FEET

NO.	REVISION	BY	DATE
1			
2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

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PERCOLATION TEST LOCATIONS

SHEET 5 OF 6

TRACS NO.

English

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F.W.H.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.	69024			

SEC 9
T1N-R1E

1213+00 1214+00 1215+00 1216+00 1217+00 1218+00 1219+00 1220+00 1221+00 1222+00 1223+00 1224+00 1225+00 1226+00 1227+00 1228+00 1229+00 1230+00 1231+00 1232+00 1233+00 1234+00 1235+00 1236+00 1237+00 1238+00 1239+00 1240+00 1241+00 1242+00 1243+00

MC 85

Exst R/W

PT9

PT10

Merwest Enterprises
101-13-004D

91st Ave

Exst R/W

Layton Ronald D
101-12-001G

Property line

N

LEGEND

DMJM Harris Percolation Test Location

SEC 16
T1N-R1E

100 0 100 200
SCALE IN FEET

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. 69024

DESIGNED	PG	10/06
DRAWN	JTN	10/06
CHECKED	KHD	10/06

NOT FOR CONSTRUCTION OR RECORDING

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SUITE 200
PHOENIX, AZ. 85016-4302
(602) 331-2777

PERCOLATION TEST LOCATIONS

SHEET 6 OF 6

TRACS NO.

11/9/2006 10:27:06 AM
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English

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT3

Date(s): 07/10/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 990.0' ±
Location: Sta 1143+00, 100' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CL) Trace Fine Subangular Gravel, Fine Sand, Weakly Lime Cemented, Medium Plasticity, Brown, Slightly Moist, Firm		10
985.0	5					CLAYEY SAND (SC) Trace Fine Subangular Gravel, Predominantly Fine Sand, Weakly Lime Cemented, Medium Plasticity, Brown, Moist, Firm Note: $CaCo_3$ Staining Present		
980.0	10					STOPPED EXCAVATION @ 4.0'		
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT4

Date(s): 08/31/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 990.0' ±
Location: Sta 1160+00, 90' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CL) Predominantly Fine Sand, Weakly Lime Cemented, Medium Plasticity, Brown, Moist, Very Soft to Soft Note: Recently Harvested Alfalfa Field		14
985.0	5					STOPPED EXCAVATION @ 4.0'		
980.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT5

Date(s): 08/31/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 993.0' ±
Location: Sta 1177+00, 100' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CH) Predominantly Fine Sand, Weakly Lime Cemented, High Plasticity, Brown, Very Moist, Moderately Firm Note: Recently Harvested Alfalfa Field		19
988.0	5					STOPPED EXCAVATION @ 4.0'		
983.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT6

Date(s): 08/31/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 995.0' ±
Location: Sta 1186+00, 60' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CH) Predominantly Fine Sand, Weakly Lime Cemented, High Plasticity, Brown, Very Moist, Moderately Firm		20
990.0	5					STOPPED EXCAVATION @ 4.0'		
985.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT7

Date(s): 08/31/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 996.5' ±
Location: Sta 1197+00, 60' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CL) Predominantly Fine Sand, Weakly Lime Cemented, Medium Plasticity, Brown, Moist, Moderately Firm		16
991.5	5					STOPPED EXCAVATION @ 4.0'		
986.5	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT8

Date(s): 08/31/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 998.0' ±
Location: Sta 1208+00, 60' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		CLAY (CL) Some Fine Sand, Weakly Lime Cemented, Medium Plasticity, Brown, Very Moist, Moderately Firm		20
993.0	5					STOPPED EXCAVATION @ 4.0'		
988.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

PT9

Date(s): 07/10/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 999.0' ±
Location: Sta 1219+00, 80' Rt MC85 Cst ℄

Groundwater		
Depth	Hour	Date
None	N/A	N/A

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				0		SANDY CLAY (CL) Fine Sand, Weakly Lime Cemented, Medium Plasticity, Dark Brown, Very Moist to Wet, Soft Note: Recently Watered Barley Field		22
994.0	5					STOPPED EXCAVATION @ 4.0'		
989.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

Project Name: MC85, 107th Ave to 91st Ave
Location: Maricopa County, Arizona
Project Number: 6490.0000
Logged By: P. Garza

Groundwater		
Depth	Hour	Date
None	N/A	N/A

TEST PIT NO. PT10

Date(s): 07/10/2006
Backhoe/Trackhoe Type: CAT 416C w/ 24" Bucket
Surface Elevation: 998.0' ±
Location: Sta 1229+00, 75' Rt MC85 Cst ℄

Elev (ft)	Depth (ft)	Penetration Rate (Min./Ft)	Sample Interval	Sample Type & (Blowcounts)	Graphical Log	MATERIAL CLASSIFICATION & USCS	LABORATORY ANALYSIS: Dry Density (pcf)	LABORATORY ANALYSIS: Moisture Content (%)
				D		SANDY CLAY (CL) Fine Sand, Weakly Lime Cemented, Medium Plasticity, Dark Brown, Very Moist to Wet, Soft Note: Recently Watered Barley Field		25
993.0	5					STOPPED EXCAVATION @ 4.0'		
988.0	10							
	15							
	20							
	25							
	30							
	35							
	40							

Sample Type
D-DISTURBED BULK SAMPLE

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

PROJECT: MC85, 107th Avenue and 91st Avenue 6490.0000
LOCATION: Maricopa County
SAMPLE SOURCE: SEE BELOW

JOB NO: 6-119-000566
WORK ORDER NO: 2
DATE ASSIGNED: 9/6/06

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

				Silt or	SAND								GRAVEL									COBBLES	
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"	6"	Lab #

PERCENT PASSING BY WEIGHT

PI Pass

PT4 @ 1.0-4.0'	CL	36	18	57	69	81	87	91	97	99	99	99	100	100	100	100	100	100	100	100	100	100	5
PT5 @ 1.0-4.0'	CH	52	30	60	69	80	85	89	95	98	98	99	100	100	100	100	100	100	100	100	100	100	6
PT6 @ 1.0-4.0'	CH	58	34	66	76	85	89	92	96	98	99	100	100	100	100	100	100	100	100	100	100	100	7
PT7 @ 1.0-4.0'	CL	48	25	72	81	89	92	95	98	99	100	100	100	100	100	100	100	100	100	100	100	100	8
PT8 @ 1.0-4.0'	CL	44	24	82	88	92	94	96	98	99	100	100	100	100	100	100	100	100	100	100	100	100	9

AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	JOB NO:	6-119-000566
LOCATION:	Maricopa County	WORK ORDER NO:	1
MATERIAL:	Native Soil	LAB NO:	1
SAMPLE SOURCE:	PT1 @ 1.0-4.0'	DATE SAMPLED:	7/13/06

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6in.	100
4in.	100
3in.	100
2in.	100
1 1/2in.	100
1 1/4in.	100
1in.	100
3/4in.	100
1/2in.	100
3/8in.	100
1/4in.	100
#4	100
#8	99
#10	99
#16	98
#30	95
#40	93
#50	89
#100	81
#200	74

ATTERBERG LIMITS

LL:	51
PL:	19
PI:	32
USCS:	CH

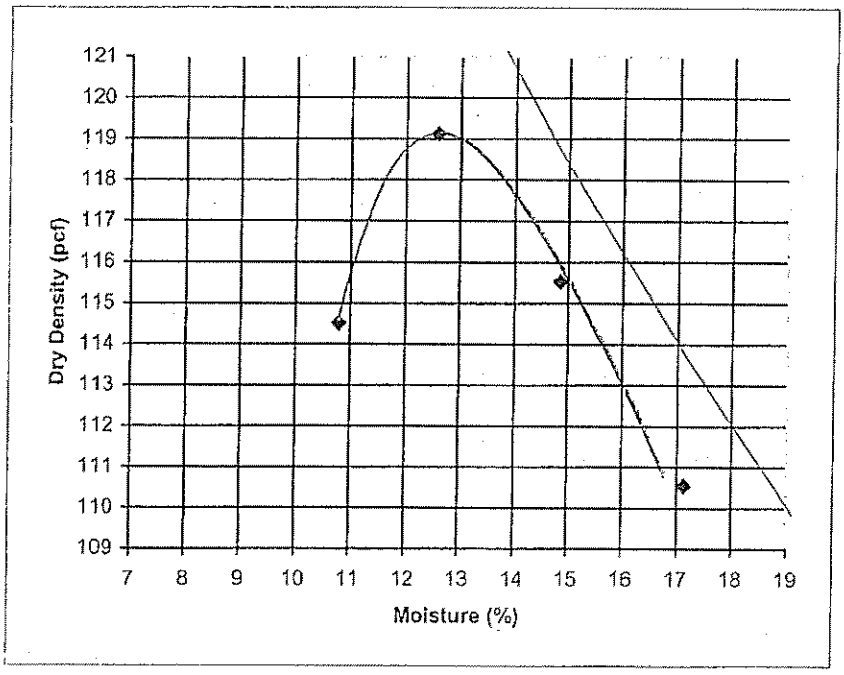
AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	1
MATERIAL:	Native Soil	**LAB NO:**	2
SAMPLE SOURCE:	PT3 @ 1.0-4.0'	**DATE SAMPLED:**	7/13/06

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MAXIMUM DRY DENSITY (pcf):	119.1
OPTIMUM MOISTURE (%):	12.6



SIEVE SIZE	PERCENT PASSING
6"	100
4"	100
3"	100
2"	100
1 1/2"	100
1 1/4"	100
1"	100
3/4"	100
1/2"	100
3/8"	99
1/4"	97
#4	97
#8	95
#10	95
#16	93
#30	88
#40	84
#50	77
#100	60
#200	46

ATTERBERG LIMITS

LL:	26
PL:	18
PI:	8
USCS:	SC

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.651 ASSUMED.

THIS IS A SUMMARIZED REPORT OF THE REFERENCED PROCEDURES AND DOES NOT INCLUDE ALL REPORTING REQUIREMENTS. ADDITIONAL DATA CAN BE PROVIDED AT CLIENT'S REQUEST.

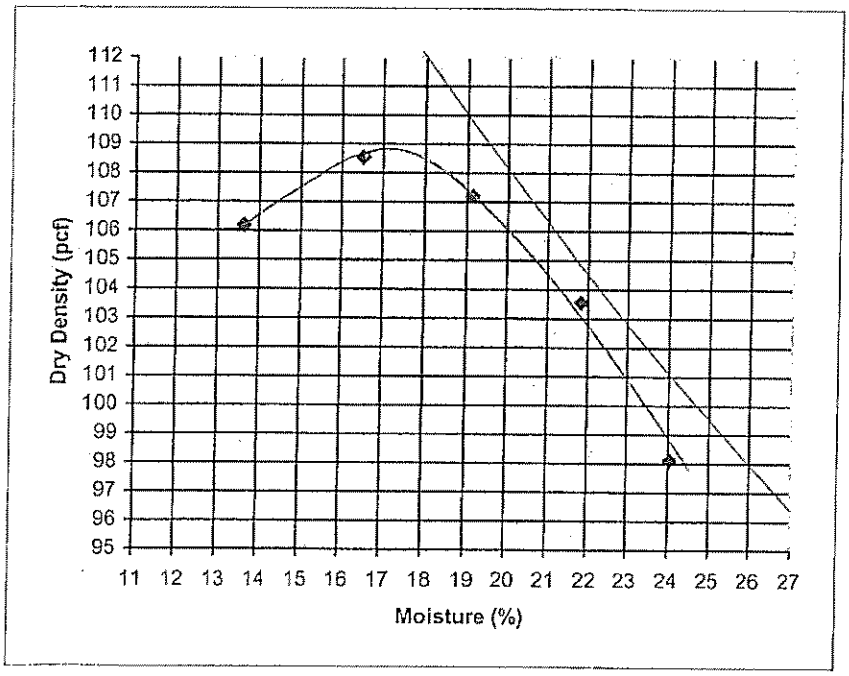
AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	1
MATERIAL:	Native Soil	**LAB NO:**	3
SAMPLE SOURCE:	PT9 @ 1.0-4.0'	**DATE SAMPLED:**	7/13/06

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MAXIMUM DRY DENSITY (pcf):	107.8
OPTIMUM MOISTURE (%):	17.3



SIEVE SIZE	PERCENT PASSING
6"	100
4"	100
3"	100
2"	100
1 1/2"	100
1 1/4"	100
1"	100
3/4"	100
1/2"	100
3/8"	100
1/4"	100
#4	100
#8	100
#10	100
#16	100
#30	98
#40	97
#50	95
#100	88
#200	78

ATTERBERG LIMITS

LL:	42
PL:	21
PI:	21
USCS:	CL

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.651 ASSUMED.

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AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	1
MATERIAL:	Native Soil	**LAB NO:**	4
SAMPLE SOURCE:	PT10 @ 1.0-4.0'	**DATE SAMPLED:**	7/13/06

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MECHANICAL ANALYSIS

SIEVE SIZE	% PASSING
6in.	100
4in.	100
3in.	100
2in.	100
1 1/2in.	100
1 1/4in.	100
1in.	100
3/4in.	100
1/2in.	100
3/8in.	100
1/4in.	100
#4	100
#8	99
#10	99
#16	99
#30	99
#40	98
#50	97
#100	93
#200	88

ATTERBERG LIMITS

LL:	48
PL:	23
PI:	25
USCS:	CL

AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	JOB NO:	6-119-000566
LOCATION:	Maricopa County, Arizona	WORK ORDER NO:	1
MATERIAL:	See Below	LAB NO:	See Below
SAMPLE SOURCE:	See Below	DATE ASSIGNED:	7/13/06

MOISTURE CONTENT OF SOIL (ASTM D2216)

LAB #	BORING & DEPTH	WET WT. (gram)	DRY WT. (gram)	MOISTURE CONTENT
1	PT1 @ 1.0-4.0'	1830.8	1610.5	13.7%
2	PT3 @ 1.0-4.0'	913.4	832.3	9.7%
3	PT9 @ 1.0-4.0'	1229.3	1010.0	21.7%
4	PT10 @ 1.0-4.0'	1365.3	1097.0	24.5%

AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	2
MATERIAL:	Native Soil	**LAB NO:**	See Below
SAMPLE SOURCE:	See Below	**DATE ASSIGNED:**	9/6/06

MOISTURE CONTENT OF SOIL (ASTM D2216)

LAB #	BORING & DEPTH	WET WT. (gram)	DRY WT. (gram)	MOISTURE CONTENT
5	PT4 @ 1.0-4.0'	990.5	872.7	13.5%
6	PT5 @ 1.0-4.0'	940.8	789.9	19.1%
7	PT6 @ 1.0-4.0'	1594.3	1324.2	20.4%
8	PT7 @ 1.0-4.0'	911.5	783.6	16.3%
9	PT8 @ 1.0-4.0'	1385.5	1151.2	20.4%

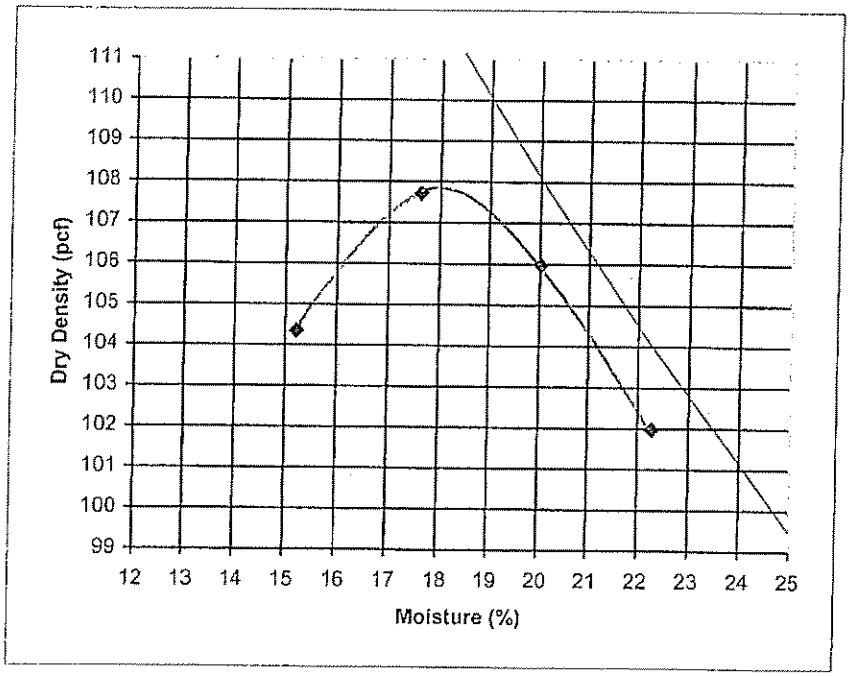
AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	2
MATERIAL:	Native Soil	**LAB NO:**	6
SAMPLE SOURCE:	PT5 @ 1.0-4.0'	**DATE SAMPLED:**	9/6/06

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MAXIMUM DRY DENSITY (pcf):	107.7
OPTIMUM MOISTURE (%):	18.0



SIEVE SIZE	PERCENT PASSING
6"	100
4"	100
3"	100
2"	100
1 1/2"	100
1 1/4"	100
1"	100
3/4"	100
1/2"	100
3/8"	100
1/4"	100
#4	99
#8	98
#10	98
#16	95
#30	89
#40	85
#50	80
#100	69
#200	60

ATTERBERG LIMITS

LL:	52
PL:	22
PI:	30
USCS:	CH

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.651 ASSUMED.

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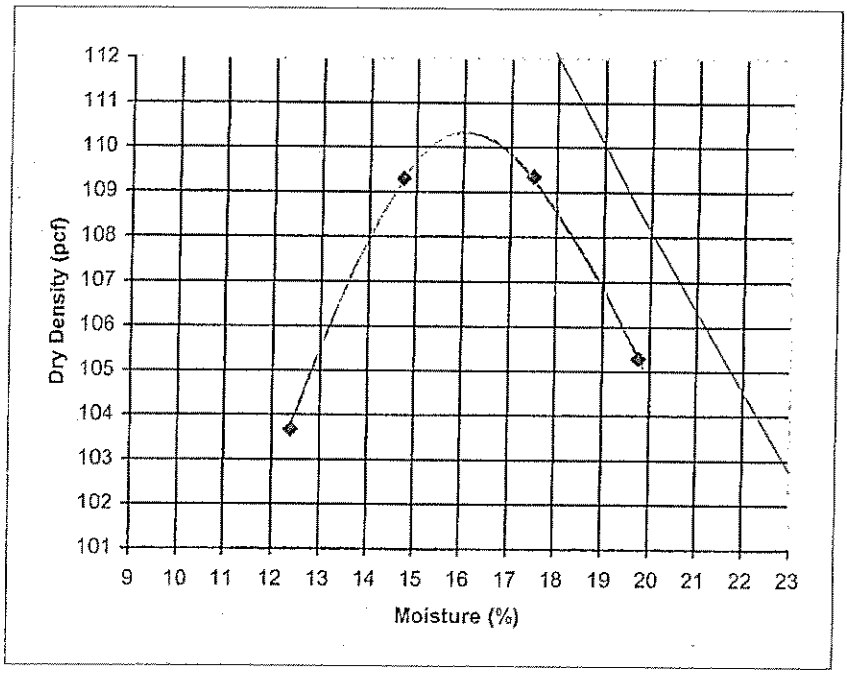
AASHTO R18

REVIEWED BY _____

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	2
MATERIAL:	Native Soil	**LAB NO:**	8
SAMPLE SOURCE:	PT7 @ 1.0-4.0'	**DATE SAMPLED:**	9/6/06

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
DETERMINING PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (AASHTO T89 & T90)

MAXIMUM DRY DENSITY (pcf):	110.2
OPTIMUM MOISTURE (%):	16.0



SIEVE SIZE	PERCENT PASSING
6"	100
4"	100
3"	100
2"	100
1 1/2"	100
1 1/4"	100
1"	100
3/4"	100
1/2"	100
3/8"	100
1/4"	100
#4	100
#8	100
#10	99
#16	98
#30	95
#40	92
#50	89
#100	81
#200	72

ATTERBERG LIMITS

LL:	48
PL:	23
PI:	25
USCS:	CL

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.651 ASSUMED.

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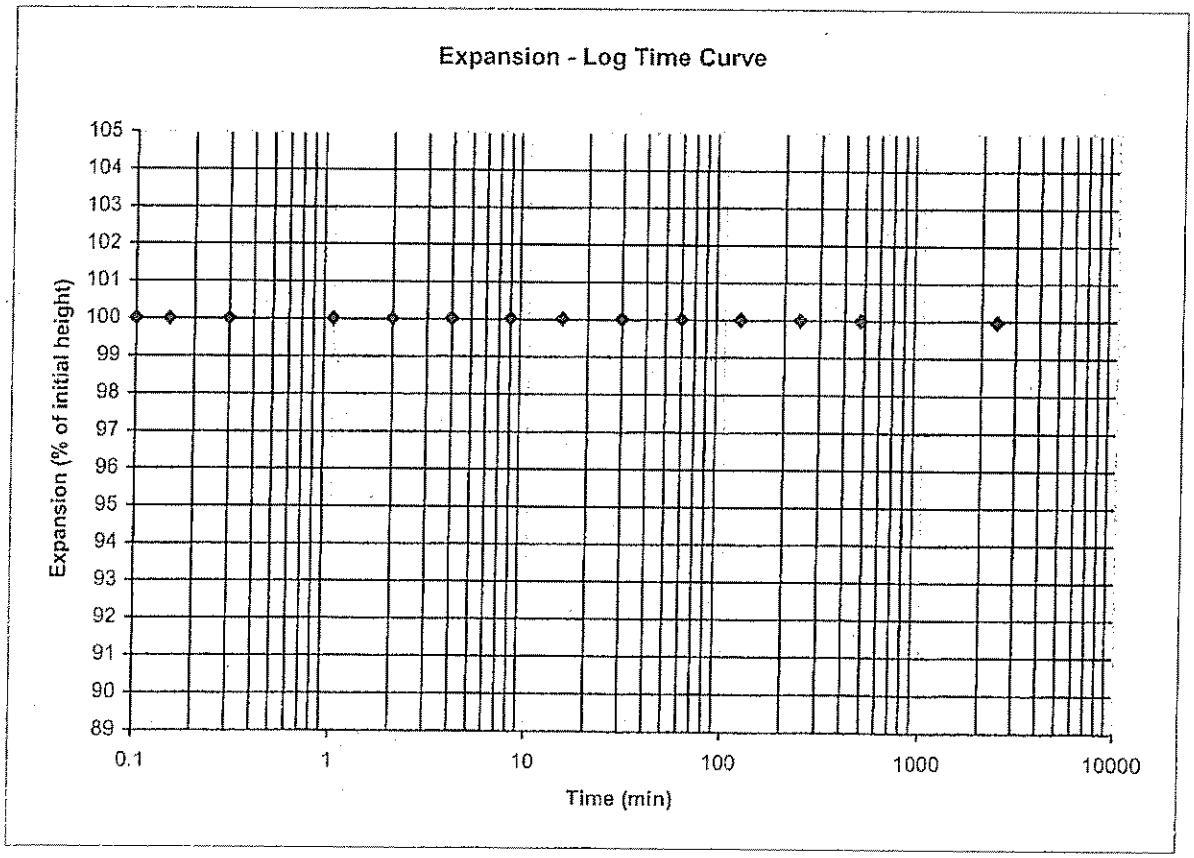
AASHTO R18

REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	1
MATERIAL:	Native Soil	**LAB NO:**	2
SAMPLE SOURCE:	PT3 @ 1.0-4.0'	**DATE SAMPLED:**	7/12/06
SAMPLE PREP:	Remolded to 95% max dry density and optimum moisture Max dry density D698A 119.1 pcf @ 12.6 opt. moisture		

ONE DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS (ASTM D-4546)

INITIAL DRY DENSITY	113.4 pcf
FINAL DRY DENSITY	113.4 pcf
INITIAL MOISTURE CONTENT	12.6%
FINAL MOISTURE CONTENT	17.3%
MOIST. PICK-UP (% DRY WT.)	4.7%
MOIST. PICK-UP (% IN. VOL.)	8.6%
SWELL (% INITIAL HT.)	0.0%
TYPE OF WATER USED	TAP WATER

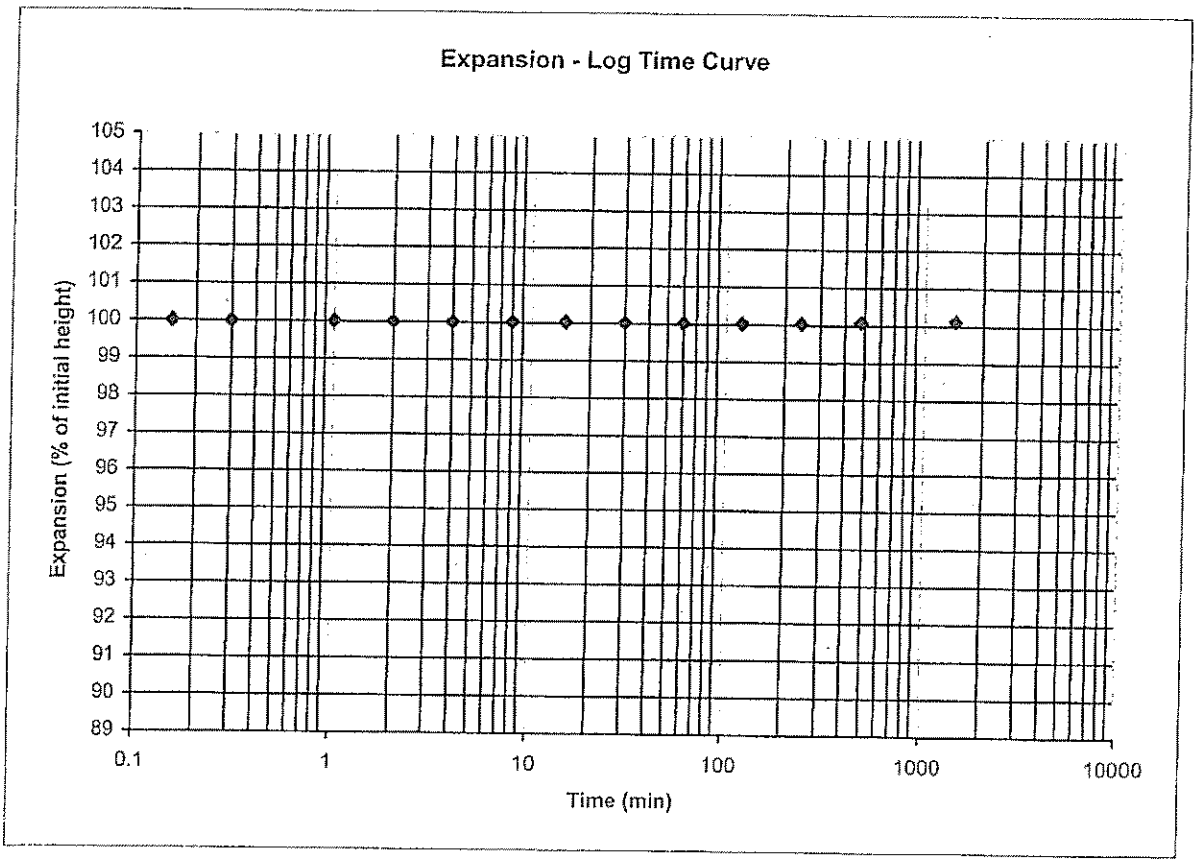


REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	2
MATERIAL:	Native Soil	**LAB NO:**	6
SAMPLE SOURCE:	PT5 @ 1.0-4.0'	**ASSIGNED DATE:**	9/6/06
SAMPLE PREP:	Remolded to 95% max dry density and optimum moisture Max dry density D698A 107.7 pcf @ 18.0 opt. moisture		

ONE DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS (ASTM D-4546)

INITIAL DRY DENSITY	104.0 pcf
FINAL DRY DENSITY	103.9 pcf
INITIAL MOISTURE CONTENT	16.2%
FINAL MOISTURE CONTENT	25.6%
MOIST. PICK-UP (% DRY WT.)	9.4%
MOIST. PICK-UP (% IN. VOL.)	15.8%
SWELL (% INITIAL HT.)	0.1%
TYPE OF WATER USED	TAP WATER

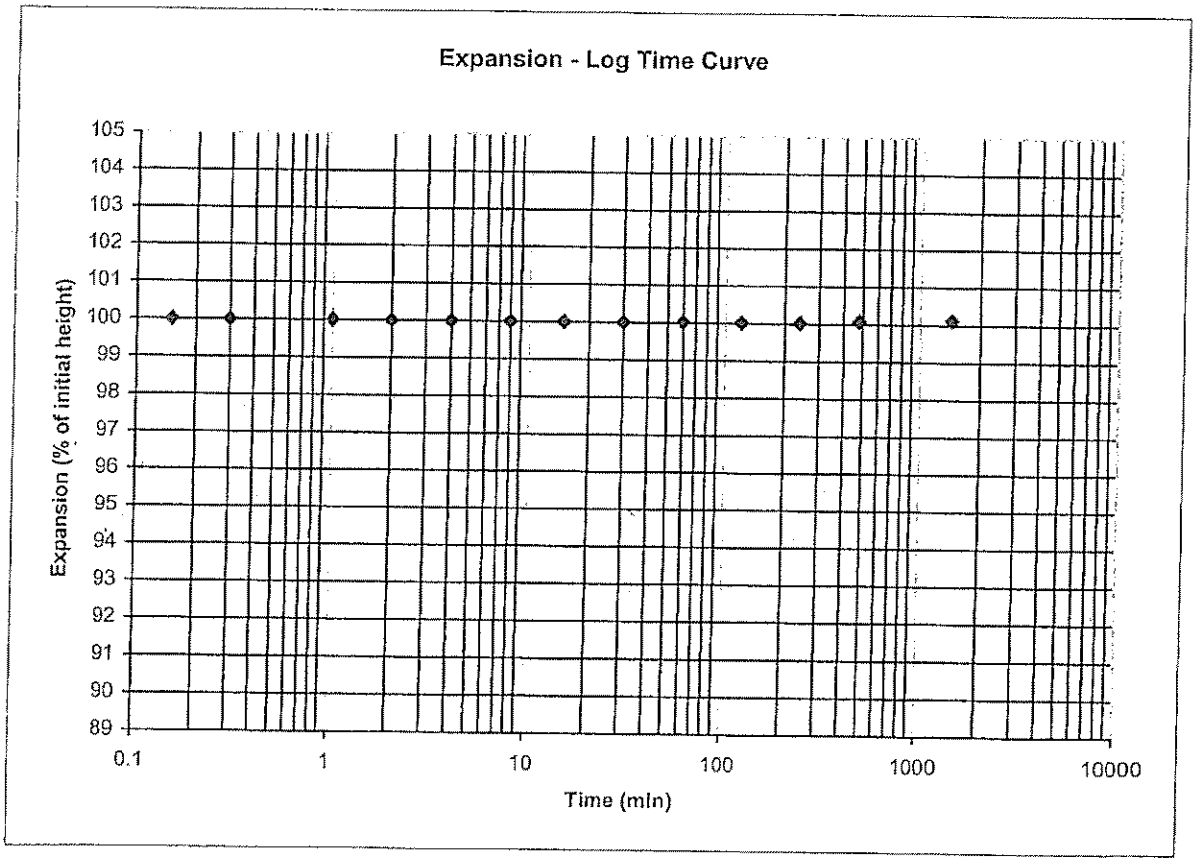


REVIEWED BY _____

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	2
MATERIAL:	Native Soil	**LAB NO:**	8
SAMPLE SOURCE:	PT7 @ 1.0-4.0'	**ASSIGNED DATE:**	9/6/06
SAMPLE PREP:	Remolded to 95% max dry density and optimum moisture Max dry density D698A 110.2 pcf @ 16.0 opt. moisture		

ONE DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS (ASTM D-4546)

INITIAL DRY DENSITY	105.8 pcf
FINAL DRY DENSITY	105.7 pcf
INITIAL MOISTURE CONTENT	15.0%
FINAL MOISTURE CONTENT	21.4%
MOIST. PICK-UP (% DRY WT.)	6.4%
MOIST. PICK-UP (% IN. VOL.)	10.9%
SWELL (% INITIAL HT.)	0.1%
TYPE OF WATER USED	TAP WATER

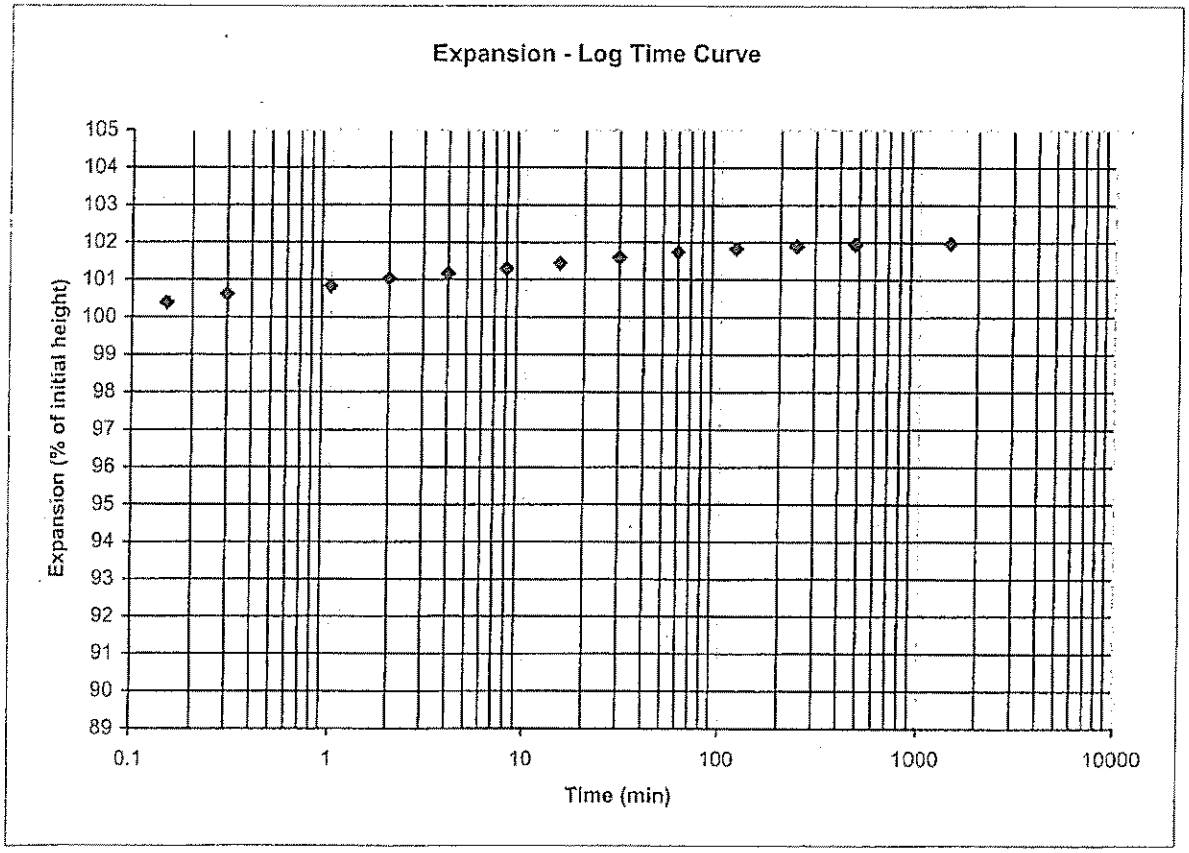


REVIEWED BY

PROJECT:	MC85, 107th Avenue and 91st Avenue 6490.0000	**JOB NO:**	6-119-000566
LOCATION:	Maricopa County	**WORK ORDER NO:**	1
MATERIAL:	Native Soil	**LAB NO:**	3
SAMPLE SOURCE:	PT9 @ 1.0-4.0'	**DATE SAMPLED:**	7/12/06
SAMPLE PREP:	Remolded to 95% max dry density and optimum moisture Max dry density D698A 107.8 pcf @ 17.3 opt. moisture	**LOAD:**	

ONE DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS (ASTM D-4546)

INITIAL DRY DENSITY	102.0 pcf
FINAL DRY DENSITY	100.0 pcf
INITIAL MOISTURE CONTENT	17.9%
FINAL MOISTURE CONTENT	24.2%
MOIST. PICK-UP (% DRY WT.)	6.3%
MOIST. PICK-UP (% IN. VOL.)	10.3%
SWELL (% INITIAL HT.)	2.0%
TYPE OF WATER USED	TAP WATER



REVIEWED BY

SECTION 7

PAVEMENT STRUCTURE DESIGN

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7 PAVEMENT STRUCTURE DESIGN

7.1 GENERAL

The proposed MC-85 (Buckeye Road) roadway improvements will extend from 107th Avenue to 75th Avenue in Maricopa County (Phoenix), Arizona. The approximate location of the site is shown on the Site Vicinity Map (Figure PAV-1).

At the time of our field exploration along MC-85, the site consisted of an asphalt (AC) paved roadway divided into 2 travel lanes each way. The lanes along the site alternated between 5 lanes (2 lanes each way with a center median/turn lane) and 4 lanes (2 lanes each way) with the center median/turn lane transitioning from a full width center turn lane to just a stripe dividing the east and west travel lanes. We understand the planned roadway improvements will include construction of a continuous 5-lane section across the site.

The pavement structure design for the project was previously performed by other consultants, and these designs are summarized in this report section. Based on the pavement structure designs previously performed, the City of Phoenix approved a pavement section for the site. This report section summarizes the proposed pavement structure design for the project.

7.2 PREVIOUS PAVEMENT STRUCTURE DESIGN

Previous geotechnical reports were prepared for the project, and these previous reports included pavement structure design recommendations for the site. The following are the previous pavement structure design reports provided by MCDOT for this project:

- MACTEC, Report of Geotechnical Evaluation, MC85 (Buckeye Road), 107th Avenue to 91st Avenue, Maricopa County, Arizona (Mactec Project No. 4975-03-1401, report dated June 17 and revised October 23, 2003).
- DMJM Harris/AECOM, Pavement Design Report, MC 85, 107th Avenue to 91st Avenue, Maricopa County, Arizona (DMJM Harris Project No. 6490.0000, report dated April 25, 2006).
- Ninyo and Moore (N&M), Geotechnical Evaluation, MC-85 Roadway Improvements, 75th Avenue to 91st Avenue, Maricopa, Arizona (N&M Project No. 601301002, report dated September 28, 2010).

These 3 pavement structure design reports listed above are included as an appendix in this section.

7.2.1 SUMMARY OF MACTEC REPORT

The MACTEC report was a preliminary geotechnical evaluation for the proposed reconstruction for the western roughly 2 miles of the MC-85 project, from 107th Avenue to 91st Avenue. MACTEC advanced 11 borings across the site to evaluate the subsurface conditions. MACTEC determined a mean R-value of 17 for the project, and a resilient modulus (M_r) of the subgrade soil of 10,369 pounds per square inch (psi). The MACTEC report indicated design equivalent single axle loads (ESALs) ranging from 9,500,000 to 5,000,000, which resulted in design structural numbers ranging from 4.46 to 4.07. MACTEC presented various pavement section alternatives that included a combination of different thicknesses of asphalt rubber (AR), asphalt concrete (AC), aggregate base (AB), lime stabilized subbase (LSS), imported fill subgrade, and existing aggregate subbase. The MACTEC report is included in Appendix PAV-B.

7.2.2 SUMMARY OF DMJM HARRIS/AECOM REPORT

The DMJM Harris/AECOM (AECOM) report was a geotechnical evaluation for the western roughly 2 miles of the MC-85 project, from 107th Avenue to 91st Avenue. The AECOM report relied upon the previous MACTEC report and presented final pavement design recommendations. AECOM advanced 16 pavement exploration cores across the site to evaluate the subsurface conditions. AECOM determined a mean R-value of 15.6 for the project, and a M_r of the subgrade soil of 9,830 psi. The AECOM report indicated design ESALs ranging from 11,724,000 to 9,377,000, which resulted in design structural numbers ranging from 4.08 to 3.86. AECOM presented various pavement section alternatives that included a combination of different thicknesses of AR, AC, AB, LSS, and imported fill subgrade. The AECOM report is included in Appendix PAV-C.

7.2.3 SUMMARY OF NINYO AND MOORE REPORT

The Ninyo and Moore (N&M) report was a geotechnical evaluation for the eastern roughly 2 miles of the MC-85 project, from 91st Avenue to 75th Avenue. The N&M report relied upon data from a previous report prepared by Terracon as part of a final design concept report (DCR). N&M advanced 11 pavement exploration cores across the site to evaluate the subsurface

conditions. N&M determined an average R-value of 20 for the project, and a M_r of the subgrade soil of 13,000 psi. The N&M report indicated design ESALs of 15,000,000, which resulted in design structural numbers of 4.42. N&M presented various pavement section alternatives that included a combination of different thicknesses of AR, AC, AB, and LSS. The N&M report is included in Appendix PAV-D.

7.3 CITY OF PHOENIX APPROVED PAVEMENT STRUCTURE SECTION

Based on the previous pavement structure design reports prepared for the site, the City of Phoenix (COP) approved a pavement section for the project. The approved COP pavement sections were approved in the following engineering letters:

- City of Phoenix pavement section approval letter titled *MC-85 Buckeye Road from 91st Avenue to 107th Avenue, STX2011X3* (letter dated July 14th, 2011).
- City of Phoenix pavement section approval letter titled *MC-85 Buckeye Road from 75th Avenue to 91st Avenue, STX2011X1* (letter dated July 14th, 2011).

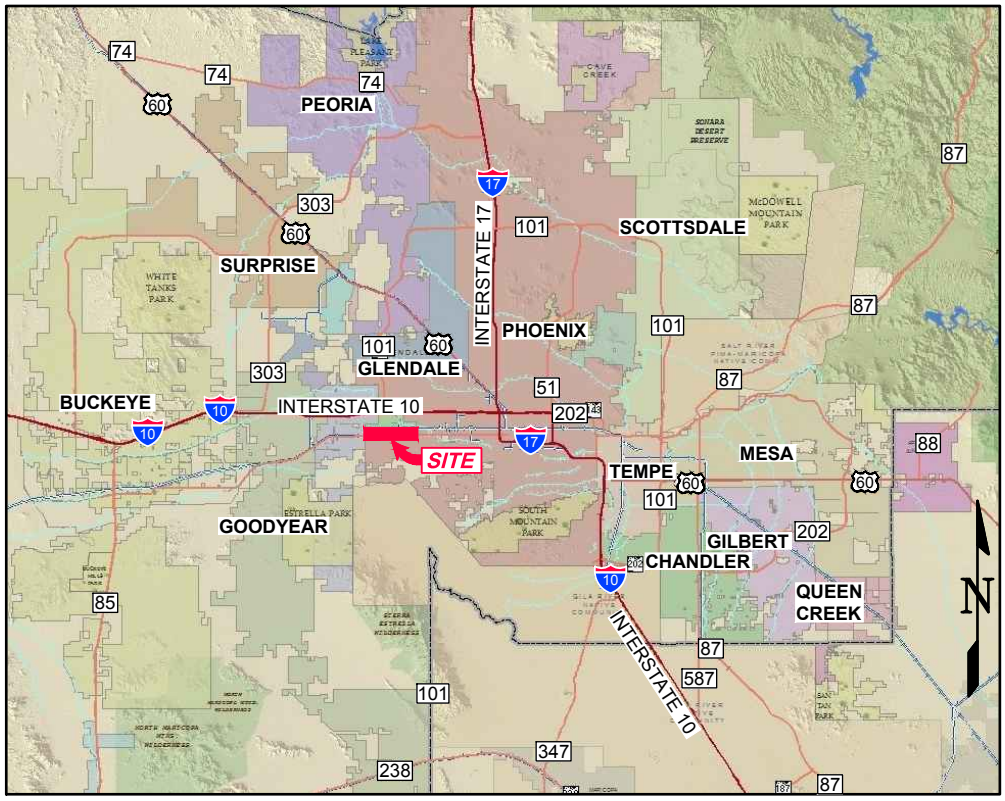
The parameters used in the COP pavement section approval letter for the western 2 miles of the MC-85 project (from 107th Avenue to 91st Avenue) included a design ESAL of 12,955,000, a design M_r of 10,000 psi, and the resulting structural number was 4.3. The parameters used in the COP pavement structural section approval letter for the eastern 2 miles of the MC-85 project (from 91st Avenue to 75th Avenue) included a design ESAL of 13,550,000, a design M_r of 10,158 psi, and the resulting structural number was also 4.3. The resulting structural number was the same for the east and west 2 miles of the MC-85 project; therefore, the same new pavement section was recommended for both 2 mile segments of the project. The COP pavement section approval letters are included in Appendix PAV-A. The following table summarizes the COP approved pavement section for the project.

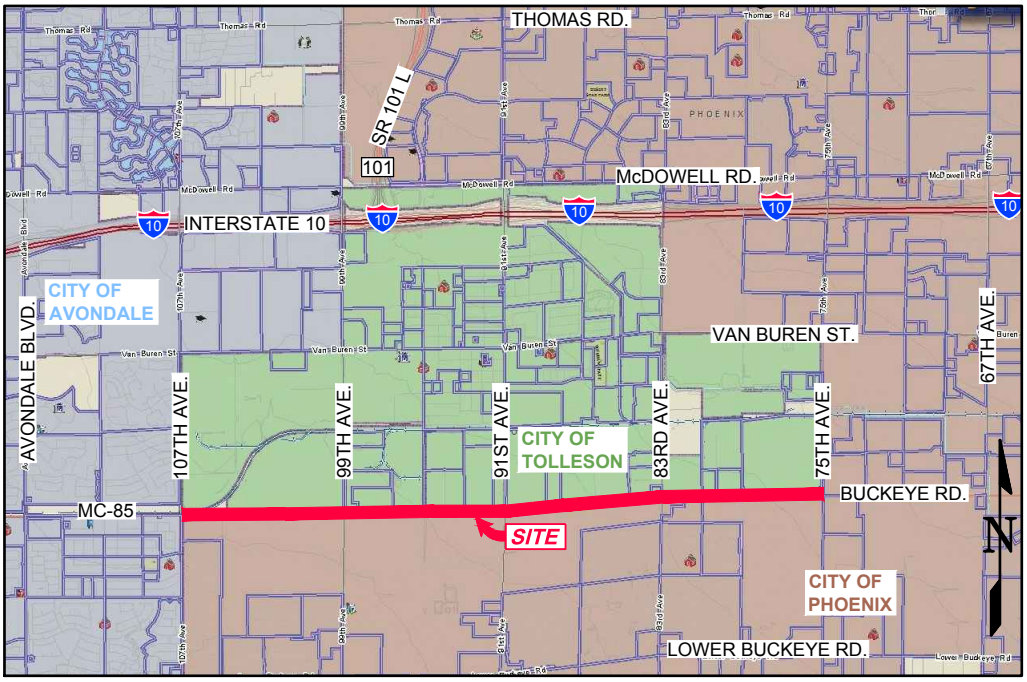
Table 7.3-1 COP Approved New Pavement Structure Thicknesses

Roadway Section	Asphaltic Concrete *	Aggregate Base Course	Lime Stabilized Subbase
MC-85 (Buckeye Road) from 107th Avenue to 75th Avenue	7 inches	6 inches	8 inches

* Asphaltic concrete pavement should be placed in three lifts: two base courses, 3-inch and 2½-inch thick with A1½ mix at 4.3% oil; and a surface course, 1½-inch thick with D ½ mix at 5.1% oil.

FIGURE





VICINITY MAPS

NOT TO SCALE

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PROJECT NO.	129067
DRAWN:	12/2012
DRAWN BY:	DMF
CHECKED BY:	RP
FILE NAME:	129067_F1.dwg

SITE VICINITY MAP

MC-85 (BUCKEYE ROAD)
FROM 107TH AVENUE TO 75TH AVENUE
MARICOPA COUNTY (PHOENIX), ARIZONA

FIGURE
PAV-1

ATTACHED IMAGES: Images: Vicinity1.jpg Images: Vicinity2.jpg
ATTACHED XREFS:
RIVERSIDE, CA
CAD FILE: L:\2012\CADD\129067\ LAYOUT: 1
PLOTTED: 07 Dec 2012, 8:22am, dfahrney

APPENDIX PAV-A

City of Phoenix Pavement Section Approval Letter

City of Phoenix

To: Chris Kowalsky
Civil Engineer II,
Planning, Design and Programming

Date: July 14th 2011

From: Equbalali Charania, P.E., Ph.D
Engineering Supervisor, Materials Lab

Subject: **MC- 85 Buckeye Road from 91st Avenue to 107th Avenue, STX2011X3**

Introduction:

The project involves Paving and Storm Drain improvements for MC-85 Buckeye Road from 91st Avenue to 107th Avenue.

Geotechnical investigations were performed by MACTEC (project number 4975-03-140, dated 6/17/2003) and by DMJM Harris (project number 64900000, dated 4/25/2006). Geotechnical reports were prepared by both MACTEC and DMJM.

Investigations showed that the thickness of the existing pavement on Buckeye Road from 91st Avenue to 107th Avenue varied between 3.0-inch to 12.0-inch asphaltic concrete on 5-inches to 26 ½ -inch aggregate base course. In some areas, concrete was encountered and the thickness of concrete varied from 6-inch to 12-inch.

Asphaltic Concrete pavement on Lower Buckeye Road is in fair to poor condition, with longitudinal and transverse cracks, patches and some potholes.

Pavement Recommendations:

The pavement was designed according to the new AASHTO (1993) design procedure. The following parameters were used in the design:

20 Year, ESAL	12,955,000
Lane Distribution Factor	0.75
Design MR (PSI)	10,000
Overall Standard Deviation	0.4
Reliability	95%
Design Serviceability Loss	2.5
Drainage Factor	1.0
The Resulting Structural Number	4.3

a) Pavement Structure for new pavement

On the basis of the above investigations, soil test results and field inspection, the following pavement structure is recommended for new pavement;

7 inch asphaltic concrete and 6-inch ABC on 8-inch lime stabilized subbase.

Asphaltic concrete pavement should be placed in three lifts, two base courses, 3–inch and 2 ½ inch thick with A 1 ½ mix at 4.3% oil and a surface course, 1 ½ -inch thick with D ½ mix at 5.1% oil.

Registered Professional Engineer (Civil) CERTIFICATE NO. 19668 EQUBALALI H. CHARANIA Date Signed 7/14/11 ARIZONA, U. S. A.

Expires 06/30/2014

Equbalali Charania, P.E., Ph.D
Engineering Supervisor

REPORT OF
GEOTECHNICAL EVALUATION

MACTEC Project No. 4975-03-1401

MC85 (BUCKEYE ROAD)

107TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA
JOB NO. 40069024

Prepared for:

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION
PHOENIX, ARIZONA

Prepared by:

MACTEC ENGINEERING AND CONSULTING, INC.
PHOENIX, ARIZONA

June 17, 2003
Revised October 23, 2003

MACTEC

DMJM Harris
2777 East Camelback Road, Suite 200, Phoenix, AZ 85016
T 602.337.2777 F 602 337.2620 www.dmjmharris.com

April 25, 2006

Mr. Sami Ayoub
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Re: Pavement Design Report
MC 85 (Buckeye Road), 107th Avenue to 91st Avenue
Maricopa County, Arizona
MCDOT Work Order 69024
DMJM Harris Project No. 6490.0000

Dear Mr. Ayoub:

DMJM Harris is pleased to present this Pavement Design Report to the Maricopa County Department of Transportation (MCDOT) for the above referenced project. This report details our scope of work, and includes the results of our investigation, design and test data obtained as part of the preliminary geotechnical investigation (Mactec, 2003) as well as recommendations for the design of pavements based on life cycle cost analyses of various alternatives for the section of MC 85 (Buckeye Road) between 107th Avenue and 91st Avenue and in Maricopa County, Arizona.

We appreciate the opportunity to provide geotechnical services to the MCDOT on this project. Should you have any questions concerning this report, please contact Keith Dahlen of our office at (602) 337-2596.

Sincerely,
DMJM Harris

Francisco J. Garza

Francisco Garza, E.I.T.

Reviewed by:

Keith Dahlen, P.E.
Senior Geotechnical Engineer

CERTIFICATE NO. 25151 KEITH H. DAHLEN Date Signed 4/25/06 ARIZONA U.S.A.

cc: 6490.0005 505

City of Phoenix

To: Chris Kowalsky
Civil Engineer II,
Planning, Design and Programming

Date: July 14th 2011

From: Equbalali Charania, P.E., Ph.D
Engineering Supervisor, Materials Lab

Subject: **MC- 85 Buckeye Road from 75th Avenue to 91st Avenue, STX2011X1**

Introduction:

The project involves Paving and Storm Drain improvements for MC-85 Buckeye Road from 75th Avenue to 91st Avenue.

Geotechnical investigations were performed by Ninyo and Moore (N&M project number 601301002). Geotechnical report was prepared by Ninyo and Moore in 9/28/2010 and the their report included results of investigations carried out by Terracon (project number 65035025 dated 5/14/2003).

Investigations showed that the thickness of the existing pavement on Buckeye Road from 75th Avenue to 91st Avenue varied between 6.0-inch to 9.0-inch asphaltic concrete on 5-inches to 12-inch aggregate base course.

Asphaltic Concrete pavement on Lower Buckeye Road is in fair to poor condition, with longitudinal and transverse cracks, patches and some potholes.

Pavement Recommendations:

The pavement was designed according to the new AASHTO (1993) design procedure. The following parameters were used in the design:

20 Year, ESAL	13,550,000
Lane Distribution Factor	0.75
Design MR (PSI)	10,158
Overall Standard Deviation	0.4
Reliability	95%
Design Serviceability Loss	2.5
Drainage Factor	1.0
The Resulting Structural Number	4.3

a) Pavement Structure for new pavement

On the basis of the above investigations, soil test results and field inspection, the following pavement structure is recommended for new pavement;

7 inch asphaltic concrete and 6-inch ABC on 8-inch lime stabilized subbase.

Asphaltic concrete pavement should be placed in three lifts, two base courses, 3–inch and 2 ½ inch thick with A 1 ½ mix at 4.3% oil and a surface course, 1 ½ -inch thick with D ½ mix at 5.1% oil.

Registered Professional Engineer (Civil) CERTIFICATE NO. 19668 EQUBALALI H. CHARANIA Date Signed 7/14/11 ARIZONA, U. S. A.

06/30/2014

Equbalali Charania, P.E., Ph.D
Engineering Supervisor

September 28, 2010
Project No. 601301002

Mr. John Shi
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Subject: Geotechnical Evaluation
MC-85 Roadway Improvements
75th Avenue to 91st Avenue
Maricopa County, Arizona

Dear Mr. Shi:

In accordance with your authorization, we have performed a geotechnical evaluation for the above-referenced project in Maricopa County, Arizona. This report presents our geotechnical findings, conclusions, and recommendations for the design and construction of the subject project.

We appreciate the opportunity to be of service to you during this phase of the project. If you have any questions or comments regarding this report, please call.

Sincerely,
NINYO & MOORE

Marek J. Kasztalski, P.E., P.M.P., LEED A.P.
Senior Geotechnical Engineer

Steven D. Nowaczyk, P.E.
Principal Engineer

Registered Professional Engineer
CERTIFICATE NO.
24155
STEVEN D.
NOWACZYK
Registered
9.28.10
ARIZONA USA

EXPIRES 6/30/12

SV/MJK/SDN/tns

Distribution: (3) Addressee (3 hard copy & via e-mail)

APPENDIX PAV-B

MACTEC Engineering and Consulting, Inc. Report

REPORT OF
GEOTECHNICAL EVALUATION

MACTEC Project No. 4975-03-1401

MC85 (BUCKEYE ROAD)

107TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA
JOB NO. 40069024

Prepared for:

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION
PHOENIX, ARIZONA

Prepared by:

MACTEC ENGINEERING AND CONSULTING, INC.
PHOENIX, ARIZONA

June 17, 2003
Revised October 23, 2003

MACTEC

MACTEC

June 17, 2003

Mr. Joseph A. Phillips, P.E.
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Subject: **Preliminary Geotechnical Evaluation – Revised October 23, 2003**
MC85 (Buckeye Road)
107th Avenue to 91st Avenue
Maricopa County, Arizona
Job No. 40069024
MCDOT Contract No. CY 2003-03
MACTEC Project No. 4975-03-1401

Dear Mr. Phillips:

MACTEC Engineering and Consulting, Inc. (MACTEC) has completed the preliminary geotechnical evaluation for the proposed reconstruction of MC85 (Buckeye Road) between 107th Avenue and 91st Avenue. This work was performed in general accordance with our proposal for Preliminary Geotechnical Evaluation, dated January 24, 2003. The results of our evaluation, along with the boring location map, laboratory test results, and recommendations are attached.

In addition to the Preliminary Geotechnical Evaluation, the scope of the above referenced work order included review and commentary for the Draft Pavement Design Guide for MCDOT. The results of our review and the associated comments are presented under separate cover.

We at MACTEC are committed to providing quality engineering services combined with client satisfaction in order to achieve a continuing relationship with our clients. We appreciate the opportunity to provide these services for you. If you have any questions regarding any of the other engineering and testing services MACTEC provides, please do not hesitate to contact us.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

Registered Professional Engineer (Civil) CERTIFICATE NO. 34607 JODI WINNEY Date Signed 10/23/03 ARIZONA, U.S.A.

Jodi Winney, P.E.
Geotechnical Engineer

Marshall Lew

Marshall Lew, Ph.D.
Senior Principal by MW with permission

JW:ML:adm

(projects\4975\4975-03-1401\deliverables\prelim geotech report revised)

MACTEC Engineering and Consulting
3630 East Wier Avenue • Phoenix, AZ 85040
602-437-0250 • Fax: 602-437-3675

TABLE OF CONTENTS

1.0 PURPOSE

Included in this report are the results of our evaluation of existing pavement subgrade soils that will be used to support the reconstruction of 2 miles of MC85 (Buckeye Road). Consistent with the *Maricopa County Department of Transportation Draft Pavement Design Guide*, this geotechnical evaluation provides preliminary engineering recommendations and information to address the following aspects of this phase of the project:

- Existing site and subgrade soil conditions;
- Geological considerations;
- Groundwater conditions;
- Preliminary percolation rates;
- Excavation conditions for underground utilities;
- Corrosivity to corrugated metal pipe (CMP);
- Earthwork recommendations for pavement subgrade;
- Suitability of site soils as fill;
- Recommended specifications for imported fill;
- Recommended alternative pavement sections; and,
- Discussion of economics for pavement design alternatives.

This report does not address any environmental issues related to the site or the project. If you have any questions concerning environmental aspects of this project please contact us and we can discuss additional services with you.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for Maricopa County Department of Transportation for the design of the project described herein. This report has not been prepared for any other parties, and may not contain sufficient information for purposes of other parties. If any of the project information described in Section 2.0 of this report has changed, we should be notified so that we may amend our recommendations as necessary.

2.0 PROJECT INFORMATION

Based on the Corridor Improvement Study dated July 21, 1998, and information you provided, this project consists of the reconstruction of 2 miles of MC85 between 107th Avenue and 91st Avenue. We understand that the preferred improvement level for this roadway is the Full Cost Alternative consisting of a 6-lane asphalt paved divided roadway with a 16 foot wide raised median, as indicated in the Corridor Improvement Study. As part of this project, reconstruction of pavements and other associated improvements will be made at intersections included in the subject segment of MC85. Currently, the roadway consists of a 4 travel lane arterial road with a continuous center turn lane.

We understand that the pavement elevations for this segment of MC85 have not yet been finalized, however it is anticipated that they will be at or slightly above existing pavement elevations. Corrugated metal pipe (CMP) may be utilized to manage flows, although the precise locations of these drainage features have also not yet been determined.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

MACTEC advanced 11 borings to a depth of 10 feet below pavement surface within the left and right travel lanes of both the east and west directions of the existing MC85 alignment. During drilling of these borings, many of the in-place subgrade soils became contaminated with asphalt and aggregate base material when bulk soil sampling was attempted. Therefore, for the purposes of this preliminary evaluation, hand augered subgrade samples were obtained outside the existing asphalt pavement but within the shoulder of MC85. Classification tests performed indicate that the hand auger samples obtained from the shoulder are representative of the types of materials encountered below the paved areas. Preliminary percolation testing was performed within 6 of the drilled boreholes. Results of these tests are presented later in this report.

The approximate locations of these borings are shown on the Boring Location Map attached. The soils encountered at each location were visually classified and recorded on a field log using the Unified Soil Classification System (USCS). Bulk and undisturbed samples of the soils were

retrieved for laboratory testing which aided in providing the final soil classifications presented in the boring logs attached in Appendix A.

Exposed pavement sections measured within the boring locations indicate that the existing pavement consists of approximately 3 to 7 inches of asphalt concrete pavement, averaging just under 6 inches. Observed aggregate base sections within the borings measured between 11 to 24 inches. The actual pavement section thicknesses measured within the borings are presented on the attached boring logs.

The materials encountered in Borings 8A and 8B indicate the presence of portland cement concrete below the asphalt and aggregate base sections. Refusal to auger drilling was encountered in the first and second attempts at borings in this area. Based on visual inspection of the area near Borings 8A and 8B, concrete associated with either a gated concrete irrigation culvert or underground irrigation/drainage pipes may have been encountered in these borings. A portland cement concrete like material was also encountered in Borings 9 and 11, however these cemented layers did not result in drilling refusal nor was there any visual indication of underground concrete pavement or structures. We were unable to determine or even estimate the lateral extent of these concrete or cemented areas. During the final design, additional field exploration, possibly including potholing, should be scheduled to more precisely determine the extent of this existing concrete section since removal of this concrete may prove costly.

Overall the general condition of the pavement along the subject portion of MC85 was observed to be in a good condition with only minor transverse cracking at the roadway edge and slight intermittent depressions. Alligator cracking along the roadway was observed to a light to moderate degree in the center turn lane, becoming more prominent toward 107th Avenue.

Within the borings, sandy clay soils were encountered from below the asphalt pavement section extending to the full depth of exploration, except in a couple of borings where silty and clayey sand soils were encountered at depth. The soil conditions in the borings ranged from stiff to hard with varying levels of cementation and low to medium plasticity. Surface soils at pavement subgrade level were tested for expansion and exhibited expansion potentials ranging from moderate to high.

3.2 SITE CONDITIONS AND GEOLOGIC HAZARDS

At the time our field exploration was performed, the surrounding areas around the roadway alignment typically consisted of relatively flat agriculturally developed land to the south and light to moderate industrial developments to the north. Several intersecting roadways ranging from unpaved private drives to connecting collector or arterial roads exist along the subject portion of MC85. Vegetation consisted of young crops, and within some areas a sparse growth of desert trees, brush and grasses.

Area surface topography is interpreted to consist of a gentle slope toward the southwest (USGS, *Tolleson, Arizona Quadrangle,* 7.5-minute [topographic] series dated 1957, photorevised 1982). Surface water generated on the roadway flows as sheet flow to the north or south shoulders. Runoff water is either allowed to flow into open irrigation canals paralleling the roadway, is captured by intentional or unintentional small earth berms along the open irrigation canals, or is captured by curb and gutters constructed along developed properties.

A 1988 Flood Insurance Rate Map (Panel Number 04013C2095 D, effective April 15, 1988) reveals that the existing alignment was reported to be within the 500-year flood boundary. The Maricopa County Flood Control district website indicates that the area north of the railroad tracks located at the very west end of the alignment at 107th Avenue is adjacent to a known flood plain and is regulated.

No ground-water was encountered within any of the borings during our field exploration. Ground-water levels in the area will fluctuate, but were reported at about 60 feet below the ground surface in 1992 (Arizona Department of Water Resources Hydrologic Map Series Report No. 27, 1995).

According to the 1997 Uniform Building Code, the project area lies within Seismic Zone 1 corresponding to a Seismic Zone Factor (Z) of 0.075. As presented in Tables 16-J and 16-Q the seismic coefficients C_a and C_v for soil conditions at the site classified as S_D are 0.12 and 0.18, respectively.

3.3 LABORATORY TESTING

For evaluation of the subgrade soils for preliminary pavement section design, laboratory tests were performed on the representative samples obtained during our field exploration. The following tests were performed in general accordance with the applicable ASTM test methods:

- Plasticity Index
- Sieve Analysis
- R-Value
- pH and Minimum Resistivity
- In-situ Moisture and Density
- Moisture-Density Relationship
- Expansion Potential

The results of these tests are presented in the Summary of Laboratory Testing Tables 1, 2, and 3 included in Appendix B.

3.4 FIELD TESTING

Preliminary percolation testing was performed in six of the eight-inch diameter borings advanced along the MC85 alignment for the purpose of understanding the range of percolation rates that may be encountered once drainage feature locations are determined. The method for determining the preliminary percolation rates presented below consisted of advancing the boring to the full exploration depth of 10 feet, cleaning the hole using the auger flights, and filling the hole with water for a short pre-soak period on the order of one-half to two hours. After this pre-soak period and one to two refillings as needed, the drop rate of the water within the hole was recorded through direct measurement.

The rates measured should only be taken as rough estimates for preliminary design. Final rates should be determined using applicable Maricopa County and/or ADEQ guidelines.

Boring No.	Depth of Boring (feet)	Preliminary Percolation Rate* (min/inch)
1	9.9	3
3	9.4	4
5	10	2
7	10	9
9	10	1
10	10	9

*Rounded to the nearest minute

The rates reported may be faster than the rates determined during the final report due to side seepage and the short pre-soak period associated with this preliminary phase of testing.

4.0 DESIGN AND RECOMMENDATIONS

4.1 MODULUS OF RESILIENCY

In accordance with the *Maricopa County Department of Transportation Draft Pavement Design Guide* (Design Guide) the sieve and plasticity values were utilized to determine correlated R-values for use in developing the mean R-value. The correlated R-values are presented in Summary of Laboratory Testing Table 1. Based on the standard deviations of both the laboratory tested R-values and the correlated R-values, the average R-values did not require adjusting.

Also in accordance with the Design Guide, the mean R-value for the soils at this project was determined to be 17 using the following formula:

$$R_{mean} = (2*N_t * R_t * \delta_c^2 + N_c*R_c*\delta_t^2)/(2*N_t*\delta_c^2 + N_c*\delta_t^2)$$

Where

N_t = number of tested R-values
R_t = average tested R-values
δ_t = standard deviation of the tested R-values
N_c = number of correlated R-values
R_c = average correlated R-value
δ_c = standard deviation of the correlated R-values

Considering a mean R-value of 17 and a seasonal variation factor (SVF) of 1.0 for the project area, the resilient modulus (M_r) of the subgrade soil was determined to be 10,369 pounds per square inch (psi) as determined by the following formula from the Design Guide:

$$M_r = (1815 + 225*R_{mean} + 2.4*R_{mean}^2)/(0.6*SVF^{0.6})$$

It is this resilient modulus value that will be utilized in conjunction with traffic loading to determine the necessary structural number for the proposed roadway.

4.2 TRAFFIC LOAD ANALYSIS

For the purposes of pavement design, Maricopa County Department of Transportation provided both a Corridor Improvement Study and the MAG traffic projections for years 2010 and 2020. A combination of values from the information provided were used to develop the initial and final Equivalent Single Axle Loads (ESAL) for years 2003 and 2023, the analysis period of this report.

MC85 Design Traffic Load

The improvement section of MC85 that is the subject of this report was divided into two sections which exhibit similar 2020 traffic loading in terms of Average Daily Trips (ADT) as projected by MAG. After the two sections were established, the ADT provided within each of the sections were averaged to provide a design ADT for use in determining pavement material thicknesses. The two sections consisted of the portions of MC85 from 91st Avenue to the 103rd Avenue alignment at 30,000 ADT, and from the 103rd Avenue alignment to 107th Avenue at 23,000 ADT. Design truck percentages were determined for each of these sections of MC85 in a similar fashion and were based on information provided by Inca Engineers for 2003 truck counts. We understand that the percentage of trucks along the subject portion of MC85 are not expected to increase; therefore, for the purposes of this report, truck percentages are assigned a zero percent growth over the analysis period.

These averaged 2020 ADT volumes, along with the 1997 traffic counts provided in the Corridor Improvement Study were utilized to determine an approximate compounded growth rate for MC85 of 5.8% between 91st Avenue and 103rd Avenue, and 4% between 103rd Avenue and 107th Avenue.

These rates shall be used for pavement design and analysis purposes of this report only, and should not be used for future traffic projections.

Utilizing these calculated growth rates, the 2020 ADT volumes were back calculated to determine initial traffic volumes for 2003 and extrapolated to determine the final traffic volumes for 2023 for the two sections of MC85. Initial and final traffic volumes for the intersecting roadways at MC85 were also determined using similar methods assuming a single growth rate of 5.8% overall. These values are summarized below:

Roadway Section	1997 ADT[1]	2020 ADT[2]	Growth Rate[3]	2023 ADT
MC85 – 91st Ave. to 99th Ave	9,000	30,000	5.4%	35,326
MC85 – 99th Ave to 103rd Ave	8,200	30,000	5.8%	35,517
MC85 – 103rd Ave to 107th Ave	8,200	23,000	4.0%	25,872
91st Avenue	Not Provided	13,000	5.8%[4]	15,396
99th Avenue	Not Provided	17,000	5.8%[4]	20,133
107th Avenue	Not Provided	13,000	5.8%[4]	15,396

[1]Direct data from Corridor Improvement Study
[2]Averaged MAG projected ADT
[3]Estimated growth rate calculated based on 1997 and 2020 ADT data
[4]Estimated growth rate calculated based on 2010 and 2020 ADT data

Using the traffic volumes and growth rates presented above, the ESAL's and Structural numbers for the sections of MC85 and intersecting roadways were calculated using the following design parameters:

Performance Period (years)	20
Number of lanes in the Design Direction (MC85)	3
Percent of All Trucks in the Design Lane (MC85)	70%
Number of lanes in the Design Direction (Intersecting Roads)	2
Percent of All Trucks in the Design Lane (Intersecting Roads)	90%
Percent Trucks in the Design Direction	100%
Average Initial Truck Factor (provided by MCDOT)	1.2
Annual Truck Factor Growth Rate	0%
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95%
Overall Standard Deviation	0.45

Roadway Section	2003 ADT	Growth Rate	Truck Percentage	18 Kip ESALs	Structural Number
MC85 – 91st Ave. to 99th Ave	12,270	5.4%	14%	10,615,225	4.54
MC85 – 99th Ave to 103rd Ave	11,505	5.8%	9%	6,430,830	4.22
MC85 – 103rd Ave to 107th Ave	11,808	4.0%	7%	5,138,823	4.08
91st Avenue	4,985	5.8%	10%	3,975,346	3.93
99th Avenue	6,519	5.8%	18%	9,308,194	4.45
107th Avenue	4,985	5.8%	5%	2,011,273	3.55

In review of the structural numbers and design ESAL above for the roadway sections, and after considering the feasibility of multiple pavement section designs, it was apparent that the sections above could be grouped into two levels of pavement loading. In evaluation of the data presented previously, we propose that certain portions of the improvement area be considered within the same pavement loading level and be combined or averaged as follows for pavement section design:

Design No.	Roadway Section	Design ESAL	Design Structural Number
Design 1	MC85–91st Ave. to 99th Ave	9,500,000	4.46
	MC85–99th Ave to 103rd Ave		
	99th Avenue		
Design 2	MC85–103rd Ave to 107th Ave	5,000,000	4.07
	91st Avenue		
	107th Avenue		

Some consideration may be given to using Design 2 for any improvements to 99th Avenue south of the MC85 intersection since it is apparent from the MAG projections provided that traffic volumes south of MC85 are much less at approximately 4000 ADT in 2020. Certainly, ease of construction may be considered when making this decision.

4.3 PAVEMENT SECTION DESIGN

The subgrade soils along the MC85 alignment are considered to be poor quality soils for pavement support due to their high fines content, plasticity and moderately high expansion potential. Therefore, alternative pavement section designs have been provided to determine the most economic section combination or soil remediation option for achieving the structural numbers required.

In accordance with the AASHTO method for layered thickness design, and based on the above design parameters, pavement section alternatives for each of the pavement loading levels were determined as presented below. As requested by Maricopa County Department of Transportation, the upper portion of the asphalt concrete section required was replaced by a 1.5 inch section of asphalt rubber overlay using a replacement ratio of approximately 1.5 to 1, or a structural coefficient of 0.61. Structural coefficients of 0.42, 0.12, and 0.16 were utilized for asphalt concrete, aggregate base course, and lime stabilized soil subgrade, respectively. More detailed section thicknesses and material properties are available for review in the pavement analysis data sheets attached in Appendix C.

Alternative 1 – Full Depth Asphalt over Native Subgrade		
Pavement Section	**Design 1 (inches)** MC85 – 91st Ave to 103rd Ave, and Intersecting 99th Ave SN 4.46	**Design 2 (inches)** MC85 – 103rd Ave to 107th Ave, and Intersecting 91st and 107th Aves. SN 4.07
Asphalt Rubber Surface	1.5	1.5
Asphalt Concrete	8.5	7.5
Native Subgrade	--	--

Alternative 2 – AC and AB over Native Subgrade		
Pavement Section	**Design 1 (inches)** MC85 – 91st Ave to 103rd Ave, and Intersecting 99th Ave SN 4.46	**Design 2 (inches)** MC85 – 103rd Ave to 107th Ave, and Intersecting 91st and 107th Aves. SN 4.07
Asphalt Rubber Overlay	1.5	1.5
Asphalt Concrete	5	4.5
Aggregate Base	12	11
Native Subgrade	--	--

Alternative 3 – AC and AB over Lime Stabilized Subbase		
Pavement Section	**Design 1 (inches)** MC85 – 91st Ave to 103rd Ave, and Intersecting 99th Ave SN 4.46	**Design 2 (inches)** MC85 – 103rd Ave to 107th Ave, and Intersecting 91st and 107th Aves. SN 4.07
Asphalt Rubber Surface	1.5	1.5
Asphalt Concrete	5	4
Aggregate Base	4	4
Lime Stabilized Subbase	12	12

Alternative 4 – AC and AB over Imported Fill Subgrade*		
Pavement Section	**Design 1 (inches)** MC85 – 91st Ave to 103rd Ave, and Intersecting 99th Ave SN 3.5	**Design 2 (inches)** MC85 – 103rd Ave to 107th Ave, and Intersecting 91st and 107th Aves. SN 3.17
Asphalt Rubber Overlay	1.5	1.5
Asphalt Concrete	5	4.5
Aggregate Base	4	4
24" Imported Fill Subgrade*	24	24

*For the pavement sections presented above, the imported fill must meet the quality specifications presented in the Earthwork and Materials section of this report.

Alternative 5 – AC over Existing AB and Undisturbed Subgrade*		
Pavement Section	**Design 1 (inches)** MC85 – 91st Ave to 103rd Ave, and Intersecting 99th Ave SN 4.46	**Design 2 (inches)** MC85 – 103rd Ave to 107th Ave, and Intersecting 91st and 107th Aves. SN 4.07
Asphalt Rubber Overlay	1.5	1.5
Asphalt Concrete	5	4
Aggregate Base	4	4
Existing Aggregate Subbase*	11	11
Undisturbed Subgrade	--	--

*Existing aggregate srbbase section assumes that the in-place material meets or exceeds compaction requirements in its present state. In-place density testing should be performed to verify this condition.

If Alternative 5 is chosen for this project, construction of the two new outside lanes must be accomplished in a manner that will allow positive drainage beneath the pavement sections. Therefore, it is recommended that the aggregate base layer of the new outside lanes be at least as deep as the existing aggregate base layer that is left in place in Alternative 5.

A reduced structural coefficient of 0.10 was used in design to represent the existing aggregate base subbase. Alternative 5 assumes that there will be sufficient existing aggregate base in place after removal of asphalt pavement to allow for the minimum aggregate base section indicated above. The actual depths should be verified either in the final geotechnical report for this project or during construction, or both to ensure that the minimum section requirements are met. In areas where insufficient base exists, either pulverized asphalt concrete or additional aggregate base shall be added.

Structural coefficients of 0.42 and 0.12 represent high quality plant mix asphalt and Maricopa Association of Governments (MAG) quality aggregate base course, respectively. A structural coefficient of 0.12 was also used for both recycled or existing aggregate base and pulverized asphalt concrete used as base material.

The lime stabilized subbase structural coefficient of 0.16 assumes the addition of a minimum of 5% quicklime by weight to the native subgrade soils. Please be aware that this minimum amount may not be enough to limit the expansion potential of the native subgrade soils, especially if subgrade soils are mixed and stabilized in place. Therefore, a more precise determination of the required amount of lime and mixing guidelines should be determined by a lime-mix design provided in the final report or by the Contractor prior to placement. The actual amount of lime required to sufficiently limit the expansion of the native soils may prove to be costly and should be evaluated further.

The pavement section thickness represents values that have been adjusted to the nearest ½ inch for asphalt and the nearest inch for aggregate base and lime stabilized subbase. In determining the final sections, consideration was also given to practicality of paving operations, minimum MCDOT section thicknesses for the roadway classification, and the minimum and maximum compacted lift thicknesses of asphalt concrete allowed by MAG.

The 20-year pavement design life is based on the premise that normal maintenance of the pavement is performed. This may include crack sealing, slurry sealing, and/or chip sealing as deemed necessary by a pavement management plan.

4.4 OPINION OF COSTS

The five alternatives presented were evaluated based on their construction and material costs to estimate the most economic pavement section for each traffic loading level of this project. For the purposes of this preliminary report, only those items which differ based on the pavement section design chosen have been provided for cost analysis. Therefore, unavoidable costs such as removal of the existing pavement section and prime coat application have not been included in this analysis.

Roadway lengths associated with the two Design portions, along with the existing and new roadway widths, were used to determine the estimated section volumes. Unit prices from the Pavement Design Guide and the ADOT Construction Cost 1999 manual were used to develop the tables pertaining our opinions of cost are presented below:

Design 1 - Alternative 1 - Full Depth Asphalt Over Native Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	5,875	ton	$45.00	$264,375
Asphalt Concrete (3/4" Mix at 147 pcf)	8.5	33,290	ton	$30.00	$998,700
Tack Coat (0.1 gal/sq yd)	--	39	ton	$115.00	$4,485
Apply Tack Coat	--	30	hour	$110.00	$3,300
Removal of Existing AC and AB for Soil Prep	20	1,126,400	sq yd/in	$0.70	$788,480
Roadway Excavation*	12	25,227	cu yd	$2.00	$50,454
				Total Cost	$2,109,794

*Represents the depth of subgrade preparation below pavement sections

Design 2 - Alternative 1 - Full Depth Asphalt Over Native Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	1,958	ton	$45.00	$88,110
Asphalt Concrete (3/4" Mix at 147 pcf)	7.5	9,791	ton	$30.00	$293,730
Tack Coat (0.1 gal/sq yd)	--	39	ton	$115.00	$4,485
Apply Tack Coat	--	30	hour	$110.00	$3,300
Removal of Existing AC and AB for Soil Prep	20	375,467	sq yd/in	$0.70	$262,827
Roadway Excavation*	12	8,409	cu yd	$2.00	$16,818
				Total Cost	$669,270

*Represents the depth of subgrade preparation below pavement sections

Design 1 - Alternative 2 - AC and AB Over Native Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	5,875	ton	$45.00	$264,375
Asphalt Concrete (3/4" Mix at 147 pcf)	5	19,582	ton	$30.00	$587,460
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	12	45,976	ton	$7.50	$344,817
Removal of Existing AC and AB for Soil Prep	20	1,126,400	sq yd/in	$0.70	$788,480
Pulverization of Existing AC	4	225,280	sq yd/in	$0.46	$103,629
Reduction of AB by using Recycled AC	4	15,325	Ton	-$7.50	-$114,939
Roadway Excavation*	12	25,227	cu yd	$2.00	$50,454
				Total Cost	$2,029,466

*Represents the depth of subgrade preparation below pavement sections

Design 2 - Alternative 2 - AC and AB Over Native Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	1,958	ton	$45.00	$88,110
Asphalt Concrete (3/4" Mix at 147 pcf)	4.5	5,875	ton	$30.00	$176,250
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	11	14,048	ton	$7.50	$105,361
Removal of Existing AC and AB for Soil Prep	20	375,467	sq yd/in	$0.70	$262,827
Pulverization of Existing AC	4	75,093	sq yd/in	$0.46	$34,543
Reduction of AB by using Recycled AC	4	5,108	Ton	-$7.50	-$38,310
Roadway Excavation*	12	8409	cu yd	$2.00	$16,818
				Total Cost	$650,789

*Represents the depth of subgrade preparation below pavement sections

Design 1 - Alternative 3 - AC and AB Over Lime Stabilized Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	5,875	ton	$45.00	$264,375
Asphalt Concrete (3/4" Mix at 147 pcf)	5	19,582	ton	$30.00	$587,460
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	4	15,325	ton	$7.50	$114,939
Removal of Existing AC and AB for Soil Prep	20	1,126,400	sq yd/in	$0.70	$788,480
Pulverization of Existing AC	4	225,280	sq yd/in	$0.46	$103,629
Reduction of AB by using Recycled AC	4	15,325	Ton	-$7.50	-$114,938
Roadway Excavation*	0	0	cu yd	$2.00	$0
5% Lime Stabilized Soil	12	908,160	sq yd/in	$0.39	$354,182
				Total Cost	$2,103,318

*Assumes that the native soil will be stabilized in place

Design 2 - Alternative 3 - AC and AB Over Lime Stabilized Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	1,958	ton	$45.00	$88,110
Asphalt Concrete (3/4" Mix at 147 pcf)	4	5,222	ton	$30.00	$156,660
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	4	5,108	ton	$7.50	$38,313
Removal of Existing AC and AB for Soil Prep	20	375,467	sq yd/in	$0.70	$262,827
Pulverization of Existing AC	4	75,093	sq yd/in	$0.46	$34,543
Reduction of AB by using Recycled AC	4	5,108	Ton	-$7.50	-$38,310
Roadway Excavation*	0	0	cu yd	$2.00	$0
5% Lime Stabilized Soil	12	302,720	sq yd/in	$0.39	$118,061
				Total Cost	$665,394

*Assumes that the native soil will be stabilized in place

Design 1 - Alternative 4 - AC and AB Over Imported Fill Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	5,875	ton	$45.00	$264,375
Asphalt Concrete (3/4" Mix at 147 pcf)	5	19,582	ton	$30.00	$587,460
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	4	15,325	ton	$7.50	$114,939
Removal of Existing AC and AB for Soil Prep	20	1,126,400	sq yd/in	$0.70	$788,480
Pulverization of Existing AC	4	225,280	sq yd/in	$0.46	$103,629
Reduction of AB by using Recycled AC	4	15,325	Ton	-$7.50	-$114,938
Roadway Excavation*	24	50,453	cu yd	$2.00	$100,907
Imported Fill Subgrade (Borrow)	24	50,453	cu yd	$2.75	$138,747
				Total Cost	$1,988,789

*Represents the depth of removal and disposal of native soils

Design 2 - Alternative 4 - AC and AB Over Imported Fill Subgrade					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	1,958	ton	$45.00	$88,110
Asphalt Concrete (3/4" Mix at 147 pcf)	4.5	5,875	ton	$30.00	$176,250
Tack Coat (0.1 gal/sq yd)	--	26	ton	$115.00	$2,990
Apply Tack Coat	--	20	hour	$110.00	$2,200
Aggregate Base (Class 2)	4	5,108	ton	$7.50	$38,313
Removal of Existing AC and AB for Soil Prep	20	375,467	sq yd/in	$0.70	$262,827
Pulverization of Existing AC	4	75,093	sq yd/in	$0.46	$34,543
Reduction of AB by using Recycled AC	4	5,108	Ton	-$7.50	-$38,310
Roadway Excavation*	24	16,818	cu yd	$2.00	$33,636
Imported Fill Subgrade (Borrow)	24	16,818	cu yd	$2.75	$46,249
				Total Cost	$646,808

*Represents the depth of removal and disposal of native soils

Design 1 - Alternative 5 - AC Over Existing AB					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	5,875	Ton	$45.00	$264,375
Asphalt Concrete (3/4" Mix at 147 pcf)	5	19,582	Ton	$30.00	$587,460
Tack Coat (0.1 gal/sq yd)	--	39	Ton	$115.00	$4,485
Apply Tack Coat	--	30	Hour	$110.00	$3,300
Aggregate Base (Class 2) Existing Lanes	4	11,405	Ton	$7.50	$85,536
Aggregate Base (Class 2) New Outside Lanes	15	14,702	Ton	$7.50	$110,261
Existing Aggregate Subbase	11	42,144	Ton	$0.00	$0
Removal of Existing AC	6	337,920	sq yd/in	$0.70	$236,544
Roadway Excavation	0	0	cu yd	$2.00	$0
				Total Cost	$1,291,961

*Represents the depth of subgrade preparation below pavement sections

Design 2 - Alternative 5 - AC Over Existing AB					
Work Item	Section Thickness (in)	Quantity	Unit of Measure	Unit Price ($)	Cost
Asphalt Rubber (138 pcf)	1.5	1,958	Ton	$45.00	$88,110
Asphalt Concrete (3/4" Mix at 147 pcf)	4	5,222	Ton	$30.00	$156,660
Tack Coat (0.1 gal/sq yd)	--	26	Ton	$115.00	$2,990
Apply Tack Coat	--	20	Hour	$110.00	$2,200
Aggregate Base (Class 2) Existing Lanes	4	3,802	Ton	$7.50	$28,512
Aggregate Base (Class 2) New Outside Lanes	15	4,901	Ton	$7.50	$36,754
Existing Aggregate Subbase	12	15,325	Ton	$0.00	$0
Removal of Existing AC	6	151,360	sq yd/in	$0.70	$105,952
Roadway Excavation*	0	0	cu yd	$2.00	$0
				Total Cost	$421,178

*Represents the depth of subgrade preparation below pavement sections

Items required for pavement construction which have not been included here should be considered either in the final geotechnical evaluation or prior to selection of an alternative. The construction items and unit rates presented in the opinion of cost tables above represent anticipated procedures and estimated unit costs. The following assumptions have been made in preparation of the opinion of costs:

- The unit cost for Roadway Excavation includes both scarification or removal of the native subgrade, then recompaction to the required density and moisture;
- The unit cost for lime stabilization assumes that the subgrade will be stabilized in place;
- The maximum amount of recycled asphalt pavement materials available results in a section equaling approximately 4 inches across the length of MC 85.

If any of the work items are incomplete or the associated unit rates are not accurate, we should be notified immediately so that appropriate changes can be made prior to final design.

Based on the opinion of cost analysis above which does not consider the associated pavement management/life-cycle costs or the cost of changing the alignment grade, Alternative 5 – Asphalt Concrete over Existing Aggregate Base represents the most economic alternative for construction of both portions of the 2 mile section of MC85.

4.5 DRAINAGE

The proposed pavement should be constructed in a way that will prevent ponding of water on or directly adjoining paved surfaces. Ponding of water will decrease the expected life of the proposed pavement potentially causing subgrade expansion, cracking, and deterioration. In accordance with the MCDOT Roadway Design Manual, the proposed roadway should be constructed with a cross slope of 0.02 foot per foot downward from the high centerline to allow for proper drainage.

4.6 CORROSIVITY

We understand that corrugated metal pipe drainage features may be utilized to manage water flow near the roadway. For suitability of existing soils around the drainage features, pH and minimum resistivity testing was performed on representative samples along the alignment. The results are presented in Table 1 Summary of Laboratory Testing. The pH and resistivity of the surface soils tested indicate that the soil's potential for attack ranges from moderately corrosive to corrosive on corrugated metal pipe.

5.0 EARTHWORK AND MATERIALS

5.1 EARTHWORK RECOMMENDATIONS

The subject portion of MC85 and the intersecting roadways should be stripped of existing pavement sections, vegetation, structures, and any other deleterious materials. The removal of such items should be performed in a manner that will result in exposed surfaces free of mounds and depressions. If removal of these items results in the shallow excavation of site soils below new pavement areas, the soils should be replaced with approved fill using proper compaction as indicated below.

Exposed subgrade below pavement sections (including lime stabilized soil), channel profiles, or fill areas should be removed and recompacted to a minimum depth of 12 inches. Fill material should be uniformly placed in uncompacted lifts not exceeding 8 inches. Materials shall be compacted to the following densities and moistures:

	ASTM D698	Moisture Spec.
Native Site Soils		
Below Pavement Areas	95% Min	Optimum to +3%
Below Site Concrete (not within upper 2 feet)	90% Max	Optimum to +3%
Imported Fill Material		
Below Pavement Areas	95% Min	+/- 2%
Below Site Concrete	95% Min	+/- 2%
Existing Aggregate Base Subbase	95% Min	+/- 2%
Aggregate Base Course	100% Min	+/- 2%
Landscape Areas	90% Min	+/- 2%

Based on the soil conditions encountered, it is anticipated that conventional excavation equipment would be suitable for shallow utility excavations. For shallow utility excavations, site clay and silt soils can be considered Type B soils when applying the OSHA regulations. This corresponds to a maximum recommended slope inclination of 1:1 (horizontal to vertical) for depths up to 4 feet below site grades. All other site soils shall be considered Type C soils corresponding to a maximum slope inclination of 1.5:1.

5.2 MATERIALS

Clean on-site native soils, or approved imported soil, may be used as fill material below pavement areas in accordance with the pavement section alternative chosen. Site soil that is tested to be non-plastic or approved imported soil, may be used as engineered fill material below site concrete. All other site soils should not be used within the upper 2 feet below site concrete due to the expansion potential of the native soils.

Imported fill to be used as subgrade soils within the upper 24 inches below pavement sections shall fall within the acceptable range presented on the Construction Control R-Value Chart attached. Imported fill soils to be placed as subgrade or engineered fill should also conform to the following criteria:

Particle Size (ASTM C136)	Percent Finer by Weight
6"	100
2"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	50 or less*
Expansion Potential	1.5% or less**

*Or fall within the acceptable range on the Construction Control R-value Chart for pavement subgrade.
**When remolded to 95% of ASTM D698 and 3 percent below optimum, and tested under a 100 psf surcharge while inundated with water.

Asphalt rubber overlay should be open graded rubberized asphalt conforming to Section 325 of the MAG Specifications. Structural asphalt concrete should consist of dense-graded, plant-mix asphalt concrete. The asphalt concrete should conform to MAG specifications for Asphalt Concrete Type A19mm for heavy traffic. Imported base course materials should conform to MAG specifications.

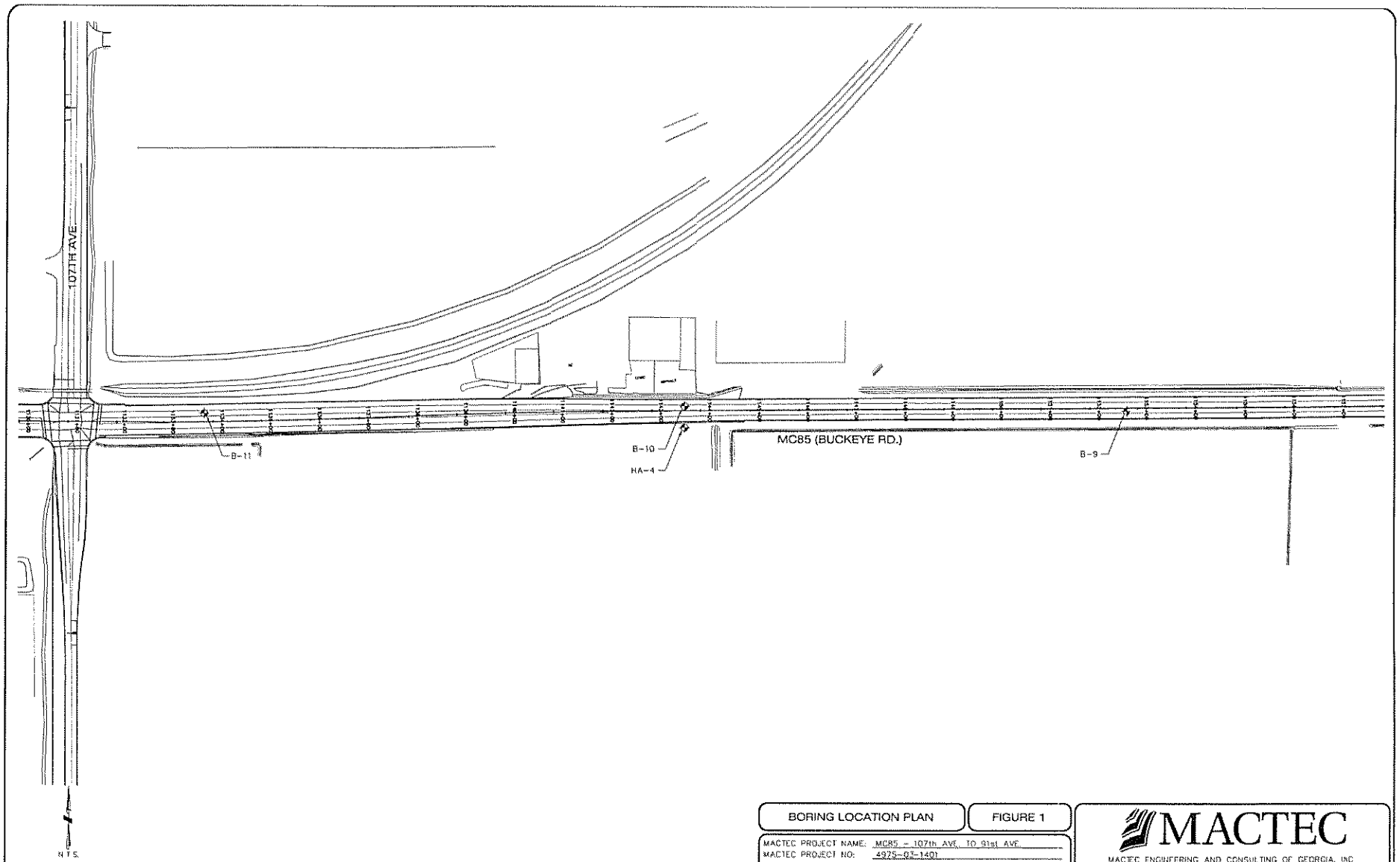
6.0 BASIS FOR RECOMMENDATIONS

The recommendations provided in this report are preliminary and are based on our understanding of the project described herein and on our interpretation of the data collected during the subsurface exploration. These preliminary recommendations apply to the specific project discussed in this report. A final geotechnical evaluation report and pavement design must be completed prior to the

start of final design or construction operations. As the project progresses, any changes in project scope, traffic or site conditions, or site grades should be clearly identified in the final pavement design report.

Regardless of the thoroughness of the geotechnical exploration, there is always a possibility that conditions between the test borings will be different than those encountered in the test borings, or that soil conditions may change subsequent to our investigation. Therefore, a final subsurface evaluation must be performed and an experienced geotechnical engineer or qualified technical representative should monitor the earthwork and subgrade construction to confirm that the soil conditions encountered in the field conform to those described in this report.

FIGURES



BORING LOCATION PLAN	FIGURE 1

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE 05/29/03 E-FILE: DRAWING 4
DRAWN BY: BWF CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC
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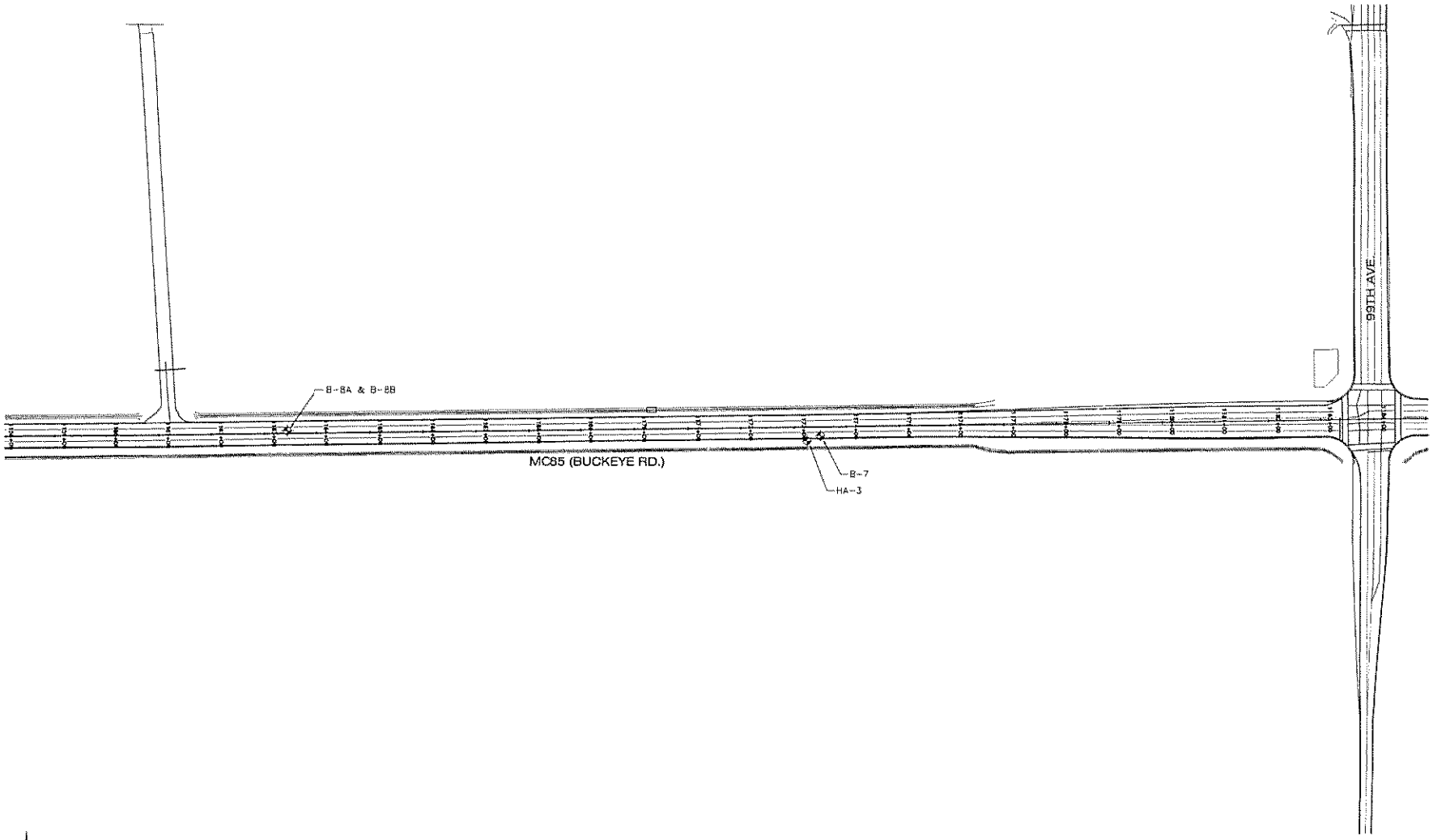


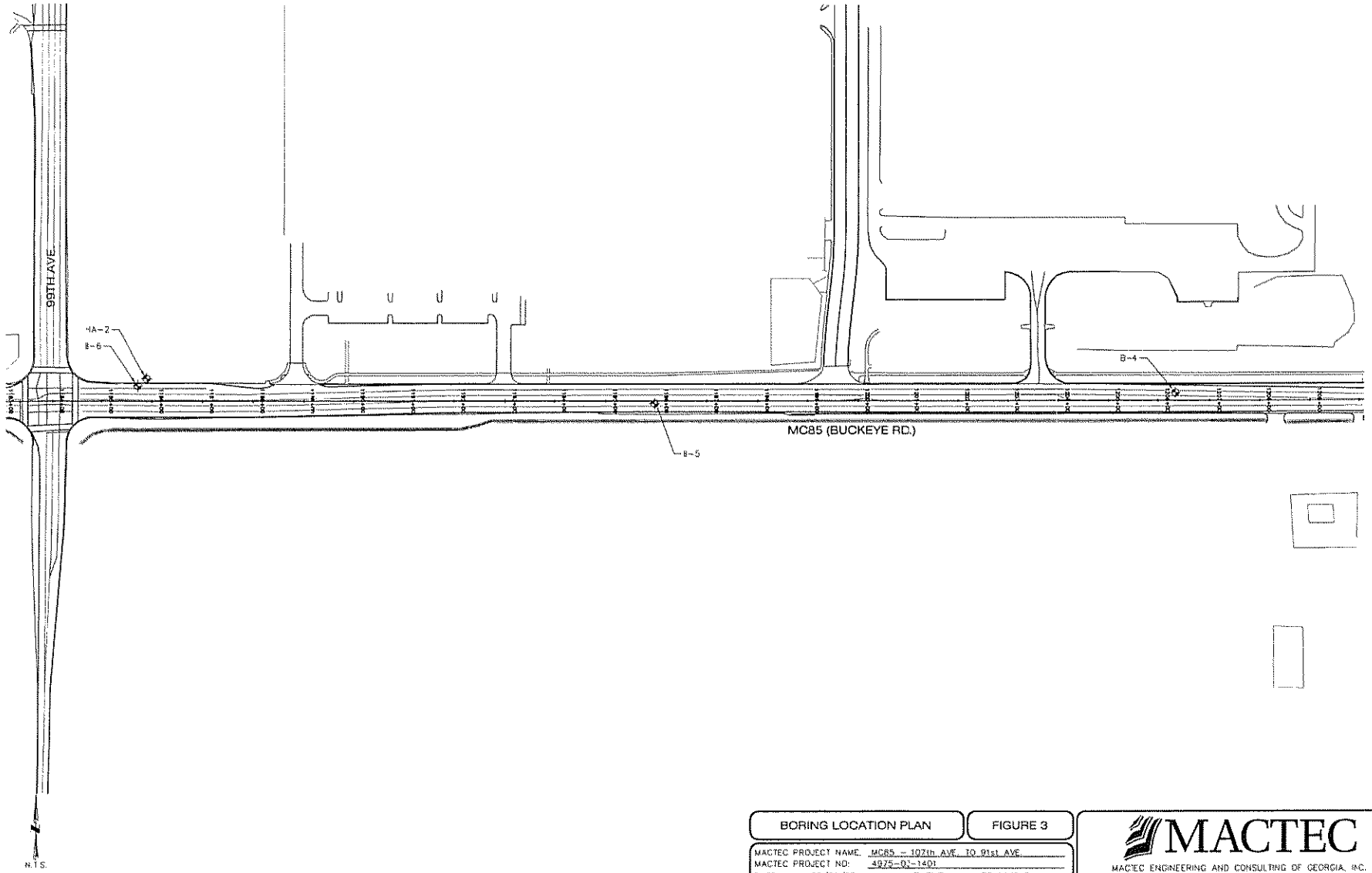
N.T.S.

BORING LOCATION PLAN | FIGURE 2

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 3
DRAWN BY: BWT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WIER AVE., PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3575

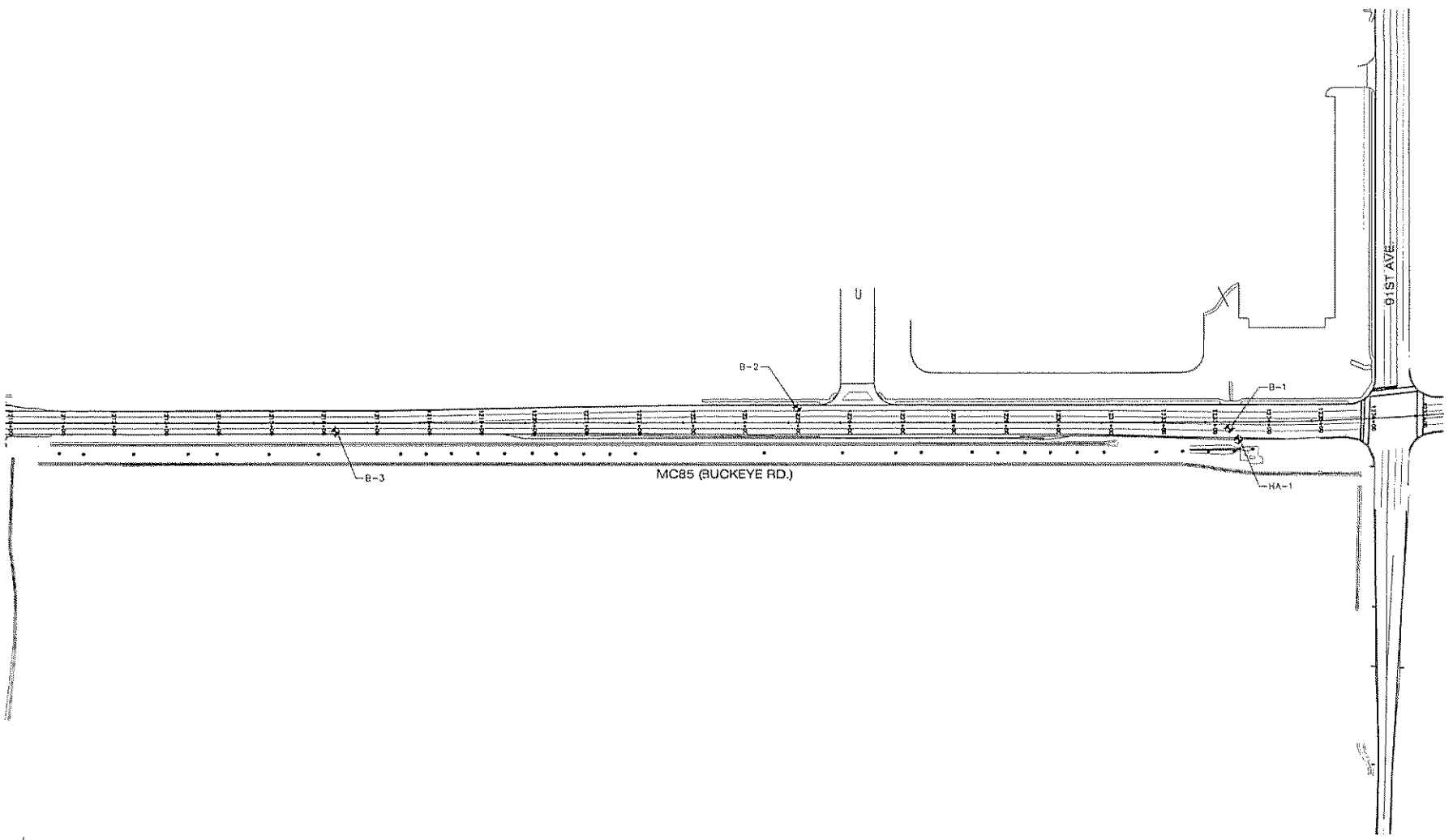


BORING LOCATION PLAN | FIGURE 3

MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 2
DRAWN BY: BWT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WEER AVE.; PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3675



BORING LOCATION PLAN | FIGURE 4

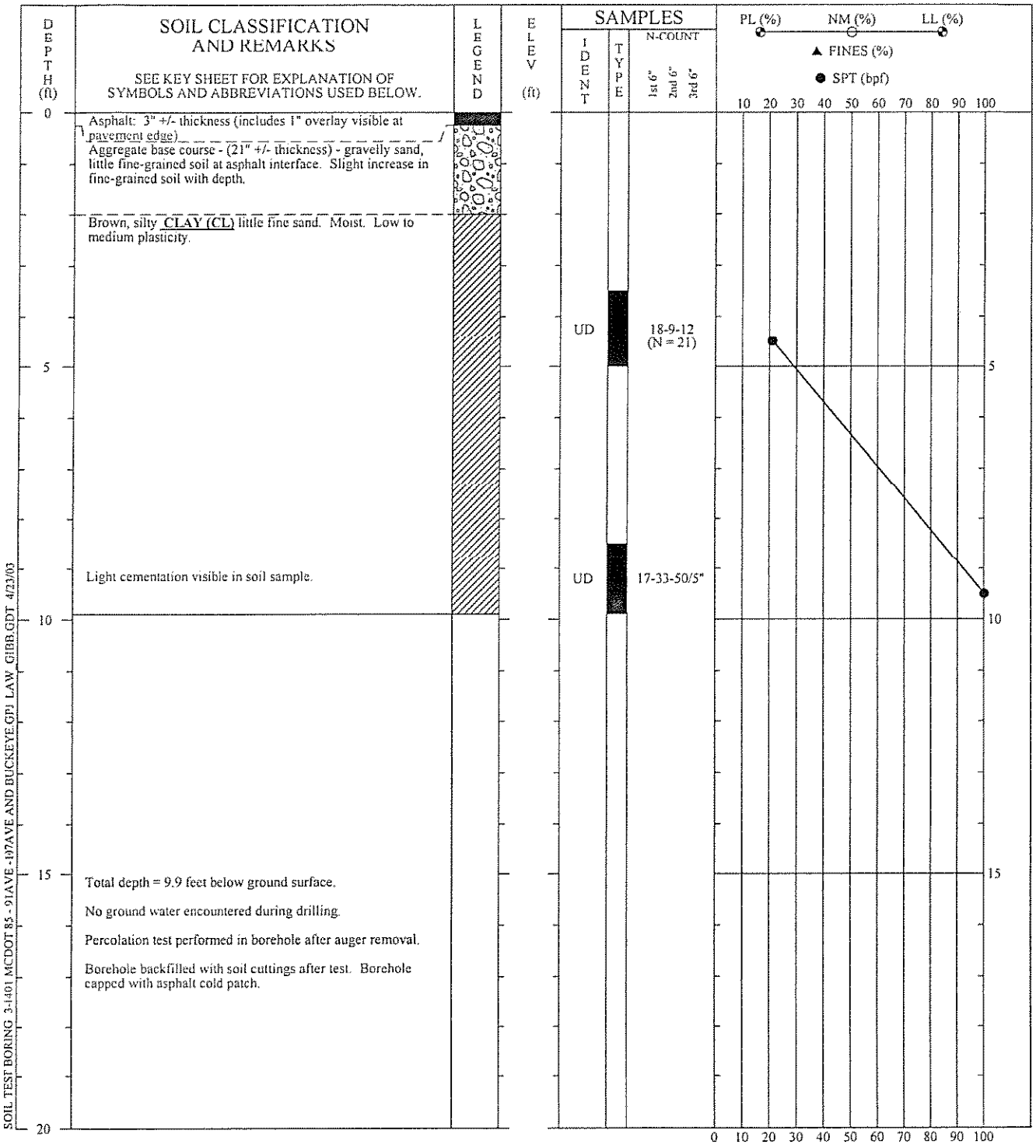
MACTEC PROJECT NAME: MC85 - 107th AVE. TO 91st AVE.
MACTEC PROJECT NO: 4975-03-1401
DATE: 05/29/03 E-FILE: DRAWING 1
DRAWN BY: BMT CHECKED BY:

MACTEC

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
3630 E. WIER AVE.; PHOENIX, ARIZONA 85040
PHONE: (602) 437-0250 FAX: (602) 437-3575

APPENDICES

APPENDIX A



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE - 107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

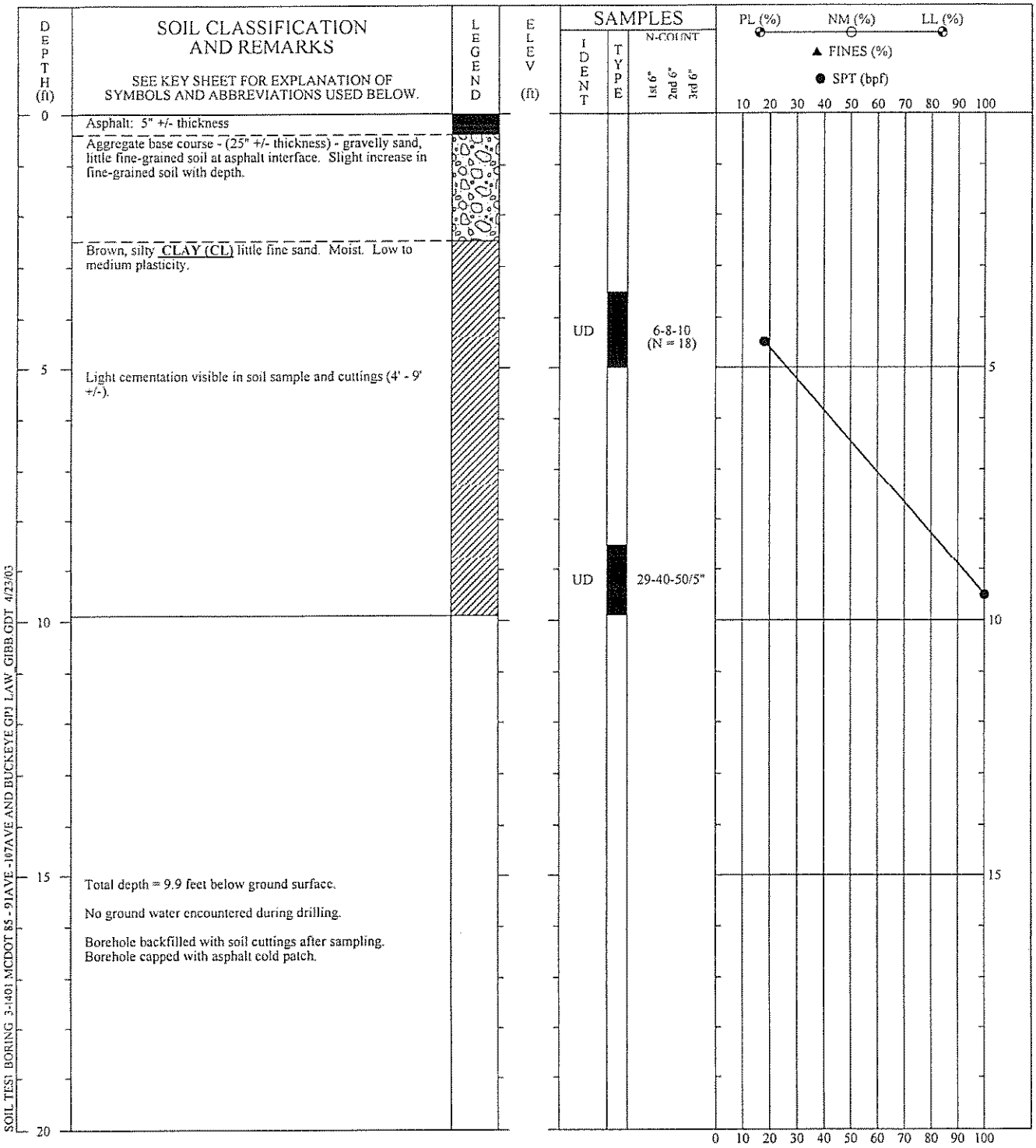
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-1
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE GPJ LAW_GIBB.GDT 4/23/03

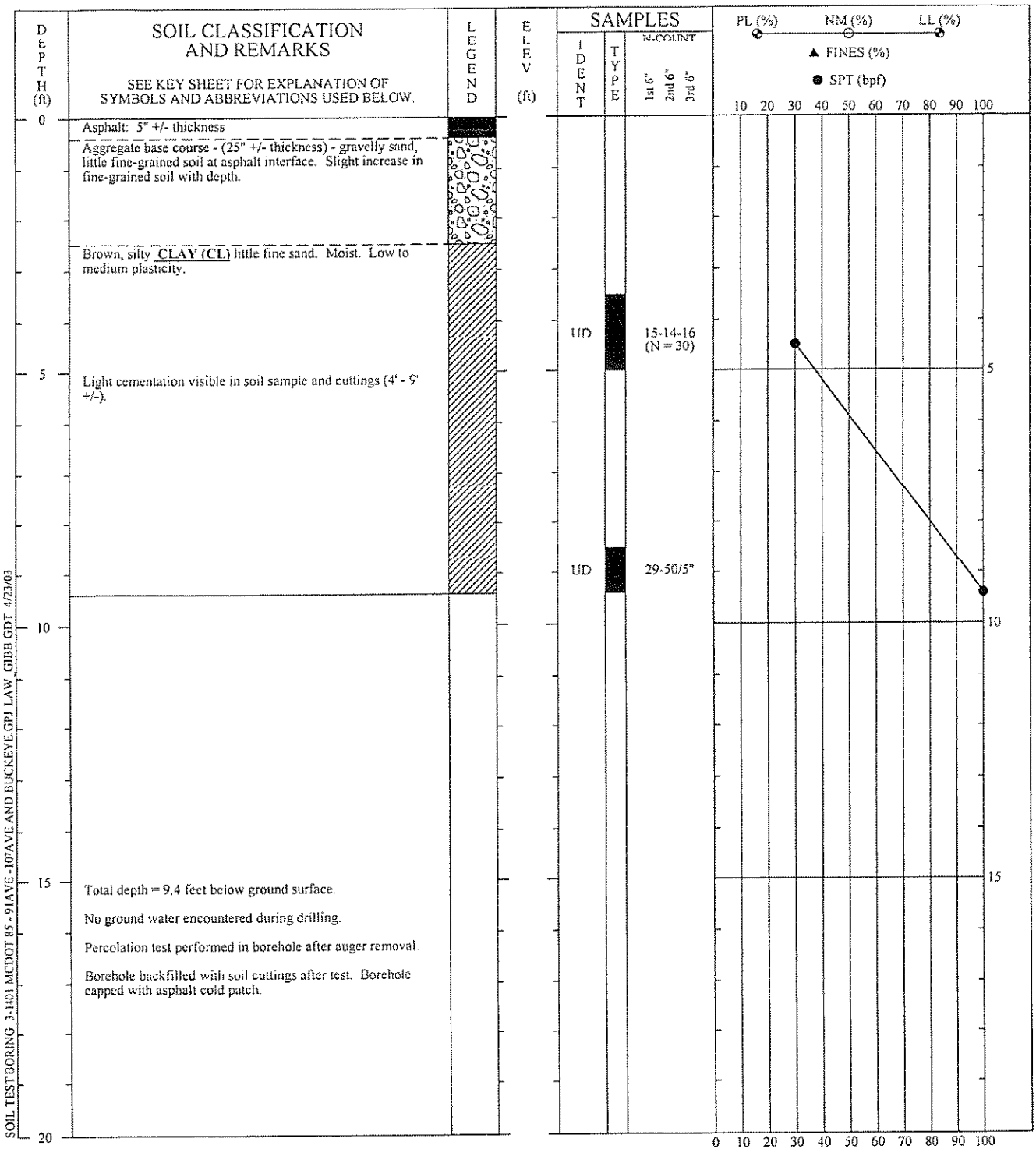
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-2
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



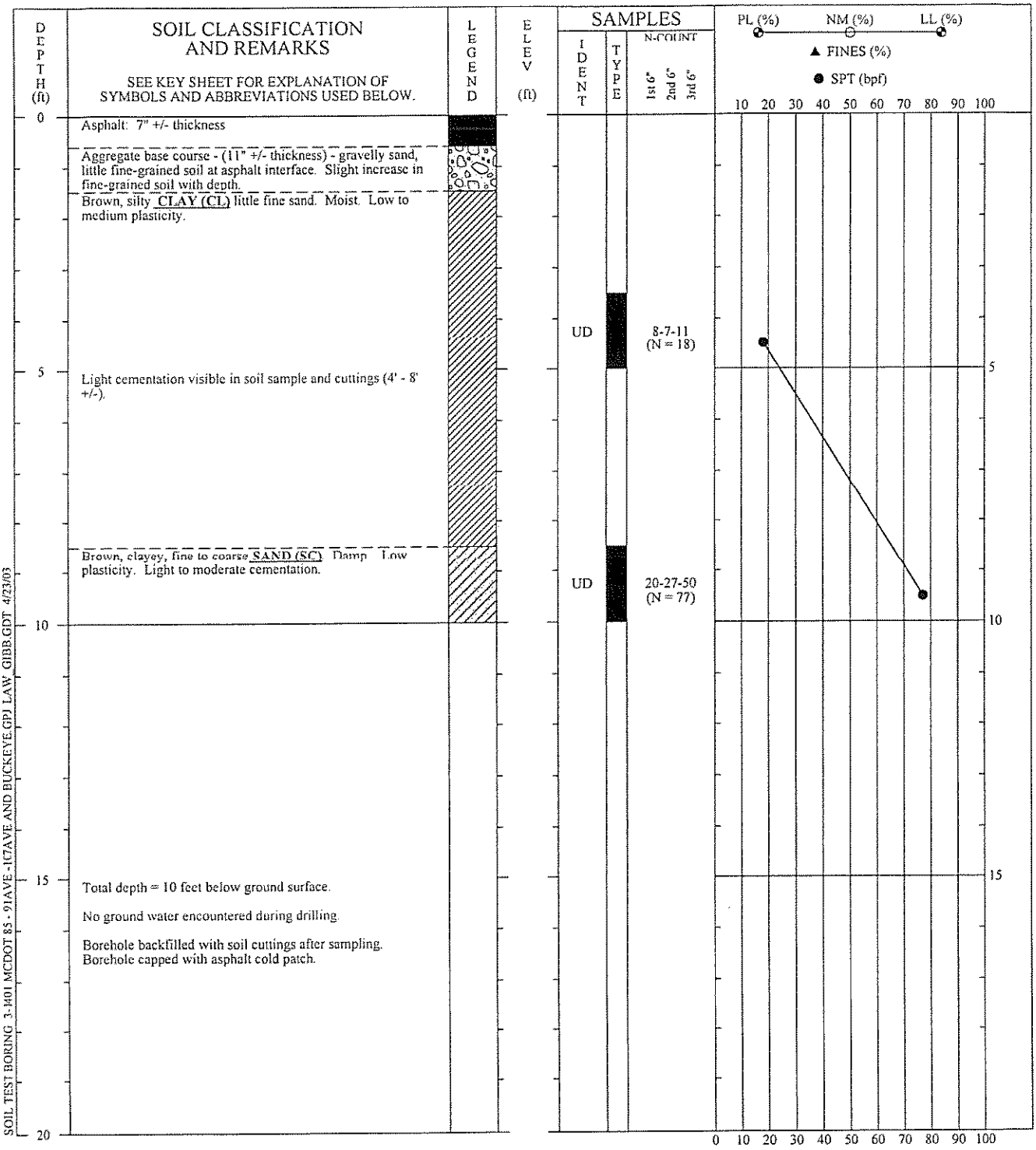
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-3
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



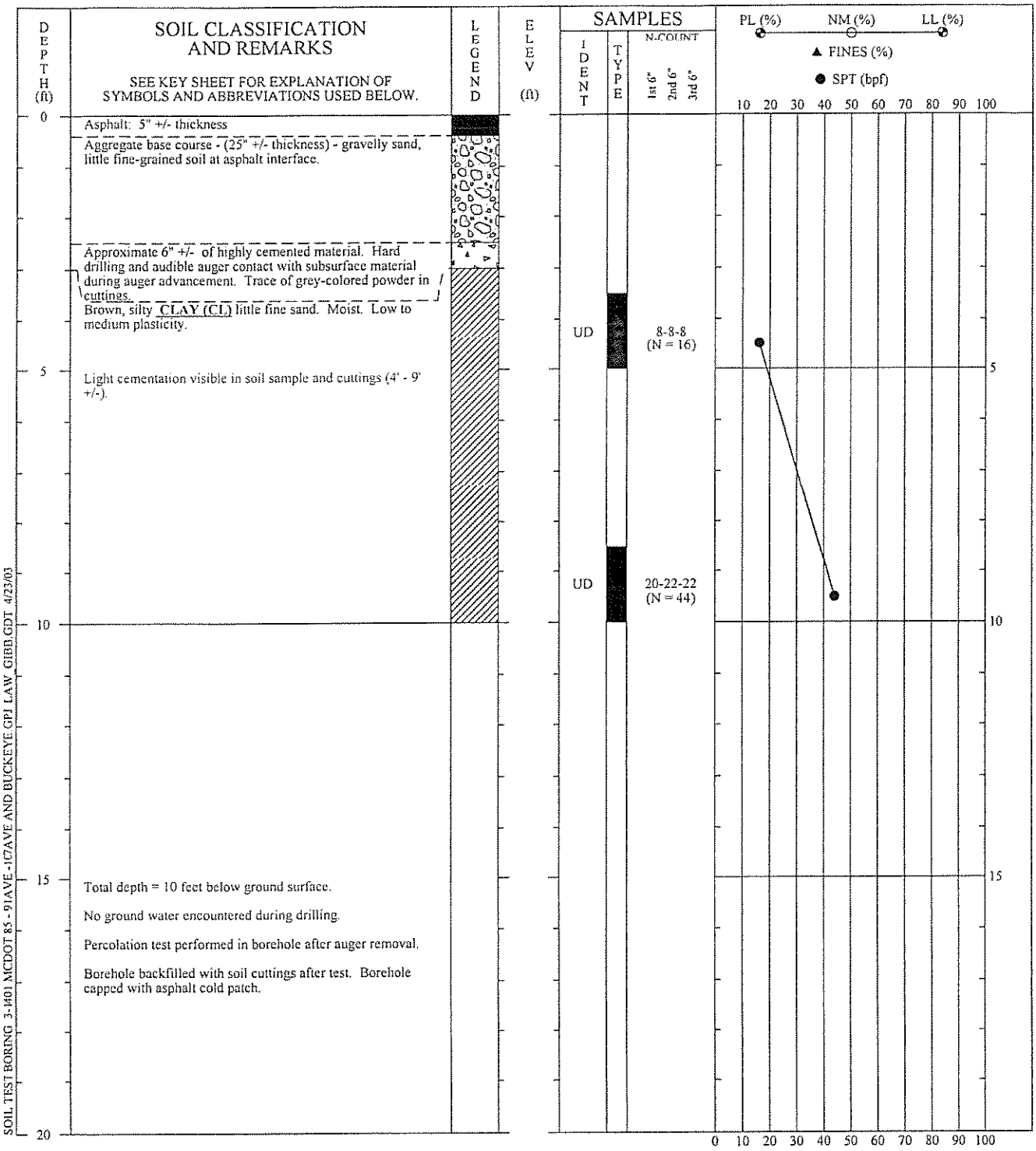
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	B-4
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

MACTEC



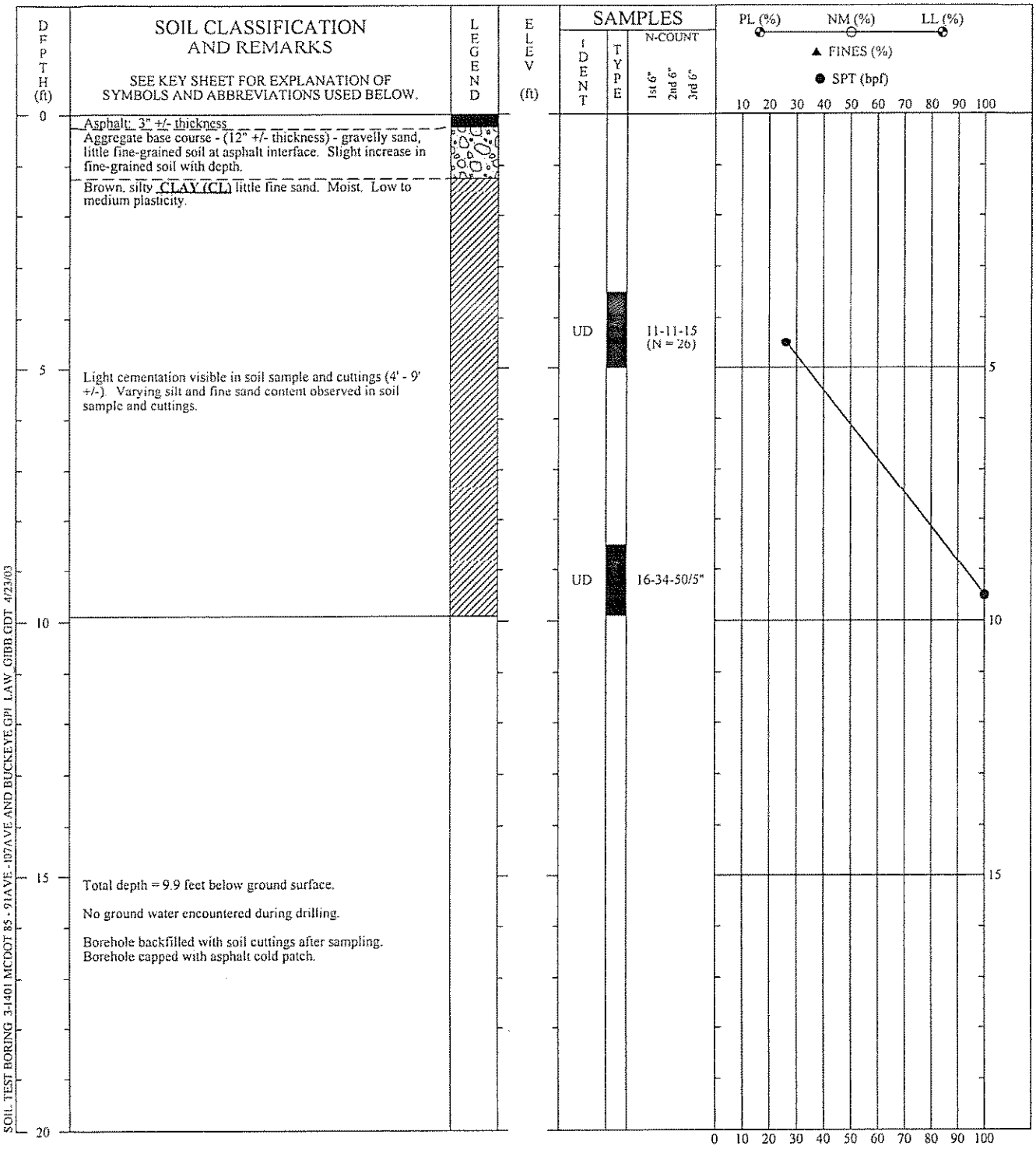
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-5
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL_TEST BORING_3-1401 MCDOT 85 - 91AVE - 107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

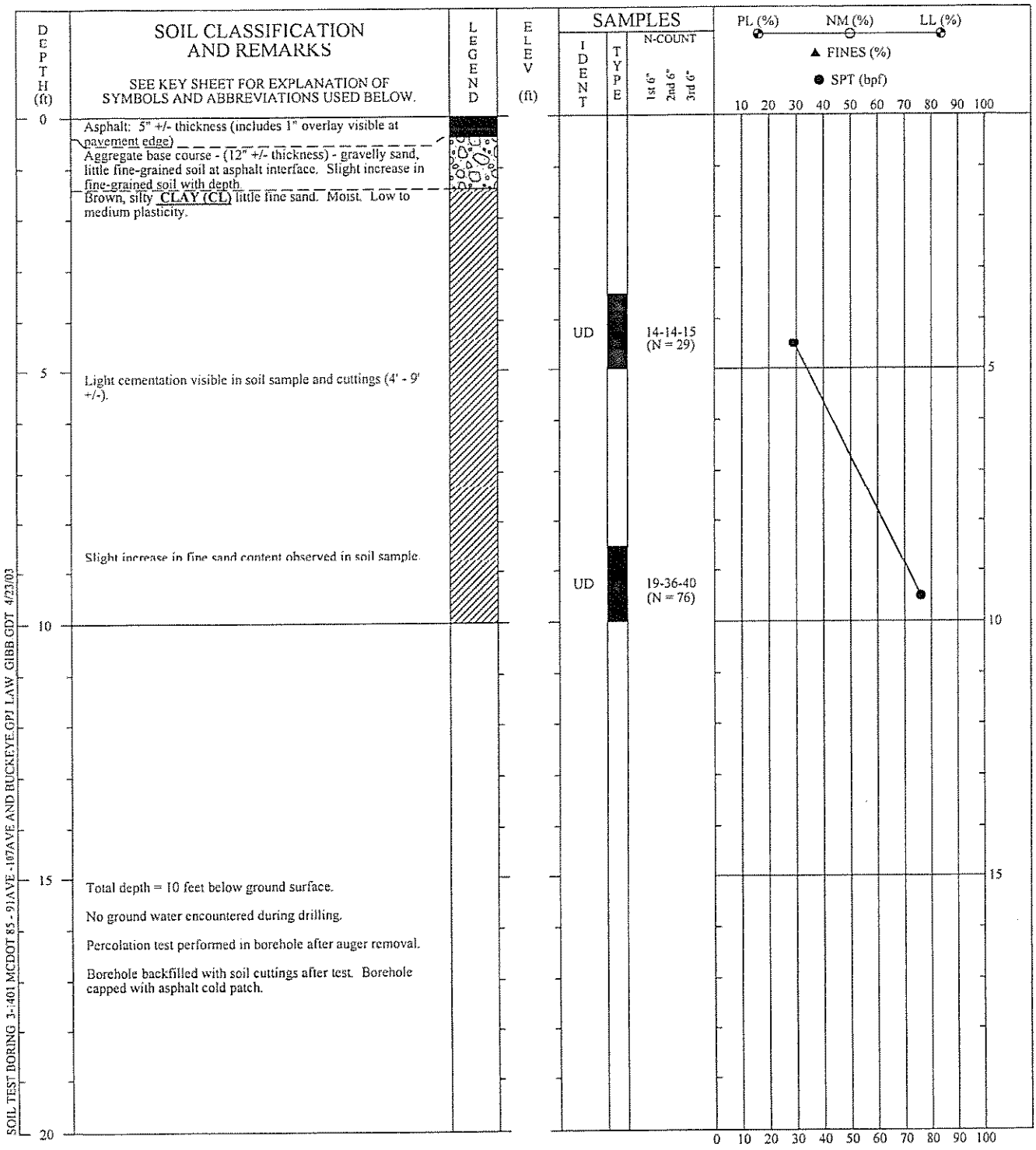
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	B-6
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

MACTEC



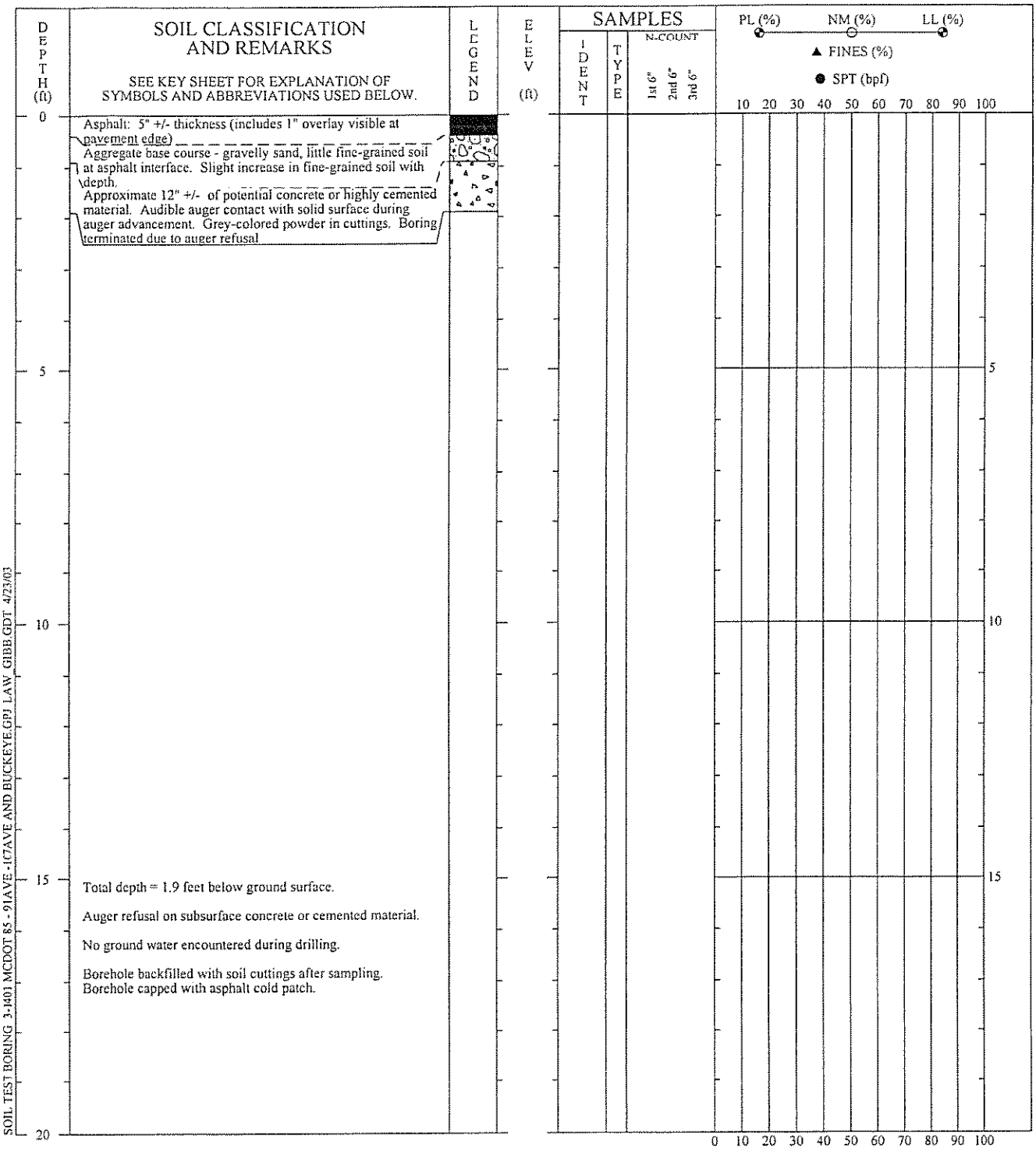
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-7
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



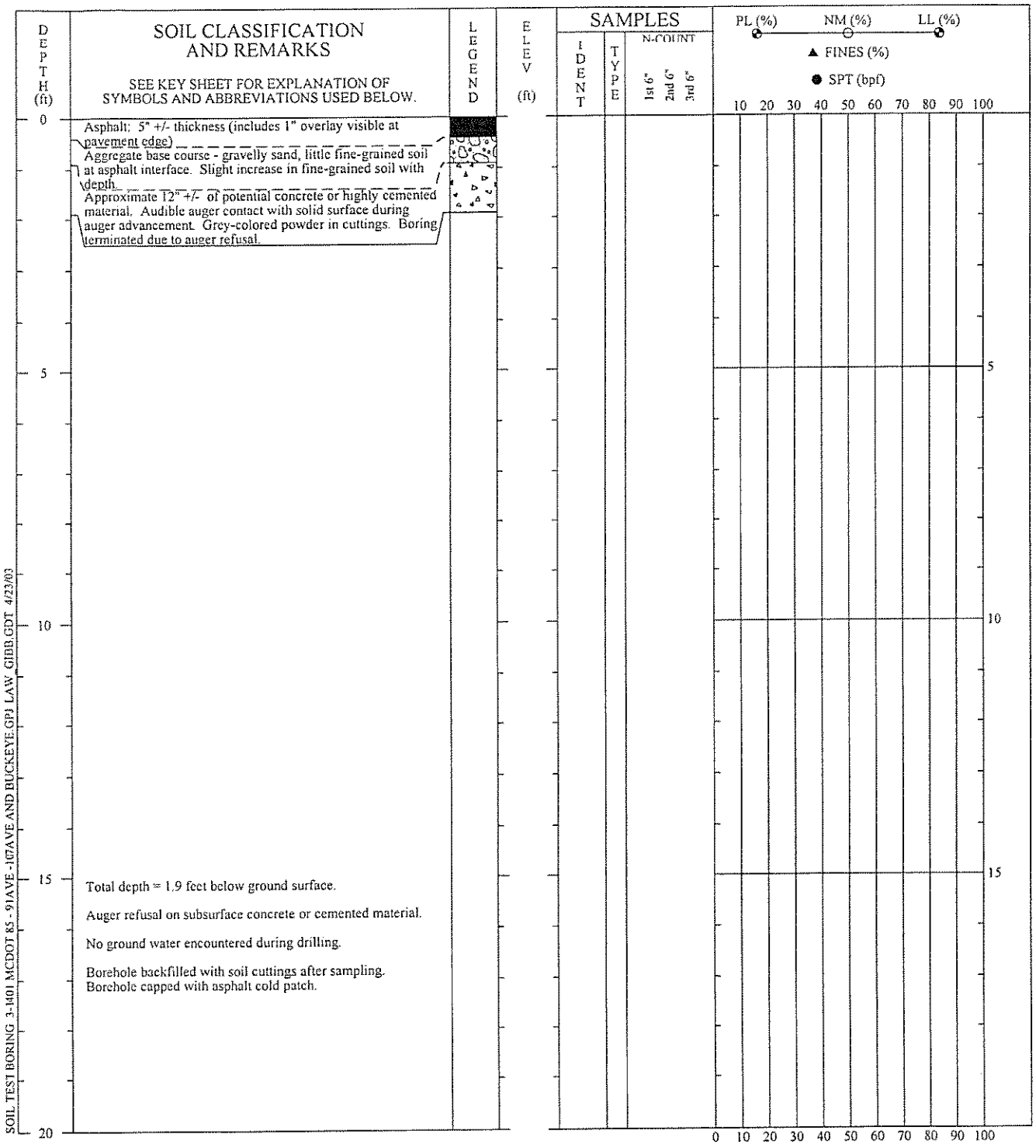
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-8A
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



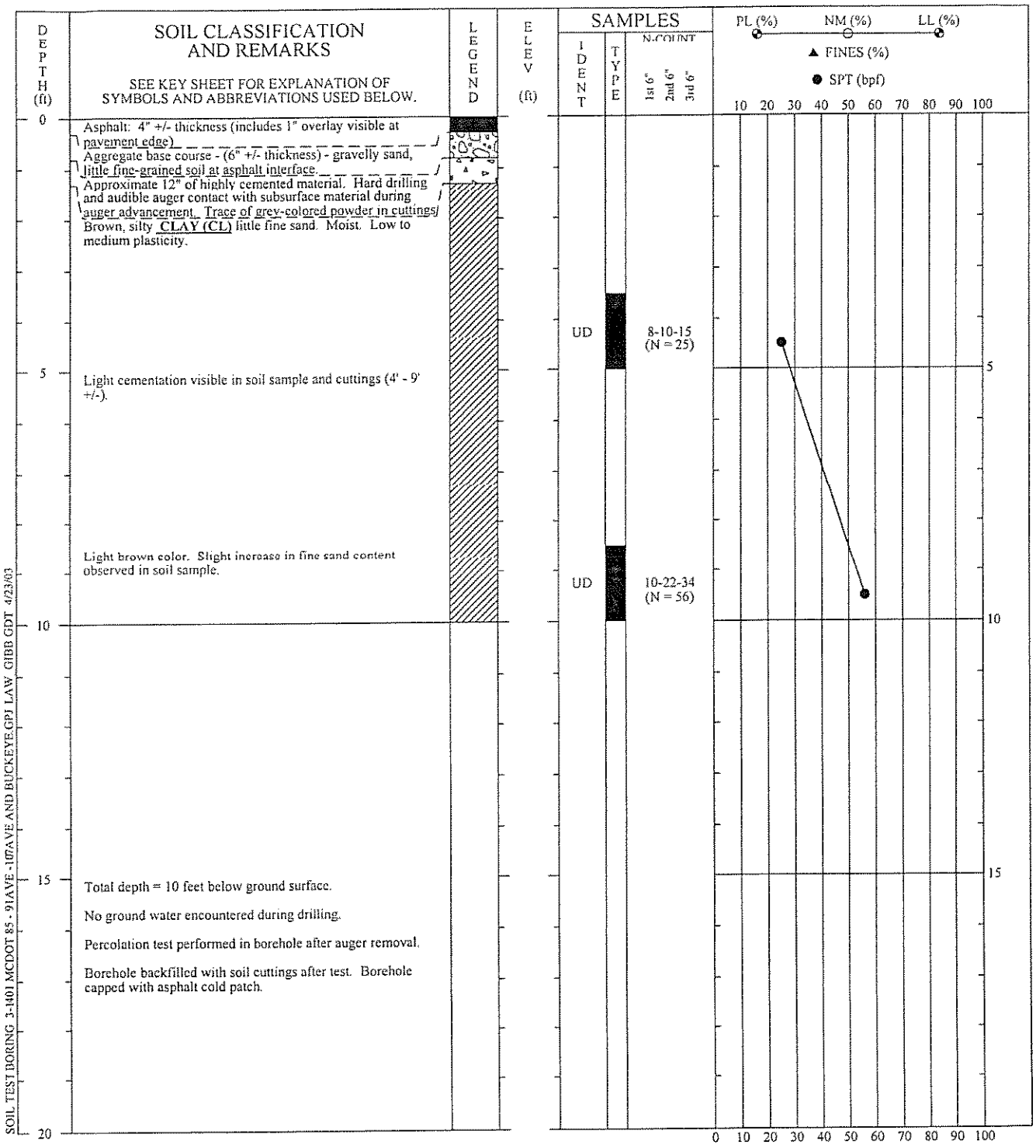
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-8B
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

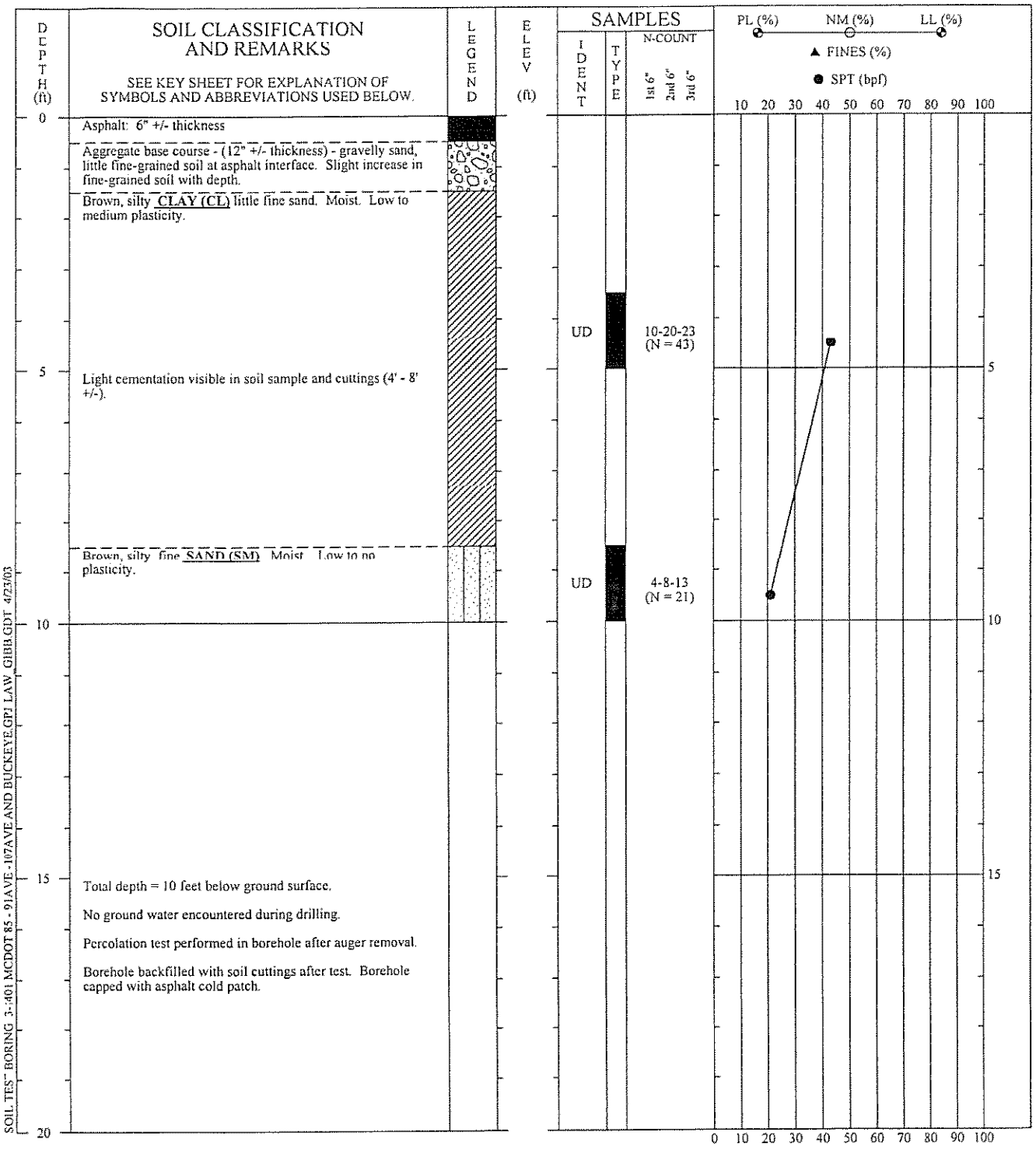
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	B-9
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 13, 2003
PROJECT NO.:	4975-03-1401.01

MACTEC



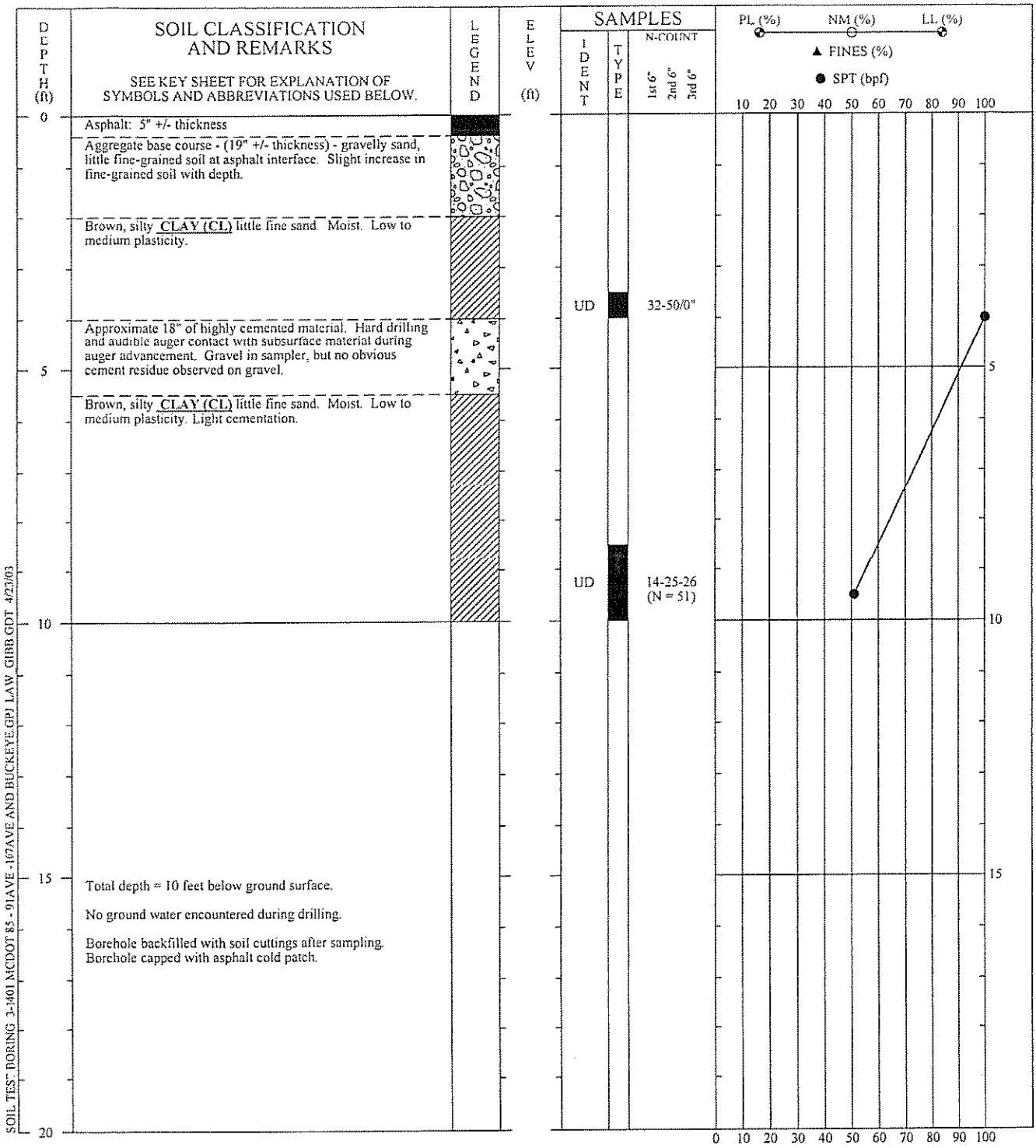
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-10
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



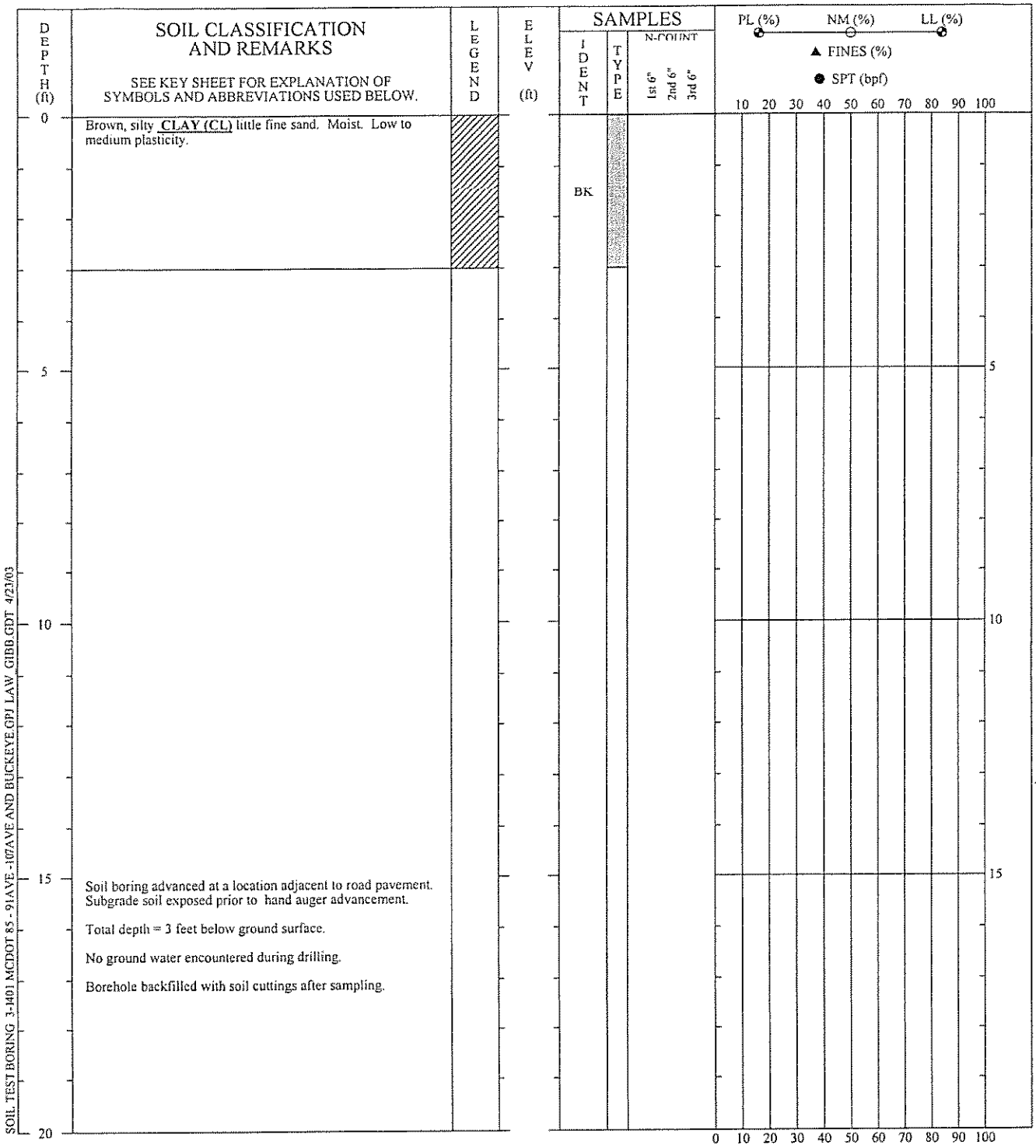
DRILLER:	EDI
EQUIPMENT:	CME-75
METHOD:	hollow stem auger
HOLE DIA.:	8" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). UD=Undisturbed sample collected by driving 2.5"-diameter ring sampler using 140-lb hammer free-falling 30" (ASTM D 1586).

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-11
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 13, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



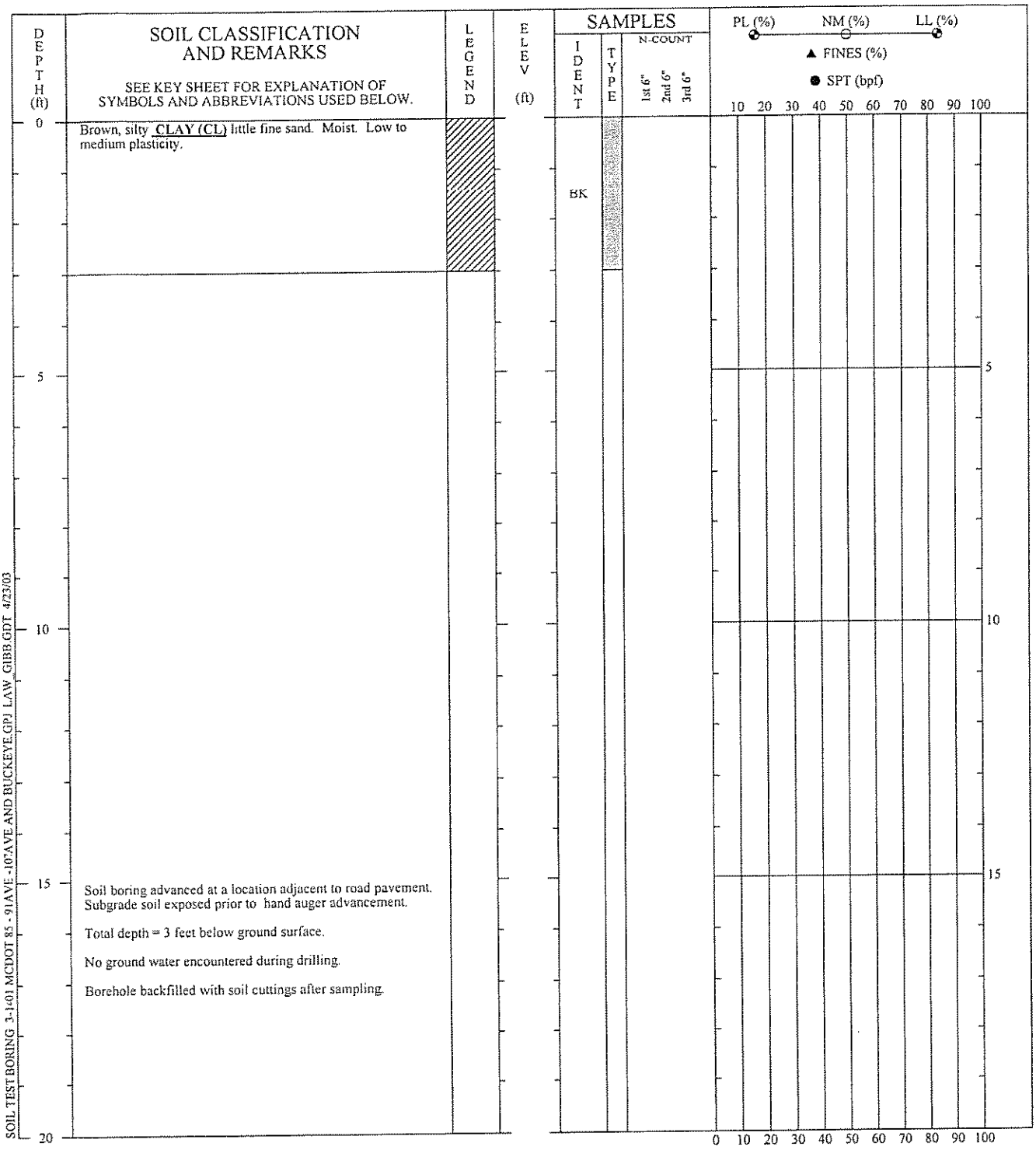
DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-1
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

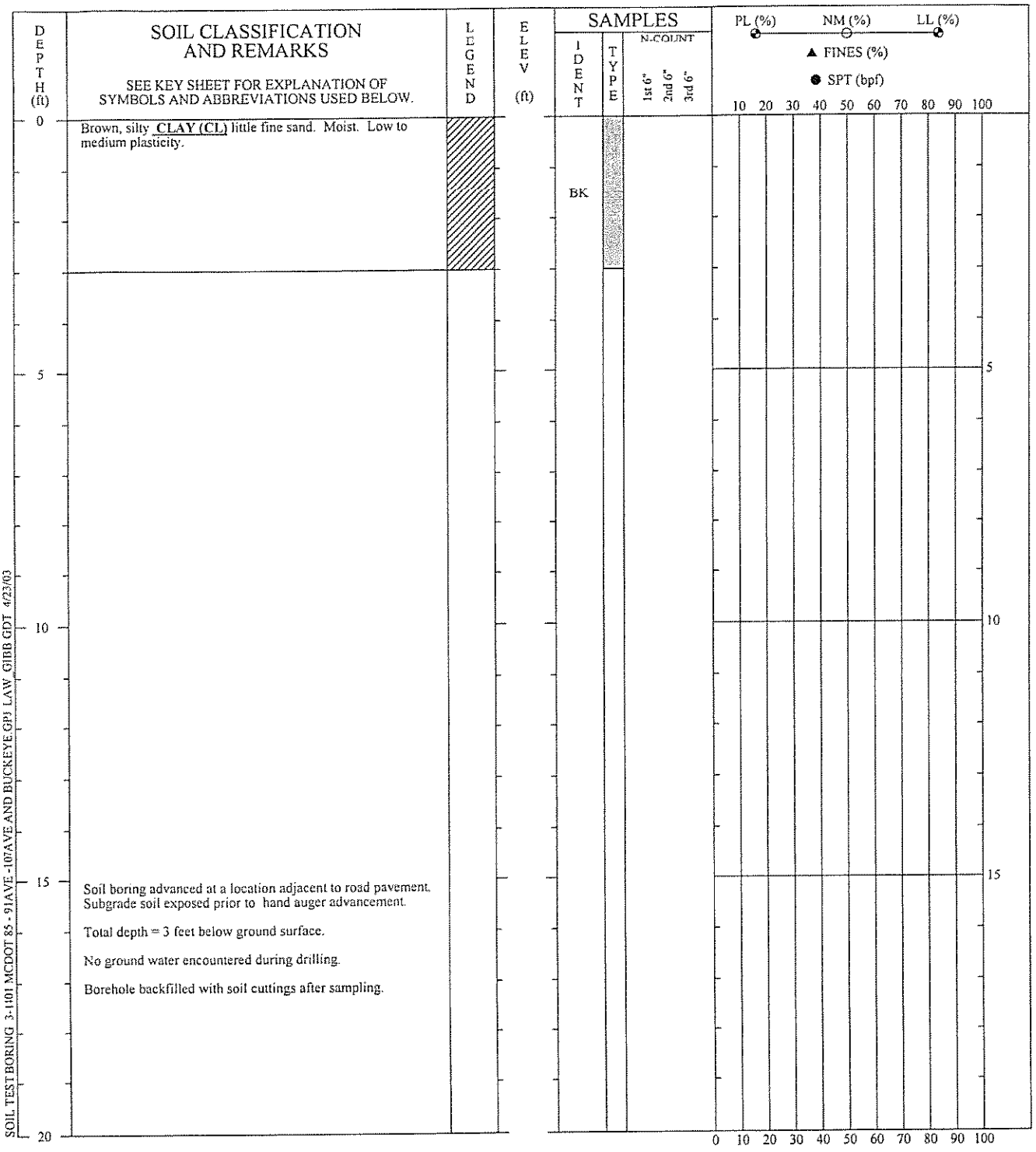
DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-2
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC



SOIL TEST BORING 3-1101 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GINB.GDT 4/23/03

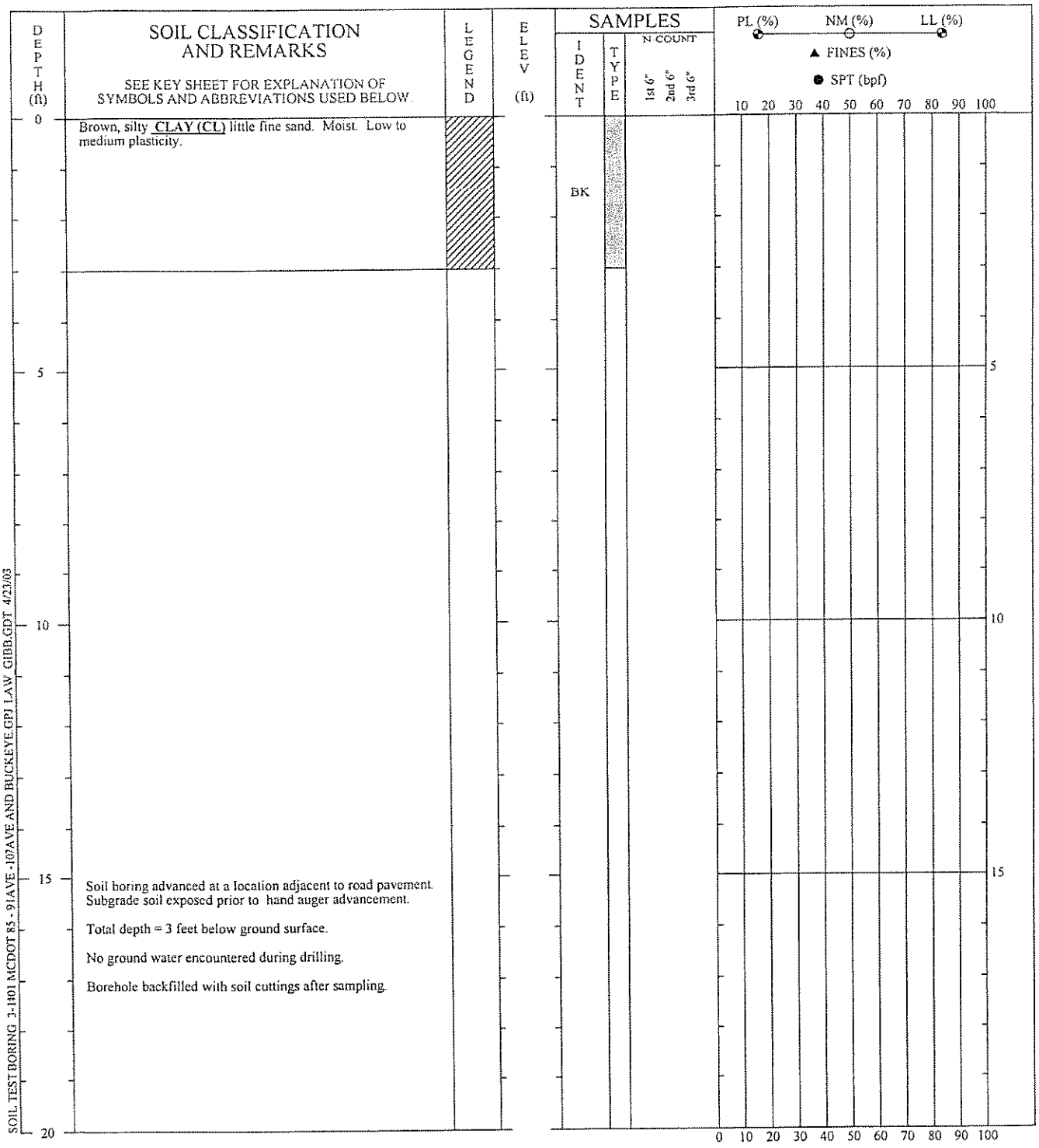
DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.:	HA-3
PROJECT:	Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:	
DRILLED:	March 20, 2003
PROJECT NO.:	4975-03-1401.01

MACTEC



SOIL TEST BORING 3-1401 MCDOT 85 - 91AVE -107AVE AND BUCKEYE.GPJ LAW_GIBB.GDT 4/23/03

DRILLER:	EDI
EQUIPMENT:	Hand Auger
METHOD:	Manual
HOLE DIA.:	4" diam.
REMARKS:	Soil classification per Unified Soil Classification System (USCS). BK=Disturbed bulk sample collected from hand auger cuttings.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: HA-4
PROJECT: Arizona 85 (Buckeye Rd.), 91st to 107th Ave.
LOCATION:
DRILLED: March 20, 2003
PROJECT NO.: 4975-03-1401.01 **PAGE 1 OF 1**

MACTEC

APPENDIX B

SUMMARY OF LABORATORY TESTING

TABLE 1
MC85 - 107th Ave to 91st Ave
MACTEC Project No. 4975-03-1401

Boring No.	Sample Depth (ft)	MACTEC Lab No.	USCS*	Sieve Analysis (% Passing)						Liquid Limit	Plasticity Index	Actual/ Laboratory Tested R-values (at 300 psi)	Correlated R-values	Notes
				3/4"	No. 4	No. 16	No. 40	No. 100	No. 200					
1	4-5	30931	CL	100	100	100	69	62	53.8	30	16		24	
2	4-5	30934	CL	100	100	100	98	93	88.0	40	20		16	
3	4-5	30937	CL	100	100	100	91	71	57.4	46	27		16	
4	4-5	30940	CL	100	100	100	98	96	93.0	47	22		15	
5	4-5	30943	CL	100	100	99	94	85	75.9	32	16		20	
6	4-5	30946	CL	100	100	99	95	85	76.9	49	29		13	
7	4-5	30949	CL	100	99	98	94	86	77.6	39	24		15	
9	4-5	30951	CL	100	100	99	94	86	79.2	48	30		13	
10	4-5	30954	CL	100	100	98	92	78	68.9	37	23		17	
HA1	0-3	30992	CL	100	95	94	91	83	72.0	36	19	7	19	
HA2	0-3	30993	CL	95	83	78	70	61	55.2	37	19	9	21	
HA3	0-3	30994	CL	96	95	93	88	80	72.4	36	19	7	18	
HA4	0-3	30995	CL	100	98	96	88	70	61.1	30	15	19	24	
												Actual	**Correlated**	
											Total Number of Values:	4	13	
											Average R-value:	11	18	
											Standard Deviation:	5.7	3.6	
											Adjusted Average R-Value:	11	18	
											SVF=	1.0		
											Rmean=	17		
											M_R=	10,369		

HA indicates these bulk samples were obtained using a hand auger.
*Unified Soil Classification System
1. Minus #200 wash only
2. Visual Classification

SUMMARY OF LABORATORY TESTING

TABLE 2
MC85 - 107th Ave to 91st Ave
MACTEC Project No. 4975-03-1401

Boring No.	Sample Depth (ft)	MACTEC Lab No.	USCS*	Remolded Moisture Content (%)	Remolded Density (pcf)	Moisture-Density Relationship		Expansion (%)	Sulfur Content (ppm)	Chloride Content (ppm)	Minimum Resistivity (ohm-cm)	pH	Notes
						Opt. Moist. (%)	Max. Density (pcf)						
3	4-5	30937	CL	12.6	106			10.0					2
HA1	0-3	30992	CL								1470	8.4	
HA3	0-3	30994	CL	12.0	107			5.4			930	8.0	1,2

HA indicates these bulk samples were obtained using a hand auger.
*Unified Soil Classification System
1. Ariz Test Methods 733 and 736.
2. Remolded at approximately 95% of ASTM D698A and 3% below optimum and loaded with a 100 psf surcharge.

SUMMARY OF LABORATORY TESTING

TABLE 3

MC85 - 107th Ave to 91st Ave

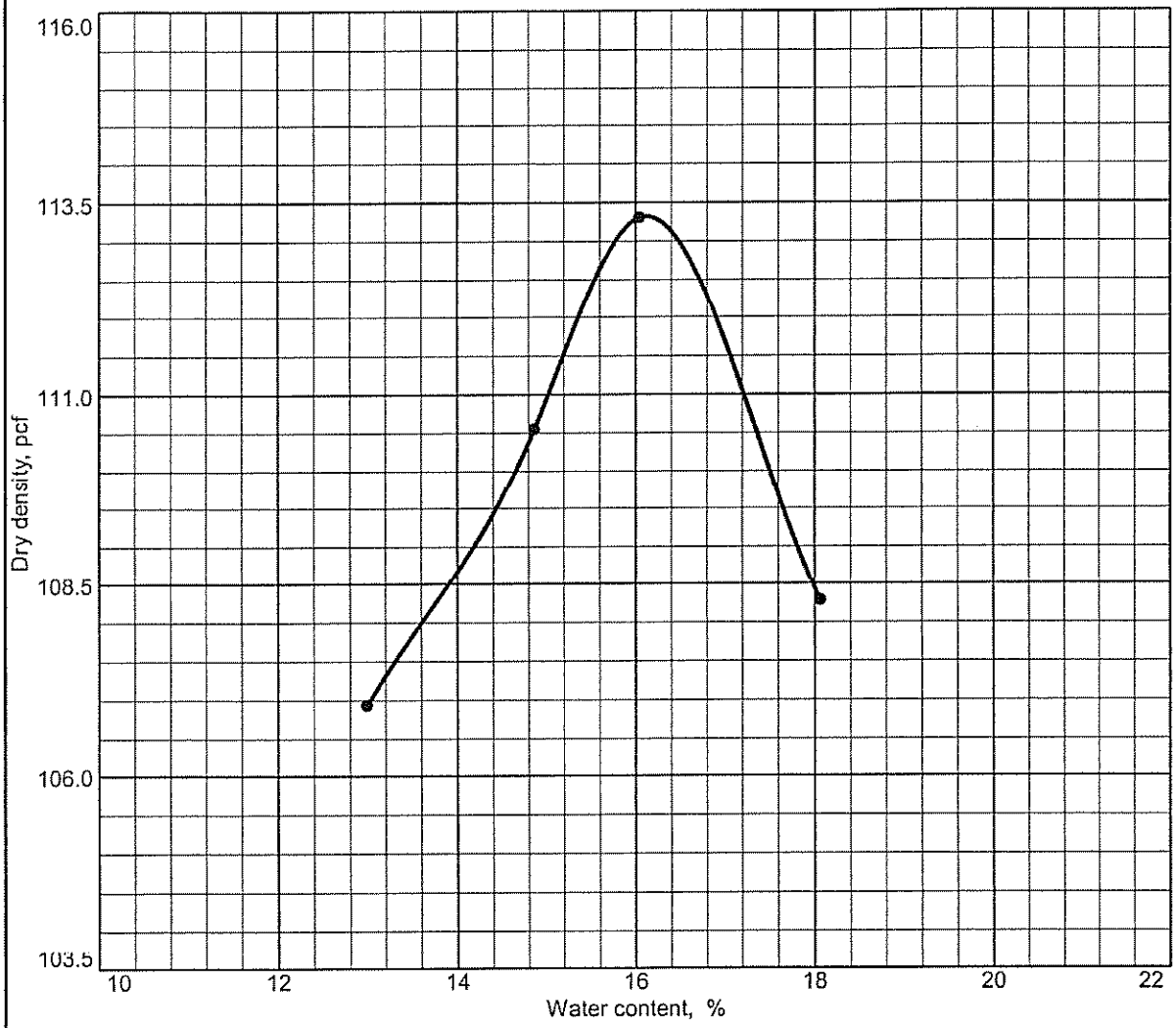
MACTEC Project No. 4975-03-1401

Boring No.	Sample Depth (ft)	MACTEC Lab No.	USCS*	In-situ		Notes
				Moisture Content (%)	Density (pcf)	
1	4-5	30931	CL	20.1	102.7	
2	4-5	30934	CL	20.7	104.4	
2	9-10	30935	CL	17.1	113.2	2
3	4-5	30937	CL	13.6	122.4	
4	4-5	30940	CL	28.0	94.9	
4	9-10	30941	SC	10.3	123	2
5	4-5	30943	CL	14.3	112.3	
5	9-10	30944	CL	16.1	113.3	2
6	4-5	30946	CL	17.3	107.5	
6	9-10	30947	CL	14.9	117.6	2
7	9-10	30950	CL	16.4	118.5	2
9	4-5	30951	CL	16.0	111	
9	9-10	30952	CL	16.8	115	2
10	4-5	30954	CL	11.2	123.1	
10	9-10	30955	SM	16.3	115.8	2
11	9-10	30958	CL	12.1	125	2

*Unified Soil Classification System

1. Minus #200 wash only
2. Visual Classification

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 113.3 pcf Optimum moisture = 16.1 %	Native HA-1

Project No. 03-1401.01 **Client:** Maricopa County Department of Transportation

Project: MC-85 107th Ave to 91st Ave

● **Source:** Native **Sample No.:** 30992

Remarks:

Sample Date: 3/25/03

Plate

COMPACTION TEST REPORT

Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.5 pcf Optimum moisture = 15.0 %	Native HA-3

Project No. 03-1401.01 **Client:** Maricopa County Department of Transportation

Project: MC-85 107th Ave to 91st Ave

● **Source:** Native **Sample No.:** 30994

Remarks:

Sample Date: 3/25/03

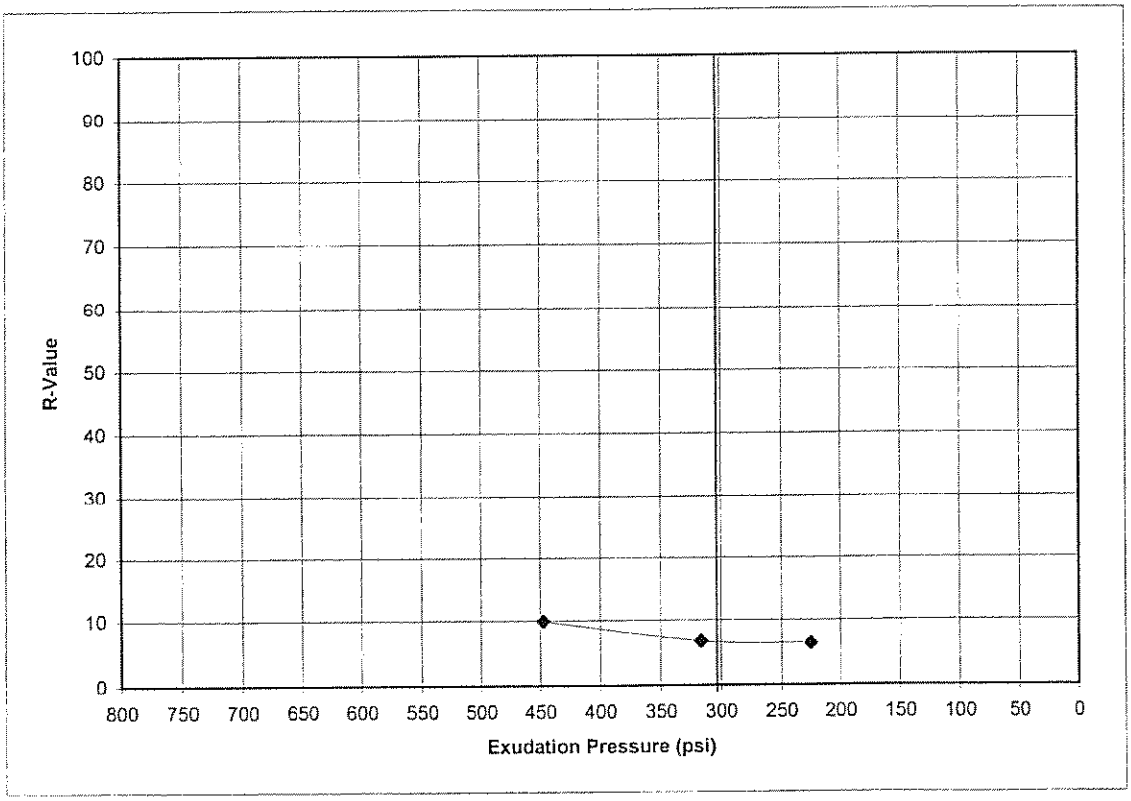
Plate

PROJECT:	03-1401	JOB NO:	2-119-000224
LOCATION:	BUCKEYE ROAD	WORK ORDER NO:	6
MATERIAL:	NATIVE	LAB NO:	7
SAMPLE SOURCE:	30992	DATE SAMPLED:	03/27/03

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	21.3%	19.5%	17.7%
Compaction Pressure (psi)	*	*	75
Specimen Height (inches)	2.58	2.44	2.40
Dry Density (pcf)	103.5	107.2	110.5
Horiz. Pres. @ 1000lbs (psi)	68.0	64.0	58.0
Horiz. Pres. @ 2000lbs (psi)	140.0	140.0	133.0
Displacement	5.63	4.62	4.16
Expansion Pressure (psi)	0.0	0.3	0.7
Exudation Pressure (psi)	225	316	447
R Value	6	7	10

* HAND TAMPED



R Value at 300 PSI = 7

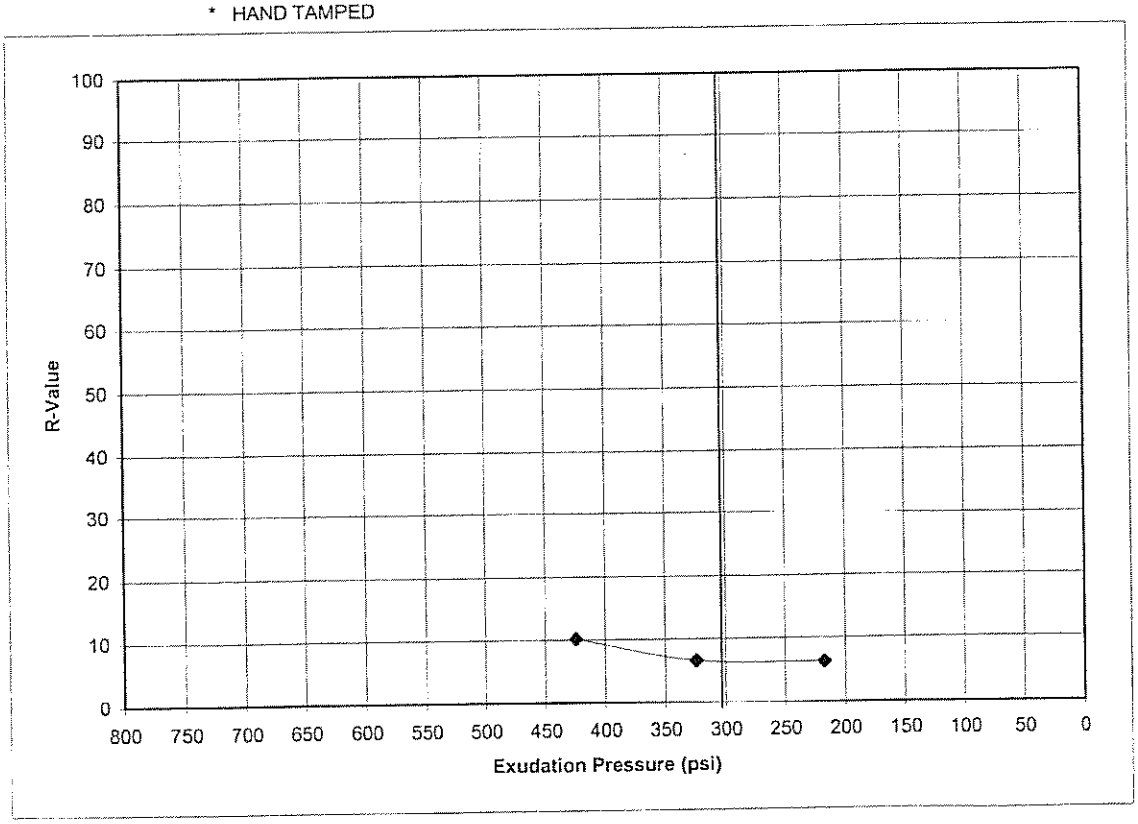
REVIEWED BY

PROJECT:	03-1401	JOB NO:	2-119-000224
LOCATION:	BUCKEYE ROAD	WORK ORDER NO:	6
MATERIAL:	NATIVE	LAB NO:	8
SAMPLE SOURCE:	30994	DATE SAMPLED:	03/27/03

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	20.8%	19.0%	17.2%
Compaction Pressure (psi)	*	*	75
Specimen Height (inches)	2.50	2.43	2.41
Dry Density (pcf)	104.5	108.9	112.2
Horiz. Pres. @ 1000lbs (psi)	68.0	63.0	58.0
Horiz. Pres. @ 2000lbs (psi)	140.0	140.0	133.0
Displacement	5.29	4.66	4.11
Expansion Pressure (psi)	0.0	0.0	0.1
Exudation Pressure (psi)	217	324	424
R Value	6	7	10

* HAND TAMPED



R Value at 300 PSI = 7

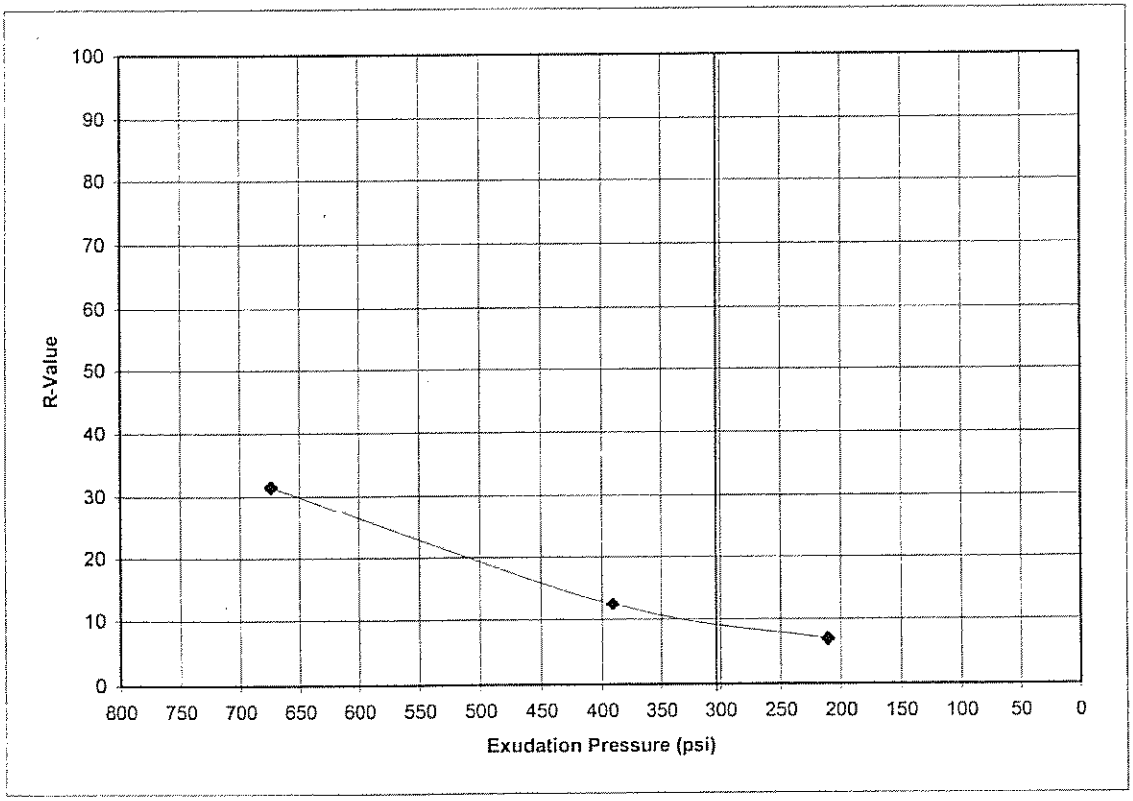
REVIEWED BY

PROJECT:	03-1401	JOB NO:	2-119-000224
LOCATION:	BUCKEYE ROAD	WORK ORDER NO:	6
MATERIAL:	NATIVE	LAB NO:	9
SAMPLE SOURCE:	30993	DATE SAMPLED:	03/27/03

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	19.6%	15.9%	14.0%
Compaction Pressure (psi)	*	75	175
Specimen Height (inches)	2.57	2.53	2.44
Dry Density (pcf)	107.9	116.6	121.8
Horiz. Pres. @ 1000lbs (psi)	67.0	54.0	36.0
Horiz. Pres. @ 2000lbs (psi)	140.0	129.0	97.0
Displacement	5.13	4.21	3.33
Expansion Pressure (psi)	0.0	0.1	5.0
Exudation Pressure (psi)	211	391	674
R Value	7	12	31

* HAND TAMPED



R Value at 300 PSI = 9

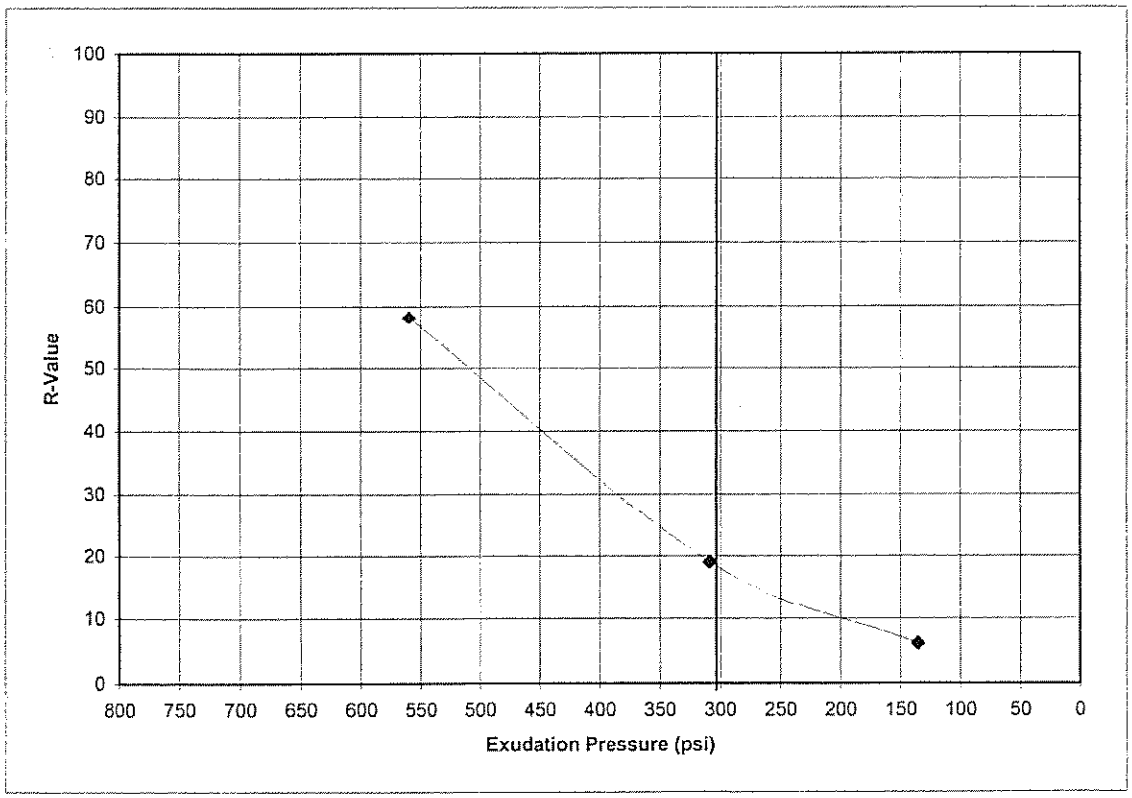
REVIEWED BY

PROJECT:	03-1401	**JOB NO:**	2-119-000224
LOCATION:	BUCKEYE ROAD	**WORK ORDER NO:**	6
MATERIAL:	NATIVE	**LAB NO:**	10
SAMPLE SOURCE:	30995	**DATE SAMPLED:**	03/27/03

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	19.4%	15.7%	13.8%
Compaction Pressure (psi)	*	75	350
Specimen Height (inches)	2.61	2.56	2.48
Dry Density (pcf)	108.1	116.1	120.8
Horiz. Pres. @ 1000lbs (psi)	67.0	48.0	20.0
Horiz. Pres. @ 2000lbs (psi)	140.0	116.0	51.0
Displacement	6.07	4.26	3.85
Expansion Pressure (psi)	0.0	0.4	7.9
Exudation Pressure (psi)	136	309	560
R Value	6	19	58

* HAND TAMPED



R Value at 300 PSI = 19

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APPENDIX C

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

MC85 from 91st to 99th Avenues, 12270 ADT, 5.4% growth, 14% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	10,615,225
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.54 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	12,270
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Compound
Total Calculated Cumulative ESALs	~~13,552,411 *~~

~~*Note: This value is not represented by the inputs or an error occurred in calculation.~~

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	12,270
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	86	5.4	0.0008	0	74,461
2	14	0	1.2	0	10,540,764

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	10,615,225

Growth: Compound

Total Calculated Cumulative ESALs: 10,615,225

1993 AASHTO Pavement Design

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Flexible Structural Design Module

MC85 - 99th to 103rd Avenues , 11505 ADT, 5.8% growth, 9% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	6,430,830
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.22 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	11,505
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Simple
Total Calculated Cumulative ESALs	- *

*Note: This value is not represented by the inputs or an error occurred in calculation.

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	11,505
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	91	5.8	0.0008	0	77,101
2	9	0	1.2	0	6,353,728

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	6,430,830
Growth			Compound		
Total Calculated Cumulative ESALs			6,430,830		

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Flexible Structural Design Module

MC85 from 103rd to 107th Avenues, 11808 ADT, 4.0% growth, 7% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,138,823
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.08 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	11,808
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Simple
Total Calculated Cumulative ESALs	- *

*Note: This value is not represented by the inputs or an error occurred in calculation.

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	11,808
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	93	4	0.0008	0	66,886
2	7	0	1.2	0	5,071,937

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	5,138,823
Growth			Compound		
Total Calculated Cumulative ESALs			5,138,823		

1993 AASHTO Pavement Design

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Flexible Structural Design Module

91st Avenue - 4985 ADT, 5.8% growth, 10% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	3,975,346
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	3.93 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	4,985
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Simple
Total Calculated Cumulative ESALs	- *

*Note: This value is not represented by the inputs or an error occurred in calculation.

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	4,985
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	90	5.8	0.0008	0	42,480
2	10	0	1.2	0	3,932,866

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	3,975,346

Growth Compound

Total Calculated Cumulative ESALs 3,975,346

1993 AASHTO Pavement Design

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Flexible Structural Design Module

99th Avenue - 6519 ADT, 5.8% growth, 18% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,308,194
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.45 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	6,519
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Simple
Total Calculated Cumulative ESALs	- *

*Note: This value is not represented by the inputs or an error occurred in calculation.

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	6,519
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	82	5.8	0.0008	0	50,614
2	18	0	1.2	0	9,257,580

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	9,308,194

Growth: Compound

Total Calculated Cumulative ESALs: 9,308,194

1993 AASHTO Pavement Design

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Computer Software Product
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Flexible Structural Design Module

107th Avenue - 4985 ADT, 5.8% growth, 5% trucks.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	2,011,273
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	3.55 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	4,985
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	- %
Average Initial Truck Factor (ESALs/truck)	-
Annual Truck Factor Growth Rate	- %
Annual Truck Volume Growth Rate	- %
Growth	Simple
Total Calculated Cumulative ESALs	- *

*Note: This value is not represented by the inputs or an error occurred in calculation.

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	4,985
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	90 %
Percent Trucks in Design Direction	100 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	95	5.8	0.0008	0	44,840
2	5	0	1.2	0	1,966,433

Why?

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
Total	100	-	-	-	2,011,273

Growth Compound

Total Calculated Cumulative ESALs 2,011,273

DESIGN 1

1993 AASHTO Pavement Design

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Flexible Structural Design Module

MC85 - 91st Avenue to 103rd Avenue, and Intersecting 99th Avenue

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.46 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	8.5	43	3.57
Total	-	-	-	10.00	-	4.48

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	8.44	3.54
Total	-	-	-	-	-	-	-	9.94	4.46

Optimized Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Cost (sq yd/in)	Min Thick (Di)(in)	Max Thick (in)	Width (ft)	Optimum Thick (in)	Calculated SN (in)	Calculated Cost (sq yd)
Total	-	-	-	-	-	-	-	-	-	-

*Note: This value is not represented by the inputs or an error occurred in calculation.

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

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Flexible Structural Design Module

MC85 - 91st Avenue to 103rd Avenue, and Intersecting 99th Avenue

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.46 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	5	43	2.10
3	Aggregate Base Course	0.12	1	12	-	1.44
Total	-	-	-	18.50	-	4.46

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.90	2.06
3	Aggregate Base Course	0.12	1	-	-	33,000	43	12.38	1.49
Total	-	-	-	-	-	-	-	18.78	4.46

Optimized Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Cost (sq yd/in)	Min Thick (Di)(in)	Max Thick (in)	Width (ft)	Optimum Thick (in)	Calculated SN (in)	Calculated Cost (sq yd)
Total	-	-	-	-	-	-	-	-	-	-

*Note: This value is not represented by the inputs or an error occurred in calculation.

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

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Flexible Structural Design Module

MC85 - 91st Avenue to 103rd Avenue, and Intersecting 99th Avenue

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.46 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	5	43	2.10
3	Aggregate Base Course	0.12	1	4	43	0.48
4	Lime Stabilized Subgrade	0.16	1	12	43	1.92
Total	-	-	-	22.50	-	5.42

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.90	2.06
3	Aggregate Base Course	0.12	1	4	-	33,000	43	4.00	0.48
4	Lime Stabilized Subgr...	0.16	1	12	-	47,500	43	12.00	1.92
Total	-	-	-	-	-	-	-	22.40	5.37

Optimized Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Cost (sq yd/in)	Min Thick (Di)(in)	Max Thick (in)	Width (ft)	Optimum Thick (in)	Calculated SN (in)	Calculated Cost (sq yd)
Total	-	-	-	-	-	-	-	-	-	-

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

MC85 - 91st Avenue to 103rd Avenue, and Intersecting 99th Avenue

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	21,000 psi
Stage Construction	1
Calculated Design Structural Number	3.50 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	5	43	2.10
3	Aggregate Base Course	0.12	1	4	43	0.48
Total	-	-	-	10.50	-	3.50

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.90	2.06
3	Aggregate Base Course	0.12	1	-	-	33,000	43	4.38	0.53
Total	-	-	-	-	-	-	-	10.78	3.50

Optimized Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Cost (sq yd/in)	Min Thick (Di)(in)	Max Thick (in)	Width (ft)	Optimum Thick (in)	Calculated SN (in)	Calculated Cost (sq yd)
Total	-	-	-	-	-	-	-	-	-	-

*Note: This value is not represented by the inputs or an error occurred in calculation.

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

Deisgn 1, using a reduced Resilient Modulus for undisturbed subgrade.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	9,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.46 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	5	43	2.10
3	Aggregate Base Course	0.12	1	4	43	0.48
4	Existing AB Subbase	0.1	1	11	43	1.10
Total	-	-	-	21.50	-	4.60

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.90	2.06
3	Aggregate Base Course	0.12	1	-	-	33,000	43	2.40	0.29
4	Existing AB Subbase	0.1	1	12	-	26,000	43	12.00	1.20
Total	-	-	-	-	-	-	-	20.81	4.46

DESIGN 2

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

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Computer Software Product

Mactec, Inc.

Flexible Structural Design Module

MC85 - 103rd Ave to 107th Ave, Intersecting 91st Ave and 107th Ave

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,000,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.07 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	7.5	43	3.15
Total	-	-	-	9.00	-	4.06

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	7.51	3.16
Total	-	-	-	-	-	-	-	9.01	4.07

1993 AASHTO Pavement Design

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Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

MC85 - 103rd Ave to 107th Ave, Intersecting 91st Ave and 107th Ave

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,000,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.07 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	4.5	43	1.89
3	Aggregate Base Course	0.12	1	11	43	1.32
Total	-	-	-	17.00	-	4.13

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.22	1.77
3	Aggregate Base Course	0.12	1	-	-	33,000	43	11.51	1.38
Total	-	-	-	-	-	-	-	17.24	4.07

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

MC85 - 103rd Ave to 107th Ave, Intersecting 91st Ave and 107th Ave

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,000,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.07 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	4	43	1.68
3	Aggregate Base Course	0.12	1	4	43	0.48
4	Lime Stabilized Subgrade	0.16	1	12	43	1.92
Total	-	-	-	21.50	-	4.99

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.22	1.77
3	Aggregate Base Course	0.12	1	4	-	33,000	43	4.00	0.48
4	Lime Stabilized Subgr...	0.16	1	12	-	47,500	43	12.00	1.92
Total	-	-	-	-	-	-	-	21.72	5.09

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

MC85 - 103rd Ave to 107th Ave, Intersecting 91st Ave and 107th Ave

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,000,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	21,000 psi
Stage Construction	1
Calculated Design Structural Number	3.17 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	4.5	43	1.89
3	Aggregate Base Course	0.12	1	4	43	0.48
Total	-	-	-	10.00	-	3.28

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.22	1.77
3	Aggregate Base Course	0.12	1	-	-	33,000	43	4.01	0.48
Total	-	-	-	-	-	-	-	9.74	3.17

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product
Mactec, Inc.

Flexible Structural Design Module

Deisgn 2, using a reduced Resilient Modulus for undisturbed subgrade.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	5,000,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	10,369 psi
Stage Construction	1
Calculated Design Structural Number	4.07 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	43	0.92
2	Asphalt Concrete	0.42	1	4	43	1.68
3	Aggregate Base Course	0.12	1	4	43	0.48
4	Existing AB Subbase	0.1	1	11	43	1.10
Total	-	-	-	20.50	-	4.18

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	Asphalt Rubber	0.61	1	1.5	-	400,000	43	1.50	0.92
2	Asphalt Concrete	0.42	1	-	-	400,000	43	4.22	1.77
3	Aggregate Base Course	0.12	1	-	-	33,000	43	2.05	0.25
4	Existing AB Subbase	0.1	1	12	-	26,000	43	12.00	1.20
Total	-	-	-	-	-	-	-	19.77	4.13

APPENDIX PAV-C

DMJM Harris/AECOM Report

MC 85, 107TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA

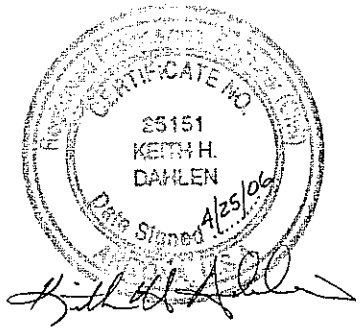
PAVEMENT DESIGN REPORT

Prepared for:

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

By

DMJM HARRIS | AECOM
2777 E. Camelback Road, Suite 200
Phoenix, AZ 85016



April 2006

DMJM Harris
2777 East Camelback Road, Suite 200, Phoenix, AZ 85016
T 602.337.2777 F 602.337.2620 www.dmjmharris.com

April 25, 2006

Mr. Sami Ayoub
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Re: Pavement Design Report
MC 85 (Buckeye Road), 107th Avenue to 91st Avenue
Maricopa County, Arizona
MCDOT Work Order 69024
DMJM Harris Project No. 6490.0000

Dear Mr. Ayoub:

DMJM Harris is pleased to present this Pavement Design Report to the Maricopa County Department of Transportation (MCDOT) for the above referenced project. This report details our scope of work, and includes the results of our investigation, design and test data obtained as part of the preliminary geotechnical investigation (Mactec, 2003) as well as recommendations for the design of pavements based on life cycle cost analyses of various alternatives for the section of MC 85 (Buckeye Road) between 107th Avenue and 91st Avenue and in Maricopa County, Arizona.

We appreciate the opportunity to provide geotechnical services to the MCDOT on this project. Should you have any questions concerning this report, please contact Keith Dahlen of our office at (602) 337-2596.

Sincerely,
DMJM Harris

Francisco J. Garza

Francisco Garza, E.I.T.

Reviewed by:

CERTIFICATE NO. 25151 KEITH H. DAHLEN Date Signed 4/25/06 ARIZONA, U.S.A.

Keith Dahlen, P.E.
Senior Geotechnical Engineer

cc: 6490.0005 505

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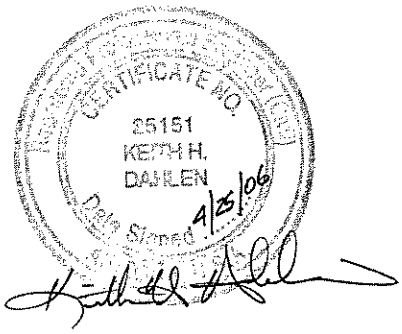


1.0 INTRODUCTION

This Pavement Design Report is submitted subsequent to a subsurface investigation performed by DMJM Harris for the planned widening and improvement of a two-mile segment of MC 85, extending from 107th Avenue to 91st Avenue, and located within Maricopa County, Arizona. The Project Site Vicinity Map is shown in Figure 1. It is our understanding that the existing four-lane roadway with an intermittent center turn lane will be widened to a 6-lane road with a raised median. Given the existing roadway geometry, the majority of new construction will occur along the south side of MC 85 and along the widened edges of the cross-road pavements while reconstruction will take place along the existing MC 85 roadway and portions of the main cross roads to meet new pavement design sections and site profiles. Based on current design plans (DMJM Harris, 2005), the new profile of MC 85 will generally extend from 0 to 2 feet above existing pavement grades, with the low points located at or near the intersections at 107th, 99th and 91st avenue.

2.0 REVIEW OF EXISTING DATA

The pavement design recommendations presented herein are based in part on results from the *Preliminary Report of Geotechnical Evaluation*, (Mactec, Revised October 2003). DMJM Harris has conducted a review of this report and determined that it generally meets the specified MCDOT requirements for final design, relative to the field investigation and laboratory testing.

As-Built Plans were also reviewed as part of this investigation. The primary focus of the review was to determine the location of a 16-foot wide section of Portland cement concrete pavement (PCCP) that is known to underlie a portion of the MC85 asphaltic concrete (AC). MCDOT has considered leaving the PCCP in–place if it does not adversely impact the design or construction of the new MC 85. MCDOT requested that DMJM Harris perform additional coring through the existing MC 85 pavement to better define the location and condition of the existing PCCP.

3.0 PAVEMENT CORE INVESTIGATION

The pavement core investigation was supervised by Ammi Osorio, P.E., and Pancho Garza, E.I.T., of DMJM Harris. A total of sixteen pavement cores (C1 through C16) were advanced to depths ranging from 1.4 feet (17") to 3.2 feet (38") below ground surface using a Milwaukee 480 portable drill with 6-inch and 3-inch bits. The coring equipment is owned and operated by Concrete Coring Company, Inc. The coring was performed through the Asphalt Concrete (AC) layer using a 6-inch drill bit and the underlying PCCP layer, where encountered, using a 3-inch diameter bit. The majority of coring encountered Aggregate Base (AB) materials below the AC layer. Clay soil was encountered below the AB in Core C12. The AB material and clayey materials were excavated using hand tools. The thickness of each pavement layer was measured and the PCCP cores were sampled and stored. After the coring operation, each hole was backfilled with excess cuttings and the AC core replaced with cold patch.

The preliminary investigation (MACTEC, 2003) included advancing a total of eleven test borings to depths of 10 feet along the existing MC 85 alignment. A Site Plan (three sheets), which indicates the DMJM Harris pavement core locations and Mactec test boring locations is included in Appendix A.

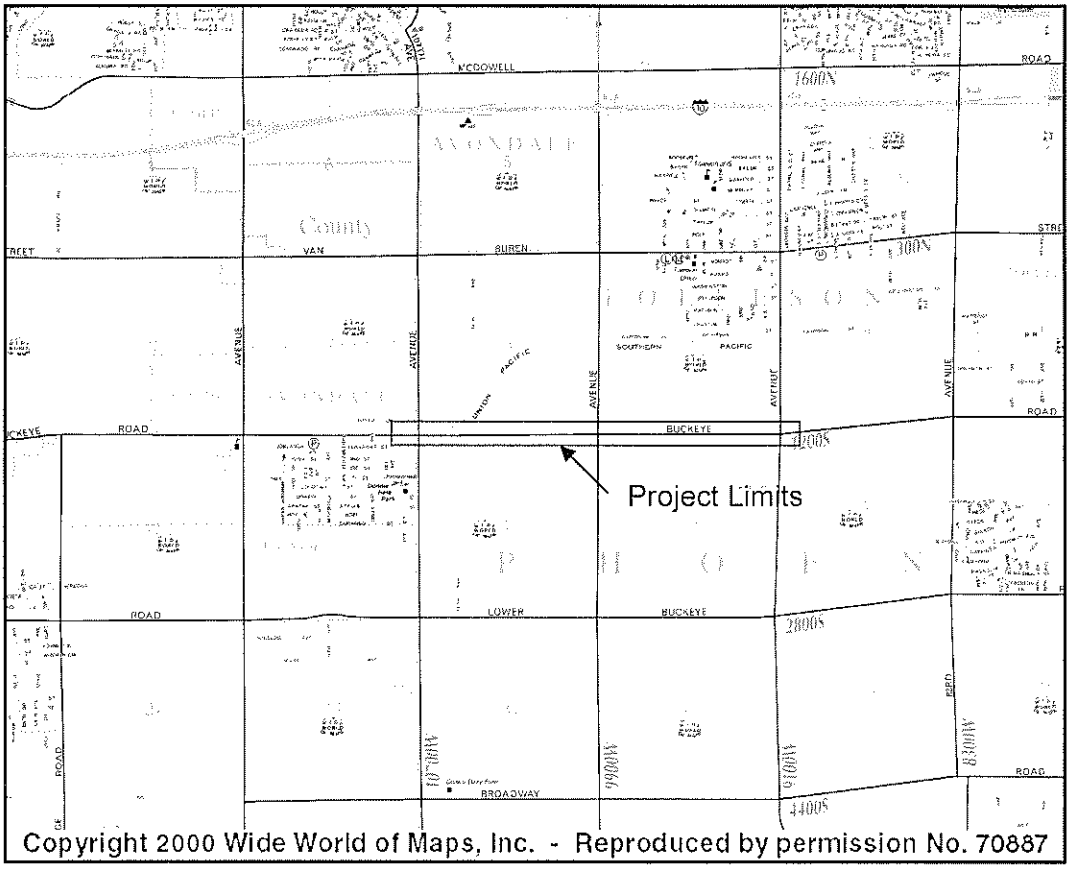


Figure 1: Project Vicinity Map

North

4.0 SITE DESCRIPTION

Development within the vicinity of the MC 85 roadway is a mixture of newer warehouse buildings to the north, and residential use mixed with agricultural farm land to the south. The area has historically been primarily agricultural. The area is generally flat with a gentle regional slope to the southwest. The MC 85 pavement surface is sloped such that drainage is directed toward the shoulders.

Within the project limits, MC 85 (Buckeye Road) consists primarily of two 12-foot wide travel lanes in each direction with 8- to 12-foot wide gravel shoulders and a 12-foot wide center turn lane at various locations. At the time of the field investigation, the existing pavement section appeared to be in fair to good condition. Some light, generally widely spaced cracking was noted and occasional potholes were observed in the roadway.

Major intersections are located at 107th Avenue, 99th Avenue and 91st Avenue within the project limits. Currently, each intersection consists of two lanes in each direction with a left turn lane. Projected traffic data indicates a large increase in traffic volume after the year 2015 due to a planned I-10 reliever to the south of MC 85. The increased traffic volume will result in the 99th Avenue intersection expanding to 3 lanes at the intersection.

5.0 EXISTING MC 85 PAVEMENT SECTION CONDITIONS

The 16-foot wide PCCP section, centered approximately on the existing Section Line, was encountered below the existing roadway in all but five of the core holes (C1, C2, C8, C10 and C12). The field investigation indicated that the AC pavement section varies from 4 inches to 12 inches, with an average depth of 10 inches. The aggregate base (AB) material underlying the AC ranges in thickness from 5 inches to 14 inches. The underlying PCCP ranges in thickness from 6 inches to 7 inches. In Cores C2 and C3, a 4-inch AC layer was encountered under the AB layer. A summary of the pavement sections encountered within the DMJM Harris cores and MACTEC borings is included as Table 1.

Based on the preliminary test borings, the site is generally underlain by finer-grained clayey soils. This medium to highly plastic and moderately expansive material was encountered in all the test borings advanced during the preliminary investigation.

**Table 1 – Summary of Existing MC 85 Pavement Conditions
Based on Preliminary Test Drilling and Final Investigation Pavement Cores**

Final Investigation (DMJM Harris, 2005)						Preliminary Investigation (Mactec, 2003)					
Core ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)	Bore ID	Station[1]	Offset[1]	AC (in)	AB (in)	PCCP (in)
C1	1136+00	7' Lt	12.1	12.0	-	B-11	1133+80	20' Lt	5.0	19.0	-
C2	1144+00	2.5' Lt	5.0	7.0[2]	-	B-10	1143+70	10' Lt	6.0	12.0	-
C3	1150+00	2.5' Rt	4.0	5.0[2]	7.0	HA-4	1143+65	35' Rt	-	-	-
C4	1156+00	3' Lt	9.0	7.0	6.0	B-9	1152+75	10' Rt	4.0	6.0	12.0
C5	1163+00	2.5'Rt	8.0	9.0	7.0	B-8B	1163+45	5' Lt	5.0	5.0	12.0
C6	1170+00	3' Lt	10.0	9.0	6.0	B-8A	1163+45	5' Lt	5.0	5.0	12.0
C7	1177+00	3' Rt	11.0	11.0	6.0	HA-3	1173+25	25' Rt	-	-	-
C8	1183+00	8' Lt	13.0	13.0	-	B-7	1173+50	20' Rt	5.0	12.0	-
C9	1190+00	2.5' Lt	12.0	12.0	7.0	HA-2	1185+90	45' Lt	-	-	-
C10	1197+00	14' Lt	9.5	26.5	-	B-6	1185+75	30' Lt	3.0	12.0	-
C11	1203+00	6.5' Rt	10.0	14.0	7.0	B-5	1196+00	5' Rt	5.0	25.0	6.0
C12	1209+00	3' Lt	12.0	5.0	-[3]	B-4	1206+30	15' Lt	7.0	11.0	-
C13	1217+00	2.5' Rt	9.0	11.0	7.0	B-3	1216+40	15' Rt	5.0	25.0	-
C14	1220+00	3' Rt	9.0	12.0	6.0	B-2	1225+20	30' Lt	5.0	25.0	-
C15	1227+00	6.5' Rt	8.0	13.0	6.0	HA-1	1233+60	30' Rt	-	-	-
C16	1234+00	3' Rt	12.0	6.0	6.0	B-1	1233+40	15' Rt	3.0	21.0	-

[1]: MC 85 Existing Centerline (Section Line)
[2]: 4-inch AC encountered underlying AB
[3]: Clay soil encountered underlying AB to a depth of 3.2' (38")

6.0 PAVEMENT SECTION ANALYSIS AND RECOMMENDATIONS

6.1 SUBGRADE MODULUS

The pavement section analysis was performed using the *MCDOT Pavement Design Guide* (2004). This design method utilizes the American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures (1993) as the design standard for asphalt pavement structures in Maricopa County. A combination of laboratory correlated R-values and actual R-values are used for the determination of the subgrade modulus.

Laboratory testing for this project was performed by MACTEC (2003). The testing included grain-size analysis, and Atterberg limits testing (plasticity index) for calculation of correlated R-values (in accordance with Table 202.02-3 of ADOT, 1993) and actual R-value tests. Actual R-value tests were performed on four near-surface bulk samples. Grain-size analysis and Atterberg limits (plasticity index) tests, for determination of correlated R-values were performed on near surface samples as well. Based on the average correlated and actual test R-values indicated above and respective standard deviation values of 4.9 and 5.7, a design R_{mean} value of 15.6 is determined. The R_{mean} value, based on Figure 202.02-2, and a Seasonal Variation Factor (SVF) of 1.0 (determined for Phoenix, Arizona from Table 202.02-4), provides the maximum limiting value for resilient modulus (M_r) of 9,830 pounds per square inch (psi).

6.2 TRAFFIC LOADINGS

The existing and projected Average Daily Traffic (ADT) loadings were provided by the Maricopa Association of Governments (MAG), and the MC 85 Corridor Study (DMJM Harris, 2005). Total one-way equivalent single axle loadings were calculated as follows:

Roadway Section	Existing One-Way ADT	Annual Growth Rate (%)	Truck (%)	Flexible Total One-Way 18 Kip ESAL
MC 85 – 107th Ave. to 91st Ave.	18,000(1)	2.25	17	11,724,000
91st Avenue	10,000(2)	5.5	17	11,721,000
99th Avenue	8,000(3)	7.0	17	11,025,000
107th Avenue	8,000(3)	5.5	17	9,377,000

(1): 2005 ADT, (2): 2003 ADT, (3): 2004 ADT

The growth rates were calculated by taking the current traffic data and determining the appropriate growth rate to meet 20-year traffic projections. The MC 85 growth rate projection is lower than the anticipated growth rate for the north-south arterials. 99th Avenue is anticipated to experience the highest growth. These variations can be attributed to the planned addition of a freeway traffic reliever to the south of MC 85. In general for the region, the north and southbound traffic volumes are expected to increase more than the east and west traffic volume along MC 85.

6.3 STRUCTURAL NUMBER

The drainage coefficient of 1.0 was selected, from MCDOT (2004) Table 10.2.6, utilizing a "roadway designed with concrete curbs and drop inlet' designation. The mean resilient modulus was utilized in conjunction with the traffic data to develop 18-kip Equivalent Single Axle Loads (ESALs). The following parameters for an arterial road were used for the pavement section analysis:

Seasonal Variation Factor (Phoenix)	1.0
Drainage Coefficient (Fair)	1.0
Performance Period (years)	20
Number of Lanes in Design Direction (MC85)	3
Percent of All Truck in the Design Lane (MC85)	70
Number of Lanes in the Design Direction (Intersections)	2
Percent of All Trucks in the Design Lane (Intersections)	90
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level	95%
Overall Standard Deviation	0.45

The outcome of the input values resulted in the following:

Roadway Section	Design 18-Kip ESALs	Design Structural Number
MC 85 –107th to 91st Ave including 91st Ave, 99th Ave & 107th Ave intersections – New Construction	11,724,000	4.08
MC 85 – 107th to 91st Ave including 91st Ave, 99th Ave & 107th Ave intersections – Reconstruction	11,724,000	3.86

6.4 PAVEMENT SECTION DESIGN

The pavement section design utilizes the maximum calculated 18-kip ESAL for all segments of the roadway including the intersections. While the 107th Avenue intersection has the lowest ESAL count, it does not warrant including that intersection as a separate design as the drop in anticipated ESALs is not significant. By using a single ESAL loading for the intersections, a single pavement section can be utilized. However, it may be necessary to utilize various pavement sections for certain areas of the project.

6.4.1 Widening of MC 85

The medium to high plasticity (low R-value) clay subgrade soils exhibit potential for expansion or settlement upon wetting and drying, and are not considered adequate for roadway support without some type of modification. Thus, no alternatives were studied that would leave the unaltered soil in-place directly below the new pavement section. The two options considered for subgrade treatment are to treat the in-place clayey material (upper 12 inches) with lime or to overexcavate the soils to a minimum depth of 2.0 feet and replace with AB or good quality imported fill.

If overexcavation is chosen as the construction method it is recommended that the existing medium to high plasticity soils, which are exposed beneath the pavement section, be overexcavated to a depth of 2.0 feet below the finished pavement subgrade elevation, and be replaced with materials meeting a recommended minimum construction control R-value of 30. An alternative to overexcavation, would be the placement of a geogrid and high survivability separation fabric beneath the pavement section aggregate base. It may be preferable to leave any existing lower quality soils in-place and cover with geogrid to limit the depth of excavation. This option would be limited to those in-place soils that when tested would have a correlated R-value of at least 20 (within 10 of the construction control R-value of 30). Any soils with correlated R-values of less than 20 should be overexcavated and replaced, as discussed above.

As a minimum, existing soils within all areas to receive embankment, pavements, and general fill should be scarified to a minimum depth of 8 inches, moisture-conditioned to within plus or minus two percent of the optimum moisture content, and be compacted to a minimum of 95 percent of standard Proctor (ASTM D698) density. It is recommended that a representative of the geotechnical engineer inspect the exposed surfaces of overexcavations prior to placement of fill to verify suitable bearing conditions. All placement and compaction of subgrade materials should be in general accordance with Section 203 of the MAG Specifications (1998 includes updates through 2005).

Lime can be incorporated to stabilize fine-grained soil, typically soils with a minimum of 25% passing the #200 sieve and a plasticity index greater than 10, either employed as a subgrade or subbase to create a layer with structural value in the pavement system. Subgrade stabilization usually involves in-place "road mixing," and generally requires adding 3 to 6 percent lime by weight of the dry soil. The on-site clayey soils based on laboratory results have an expansion potential between 5.4% and 10.0%. This soil (in accordance with Table 10.2.8 of MCDOT, 2004) requires a stabilized depth of 12 inches. The actual lime percentage should be determined by following the test protocol for a mixture design. All placement of lime slurry should be in general accordance with Section 309 of the MAG Specifications (1998 includes updates through 2005).

In accordance with the AASHTO method for layered thickness design, and based on the given design parameters, the following eight alternatives listed herein were developed. Structural coefficients of 0.61, 0.42, 0.12, and 0.16 were used for asphalt rubber (AR), AC, AB, and lime stabilized soil subgrade. The detailed calculations for determined section thicknesses are attached. Alternatives 1 through 4 present the new construction options for the widening of MC85 utilizing AR. Alternatives 5 through 8 present new construction options for the widening of MC85 utilizing a combination of 12.5 mm and 19 mm Strategic Highway Research Program (SHRP) AC mixes.

Alternative 1 – AR over AC over AB over Imported Fill Subgrade*	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue , SN = 4.08 (inches)**
Asphalt-Rubber	1.5
Asphalt Concrete	5.0
Aggregate Base	10.0
Borrow Excavation (Imported)*	24.0

* See Appendix C for subgrade requirements

Alternative 2 – AR over AC over AB over Lime Stabilized Subgrade	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt-Rubber	1.5
Asphalt Concrete	3.5
Aggregate Base	6.0
Lime Slurry Stabilization Subbase (5%)	12.0

Alternative 3 – AR over AC over Imported Fill Subgrade*	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt-Rubber	1.5
Asphalt Concrete	8.0
Borrow Excavation (Imported) *	24.0

* See Appendix C for subgrade requirements

Alternative 4 – AR over AC over Lime Stabilized Subgrade	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt-Rubber	1.5
Asphalt Concrete	5.0
Lime Slurry Stabilization Subbase (5%)	12.0

Alternative 5 – AC over AB over Imported Fill Subgrade*	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt Concrete	6.0
Aggregate Base	14.0
Borrow Excavation (Imported) *	24.0

* See Appendix C for subgrade requirements

Alternative 6 – AC over AB over Lime Stabilized Subgrade	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt Concrete	4.0
Aggregate Base	11.0
Lime Slurry Stabilization Subbase (5%)	12.0

Alternative 7 – AC over Imported Fill Subgrade*	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt Concrete	10.0
Borrow Excavation (Imported) *	24.0

* See Appendix C for subgrade requirements

Alternative 8 – AC over Lime Stabilized Subgrade	
Material	**New Construction/Widening MC 85- 107th Avenue to 91st Avenue, SN = 4.08 (inches)**
Asphalt Concrete	7.0
Lime Slurry Stabilization Subbase (5%)	12.0

6.4.2 Reconstruction of MC 85 Pavement

As indicated in Table 1, the top of the existing PCCP varies from about 10 to 30 inches in depth below the existing AC pavement surface. Given the depths involved and the fact that much of the new alignment will be elevated from existing site grades, MCDOT has determined that the PCCP should remain in-place. In accordance with the AASHTO method for layered thickness design, and based on the given design parameters, the following alternatives were developed. Alternatives 9 and 10 address the reconstruction of MC 85 with the assumption that the existing

AB and PCCP will be left in-place. Both the existing AB and AC are highly variable in thickness along MC 85. The existing profile will need to be raised, from 10 inches to 27 inches, to meet the proposed new profile grade. Though re-using the existing AB for the new AB section is not recommended given the variability and unknowns concerning quality, it would be good to leave the existing AB as subgrade for the new pavement section. The existing AC will first need to be removed to expose the AB. The removed AC may be milled and taken to a disposal site, and/or milled and reused as a percentage of the AB or as part of the general import fill given that it meets a minimum correlated R-value of 30.

Alternative 9 –AR over AB/Import over Existing AB	
Material	**Reconstruction MC 85- 107th Avenue to 91st Avenue, SN = 3.86 (inches)**
Asphalt Rubber	1.5
Asphalt Concrete	5.0
Aggregate Base	8.0

Alternative 10 – AC over AB/Import over Existing AB	
Material	**Reconstruction MC 85- 107th Avenue to 91st Avenue, SN = 3.86 (inches)**
Asphalt Concrete	6.0
Aggregate Base	12.0

6.5 ALTERNATIVE COST ESTIMATES

Anticipated costs for the 10 alternative pavement sections described in Section 6.4 are presented herein. The cost estimates are prepared on the basis of cost per lane mile of pavement. In accordance with MCDOT (2004), a lane mile of pavement is considered as 15-feet wide by 5280-feet in length. The roadway excavation cost includes both scarification, and recompaction of the exposed soil. The lime stabilization assumes that the subgrade will be stabilized in place.

Alternative 1 – AR over AC over AB over Imported Fill Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
325.10125 Asphalt-Rubber, (12.5 mm Mix) @ 137 pcf	1.5	678	$50/ton	$33,900
321.01300 Asphalt Concrete (19 mm Mix) @ 145 pcf	5.0	2,393	$32/ton	$76,576
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
310.03300 Aggregate Base (135 pcf)	10.0	4,455	$8/ton	$35,640
205.01150 Roadway Excavation	24	5,867	$2.00 cu yd	$11,734
210.02000 Borrow Excavation (Imported)	24	5,867	$5.00 cu yd	$29,335
			Total Cost per lane mile	$190,335

Alternative 2 – AR over AC over AB over Lime Stabilized Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
325.10125 Asphalt-Rubber, (12.5 mm Mix) @ 137 pcf	1.5	678	$50/ton	$33,900
321.01300 Asphalt Concrete (19 mm Mix) @ 145 pcf	3.5	2,393	$32/ton	$53,600
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
310.03300 Aggregate Base (135 pcf)	6.0	2,673	$8/ton	$21,384
309.05008 Lime Slurry Stabilization (5%)	12.0	79,200	$0.36 sq ft	$28,600
			Total Cost per lane mile	$140,634

Alternative 3 – AR over AC over Imported Fill Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
325.10125 Asphalt-Rubber, (12.5 mm Mix) @ 137 pcf	1.5	678	$50/ton	$33,900
321.01300 Asphalt Concrete (19 mm Mix) @ 145 pcf	8.0	3,828	$32/ton	$122,496
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
205.01150 Roadway Excavation	24	5,867	$2.00 cu yd	$11,734
210.02000 Borrow Excavation (Imported)	24	5,867	$5.00 cu yd	$29,335
			Total Cost per lane mile	$200,615

Alternative 4 – AR over AC over Lime Stabilized Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
325.10125 Asphalt-Rubber, (12.5 mm Mix) @ 137 pcf	1.5	678	$50/ton	$33,900
321.01300 Asphalt Concrete (19 mm Mix) @ 145 pcf	5.0	2,393	$32/ton	$76,576
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
309.05008 Lime Slurry Stabilization (5%)	12	79,200	$0.36 sq ft	$28,600
			Total Cost per lane mile	$142,226

Alternative 5 – AC over AB over Imported Fill Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
321.01200 Asphalt Concrete (12.5mm Mix) @ 145 pcf	1.5	718	$32/ton	$22,976
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	4.5	2,153	$32/ton	$68,896
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
310.03300 Aggregate Base Course (135 pcf)	14.0	6,237	$8/ton	$49,896
205.01150 Roadway Excavation	24	5,867	$2.00 cu yd	$11,734
210.02000 Borrow Excavation (Imported)	24	5,867	$5.00 cu yd	$29,335
			Total Cost per lane mile	$185,987

Alternative 6 – AC over AB over Lime Stabilized Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
321.01200 Asphalt Concrete (12.5mm Mix) @ 145 pcf	1.5	678	$32/ton	$21,696
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	2.5	1197	$32/ton	$38,304
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	3	$350/ton	$1,050
310.03300 Aggregate Base Course (135 pcf)	11	4,901	$8/ton	$39,208
309.05008 Lime Slurry Stabilization (5%)	12	79,200	$0.36 sq ft	$28,600
			Total Cost per lane mile	$128,858

Alternative 7 – AC over Imported Fill Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
321.01200 Asphalt Concrete (12.5mm Mix) @ 145 pcf	1.5	718	$32/ton	$22,976
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	8.5	4,067	$32/ton	$130,144
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
205.01150 Roadway Excavation	24	5,867	$2.00 cu yd	$11,734
210.02000 Borrow Excavation (Imported)	24	5,867	$5.00 cu yd	$29,335
			Total Cost per lane mile	$197,339

Alternative 8 – AC over Lime Stabilized Subgrade				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
321.01200 Asphalt Concrete (12.5mm Mix) @ 145 pcf	1.5	718	$32/ton	$22,976
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	5.5	2,632	$32/ton	$84,224
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
309.05008 Lime Slurry Stabilization (5%)	12	8,800	$0.36 sq ft	$28,600
			Total Cost per lane mile	$138,950

Alternative 9 – AR over AB/Import over Existing AB				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
325.10125 Asphalt-Rubber, (12.5mm Mix) @ 137 pcf)	1.5	678	$50/ton	$33,900
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	5.0	2,393	$32/ton	$76,576
329.01000 Bituminous Tack Coat, (0.07 gal/sq yd)	-	9	$350/ton	$3,150
310.03300 Aggregate Base Course, (135 pcf)	8.0	3,564	$8/ton	$28,512
			Total Cost per lane mile	$142,138

Alternative 10 – AC over AB/Import over Existing AB				
Pavement Construction Item	**Section Thickness (in)**	**Quantity**	**Unit Price**	**Cost per lane mile**
321.01200 Asphalt Concrete (12.5mm Mix) @ 145 pcf	1.5	718	$32/ton	$22,976
321.01300 Asphalt Concrete (19mm Mix) @ 145 pcf	4.5	2,153	$32/ton	$68,896
329.01000 Bituminous Tack Coat (0.07 gal/sq yd)	-	9	$350/ton	$3,150
310.03300 Aggregate Base Course (135 pcf)	12.0	5,346	$8/ton	$42,768
			Total Cost per lane mile	$137,790

6.6 RECOMMENDATIONS

The Alternative 10 – AC over AB/Import over Existing AB appears to be the most economical choice for reconstruction of the existing MC85 pavement. However, given the relative minor cost differential between Alternatives 9 and 10, and the fact that MCDOT prefers that asphalt rubber be used as the surface coarse, it is recommended that Alternative 9 be utilized. The use

of import soils versus placement of additional AB to accommodate the planned profiles changes along MC 85 should be based on the quantities involved and the difficulty associated with placement of soil between existing and new AB in combination with varying existing and proposed roadway profiles.

The cost analysis indicates that Alternative 6 - AC and AB over lime stabilized subbase is the most economical alternative for new construction (widening) of the two-mile design segment. However, as the use of an asphalt rubber surface is preferred, Alternative 2 – asphalt rubber over AC over AB over lime stabilized subgrade, would be the preferred choice. It may also be preferable to match the AR, AC and AB sections for Alternative 2 with that of Alternative 9 in order to accommodate construction. Though more costly, this will result in added benefit for the widened section of pavement.

For reconstruction and widening of the cross-road pavements (where AR is not currently utilized), the Alternative 10 section is recommended. As the scope of work for this project did not include an investigation of the pavement subgrade of the cross-roads, this recommendation may be conservative relative to what materials actually exist. However, given the lack of data and the belief that the subgrade conditions are similar to what was encountered along MC 85, the recommendation is likely warranted. As with MC 85, it is recommended that the subgrade soils located within the limits of pavement widening be modified with a 12-inch layer of lime stabilized base.

It is recommended that any driveways associated with this project be constructed with a minimum section of 4 inches AC over 6 inches AB.

7.0 MATERIAL SOURCES

Although there are material sources known to exist near this project, there is currently no designated source for borrow or aggregates within the project limits. Fills imported from other sites should contain no debris or other deleterious or hazardous materials, and meet a minimum correlated R-value criteria of 30.

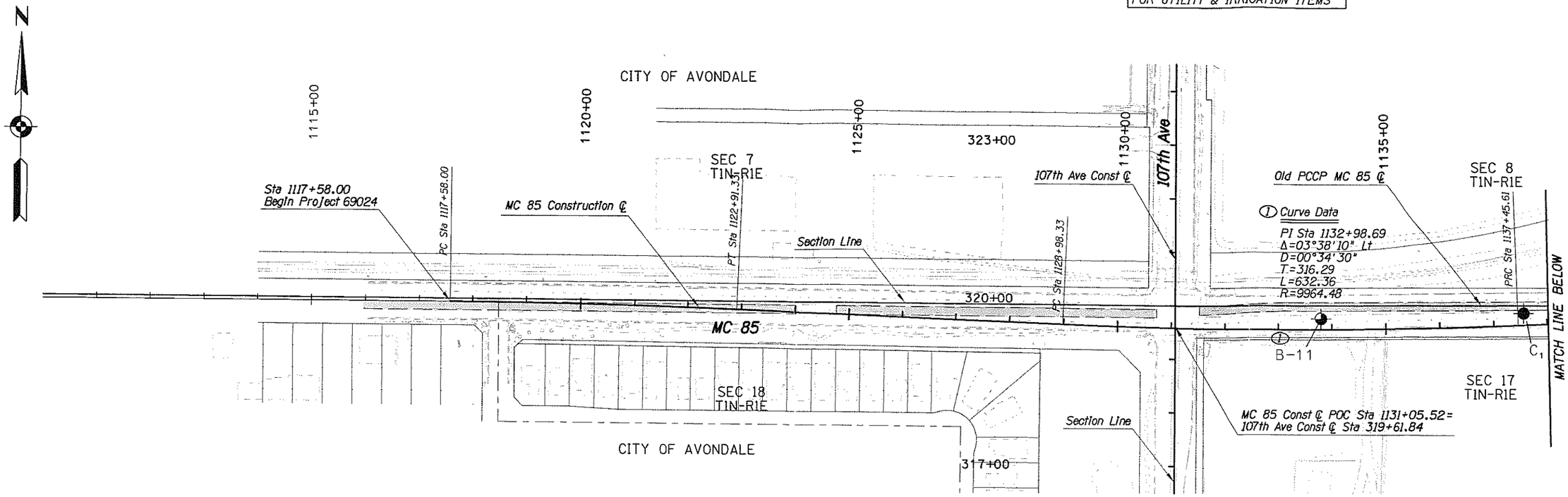
Asphalt concrete should be as specified in Section 321, 329, 710 and 711 of the MAG Specifications (1998 includes updates through 2005). The Superpave mix design method is recommended, though the surface coarse may be better suited to the Marshall mix. Asphalt rubber should be as specified in Section 325 of the current MAG Specifications. The Aggregate Base shall be as specified in Section 702 of the current MAG Specifications.

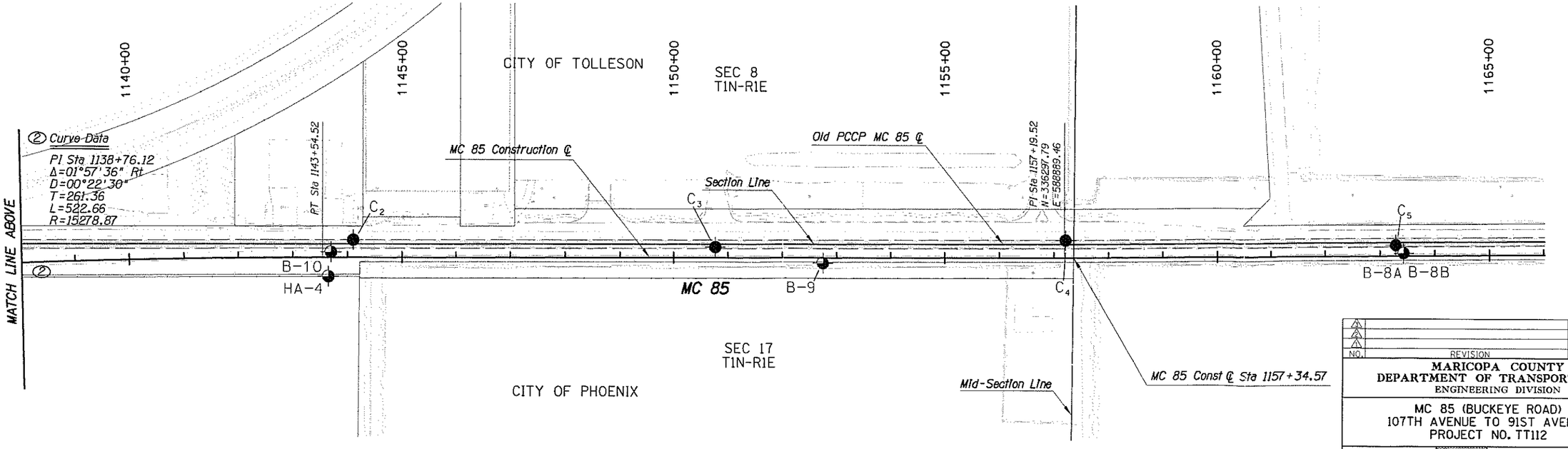
8.0 CLOSURE

The recommendations presented in this report are based on a limited number of small diameter test corings, review of a geotechnical investigation performed by others, our understanding of this project and our general experience in the project area. The subsurface conditions identified are based on the conditions encountered only at the specific test bore and pavement core locations and it is anticipated that the subsurface conditions will vary between test locations.

APPENDIX A – SITE PLAN

SEE UTILITY & IRRIGATION SHEETS
FOR UTILITY & IRRIGATION ITEMS





Legend

- DMJM Harris Coring (April/May 2005)
- Mactec Boring (March 2003)

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SCALE IN FEET

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. TT112

PRELIMINARY
90%
Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGNED	CCD/BWS	4/06
DRAWN	RPG	4/06
CHECKED	RLB	4/06

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 1 OF 3

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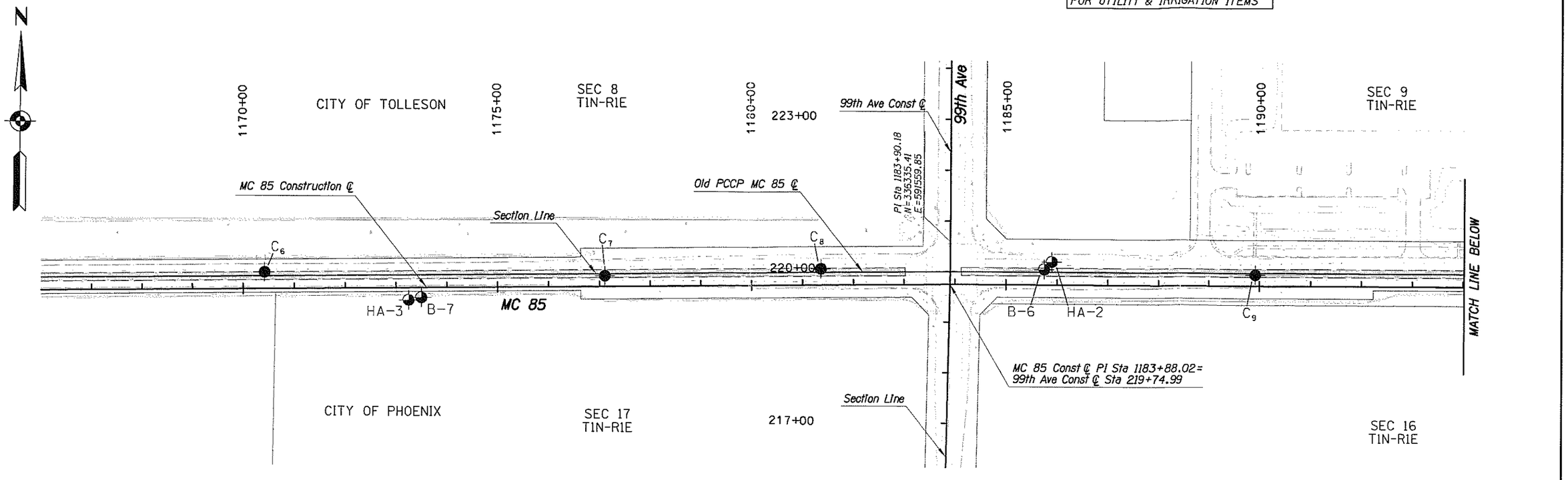
SEE UTILITY & IRRIGATION SHEETS FOR UTILITY & IRRIGATION ITEMS



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- Mactec Boring (March 2003)

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NO.	REVISION	BY	DATE

MARICOPA COUNTY
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ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
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PRELIMINARY
90%
Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGNED	CCD/BWS	4/06
DRAWN	RPG	4/06
CHECKED	RLB	4/06

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 337-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 2 OF 3

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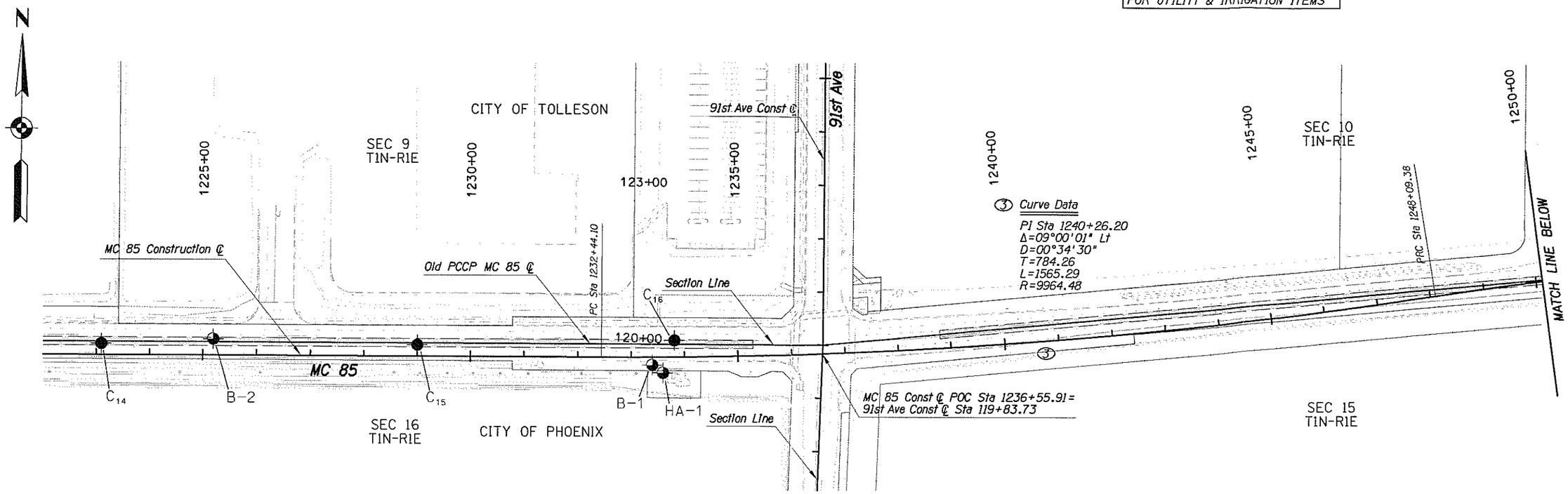
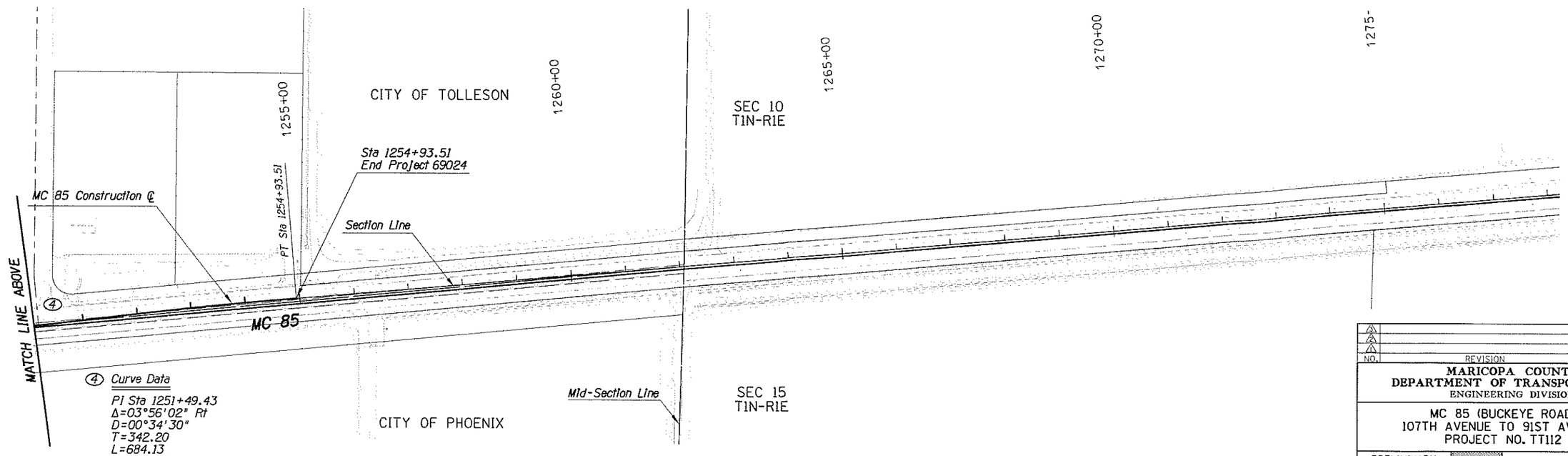
SEE UTILITY & IRRIGATION SHEETS
FOR UTILITY & IRRIGATION ITEMS





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- DMJM Harris Coring (April/May 2005)
- Mactec Boring (March 2003)

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2			
3			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

MC 85 (BUCKEYE ROAD)
107TH AVENUE TO 91ST AVENUE
PROJECT NO. TT112

PRELIMINARY
90%
Review
NOT FOR CONSTRUCTION OR RECORDING

DESIGNED	CCD/BWS	4/06
DRAWN	RPG	4/06
CHECKED	RLB	4/06

DMJM HARRIS | AECOM
2777 E. CAMELBACK RD
SUITE 200
PHOENIX, AZ. 85016-4302
(602) 331-2777

SITE PLAN SHOWING DMJM HARRIS CORE LOCATIONS & MACTEC BORING LOCATIONS

SHEET 3 OF 3

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APPENDIX B – PAVEMENT ANALYSIS

WORKSHEET FOR CALCULATING RESILIENT MODULUS OF SUBGRADE, MEAN, DESIGN, AND CONSTRUCTION CONTROL R-VALUES
(Based on Section 202.02, Subsections F, G, H, I of
Arizona Department of Transportation, Materials Preliminary Engineering and Design Manual, 1989)

PROJECT: MC 85, 91st Ave to 107th Ave
No.: 6490.0000

ENTER LABORATORY TEST DATA IN APPROPRIATE CELLS-CLEAR CELLS IF NO DATA

R-VALUE TEST RESULTS:		GRADATION/P.I. TEST RESULTS: (Note: If sample is non-plastic, enter 0 for P.I.)				
SAMPLE I.D. Boring-(Depth)	R-VALUE @ 300 psi (R_t)	SAMPLE I.D. Boring-(Depth)	% Passing No. 200 Sieve	Plasticity Index	Correlated R-Value	Resilient Modulus
1		4 0-5.0	53.8	16	25	15143
2		4 0-5.0	88	20	14	8842
3		4 0-5.0	57.4	27	16	9911
4		4 0-5.0	93	22	12	7958
5		4 0-5.0	75.9	16	19	11453
6		4 0-5.0	76.9	29	11	7684
7		4 0-5.0	77.6	24	13	8758
9		4 0-5.0	79.2	30	10	7333
10		4 0-5.0	68.9	23	16	9893
HA1	7	0-3.0	72	19	18	10853
HA2	9	0.3.0	55.2	19	22	13306
HA3	7	0-3.0	72.4	19	17	10803
HA4	19	0-3.0	61.1	15	24	14272
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
					NO VALUE	NO VALUE
number of actual R-Values, N_t=	4			number of correlated R-Values, N_c=	13	13
mean of the actual R-Values, R_t=	10.50			mean of the correlated R-Values, R_c=	16.68	10478
standard deviation of actual R-Values, σ_t=	5.74			standard deviation of correlated R-Values, σ_c=	4.86	2511.72
min	7			min	10	MCDOT<8000
max	19			max	25	Standard Deviation ok

No adjustment, std deviation <10

MEAN R-VALUE FROM TEST DATA:
R_{mean}= 15.56

RESILIENT MODULUS DETERMINATION:
Enter seasonal variation factor (SVF) from ADOT reference
SVF= 1.0

Resilient Modulus, M_R= 9830 psi

IF DESIRED, ALTERNATIVELY ENTER A CHOSEN DESIGN R-VALUE:

Enter Design R-value:	25	15
Design Resilient Modulus, M_R=	14900	9550

CONSTRUCTION CONTROL R-VALUE (R_{CC}) DETERMINATION:

** Critical t-Value (90%) for N_c-1 Correlated R-Values tested:	1.356
CONSTRUCTION CONTROL R-VALUE (R_{CC}):	10.1

WORKSHEET FOR CALCULATION OF ESAL LOADING ESTIMATES

PROJECT: MC 85, 107th Ave to 91st Ave
No.: 046106490.0000

CUMULATIVE TRAFFIC VOLUME ESTIMATE THRU YEAR:	2026
DESIGN PERIOD, END YEAR:	2026
DESIGN/ASSUMED INITIAL YEAR OF SERVICE:	2006

LOCATION/DESIGN SEGMENT	DESIGN PAVEMENT TYPE (enter FLEX or RIGID)	DESIGN PERIOD CUMULATIVE TWO-WAY TRAFFIC VOLUME, (ΣTV) [millions]	DESIGN LANE ALLOWABLE VALUE** DI	DIRECTIOAL DISTRIBUTION FACTOR Dd	% PASSENGER CARS	% HEAVY TRUCKS	% GROWTH RATE	GROWTH FACTOR	**DESIGN PERIOD** TOTAL ONE-WAY 18-kip ESALs, W_{18} (millions)
Mactec -MC 85 - 91st Ave to 107th Ave	Flex	26.063	0.7	0.5	86.0	14.0	5.4	34	9.122
MC 85 -107th Ave to 91th Ave	Flex	33.497	0.7	0.5	83.0	17.0	2.25	25	11.724
MC 85 - 107th Ave to 91st Ave Option- 2	Flex	27.609	0.7	0.5	86.0	14.0	2.25	25	9.663
91st Ave	Flex	26.047	0.9	0.5	83.0	17.0	5.5	35	11.721
99th Ave	Flex	24.500	0.9	0.5	83.0	17.0	7.0	41	11.025
107th Ave	Flex	20.838	0.9	0.5	83.0	17.0	5.5	35	9.377

** See following table for values

# of Traffic Lanes	Value
1	1.0
2	0.9
3	0.7
4 or more	0.6

ROW	Item	2003-2005 ADT 2-way	2026 ADT 2-way	MACTEC 2-Way
11	MC85	18,000	28,778	12,270
12	MC85	18,000	28,778	11,505
13	MC85	18,000	28,778	11,808
14	91st Ave	10,000	25,921	4,985
15	99th Ave	8,000	35,746	6,519
16	107th Ave	8,000	25,999	4,985

ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:			
DESIGN SECTION:	Mactec Design 1/Full Depth	DESIGN SECTION	Alt 1- Rubberized AC & AB over Import
Initial Design Serviceability Index, p_0	4.5	Initial Design Serviceability Index, p_0	4.5
Design Terminal Serviceability Index, p_t	2.5	Design Terminal Serviceability Index, p_t	2.5
Design Serviceability Loss, ΔPSI ($=p_0-p_t$)	2.0	Design Serviceability Loss, ΔPSI ($=p_0-p_t$)	2.0
Reliability, R (%)	95	Reliability, R (%)	95
Standard Normal Deviate, Z_R	-1.645	Standard Normal Deviate, Z_R	-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	9.500	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	11.724

ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN:

MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION; CHECK RESULTS BELOW TO VERIFY ADEQUACY OF PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS

DESIGN SECTION:		Mactec Design 1/Full Depth		DESIGN SECTION:		Alt 1- Rubberized AC & AB over Import	
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i	LAYER THICKNESS (inches)	MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i	LAYER THICKNESS (inches)
Asphaltic Rubber (AR)	0.61		1.5	Asphaltic Rubber (AR)	0.61		1.5
Asphaltic Concrete (AC)	0.42		8.5	Asphaltic Concrete (AC)	0.42		5.0
Treated Subgrade				Aggregate Base (AB)	0.12	0.93	10.0
Aggregate Base (AB)	0.12	0.93	0.0	Import		0.93	24.0
LSSubBase/Other	0.16	0.93	0.0	Aggregate SubBase/Other			
PAVEMENT SECTION STRUCTURAL NUMBER, SN:			4.49	PAVEMENT SECTION STRUCTURAL NUMBER, SN:			4.13
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:				ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			
R=17	M_R (psi) =	10,393		R=25	M_R (psi) =	14,900	
	$\log_{10}W_{18}$=	6.977723605			$\log_{10}W_{18}$=	7.069075099	
	right side eq'n	6.994324649			right side eq'n	7.110652228	
ADEQUATE SECTION?		YES		ADEQUATE SECTION?		YES	

ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:			
DESIGN SECTION:	Mactec Design 2/Full Depth	DESIGN SECTION:	Alt 2 -Rubberized AC & AB over LSS
Initial Design Serviceability Index, p_0	4.5	Initial Design Serviceability Index, p_0	4.5
Design Terminal Serviceability Index, p_t	2.5	Design Terminal Serviceability Index, p_t	2.5
Design Serviceability Loss, ΔPSI ($=p_0-p_t$)	2.0	Design Serviceability Loss, ΔPSI ($=p_0-p_t$)	2.0
Reliability, R (%)	95	Reliability, R (%)	95
Standard Normal Deviate, Z_R	-1.645	Standard Normal Deviate, Z_R	-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	5.000	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	11.724

ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN:

MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION; CHECK RESULTS BELOW TO VERIFY ADEQUACY OF PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS

DESIGN SECTION:		Mactec Design 2/Full Depth		DESIGN SECTION:		Alt 2 -Rubberized AC & AB over LSS	
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i	LAYER THICKNESS (inches)	MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i	LAYER THICKNESS (inches)
Asphaltic Rubber (AR)	0.61		1.5	Asphaltic Rubber (AR)	0.61		1.5
Asphaltic Concrete (AC)	0.42		7.5	Asphaltic Concrete (AC)	0.42		3.5
Aggregate Base (AB)	0.12	0.93	0.0	Treated Subgrade			
LSS SubBase	0.16	0.93	0.0	Aggregate Base (AB)	0.12	0.93	6.0
Aggregate SubBase/Other				LimeSSubBase/Other	0.16	0.93	12.0
PAVEMENT SECTION STRUCTURAL NUMBER, SN:			4.07	PAVEMENT SECTION STRUCTURAL NUMBER, SN:			4.84
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:				ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			
R=17	M_R (psi) =	10,393		R=16	M_R (psi) =	9,830	
	$\log_{10}W_{18}$=	6.698970004			$\log_{10}W_{18}$=	7.069075099	
	right side eq'n	6.700164794			right side eq'n	7.173235187	
ADEQUATE SECTION?		YES		ADEQUATE SECTION?		YES	

ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:				
DESIGN SECTION:		Alt 3 -Rubberized AC Full Depth over import	DESIGN SECTION:	Alt-5 AC/AB over Import
Initial Design Serviceability Index, p_0		4.5	Initial Design Serviceability Index, p_0	4.5
Design Terminal Serviceability Index, p_t		2.5	Design Terminal Serviceability Index, p_t	2.5
Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0	Design Serviceability Loss, ΔPSI (=p_0-p_t)	2.0
Reliability, R (%)		95	Reliability, R (%)	95
Standard Normal Deviate, Z_R		-1.645	Standard Normal Deviate, Z_R	-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	11.724
ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN:				
MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION--CHECK RESULTS BELOW TO VERIFY ADEQUACY OF TRIAL PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS				
DESIGN SECTION:		Alt 3 -Rubberized AC Full Depth over import	DESIGN SECTION	Alt-5 AC/AB over Import
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	MATERIAL / STRUCTURAL LAYER COEFFICIENT / DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	
Asphaltic Rubber (AR)	0.61	1.5	Asphaltic Rubber (AR) 0.61	0.0
Asphaltic Concrete	0.42	8.0	Asphaltic Concrete (AC) 0.42	6.0
Import		24.0	Treated Subgrade	
Aggregate Base (AB)	0.12	0.93 0.0	Aggregate Base (AB) 0.12 0.93	14.0
Aggregate SubBase/Other	0.16	0.93 0.0	import 0.93	24.0
PAVEMENT SECTION STRUCTURAL NUMBER, SN:		4.28	PAVEMENT SECTION STRUCTURAL NUMBER, SN:	4.08
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:	
R=25	M_R (psi) =	14,900	R=25 M_R (psi) =	14,900
	$\log_{10}W_{18}$=	7.069075099	$\log_{10}W_{18}$=	7.069075099
	right side eq'n	7.212603217	right side eq'n	7.075700887
ADEQUATE SECTION?		YES	ADEQUATE SECTION?	YES

ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:				
DESIGN SECTION:		Alt 4 - Rubberized AC Full Depth over LSS	DESIGN SECTION:	Alt 6 - Option 1 AC/AB over LSS
Initial Design Serviceability Index, p_0		4.5	Initial Design Serviceability Index, p_0	4.5
Design Terminal Serviceability Index, p_t		2.5	Design Terminal Serviceability Index, p_t	2.5
Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0	Design Serviceability Loss, ΔPSI (=p_0-p_t)	2.0
Reliability, R (%)		95	Reliability, R (%)	95
Standard Normal Deviate, Z_R		-1.645	Standard Normal Deviate, Z_R	-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)	0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)	11.724
ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN:				
MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION--CHECK RESULTS BELOW TO VERIFY ADEQUACY OF TRIAL PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS				
DESIGN SECTION:		Alt 4 - Rubberized AC Full Depth over LSS	DESIGN SECTION	Alt 6 - Option 1 AC/AB over LSS
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	MATERIAL / STRUCTURAL LAYER COEFFICIENT / DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	
Asphaltic Rubber (AR)	0.61	1.5	Asphaltic Rubber (AR) 0.61	0.0
Asphaltic Concrete	0.42	5.0	Asphaltic Concrete (AC) 0.42	4.0
Import			Aggregate Base (AB) 0.12 0.93	11.0
Aggregate Base (AB)	0.12	0.93 0.0	LSS SubBase 0.16 0.93	12.0
LSS SubBase	0.16	0.93 12.0	Aggregate SubBase/Other	
PAVEMENT SECTION STRUCTURAL NUMBER, SN:		4.80	PAVEMENT SECTION STRUCTURAL NUMBER, SN:	4.69
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:	
R=16	M_R (psi) =	9,830	R=16 M_R (psi) =	9,830
	$\log_{10}W_{18}$=	7.069075099	$\log_{10}W_{18}$=	7.069075099
	right side eq'n	7.147594641	right side eq'n	7.077362587
ADEQUATE SECTION?		YES	ADEQUATE SECTION?	YES

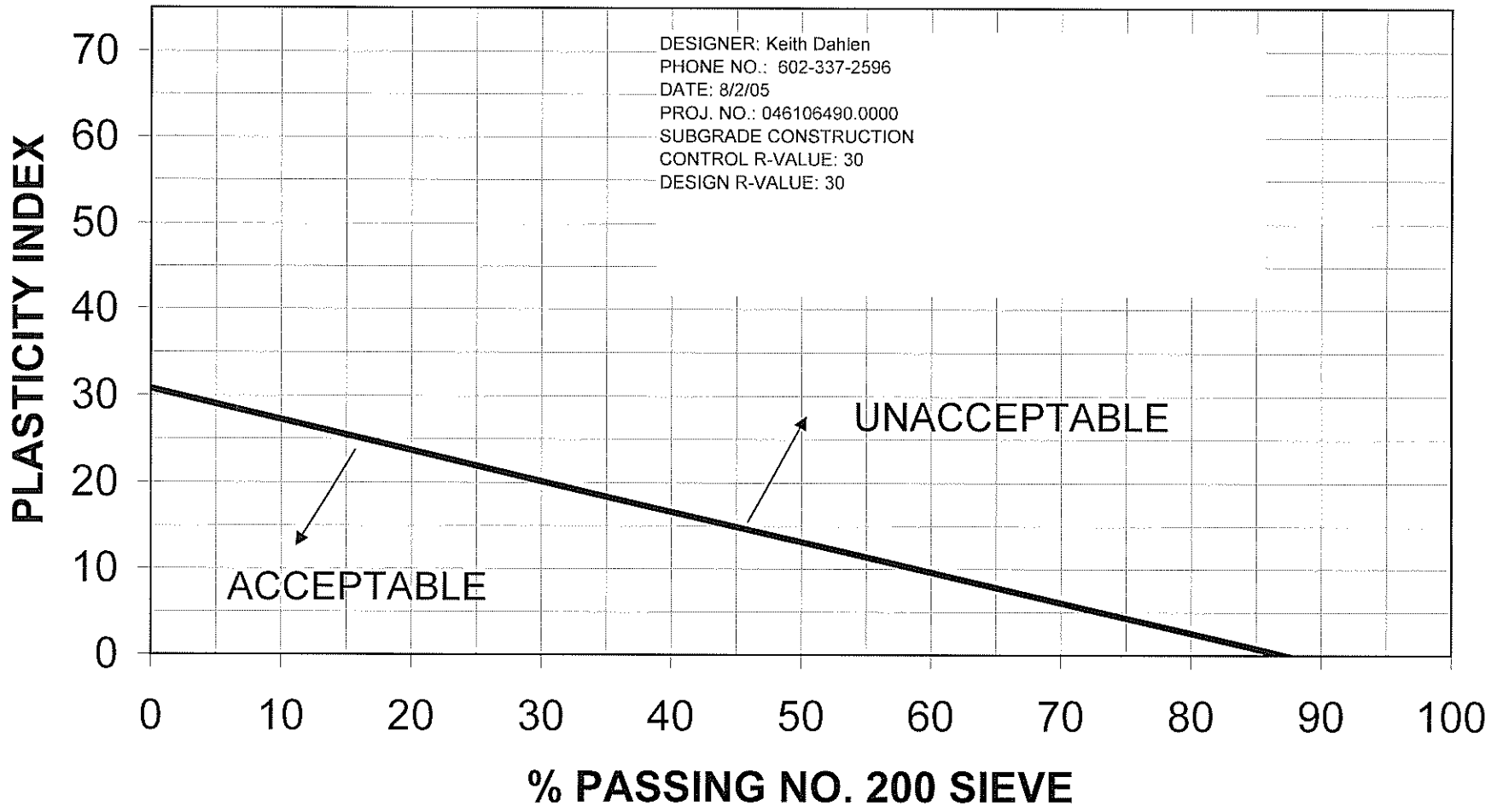
ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:					
DESIGN SECTION:		Alt 7 - AC Full Depth over import	DESIGN SECTION:		Alt 9- Rubberized AC/AB over Existing AB
Initial Design Serviceability Index, p_0		4.5	Initial Design Serviceability Index, p_0		4.5
Design Terminal Serviceability Index, p_t		2.5	Design Terminal Serviceability Index, p_t		2.5
Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0	Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0
Reliability, R (%)		95	Reliability, R (%)		95
Standard Normal Deviate, Z_R		-1.645	Standard Normal Deviate, Z_R		-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724
ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN: MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION, CHECK RESULTS BELOW TO VERIFY ADEQUACY OF PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS					
DESIGN SECTION:		Alt 7 - AC Full Depth over import	DESIGN SECTION:		Alt 9- Rubberized AC/AB over Existing AB
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)
Asphaltic Rubber (AR)	0.61		Asphaltic Rubber (AR)	0.61	1.5
Asphaltic Concrete (AC)	0.42	10.0	Asphaltic Concrete (AC)	0.42	5.0
Aggregate Base (AB)	0.12	0.93	Treated Subgrade		
Import	0.16	0.93	Aggregate Base (AB)	0.12	0.93 / 8.0
Aggregate SubBase/Other			LimeSubBase	0.10	0.93 / 0.0
PAVEMENT SECTION STRUCTURAL NUMBER, SN:		4.20	PAVEMENT SECTION STRUCTURAL NUMBER, SN:		3.91
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:		
R=25	M_R (psi) =	14,900	R=30	M_R (psi) =	17,875
	$\log_{10}W_{18}$=	7.069075099		$\log_{10}W_{18}$=	7.069075099
	right side eq'n	7.159797004		right side eq'n	7.131114674
ADEQUATE SECTION?		YES	ADEQUATE SECTION?		YES

ENTER THE DESIGN/ASSUMED PARAMETER VALUES IN WHITE CELLS FOR EACH DESIGN SECTION BELOW:					
DESIGN SECTION:		Alt 8 - AC Full Depth over LSS	DESIGN SECTION:		Alt 10- AC/AB over Existing AB
Initial Design Serviceability Index, p_0		4.5	Initial Design Serviceability Index, p_0		4.5
Design Terminal Serviceability Index, p_t		2.5	Design Terminal Serviceability Index, p_t		2.5
Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0	Design Serviceability Loss, ΔPSI (=p_0-p_t)		2.0
Reliability, R (%)		95	Reliability, R (%)		95
Standard Normal Deviate, Z_R		-1.645	Standard Normal Deviate, Z_R		-1.645
Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45	Overall Standard Deviation, S_0 (S_0=0.35 for flex pvmt, per ADOT)		0.45
Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724	Estimated Design PeriodTotal 18-kip ESAL Applications, W_{18} (10^6)		11.724
ENTER TRIAL PAVEMENT SECTION THICKNESSES (inches) AND APPROPRIATE COEFFICIENTS TO DETERMINE SN: MANIPULATE LAYER THICKNESSES TO DESIGN ADEQUATE PAVEMENT SECTION, CHECK RESULTS BELOW TO VERIFY ADEQUACY OF PAVEMENT SECTION FOR GIVEN DATA AND SUBGRADE MODULUS					
DESIGN SECTION:		Alt 8 - AC Full Depth over LSS	DESIGN SECTION:		Alt 10- AC/AB over Existing AB
MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)	MATERIAL	STRUCTURAL LAYER COEFFICIENT	DRAINAGE COEFFICIENT, M_i / LAYER THICKNESS (inches)
Asphaltic Rubber (AR)	0.61		Asphaltic Rubber (AR)	0.61	0.0
Asphaltic Concrete (AC)	0.42	7.0	Asphaltic Concrete (AC)	0.42	6.0
Aggregate Base (AB)	0.12	0.93	Import		
Existing SubBase	0.16	0.93 / 12.0	Aggregate Base (AB)	0.12	0.93 / 12.0
Aggregate SubBase/Other			Aggregate SubBase/Other	0.16	0.93 / 0.0
PAVEMENT SECTION STRUCTURAL NUMBER, SN:		4.73	PAVEMENT SECTION STRUCTURAL NUMBER, SN:		3.86
ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:			ENTER THE DESIGN RESILIENT MODULUS OF SUBGRADE:		
R=16	M_R (psi) =	9,830	R=30	M_R (psi) =	17,875
	$\log_{10}W_{18}$=	7.069075099		$\log_{10}W_{18}$=	7.069075099
	right side eq'n	7.098657763		right side eq'n	7.094763427
ADEQUATE SECTION?		YES	ADEQUATE SECTION?		YES

APPENDIX C – SUBGRADE ACCEPTANCE CHART

SUBGRADE ACCEPTANCE CHART

MC85, 107TH AVENUE TO 91ST AVENUE



APPENDIX PAV-D

Ninyo and Moore Report

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

GEOTECHNICAL EVALUATION
MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE
MARICOPA, ARIZONA

PREPARED FOR:
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
3001 South 35th Street, Suite 6
Phoenix, Arizona 85034

September 28, 2010
Project No. 601301002

September 28, 2010
Project No. 601301002

Mr. John Shi
Maricopa County Department of Transportation
2901 West Durango Street
Phoenix, Arizona 85009

Subject: Geotechnical Evaluation
MC-85 Roadway Improvements
75th Avenue to 91st Avenue
Maricopa County, Arizona

Dear Mr. Shi:

In accordance with your authorization, we have performed a geotechnical evaluation for the above-referenced project in Maricopa County, Arizona. This report presents our geotechnical findings, conclusions, and recommendations for the design and construction of the subject project.

We appreciate the opportunity to be of service to you during this phase of the project. If you have any questions or comments regarding this report, please call.

Sincerely,
NINYO & MOORE

Marek J. Kasztalski, P.E., P.M.P., LEED A.P.
Senior Geotechnical Engineer

Steven D. Nowaczyk, P.E.
Principal Engineer

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34866
STEVEN D.
NOWACZYK
Date Signed 9-28-10
ARIZONA, U.S.A.

EXPIRES 6/30/12

SV/MJK/SDN/tns

Distribution: (3) Addressee (3 hard copy & via e-mail)

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Appendices

1. INTRODUCTION

In accordance with your authorization, we have performed a geotechnical evaluation for the proposed roadway improvements along Maricopa County (MC)-85 Road from 75th Avenue to 91st Avenue in Maricopa County, Arizona. The purpose of our evaluation was to assess the general subsurface conditions along the alignment of the proposed roadway improvements in order to formulate geotechnical recommendations for the design and construction. Maricopa County Department of Transportation Roadway Design Manual (MCDOT-RDM) guidelines were followed in the design of new flexible pavement for this project. This report presents the results of our evaluation and our geotechnical conclusions and recommendations regarding the proposed construction.

2. SCOPE OF SERVICES

Ninyo and Moore's geotechnical scope of services for this project included:

- Reviewing available background data, including topographic maps, geologic data, and aerial photographs of the site.
- Reviewing and utilizing information from the Pavement Engineering Report by Terracon, dated May 22, 2003, which was part of the Final Design Concept Report (DCR) prepared by Parsons Brinckerhoff and dated October 14, 2003.
- Establishing boring locations in the field and arranging for the mark out of underground utilities through Arizona Blue Stake.
- Drilling, logging and sampling 11 exploratory soil borings along the roadway alignment. The target depth of these borings was approximately 20 feet below ground surface (bgs). The borings are presented in Appendix A.
- Conducting eight field resistivity measurements of the subsurface materials. Results of the field resistivity testing are presented in Appendix C.
- Conducting laboratory testing of selected soil samples obtained from the borings to evaluate in-situ moisture content and dry density, grain size analysis, Atterberg limits, response-to-wetting behavior (collapse/swell) and corrosivity characteristics (including pH, minimum electrical resistivity, sulfate content, and chloride content) and R-value tests. The results of the laboratory testing performed are presented on the boring logs in Appendix B of this report.

- Preparing this report presenting our findings, conclusions, and recommendations regarding the design and construction of the proposed roadway improvements.

3. SITE DESCRIPTION

The project site is located along a 2-mile roadway segment of MC-85 between 75th Avenue and 91st Avenue, in Maricopa County, Arizona. The site lies within Sections 10, 11, 14, and 15 within Township 1 North, Range 1 East. The approximate location of the site is depicted on Figure 1. At the time of our evaluation, the study consisted of a two-lane asphalt concrete (AC) paved roadway surrounded by residential and commercial developments on the north and south sides.

According to the *Fowler,* Arizona-Maricopa Co., 7.5-Minute United States Geological Survey (USGS) Topographic Quadrangle Map (1982), the site elevation ranges from approximately 1,000 feet above mean sea level (MSL) at its western limits to approximately 1,020 feet MSL at its eastern limits. The project area typically slopes from the northeast down to the southwest with approximately 20 feet of topographic relief along the project corridor.

Four aerial photographs were reviewed for this project. A 1997 United States Department of Agriculture (USDA) aerial photograph depicted the project site as being an AC paved roadway surrounded by agricultural land to the north and south sides of the roadway, and scattered residential buildings on the agricultural land. A 1999 *Landiscor's Phoenix Real Estate Photo Book* aerial photograph depicted some commercial development along the project corridor. A 2005 Maricopa County Flood Control District aerial photograph depicted the site with additional commercial development, as well as residential development along the sides of the roadway. A 2007 FCDMC aerial photograph depicted several industrial buildings and a gas station constructed adjacent to the north side of MC-85. This photograph depicted the site as being similar to its current condition.

4. PROPOSED CONSTRUCTION

The project consists of the design and construction of the improvements for the segment of MC-85 between 75th Avenue and 91st Avenue in Maricopa County, Arizona. The improvements include widening of the existing roadways in order to increase the capacity, improve the vertical and horizontal geometry of the roadway in order to meet the design speed, improve the onsite drainage, and increased intersection efficiency. The project also includes new utility lines that will be located on the north side of the roadway and will have an invert depth of approximately 15 feet. This report addresses the pavement considerations. A separate data report that addresses the utility lines is presented under a separate cover letter.

5. FIELD EXPLORATION AND LABORATORY TESTING

On June 26 and July 13, 2006, Ninyo & Moore conducted a subsurface evaluation along the proposed alignment in order to evaluate the existing subsurface conditions and to collect soil samples for laboratory testing. This exploration consisted of drilling, logging, and sampling eleven exploratory borings. The borings were advanced using a CME-75 truck-mounted drill rig equipped with hollow-stem-augers. The 11 borings extended to depths ranging from 17 to 20 feet bgs.

Ninyo & Moore personnel logged the borings in general accordance with the Unified Soil Classification System (USCS) and American Society for Testing and Materials (ASTM) D 2488 by observing cuttings and drive samples. Collected ring samples from selected intervals were trimmed in the field, wrapped in plastic bags, and placed in cylindrical plastic containers to retain in-place moisture conditions. Similarly, the Standard Penetration Test (SPT) and bulk samples were collected at selected intervals and sealed in plastic bags to retain their approximate in-place moisture. Detailed descriptions of the soils encountered in our boreholes are presented on the boring logs in Appendix A. The approximate locations of the borings are shown on the Boring and Field Resistivity Lines Location Map (Figure 2). Figure 2 also contains the approximate locations of the borings advanced by Terracon (2003) as part of the DCR.

On June 30, 2006, representatives from our office conducted soil resistivity measurements of the subsurface materials. Soil resistivity information of the subsurface materials was obtained at the site near the intersection of 75th Avenue and MC-85, near the intersection of 80th Avenue and MC-85, near the intersection of 79th Avenue and MC-85, and near the intersection of 83rd Avenue and MC-85 (Figure 2). The data was collected in general accordance with ASTM G57 using an L&R MINIRES Resistivity Meter and four electrodes in a Wenner array configuration. Soil resistivity measurements were collected at electrode spacings of 2, 5, 10, 20, 30 50, and 75 feet along surveyed traverses. The results of the resistivity surveys and details regarding the data collection are presented in Appendix C. In general, the resistivity data collected are of good quality with good to fair agreement between orthogonal traverses indicating fairly homogenous to slightly heterogeneous soil electrical properties at the locations we surveyed. Note that several of our resistivity measurements indicate that the materials we surveyed are potentially corrosive ferrous metals.

The soil samples obtained during the drilling operations were transported to our laboratory in Phoenix for testing and evaluation. The laboratory testing included in-situ moisture content and dry density, grain-size distribution, Atterberg limits, response-to-wetting behavior (collapse/swell), corrosivity characteristics (including pH, minimum electrical resistivity, sulfate content, and chloride content) and R-value tests. The results of the in-situ moisture and dry density tests are shown on the boring logs presented in Appendix A. Detailed descriptions of our laboratory test methods and the results of the tests are presented in Appendix B.

6. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding the geology and groundwater conditions along the proposed alignments are provided in the following sections.

6.1. Geologic Setting

The project site is located in the Sonoran Desert Section of the Basin and Range Physiographic Province, which is typified by broad alluvial valleys separated by steep,

discontinuous, subparallel mountain ranges. The mountain ranges generally trend north-south and northwest-southeast. The basin floors consist of alluvium with thickness extending to several thousands of feet.

The basins and surrounding mountains were formed approximately 10 to 13 million years ago during the mid- to late-Tertiary age. Extensional tectonics resulted in the formation of horsts (mountains) and grabens (basins) with vertical displacement along high-angle normal faults. Intermittent volcanic activity also occurred during this time. The surrounding basins filled with alluvium from the erosion of the surrounding mountains, as well as from deposition from rivers. Coarser-grained alluvial material was deposited at the margins of the basins near the mountains.

The surficial geology of the site generally consists of Holocene (<10,000 years) to Middle Pleistocene (<790,000 years) alluvial deposits consisting of well-sorted silt, sand, gravel, and cobbles with Stage I to Stage II caliche cementation (Demsey, 1989).

According to the USDA National Resources Conservation Service (NRCS) Soil Survey, well-drained soils of clay, silt, and sand are at the surface of the project site. These soils exhibit characteristics such as low strength, shrink-swell potential, and moderate permeability. Furthermore, excavation sidewalls may cave in due to on-site cohesionless soils.

6.2. Subsurface Conditions

Our knowledge of the subsurface conditions at the project site is based on our field exploration and laboratory testing and our understanding of the general geology of the area. The following sections provide generalized descriptions of the materials encountered in our borings. More detailed descriptions are presented on the boring logs in Appendix A.

6.2.1. Asphalt Concrete and Aggregate Base

Asphalt concrete (AC) was encountered at the surface of each of our borings drilled. The thickness of the AC ranged from approximately 3 to 8 inches. Aggregate base (AB) was encountered beneath the pavement in each of these borings. The AB was typically classified as gravel with sand, and ranged from approximately 7 to 10 inches thick.

6.2.2. Engineered Fill

Engineered fill was encountered below the pavement section in borings B-1, B-2, B-3, and B-5. The fill material generally consisted of clay, silty sand, and clayey sand. The density of the fill material ranged from medium dense to very stiff and extended to depths ranging from approximately 3.5 to 6 feet bgs.

6.2.3. Alluvium

Alluvium was encountered beneath the fill material in borings B-1, B-2, B-3, and B-5 and beneath the AB in borings B-4, and B-6 through B-8 and extended to the explored depth. This material generally consisted of silty sand, silt, clayey sand, clay, and silty gravel. Caliche filaments were encountered at various depths within the borings. Cobbles and possible boulders were noted in our borings.

6.3. Groundwater

Groundwater was not encountered in our borings. Based on well data from the Arizona Department of Water Resources, the approximate depth to groundwater is located about 90 feet bgs or deeper at the site. Groundwater levels can fluctuate due to seasonal variations, irrigation, groundwater withdrawal or injection, and other factors. In general, groundwater is not expected to be a constraint to project design and construction.

7. GEOLOGIC HAZARDS

The following sections describe potential geologic hazards at the site, including land subsidence and earth fissures, faulting and seismicity, and liquefaction.

7.1. Land Subsidence and Earth Fissures

Groundwater depletion due to groundwater pumping has caused land subsidence and earth fissures in numerous alluvial basins in southern Arizona. It has been estimated that subsidence has affected more than 3,000 square miles and has caused damage to a variety of engineered structures and agricultural land (Schumann and Genualdi, 1986). From 1948 to 1983, excessive groundwater withdrawal has been documented in several alluvial valleys where groundwater levels have been reportedly lowered by up to 500 feet. With such large depletions of groundwater, the alluvium has undergone consolidation resulting in large areas of land subsidence.

In Arizona, earth fissures are generally associated with land subsidence and pose an on-going geologic hazard. Earth fissures generally form near the margins of geomorphic basins where significant amounts of groundwater depletion have occurred. Reportedly, earth fissures have also formed due to tensional stress caused by differential subsidence of the unconsolidated alluvial materials over buried bedrock ridges and irregular bedrock surfaces (Schumann and Genualdi, 1986).

Based on our field reconnaissance and review of the referenced material, there are no known earth fissures underlying the subject site. Based on our research, the closest documented earth fissure to the project site is located approximately 8 miles to the northwest of the site, near the base of the White Tank, where the water levels have dropped 300 to 500 feet. Groundwater levels at the project site have dropped up to approximately 100 feet. Continued groundwater withdrawal in the area may result in subsidence and the formation of new fissures or the extension of existing fissures. While the future occurrence of land subsidence and earth fissures cannot accurately be predicted, these phenomena are not expected to be a constraint of this project.

7.2. Faulting and Seismicity

The site lies within the Sonoran Zone, which is a relatively stable tectonic region located in southwestern Arizona, southeastern California, southern Nevada, and northern Mexico (Euge et al., 1992). This zone is characterized by sparse seismicity and few Quaternary faults. Based on our field observations, review of pertinent geologic data and analysis of aerial photographs, faults are not located on or adjacent to the project. The closest fault to the site is the Carefree Fault Zone, located approximately 40 miles to the northeast of the site (Pearthree, 1998). Approximately 2 meters of displacement has occurred along this fault within middle Pleistocene deposits (<750,000 years), but the upper Pleistocene and Holocene deposits (l<250,000 years) are not displaced.

7.3. Liquefaction Potential

Based on the SPT values at the site, the lack of near surface water, and the low ground motion hazard (relatively low ground accelerations), the likelihood or potential for liquefaction is considered to be negligible and is therefore not a design consideration.

8. CONCLUSIONS

Based on the results of our subsurface evaluation, laboratory testing, and data analysis, it is our opinion that the proposed roadway improvements along MC-85 within the project limits are feasible from a geotechnical standpoint, provided that the recommendations of this report are incorporated into the design and construction of the proposed project, as appropriate. Geotechnical considerations include the following:

- The on-site soils should generally be excavatable to expected roadway depths, with earth moving construction equipment in good working condition. However, scattered caliche filaments were encountered in the borings, which could be more difficult to excavate depending on the actual size and degree of cementation encountered during construction. In addition, cobbles and possible boulders were encountered in some of our borings which may result in slower excavation rates.

- Subgrade soils at the project site are primarily clayey soils that exhibit moderate expansive potentials. Therefore, based on the recommendations presented in the MCDOT-RDM, these

clayey roadbed subgrade soils under the newly placed pavement aggregate base should be stabilized in place using lime slurry stabilization to a depth of 6 inches.

- Four alternatives for new flexible pavement as presented in this report are suitable for new pavement for this project.
- A mill and overlay is feasible for the existing pavement.
- Imported soils and soils generated from on-site excavation activities can generally be used as engineered fill.
- Groundwater was not observed in our borings. The regional groundwater table in the area is anticipated to be as shallow as 90 feet bgs.
- Corrosivity test results indicate that subgrade soils at the site may be corrosive to ferrous metals, and the sulfate content of the soils present a negligible sulfate exposure to concrete.
- No known or reported geologic hazards are reported underlying or adjacent to the site.

9. RECOMMENDATIONS

Based on our understanding of the project, the following recommendations are provided for the design and construction of this project. If the proposed construction is changed from that discussed in this report, Ninyo & Moore should be contacted for additional recommendations. In general, MCDOT-RDM (2004) Guidelines and Specifications contained in Maricopa Association of Governments (MAG), *Uniform Standard Specifications and Details for Public Works Construction (2006)* were followed in the design of the new flexible pavement for this project.

9.1. Earthwork

The following sections present our earthwork recommendations including our discussions on the material characteristics, grading, fill placement and compaction, and imported fill material.

9.1.1. Site Preparation

Construction areas should be cleared of deleterious materials, including grass, weeds, construction debris, and any other material that might interfere with the performance or

progress of the work. These materials, if found along the alignment of the proposed improvements, should be disposed at a legal dumpsite. An earthwork, shrinkage factor of 10 to 20 percent is estimated for the on-site soils.

It may be desirable to recognize utilities, underground and aboveground structures or other features that are near the planned construction, and to survey or document (e.g., photographs, video, official documentation, etc.) their pre-construction condition. The findings of the survey could be used to document any damage to the existing utilities that might result from this construction.

9.1.2. Excavation Characteristics

Our evaluation of the excavation characteristics of the onsite materials is based on the results of our field exploration, laboratory testing and our experience with similar materials. In our opinion, roadway excavation of the near surface soils can be accomplished with earthmoving construction equipment in good operating condition. However, scattered caliche filaments were encountered in our borings, which could be more difficult to excavate depending on the actual size and degree of cementation encountered during construction. In addition, cobbles and possible boulders were encountered in our borings which and could prove to be a hindrance to excavation activities. The contractor should be prepared for such conditions.

The contractor should provide a safely sloped or adequately constructed and braced shoring system, in compliance with Occupational Safety and Health Administration requirements, for employees working in an excavation that may expose them to the danger of moving ground. If material is stored or equipment is operated near an excavation, stronger shoring should be used to resist the extra pressure due to superimposed loads. Care should be taken by the contractor when excavating near existing utilities to protect them from damage.

9.1.3. Subgrade Preparation

We recommend that the new pavement sections be founded on a zone of adequately moisture-conditioned and compacted engineered fill that extends 12 inches below the bottom of the AB layer or until the cobble and boulder layer is encountered, whichever is shallower. This new fill should be placed in new lifts approximately 6 inches in loose thickness and compacted by appropriate mechanical methods, to 95 percent or more relative compaction, in accordance with ASTM D698 at a moisture content generally above optimum. The overexcavation should extend 1 or more feet horizontally beyond the edge of the pavement.

Following the overexcavation as described above, and prior to the placement of new fill, the resulting exposed surface should be carefully evaluated by the geotechnical consultant. Based on this evaluation additional remediation may be needed. This may include scarification of the exposed surface, moisture conditioning and recompaction. The additional remediation, if needed, should be addressed by the geotechnical consultant during the earthwork operations.

After the subgrade has been constructed and brought to grade, the upper 6 inches of the exposed subgrade should then be lime slurry stabilized to a depth of 6 inches, in accordance with the requirements of MAG Section 309. Based on our exploration, there may be isolated areas where sandy soils (PI<10) predominate at subgrade level, for which lime stabilization offers little improvement. At the discretion of the engineer, if those areas are large enough, the requirement for lime stabilization may be waived in those areas.

9.2. Fill Materials

Imported soils and soils form onsite excavation activities (excluding cobbles and large diameter particles) are generally suitable for use as roadway engineered fill. Suitable fill should not include deleterious or organic material (more than 4 percent), clay lumps,

construction debris, rock particles, and other non-soil fill materials larger than 3 inches in dimension. This material should be disposed of offsite or in non-structural areas.

Imported roadway fill, if utilized, should be inorganic soils free of debris or fragments larger than 3 inches, which will exhibit an R-value of 20 or more. The geotechnical consultant should evaluate such materials and details of their placement prior to importation. In general, imported clayey soils which are suitable for lime stabilization are preferred under the new aggregate base.

Fill material should be placed in horizontal lifts approximately 6 inches in loose thickness. The fill should be compacted by appropriate mechanical methods, to 95 percent relative compaction, in accordance with ASTM D698 at a moisture content generally near optimum.

9.3. Seismic Design Considerations

Based on a Probabilistic Seismic Hazard Assessment for the Western United States, issued by the USGS (2008), the site is located in a zone where the peak ground accelerations that have a 10, 5, and 2 percent probability of being exceeded in 50 years are 0.04g, 0.05g, and 0.07g respectively. These ground motion values are calculated for "firm rock" sites, which correspond to a shear-wave velocity of approximately 2,500 feet per second in approximately the top 100 feet bgs. Different soil or rock conditions may amplify or de-amplify these values. Seismic design parameters according to the 2006 International Building Code (IBC) are presented in Table 1.

Table 1 – 2006 International Building Code Seismic Design Criteria

Seismic Design Factors	Value
Site Class	D
Site Coefficient, F_a	1.6
Site Coefficient, F_v	2.4
Mapped Spectral Acceleration at 0.2-second Period, S_s	0.170 g
Mapped Spectral Acceleration at 1.0-second Period, S_1	0.059 g
Spectral Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	0.272 g
Spectral Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	0.142 g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0.181 g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.095 g

9.4. Corrosion

The corrosion potential of the onsite materials was analyzed in the field and laboratory to evaluate its potential effect on any buried pipelines. Corrosion potential was evaluated using the results of laboratory testing of a near-surface soil sample obtained during our subsurface evaluation that was considered representative of soils at the project site Corrosion potential was also analyzed in the field, results of which are presented in Appendix C.

Laboratory testing consisted of pH, minimum electrical resistivity, and chloride and soluble sulfate contents. The pH and minimum electrical resistivity tests were performed in general accordance with Arizona Test 236b, while soluble sulfate and chloride content tests were performed in accordance with Arizona Test 733 and 736, respectively. The results of the corrosivity tests are presented in Appendix B.

The soil pH values of the sample tested from boring B-1 indicated a pH value of 7.9, which is considered to represent an alkaline environment and the minimum electrical resistivity value measured in the laboratory from this boring was found to be 1,026 ohm-cm, which is considered to be corrosive towards ferrous materials. The chloride content of the samples tested was found to be 47 ppm , and the water soluble sulfate content was found to be 0.0057 percent. The chloride content of the samples indicates that the soils are corrosive to

ferrous metals. The water soluble sulfate content of the soils is considered to represent negligible potential for degradation of buried concrete due to sulfate attack.

The results of the laboratory testing indicate that the onsite materials may be corrosive to ferrous metals. Therefore, special consideration should be given to the use of heavy gauge, corrosion protected, underground steel pipe or culverts, if any are planned. As an alternative, plastic pipe or reinforced concrete pipe could be considered. A corrosion specialist should be consulted for further recommendations.

9.5. Concrete

Laboratory chemical tests performed on selected samples from borings B-1 and B-9 were found to be 0.0057 and 0.0055 percent by weight, respectively. Based on the following American Concrete Institute (ACI) table, the on-site soils are considered to have a negligible sulfate exposure to concrete.

Table 2 – Requirements for Concrete Exposed to Sulfate-Containing Solutions

Sulfate exposure	Water soluble sulfate (SO_4) in soil, percent by weight	Sulfate (SO_4) in water (ppm)	Cement type	Maximum water-cementitious material ratio, by weight, normal weight concrete*	Minimum f'_c, normal weight and lightweight concrete, psi
Negligible	$0.00 \leq SO_4 < 0.10$	$0 \leq SO_4 < 150$	—	—	—
Moderate[1]	$0.10 \leq SO_4 < 0.20$	$150 \leq SO_4 < 1500$	II, IP(MS), IS (MS), P(MS), I(PM) (MS), I(SM) (MS)	0.50	4,000
Severe	$0.20 \leq SO_4 < 2.00$	$1500 \leq SO_4 < 10,000$	V	0.45	4,500

Table 2 – Requirements for Concrete Exposed to Sulfate-Containing Solutions

Sulfate exposure	Water soluble sulfate (SO_4) in soil, percent by weight	Sulfate (SO_4) in water (ppm)	Cement type	Maximum water-cementitious material ratio, by weight, normal weight concrete*	Minimum f'_c, normal weight and lightweight concrete, psi
Very severe	SO_4 > 2.00	SO_4 > 10,000	V plus pozzolan[2]	0.45	4,500

*When both Table 4.3.1 ands Table 4.2.2 are considered, the lowest applicable maximum water-cementitious material ratio and highest applicable minimum f'_c shall be used.

[1] Seawater.

[2] Pozzolan that has been determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement.

Based on our experience with similar soil conditions and the Valley practice, we recommend the use of Type II cement for construction of concrete structures at this site. Due to potential uncertainties as to the use of reclaimed irrigation water, or topsoil that may contain higher sulfate contents, pozzolon or admixtures designed to increase sulfate resistance may be considered. The geotechnical consultant should evaluate such materials prior to their placement.

The concrete should have a water-cementitious materials ratio no more than 0.45 by weight for normal weight aggregate concrete. The structural engineer should select the concrete design strength based on the project specific loading conditions. Higher strength concrete may be selected for increased durability, resistance to slab curling, and shrinkage cracking.

9.6. Pavements

The following sections present our design assumptions and recommendations for new flexible pavement along MC-85 from 75th Avenue to 91st Avenue in Maricopa County, Arizona. MCDOT-RDM (2004) Guidelines and Specifications contained within MAG *Uniform Standard Specifications and Details for Public Works Construction (2006)* were followed in the design of new flexible pavement for this project.

9.6.1. Existing Pavement

Based on our field exploration, pavement distress of low to medium severity fatigue, edge cracking, polished aggregate, and longitudinal and transverse cracking were noted at various locations of MC-85 within the project limits. It is our opinion that the various distress features noted on the existing pavement may be the result of repeated traffic loadings, age of pavement, and/or environmental factors. It is our opinion that the distresses noted indicate both structural and functional failure of the pavement at those locations.

The existing pavement indicated structural sections as shown in Table 3 below. The asphalt thickness varied from 3 inches to 8 inches, and the aggregate base ranged in thickness from 5 inches to 10 inches.

Table 3 – Observed Pavement Sections at the Boring Locations

Boring Number	Estimated Total Pavement Thickness (inches)	Estimated AB Thickness (inches)
B-1	7.0	10.0
B-2	6.0	9.0
B-3	6.0	9.0
B-4	5.0	8.0
B-5	8.0	8.0
B-6	3.0	7.0
B-7	8.0	10.0
B-8	8.0	10.0
B-9	7.0	5.0
B-10	7.0	5.0
B-11	7.0	10.0

9.7. New Pavement

The following sections provide design assumptions and recommendations for those areas of MC-85 within the project limits that will be widened. In providing these recommendations,

we assumed that AC would be used for the new flexible pavement and subgrade preparation recommendations outlined in this report would be employed.

9.7.1.1. Traffic

Based on information provided by the MCDOT Traffic Count Program and the Design Concept Report prepared by Parsons Brinkerhoff, we understand that the 2005 Average Daily Traffic (ADT) was 19,068 the percentage truck traffic was 15 percent, and the annual growth rate was 5 percent. Based on these parameters the resulting design lane equivalent single axle load (ESAL) was estimated to be approximately 15,000,000 for the year 2026.

9.7.1.2. R-value

The subsurface soils encountered in our borings predominantly consisted of clay, silty sand and silt. The recommended R-value provided below assumes the soil conditions encountered within the borings are representative of the soil conditions within the proposed pavement areas. If during construction, the subgrade is found to vary from the expected soil conditions, we should be contacted so we may re-evaluate our recommended R-value.

Based on MCDOT-RDM Section 10.2.2.1.1.2, the average correlated R-value obtained form seven laboratory tests performed by Ninyo & Moore and Terracon were found to be 21 (<50) and the standard deviation was found to be 2.8 (<10). For purposes of design and new construction, it is assumed that soils located within 3 feet of the finished roadway subgrade will exhibit an average R-value of 20. If the project needs fill from an offsite source, we recommend the soils used for subgrade support should have an R-value of 20 or more.

9.7.1.3. Resilient Modulus and Drainage Coefficient

Based on Section 10.2.2.1.1.3 of the MCDOT-RDM, the approximate subgrade soil resilient modulus was calculated to be 13,000 pounds per square inch (psi). A seasonal variation factor (SVF) of 1.0 was used in the design of flexible pavement for the project.

9.7.1.4. Roadbed Swelling

Remolded swell laboratory tests conducted by Terracon on select soil samples indicated that the average expansion was approximately 4 percent. Based on the MCDOT-RDM, a 6 inch lime stabilized layer below the AB layer is recommended.

9.7.1.5. Recommended Asphalt Pavement Sections

Based on the estimated traffic and the resilient modulus of the subgrade soils, the calculated asphalt pavement sections are presented in Table 5 below. The minimum structural number is 4.42. The AASHTO method was used to evaluate bituminous layer thicknesses and was based on the input parameters presented in Table 4.

Table 4 – Pavement Design Parameters

Design Period	20 years
Average Daily Traffic (Year 2005)	19,068 vehicles
Percent Heavy Trucks:	15%
Growth Rate:	5% per year
Approximate Design ESALs (Year 2026)	15,000,000
Reliability:	95 percent
Overall Deviation:	0.45
Resilient Modulus:	13,000 psi
Initial Serviceability	4.5
Terminal Serviceability:	2.5

The following table presents the layer materials and thicknesses recommended for this project.

Table 5 – Pavement Structural Section Recommendations

Road Name	Layer	Thickness Alternative 1	Thickness Alternative 2	Thickness Alternative 3
MC 85 75th Avenue to 91st Avenue	Rubberized AC	-	-	1.5"
	Bituminous Surface Course 12.5 mm	2.0"	2.0"	2.0"
	Bituminous Base Course 19.0 mm	5.0"	6.0"	3.0"
	Aggregate Base Course MAG 710	5.0"	4.0"	4.0"
	Lime Stabilized Subgrade	6.0"	6.0"	6.0"
	Structural Number	4.50	4.80	4.46
	Cost per square yard	$34.43	$37.48	$32.22

The AB mentioned above should meet Section 710 of the MAG specifications requirements, as shown in Table 6.

Table 6 – Recommended Aggregate Base Gradation

Sieve Size (Per ASTM D422-63 (02))	Percent Passing by Weight
1 – ¼ inch	100
No. 4	38-65
No. 8	25-60
No. 30	10-40
No. 200	3-12
P.I. Max.	5

Aggregate base material should be compacted to a relative compaction of 100 percent or more of the maximum dry density, as evaluated by ASTM D-698, at a moisture content generally not exceeding the optimum moisture content.

9.7.2. Remove and Replace

Our field exploration indicated a pavement structural section of 3 inches of AC over 6 inches of AB at Boring B-6. Based on station numbers as indicated in the Final Design Concept Report (DCR) prepared by Parsons Brinckerhoff on October 14, 2003, we recommend that the existing pavement between Sta. 1293 (approximate) and Sta. 1297 (approximate) be removed and replaced with new pavement as recommended in Section 9.6.1.5 of this report. The subgrade preparation for this new pavement should also be followed as per Section 9.1.3 of this report.

9.7.3. Mill and Overlay

Our visual evaluation of the existing pavement condition indicates that the existing pavement areas should be suitable for a milling and overlaying operation. Within existing pavement areas not planned to be reconstructed, we recommend the pavement areas be milled to a depth of 1.5 inches and overlain with 1.5 inches of hot mix AC.

If cracks larger than ¼ inch wide are observed at the surface of the AC after the milling operation is finished, we recommend that a paving fabric or geotextile be incorporated into the pavement section. The paving fabric or geotextile should generally be centered on the crack, and should extend 6 or more inches laterally beyond the crack. For this application, we recommend that a ½ inch layer of gap graded AC be placed on the milled surface, and the paving fabric or geotextile be placed over this thin lift of AC. This thin lift of AC is recommended because the paving fabric or geotextile may have difficulty adhering to the milled surface due to the dust and surface roughness. After the pavement fabric or geotextile is applied, the remainder of the pavement overlay can be constructed.

For areas where high severity pavement distresses are apparent at the existing roadway surface after the milling, and also in areas where the underlying soils might get exposed during milling operations, we recommend that the asphalt be removed and replaced with new AC. After the cracked asphalt is removed and prior to the placement of the new asphalt, the exposed subgrade and/or base should be evaluated for excessively loose or wet material. If encountered, the unacceptable material should either be removed and replaced or recompacted in place. Subgrade preparation guidelines as outlined in Section 9.1.3 should be followed.

9.8. Site Drainage

Surface drainage should be provided to divert water away from the paved surfaces. Surface water should also not be permitted to pond on or below pavement areas. Positive drainage for this project is defined as a slope of 2 percent or more for a distance of 5 feet or more away from the pavements. To deter accumulation of water below the new pavement sections, the subgrade soils below the new pavement sections should be sloped away from the center of the roadway.

10. PRE-CONSTRUCTION CONFERENCE

We recommend that a pre-construction conference be held. Representatives of the owner, the civil engineer, the geotechnical consultant, and the contractor should be in attendance to discuss the project plans and schedule. Our office should be notified if the project description included herein is incorrect or if the project characteristics are significantly changed.

11. CONSTRUCTION OBSERVATION AND TESTING

During construction operations, we recommend that a qualified geotechnical consultant perform observation and testing services for the project. These services should be performed to evaluate exposed subgrade conditions, including the extent and depth of overexcavation, to evaluate the suitability of proposed borrow materials for use as fill and to observe placement and test

compaction of fill soils. If another geotechnical consultant is selected to perform observation and testing services for the project, we request that the selected consultant provide a letter to the owner, with a copy to Ninyo & Moore, indicating that they fully understand our recommendations and that they are in full agreement with the recommendations contained in this report. Qualified subcontractors utilizing appropriate techniques and construction materials should perform construction of the proposed improvements.

12. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but are not limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are

encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

13. REFERENCES

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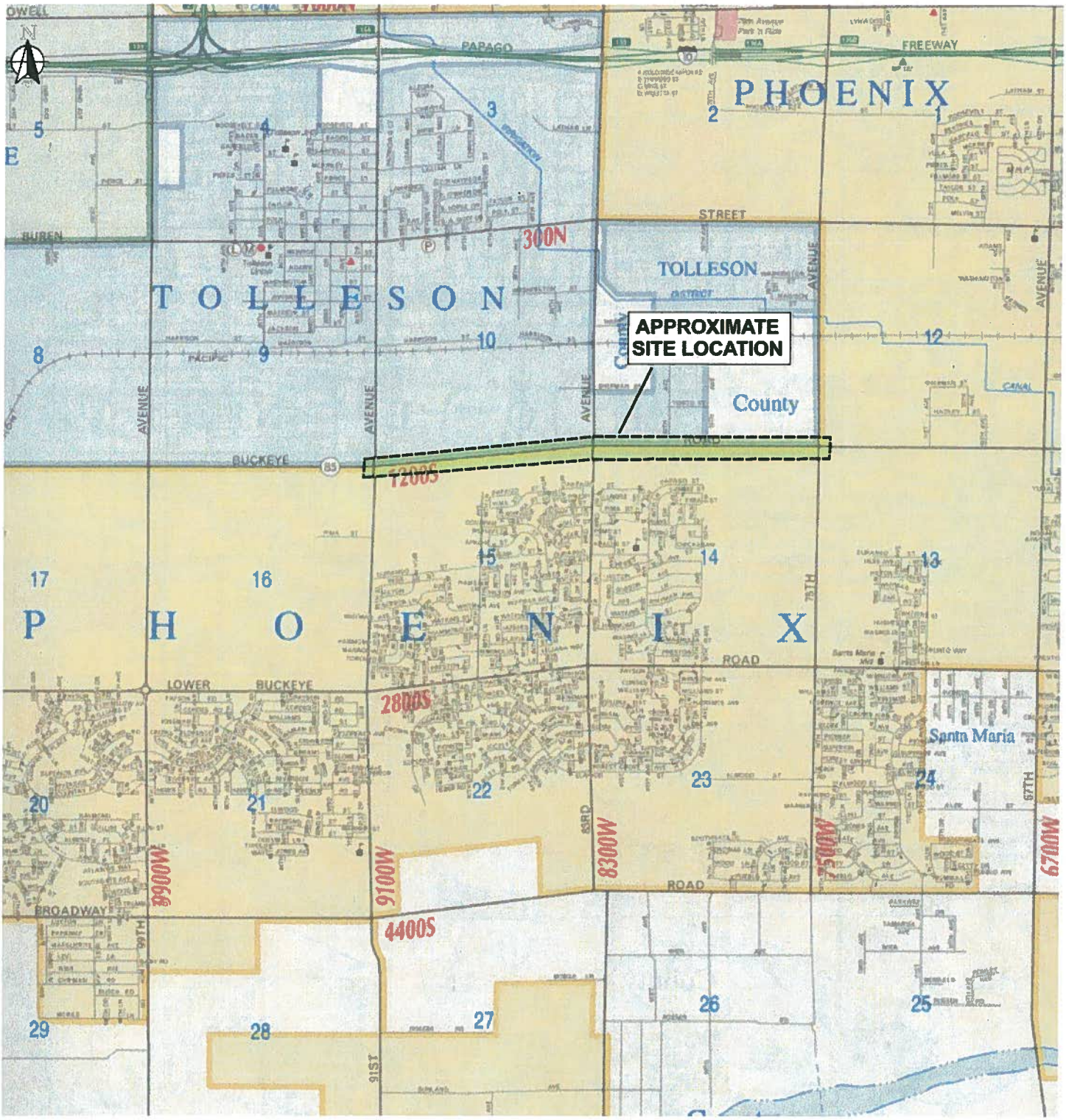
Aerial Photographs Reviewed

Source	Date
Flood Control District of Maricopa County	2005, 2007
Landiscor's Real Estate Photo Book	1999
United States Department of Agriculture	1997



0 3300

Approximate Scale:
1 inch = 3300 feet

Source: Phoenix Mapping Service, Phoenix Metro Edition 2005

Ninyo & Moore		SITE LOCATION MAP	FIGURE 1
PROJECT NO: 601301002	DATE: 9/10	MC-85 ROADWAY IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	

1301vmap0910

LEGEND

B11	⊕	Approximate Boring Location Advanced by Ninyo and Moore as part of this Geotechnical Evaluation
R8	⊢⊣	Approximate Location of Field Resistivity Measurement
P11	▲	Approximate Boring Location Advanced by Terracon in 2003 as part of the DCR

0 1200

Approximate Scale:
1 inch = 1200 feet

NOTE: All boundaries and locations are approximate.

Ninyo & Moore

PROJECT NO:	DATE:
601301002	9/10

BORING AND FIELD RESISTIVITY LINES LOCATION MAP

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE
MARICOPA COUNTY, ARIZONA

FIGURE
2

FILE NO. 1301002005

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following methods.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer or the Kelly bar of the drill rig in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

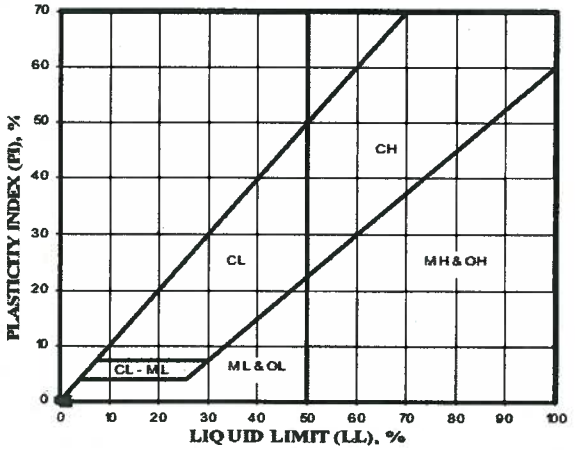
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction <No. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

GRAIN SIZE CHART

CLASSIFICATION	RANGE OF GRAIN SIZE	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
Coarse	3" to 3/4"	76.2 to 19.1
Fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.075
Coarse	No. 4 to No. 10	4.76 to 2.00
Medium	No. 10 to No. 40	2.00 to 0.420
Fine	No. 40 to No. 200	0.420 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

PLASTICITY CHART



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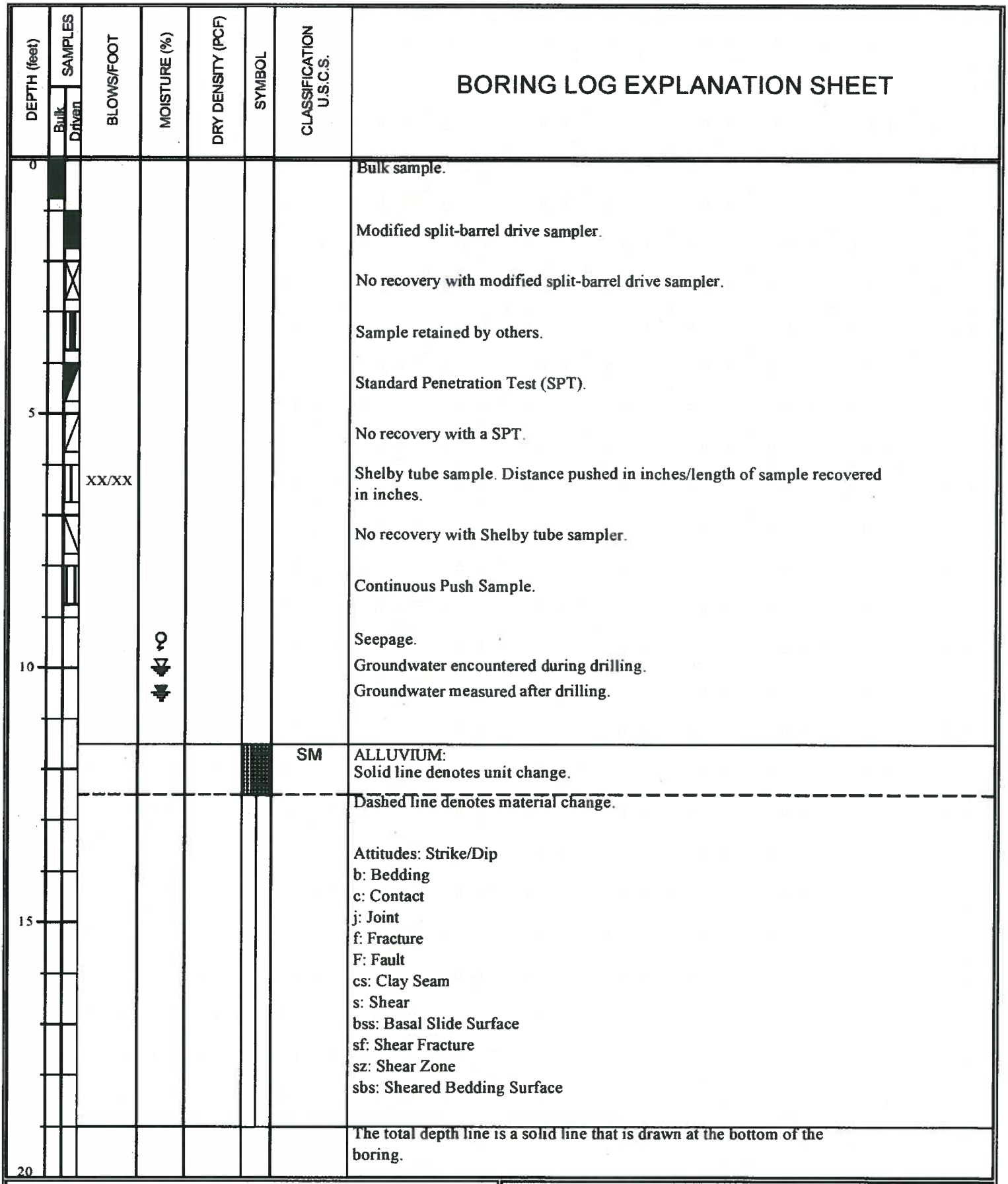
U.S.C.S. METHOD OF SOIL CLASSIFICATION



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BORING LOG

EXPLANATION OF BORING LOG SYMBOLS

PROJECT NO.	DATE	FIGURE
	Rev. 01/03	

DATE DRILLED 06/26/06 BORING NO. B-1

GROUND ELEVATION - SHEET 1 OF 1

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 7 inches thick.
						GP	AGGREGATE BASE: Approximately 10 inches thick. Brown, damp, medium dense, fine to coarse GRAVEL with sand; subrounded; few silt.
		19	9.0	120.3		CL	FILL: Brown, damp, very stiff, CLAY; few fine to coarse sand; scattered reworked caliche filaments.
		2					Soft.
5		22					Very stiff.
						ML	ALLUVIUM: Brown, damp, medium dense, fine sandy SILT.
		13					
10						CL	Brown, damp, firm, silty CLAY; few fine sand.
		32				ML	Light brown, damp, dense, fine sandy SILT; trace clay.
15							
							Total Depth = 17 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling. Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-1

DATE DRILLED 06/26/06 BORING NO. B-2

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 6 inches thick.
						GP	AGGREGATE BASE: Approximately 9 inches thick. Brown, damp, medium dense, coarse GRAVEL with sand; few silt.
						SM	FILL: Brown, moist, medium dense, silty fine to coarse SAND; few fine gravel.
		28				SC	Brown, moist, medium dense, clayey fine to coarse SAND; few silt.
		8					Coarse gravel; cobbles and possible boulders; difficult drilling.
5						CL	ALLUVIUM: Brown, moist, stiff, CLAY; few fine sand; scattered caliche filaments.
		23					Very stiff.
		17					Decrease in sand content; scattered organics.
10						ML	Brown, damp, dense, sandy SILT; few coarse gravel; trace clay.
		66					
15						SM	Brown, damp, very dense, silty fine SAND; trace coarse gravel.
		50/5"					
20							Total Depth = 18.9 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling.

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BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-2

DATE DRILLED 06/26/06 BORING NO. B-2

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-3

DATE DRILLED 06/26/06 BORING NO. B-3

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 6 inches thick.
						GP	AGGREGATE BASE: Approximately 9 inches thick. Brown, damp, medium dense, fine to coarse GRAVEL with sand; few silt.
		8				CL	FILL: Brown, moist, stiff, CLAY; few fine sand; scattered reworked caliche filaments.
5		14				SC-SM	Brown, damp, loose to medium dense, silty clayey fine SAND.
		6				SM	ALLUVIUM: Brown, moist, loose, silty fine SAND.
10		17					Medium dense.
15		11					
		50/5"					Cobbles and possible boulders.
20							Total Depth = 18.9 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling.

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BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-4

DATE DRILLED 06/26/06 BORING NO. B-3

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
25								
30								
35								
40								

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BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-5

DATE DRILLED 07/13/06 BORING NO. B-4

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 5" thick.
						GP	AGGREGATE BASE: Approximately 8" thick.
						CL	Brown, damp, medium dense, fine to coarse GRAVEL with sand; few silt.
		19	15.5	114.8			ALLUVIUM: Brown, moist, stiff to very stiff, fine sandy CLAY; trace to few silt.
		8					
5							Scattered caliche nodules.
		27					
		11					
10							
		16	13.1	114.4		SP	Brown, damp, medium dense, fine to medium SAND; trace silt.
15							
						SM	Brown, damp, medium dense, silty fine to medium SAND.
		18					
20							

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BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-6

DATE DRILLED 07/13/06 BORING NO. B-4

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 07/13/06 promptly after completion of drilling.
25								
30								
35								
40								

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BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-7

DATE DRILLED 06/26/06 BORING NO. B-5

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 8 inches thick.
						GP	AGGREGATE BASE: Approximately 8 inches thick. Brown, damp, medium dense, fine to coarse GRAVEL; few silt.
		22				CL	FILL: Brown, moist, very stiff, CLAY; few fine sand; scattered reworked caliche filaments.
5		24					
		27				SM	ALLUVIUM: Brown, damp, medium dense, silty fine SAND; trace clay; scattered caliche filaments.
		23				CL	Brown, damp, hard, silty CLAY; trace fine sand.
10							
		40				SM	Brown, moist, medium dense, silty fine to coarse SAND; trace fine gravel.
15							
		23				SC	Brown, damp, dense, clayey fine to medium SAND; few silt; scattered caliche filaments.
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-6

DATE DRILLED 06/26/06 BORING NO. B-5

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling. Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
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Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-7

DATE DRILLED 06/26/06 BORING NO. B-6

GROUND ELEVATION - SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 3 inches thick.
						GP	AGGREGATE BASE: Approximately 7 inches thick.
						CL	Brown, damp, medium dense, fine to coarse GRAVEL with sand; few silt.
		5					ALLUVIUM: Brown, moist, stiff, CLAY; trace fine sand; scattered caliche filaments.
		36				SC	Brown, damp, medium dense, clayey fine to medium SAND; few silt; scattered to numerous caliche filaments and nodules; moderately cemented.
5							
		20				CL	Brown, damp, very stiff to hard, CLAY; trace fine sand; scattered caliche filaments.
		21					Scattered organics.
10							
		67				SC	Brown, damp, very dense, clayey fine to medium SAND; few silt; scattered caliche filaments; weakly cemented.
15							
		38				GM	Brown, moist, medium dense, silty fine to coarse GRAVEL with sand.
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-8

DATE DRILLED 06/26/06 BORING NO. B-6

GROUND ELEVATION - SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling. Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
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Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-9

DATE DRILLED 06/26/06 BORING NO. B-7

GROUND ELEVATION - SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 8 inches thick.
						GP	AGGREGATE BASE: Approximately 10 inches thick. Brown, damp, medium dense, fine to coarse GRAVEL with sand; few silt.
						GP	ALLUVIUM: Brown, damp, dense, fine to coarse GRAVEL with sand; few silt; cobbles and possible boulders.
5						CL	Brown, damp, hard, CLAY; trace fine gravel.
		28					
						ML	Light brown, damp, medium dense, fine sandy SILT.
		11					
10						ML	Brown, damp, very dense, sandy SILT; scattered caliche filaments and nodules.
		50/2"					Sample disturbed.
15							
						SM	Brown, moist, medium dense, silty fine SAND.
		8					
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-10

DATE DRILLED 06/26/06 BORING NO. B-7

GROUND ELEVATION - SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling. Information on this soil boring data sheet was obtained for design purposes. It is the contractor's responsibility to establish soil information for their bid and construction purposes.
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Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-11

DATE DRILLED 06/26/06 BORING NO. B-8

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill,Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 8" thick.
						SP	AGGREGATE BASE: Approximately 10" thick. Brown, damp, medium dense, fine to coarse SAND with gravel; few silt.
						GP	ALLUVIUM: Brown, damp, dense, fine to coarse GRAVEL with sand; few silt; cobbles and possible boulders.
						CL	Brown, damp, very stiff, fine sandy CLAY; trace to few silt; scattered caliche nodules.
5		14					
		49					Hard; scattered pinhole-sized pore spaces.
10		21					
		50/5"					
15							
						SP	Brown, damp, medium dense, fine to coarse SAND; trace to few silt and fine gravel.
		18					
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-14

DATE DRILLED 06/26/06 BORING NO. B-8

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill,Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY JSR LOGGED BY JSR REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 06/26/06 promptly after completion of drilling.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-15

DATE DRILLED 07/13/06 BORING NO. B-9

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 7" thick.
						GP	AGGREGATE BASE: Approximately 5" thick.
						SM	Brown, damp, medium dense, GRAVEL with sand.
		6					ALLUVIUM: Brown, damp, loose, silty fine to medium SAND; scattered caliche nodules.
						CL	Brown, moist, very stiff, fine sandy CLAY; trace to few silt; scattered caliche nodules.
5		23	22.1	95.5			
						SM	Brown, damp, medium dense, silty fine to medium SAND; scattered caliche nodules.
		16					
						CL	Brown, moist, hard, fine sandy CLAY; trace silt.
10		34	19.6	104.3			
						SP	Brown, damp, very dense, fine to coarse SAND; trace to few silt; scattered caliche nodules; weakly cemented.
15		50/4"					
		31					Medium dense.
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-16

DATE DRILLED 07/13/06 BORING NO. B-9

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 07/13/06 promptly after completion of drilling.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-17

DATE DRILLED 07/13/06 BORING NO. B-10

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 7" thick.
						GP	AGGREGATE BASE: Approximately 5" thick.
						SP	Brown, damp, medium dense, fine to coarse GRAVEL with fine sand.
		17				CL	ALLUVIUM: Brown, damp, medium dense, fine to coarse SAND; trace to few silt; trace fine to coarse gravel.
							Dark brown, damp, very stiff, fine sandy CLAY; trace silt.
		8					Stiff.
5							
		46	12.7	134.0			Hard; numerous caliche nodules.
		18					Very stiff.
10							
						SC	Brown, damp, very dense, clayey fine to coarse SAND; trace to few silt; weakly to moderately cemented.
		76/10"	8.5	117.4			
15							
						SP	Brown, damp, medium dense, fine to coarse SAND; trace silt.
		13					
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-18

DATE DRILLED 07/13/06 BORING NO. B-10

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 07/13/06 promptly after completion of drilling.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-19

DATE DRILLED 07/13/06 BORING NO. B-11

GROUND ELEVATION _____ SHEET 1 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 7" thick.
						GP	AGGREGATE BASE: Approximately 10" thick. Brown, damp, medium dense, fine to coarse GRAVEL with sand.
		8				CL	ALLUVIUM: Brown, moist, stiff, fine sandy CLAY; trace silt; scattered caliche filaments and nodules.
		24	20.8	96.9			Very stiff.
5							
		21				SC	Brown, damp, dense, clayey fine to coarse SAND; trace to few silt; scattered caliche nodules.
		36				CL	Brown, damp, hard, fine sandy CLAY; trace to few silt; scattered caliche nodules.
10							
		63/11"				SP	Brown, damp, very dense, fine to coarse SAND; trace to few silt; trace fine gravel.
15							
		51	9.8	107.8			Dense.
20							

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-20

DATE DRILLED 07/13/06 BORING NO. B-11

GROUND ELEVATION _____ SHEET 2 OF 2

METHOD OF DRILLING CME-75, 6.5" Diameter Hollow-Stem Auger (Enviro-Drill, Inc.)

DRIVE WEIGHT 140 lbs. (Automatic) DROP 30"

SAMPLED BY DM LOGGED BY DM REVIEWED BY HAH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. Groundwater not encountered during drilling. Backfilled and asphalt patched on 07/13/06 promptly after completion of drilling.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

MC-85 ROADWAY IMPROVEMENTS
75TH AVENUE TO 91ST AVENUE - MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	FIGURE
601301002	9/10	A-21

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1through B-4. These test results were utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System (USCS).

Atterberg Limits

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System (USCS). The test results and classifications are shown on Figure B-5.

Consolidation Tests

Consolidation tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D 2435. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the tests are summarized on Figure B-6

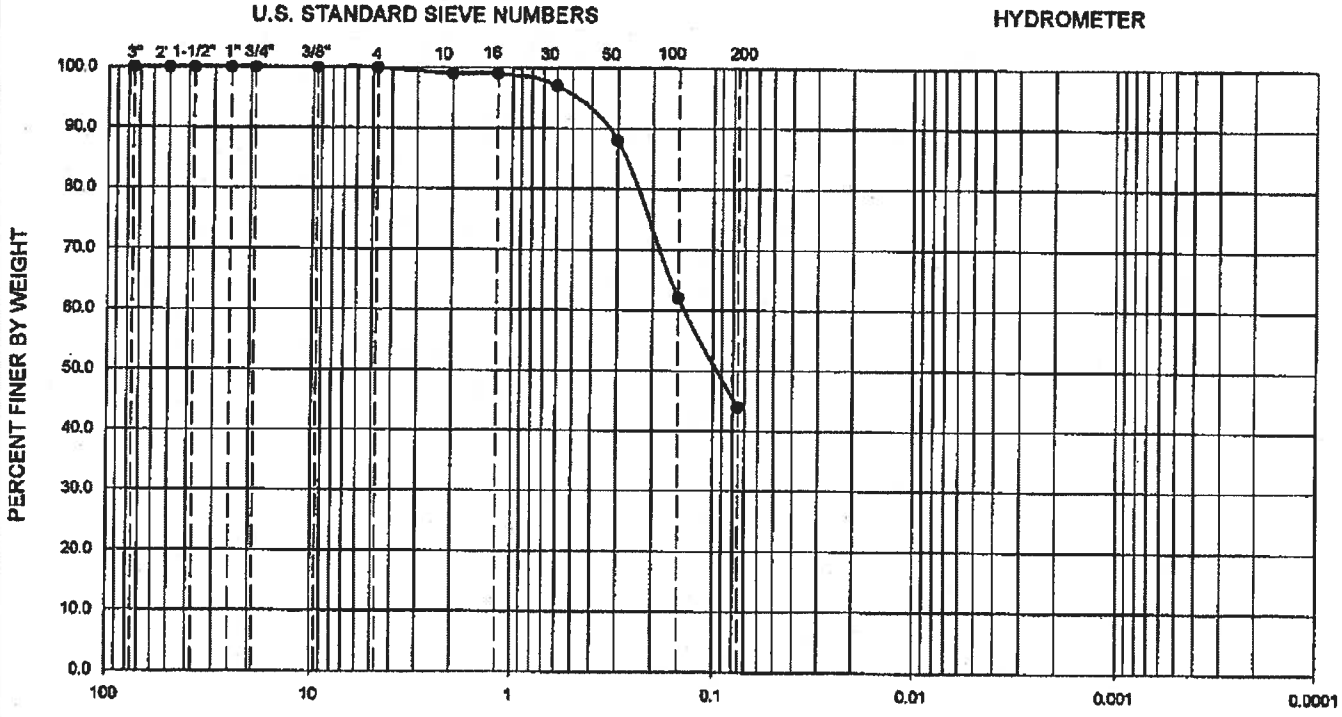
Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on representative samples in general accordance with Arizona Test Method 236b. The soluble sulfate and chloride content of selected samples were evaluated in general accordance with Arizona Test Method 733 and 736), respectively. The test results are presented on Figure B-7

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with California Test (CT) 301. Samples were prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-8

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY

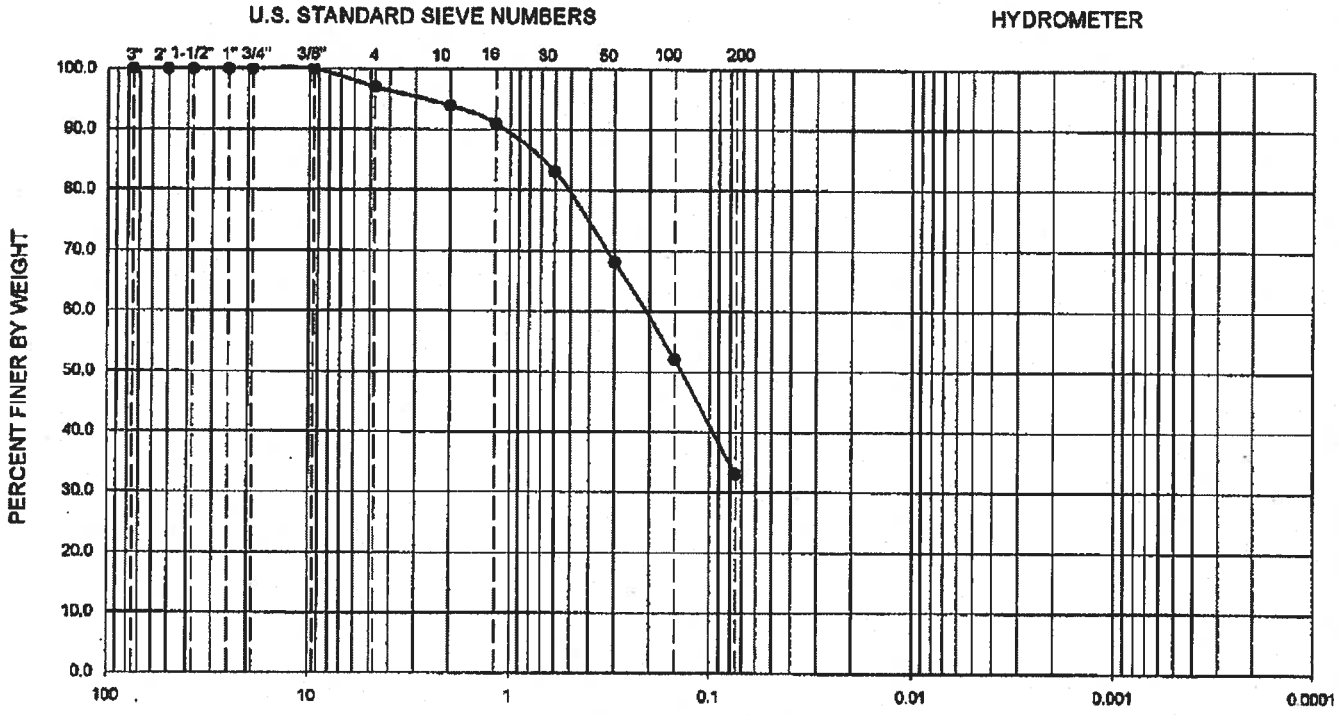


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-3	3.5-5	22	17	5	--	--	--	--	--	44	SC-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC-85 ROADWAY IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-1

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



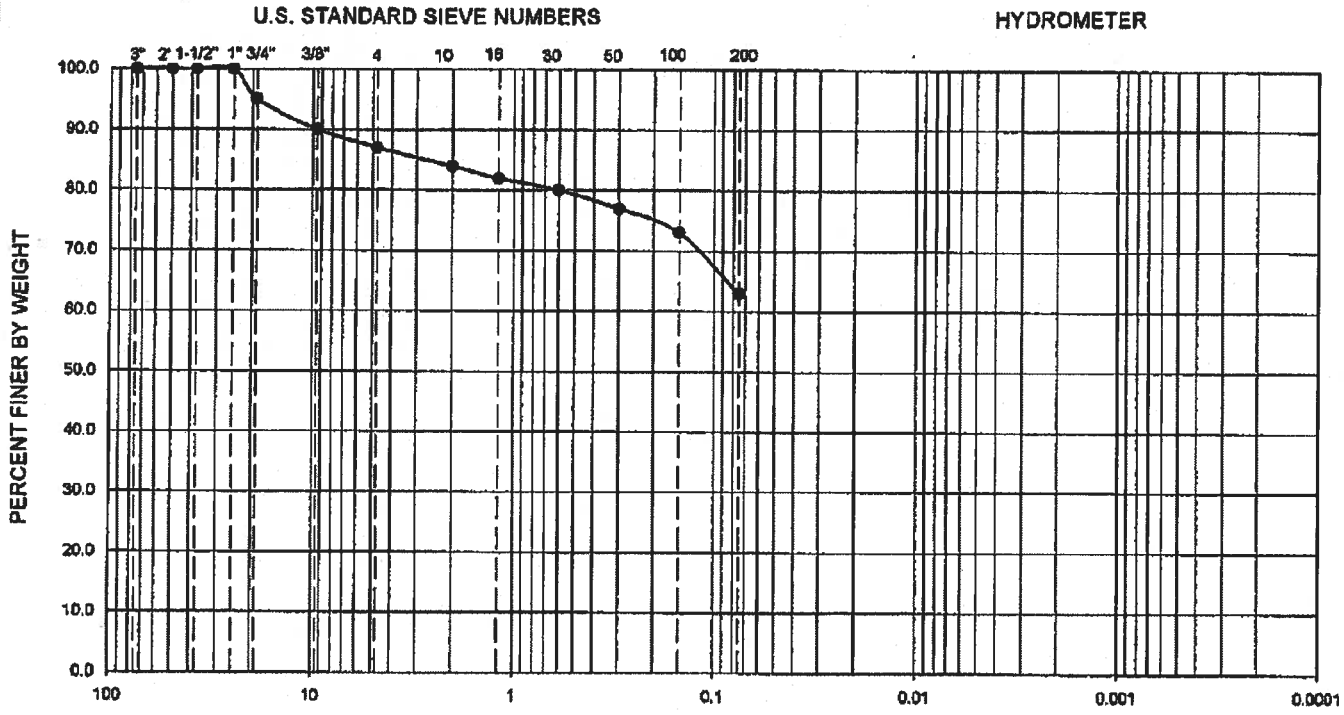
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-5	13.5-15	NP	NP	NP	--	--	--	--	--	33	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

NP Indicates Non Plastic

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC 85 IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-2

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



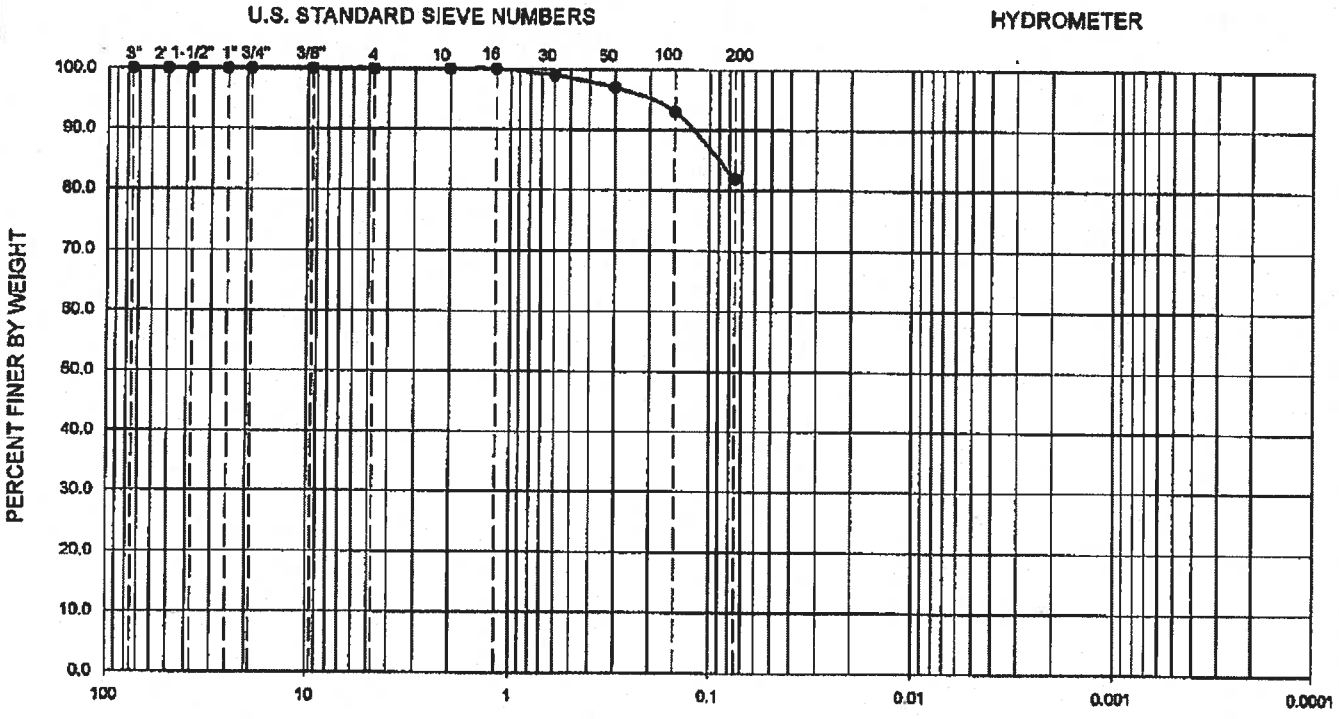
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-7	13.5-14.1	NP	NP	NP	--	--	--	--	--	63	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

NP Indicates Non Plastic

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC 85 IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-3

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



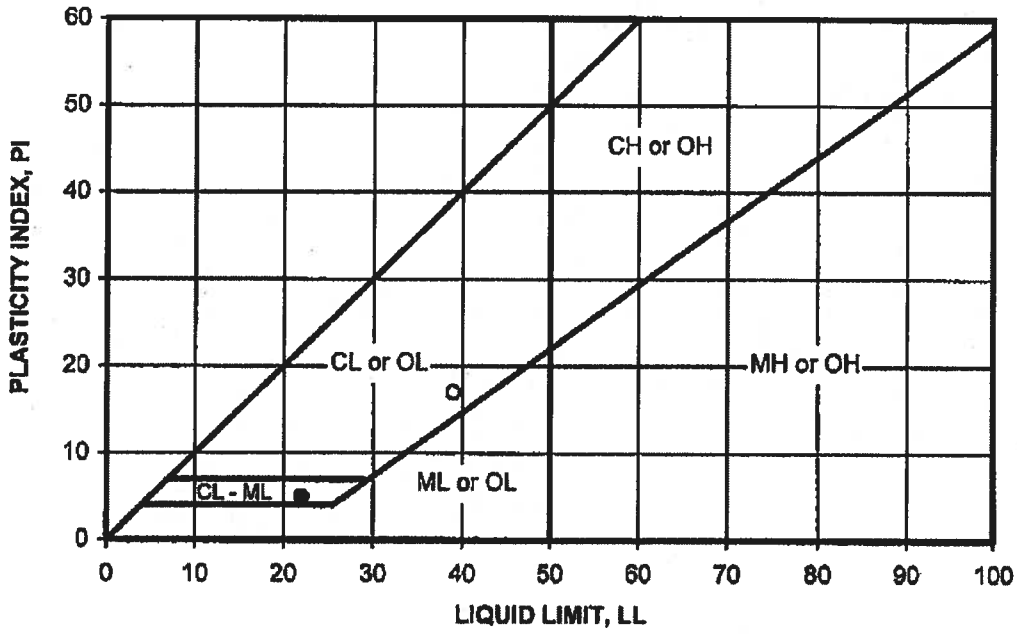
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-11	8.5-10	39	22	17	--	--	--	--	--	82	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC 85 IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-4

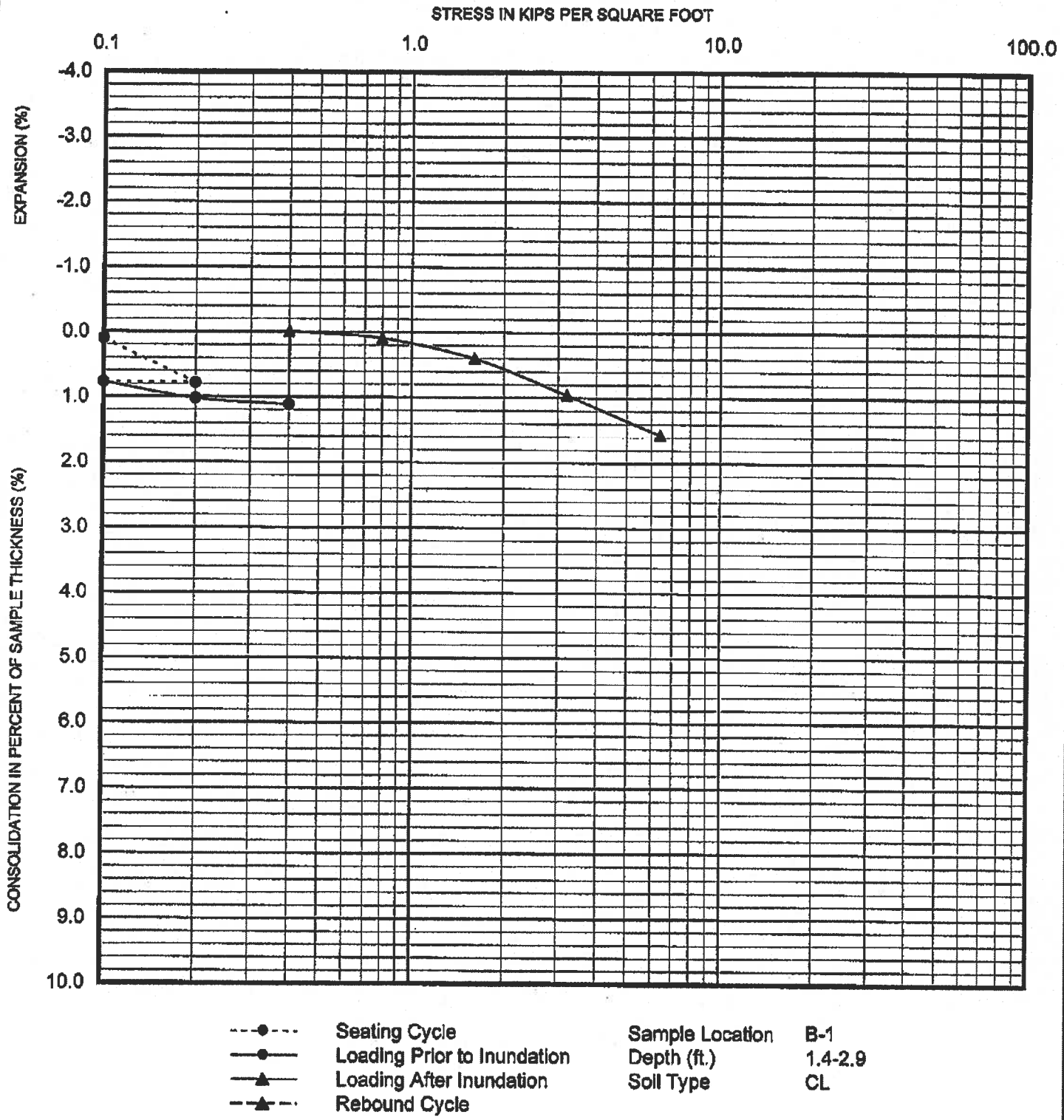
SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-3	3.5-5	22	17	5	CL-ML	SC-SM
■	B-5	13.5-15	NP	NP	NP	NP	SM
◆	B-7	13.5-14.1	NP	NP	NP	NP	ML
○	B-11	8.5-10	39	22	17	CL	CL

NP - Indicates Non-Plastic



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318-05

Ninyo & Moore	ATTERBERG LIMITS TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC 85 IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-5



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435-04

Ninyo & Moore	CONSOLIDATION TEST RESULTS	FIGURE
PROJECT NO. 601301002 / DATE 9/10	MC-85 ROADWAY IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-6

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-1	1.6-5.0	7.9	1,026	57	0.0057	47
B-9	10-15	8.5	1,847	55	0.0055	48

[1] PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD ARIZ 236b
[2] PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD ARIZ 733
[3] PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD ARIZ 736

Ninyo & Moore	CORROSIVITY TEST RESULTS	FIGURE
PROJECT: 601301002 / DATE: 9/10	MC-85 ROADWAY IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE MARICOPA COUNTY, ARIZONA	B-7

SAMPLE LOCATION	SAMPLE DEPTH (FT)	R-VALUE
B-2	1.2-2.7	15
B-5	1-5	18
B-11	1.5	15

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844-01

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	MC 85 IMPROVEMENTS 75TH AVENUE TO 91ST AVENUE PHOENIX, ARIZONA	B-8
601301002	9/10		

APPENDIX C

GEOPHYSICAL SURVEYS

On June 30, 2006 representatives from our office conducted geophysical studies that consisted of performing soil resistivity measurements at the project site at eight surveyed locations. The following paragraphs summarize our field techniques, data analysis, and results.

Soil resistivity information of the subsurface materials was obtained at the site locations indicated on Figure 2. The data were collected in general accordance with ASTM G57 using an L&R MINIRES Resistivity Meter and four electrodes in a Wenner array configuration. The MINIRES can generate up to 500volts and 5 mA, at a switching frequency of 30 Hertz. The instrument allows for the measurement of earth resistance in ohms.

It should be noted that existing buried utility lines including possible metallic lines such as electrical, water supply, and natural gas parallel many of our survey traverses within the right of way for MC-85 on both the north and south sides of the roadway. These lines can be a source of interference to our resistivity measurements and can cause measurement inaccuracies, specifically artificially decreased soil resistivity values. It should also be noted that due to site conditions, it was also not possible to conduct the orthogonal traverses over a common mid-point. This may adversely affect our accurate estimation of the soil's electrical heterogeneity in lateral dimensions.

Soil resistivity measurements were collected at electrode spacings of 2, 5, 10, 20, 30, 50, and 75 feet along surveyed traverses, generally oriented north-south or east-west respectively. The results of the resistivity surveys are presented in Table C-1. In general, the resistivity data collected are of good quality, with good to fair agreement between orthogonal traverses indicating fairly homogenous to slightly heterogeneous soil electrical properties at the locations we surveyed. Note that several of our resistivity measurements indicate that the materials we surveyed are potentially corrosive to ferrous metals.

Table C-1 – Electrical Resistivity Results

Line No.	Spacing (ft.)	Resistance (ohms)	Apparent Resistivity (ohm ft)	Apparent Resistivity (ohm cm)
R-1	2	5.57	70	2,133
	5	1.14	36	1,092
	10	0.76	48	1,455
	20	0.40	50	1,532
	30	0.31	58	1,781
	50	0.16	50	1,532
	75	0.15	71	2,155
R-2	2	5.62	71	2,153
	5	1.13	35	1,082
	10	0.74	46	1,417
	20	0.39	49	1,494
	30	0.33	62	1,896
	50	0.15	47	1,436
	75	0.14	66	2,011
R-3	2	4.76	59	1812
	5	1.57	49	1,503
	10	0.64	40	1,226
	20	0.29	36	1,111
	30	0.21	40	1,207
	50	0.14	44	1,341
	75	0.14	66	2,011

Table C-1 – Electrical Resistivity Results

Line No.	Spacing (ft.)	Resistance (ohms)	Apparent Resistivity (ohm ft)	Apparent Resistivity (ohm cm)
R-4	2	2.67	34	1,023
	5	1.61	51	1,542
	10	0.91	57	1,743
	20	0.43	54	1,647
	30	0.27	51	1,551
	20	0.43	54	1,647
	30	0.27	51	1,551
	50	0.16	50	1,532
	75	0.15	71	2,155
R-5	2	4.70	59	1,800
	5	1.59	50	1,523
	10	0.68	43	1,302
	20	0.31	39	1,187
	30	0.22	41	1,264
	50	0.16	50	1,532
	75	0.14	66	2,011
R-6	2	4.40	55	1,685
	5	1.35	42	1,293
	10	0.57	36	1,092
	20	0.39	49	1,494
	30	0.33	62	1,896
	50	0.14	44	1,341

Table C-1 – Electrical Resistivity Results

Line No.	Spacing (ft.)	Resistance (ohms)	Apparent Resistivity (ohm ft)	Apparent Resistivity (ohm cm)
R-6	75	0.14	66	2,011
R-7	2	2.65	33	1,015
	5	1.63	51	1,561
	10	0.87	55	1,666
	20	0.41	52	1,570
	30	0.30	57	1,724
	50	0.14	44	1,341
	75	0.16	75	2,298
R-8	2	4.34	55	1,662
	5	1.60	50	1,532
	10	0.82	52	1,570
	20	0.44	55	1,685
	30	0.33	62	1,896
	50	0.25	79	2,394
	75	0.20	94	2,873

APPENDIX D

BORING LOGS & LABORATORY TEST RESULTS FROM THE FINAL DESIGN CONCEPT REPORT

LOG OF BORING NO. P01

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1338 + 88, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.58 **ASPHALT CONCRETE**; 7 inches.											
	AGGREGATE BASE COURSE; 14 inches. 1.75											
	SANDY LEAN CLAY/CLAYEY SAND; trace gravel, brown, medium dense, stiff, dry.		CL/SC		RS	12	15					
		2	CL/SC		BS					30	15	54
		4										
		6										
		8	CL/SC		BS							
	10 **Bottom of Boring.**	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P02

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1326 + 68, 17 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.42 **ASPHALT CONCRETE**; 5 inches.											
	AGGREGATE BASE COURSE; 17 inches.											
	1.8											
	SANDY LEAN CLAY; brown, stiff to very stiff, moist, weakly cemented.	2	CL		RS	12	18	20	102	36	21	68
			CL		BS							
		4										
		6	CL		BS							
		8										
	10	10										
	Bottom of Boring.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ None WD	▽	
WL	▽	▽	
WL	Backfilled Upon Completion		

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P03

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1314 + 43, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.67 **ASPHALT CONCRETE.**											
	1.67 **AGGREGATE BASE COURSE.**											
	SANDY LEAN CLAY; trace gravel, brown, stiff to very stiff, moist, weakly cemented.	2	CL		RS	12	18	15	109	33	18	60
			CL		BS							
		4										
		6	CL		BS							
	dry.	8										
	10 **Bottom of Boring.**	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ None WD	▼	
WL	▽	▼	
WL	Backfilled Upon Completion		

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P04

CLIENT: MCDOT

SITE: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT: MC 85 between 75th Ave. and 91st Ave

BORING Location: 1301 + 18, 17 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.42 **ASPHALT CONCRETE**; 5 inches.											
	AGGREGATE BASE COURSE; 14 inches.											
	1.6											
	SANDY LEAN CLAY; trace gravel, brown, very stiff, moist.	2	CL CL		RS BS	NR	21			37	19	64
		4										
		6	CL		BS							
		8										
	10	10										
	Bottom of Boring											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ None WD	▽	
WL	▽	▽	
WL	Backfilled Upon Completion		

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P05

CLIENT: MCDOT

SITE: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT: MC 85 between 75th Ave. and 91st Ave

BORING Location: 1289 + 93, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.67 **ASPHALT CONCRETE**; 8 inches.											
	AGGREGATE BASE COURSE; 14 inches.											
	2	2	CL		RS	12	21	15	107	34	17	56
	SANDY LEAN CLAY; trace gravel, brown, very stiff, moist, weakly cemented.		CL		BS							
		4										
		6	CL		BS							
	10	8										
	Bottom of Boring.	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P06

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1287 + 71, 17 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	ASPHALT CONCRETE; 9 inches.											
0.75												
	AGGREGATE BASE COURSE; 12 inches.											
1.75												
	SANDY LEAN CLAY; brown, stiff to very stiff, moist.	2	CL		RS	12	18	16	107	33	16	60
			CL		BS							
		4										
		6	CL		BS							
		8										
10		10										
	Bottom of Boring.											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▼ None WD	▼
WL	▼	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P07

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1277 + 76, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	ASPHALT CONCRETE; 12 inches.	1										
	AGGREGATE BASE COURSE; 10 inches.	1.83										
	SANDY LEAN CLAY; trace gravel, brown, stiff, moist, weakly cemented.	2	CL		RS	12	17	13	112	36	18	66
			CL		BS							
		4										
	moist to dry.	6	CL		BS							
		8										
		10										
	Bottom of Boring.											

The stratification lines represent the approximate boundary lines between soil and rock types; in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P08

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1267 + 76, 17 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.58 **ASPHALT CONCRETE**; 7 inches.											
	1.08 **AGGREGATE BASE COURSE**; 6 inches.											
	SANDY LEAN CLAY; brown, moist.	2	CL		RS	12	19	16	110	35	19	62
			CL		BS							
		4										
		6	CL		BS							
		8										
	10											
	Bottom of Boring.	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P09

CLIENT: MCDOT

SITE: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT: MC 85 between 75th Ave. and 91st Ave

BORING Location: 1257 + 76, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.67 **ASPHALT CONCRETE**; 8 inches.											
	1.4 **AGGREGATE BASE COURSE**; 9 inches.											
	SANDY LEAN CLAY; trace gravel, brown, loose to medium dense, moist, weakly cemented.	2	CL CL		RS BS	12	16	13	107	33	17	65
	5 **LEAN CLAY WITH SAND**; brown, moist.	4										
		6	CL		BS							
	10	8										
	Bottom of Boring.	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P10

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1247 + 76, 17 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.67 **ASPHALT CONCRETE**; 8 inches.											
	1.4 **AGGREGATE BASE COURSE**; 9 inches.											
	LEAN CLAY WITH SAND; brown, loose to medium dense, moist, weakly cemented.	2	CL		RS	12	18	17	106	38	21	71
			CL		BS							
		4										
		6	CL		BS							
	10	8										
	Bottom of Boring.	10										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. PERC1

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1338 + 88, 26 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	SANDY LEAN CLAY; some gravel, brown, moist, trace cobbles.	2	CL		BS							
3	**Bottom of Boring**.	4										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. P11

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1237 + 76, 17 feet Left.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	ASPHALT CONCRETE; 12 inches.	1										
	1.42 **AGGREGATE BASE COURSE**; 5 inches.											
	LEAN CLAY WITH SAND; brown, stiff, moist, weakly cemented.	2	CL CL		RS BS	12	25	21	104	45	23	81
		4										
	5											
	Bottom of Boring. Boring completed at 5 feet based on reported proximity to sewer main.	6										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/18/03

LOG OF BORING NO. PERC2

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1326 + 68, 26 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	SILTY SAND; some gravel, brown, moist.	2	SM		BS							
	Bottom of Boring.	4										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ None WD	▼	
WL	▽	▼	
WL	Backfilled Upon Completion		

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. PERC3

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1301 + 18, 26 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	SANDY LEAN CLAY; some gravel, brown, moist, trace cobbles.	2	CL		BS							
	3											
	Bottom of Boring.	4										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. PERC4

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1287 + 71, 26 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	SANDY LEAN CLAY/CLAYEY SAND; some gravel, brown, moist, trace cobbles.	0	CL/SC		BS							
		1										
		2										
		3										
	Bottom of Boring.	4										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▼
WL	▽	▼
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. PERC5

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1267 + 76, 26 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	0.5 **ASPHALT CONCRETE**; 6 inches.											
	1 **AGGREGATE BASE COURSE**; 7 inches.											
	SANDY LEAN CLAY; trace gravel, brown, moist.		CL		BS							
	3 **Bottom of Boring**.	2										
		4										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft

WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03

LOG OF BORING NO. PERC6

CLIENT MCDOT

SITE MC 85 between 75th Ave. and 91st Ave.
Maricopa County, Arizona

PROJECT MC 85 between 75th Ave. and 91st Ave

BORING Location: 1247 + 76, 26 feet Right.

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE RECOVERY (in)	SAMPLE BLOWS/FT.	TESTS WATER CONTENT, %	TESTS DRY DENSITY pcf	TESTS LIQUID LIMIT	TESTS PLASTICITY INDEX	TESTS #200
	SANDY LEAN CLAY; some gravel, brown, moist, trace cobbles.	2	CL		BS							
	Bottom of Boring.	4										

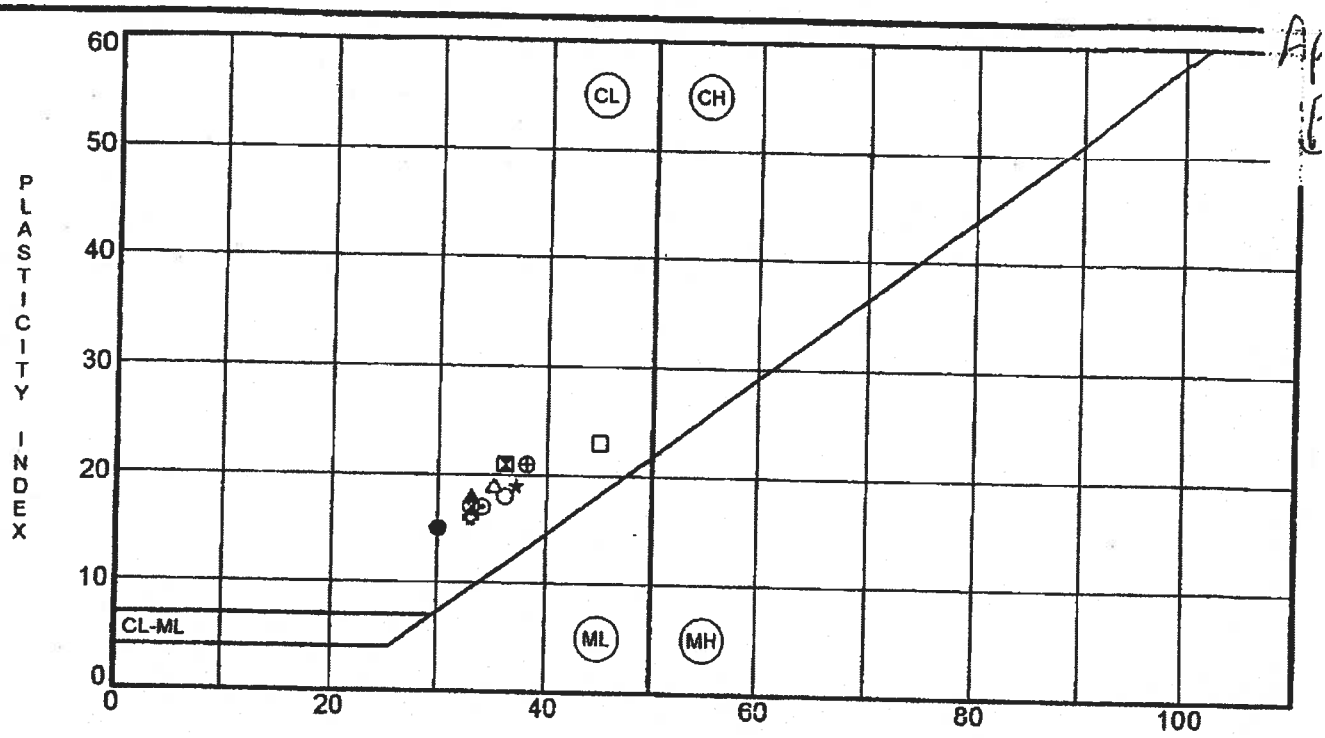
The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft		
WL	▽ None WD	▽
WL	▽	▽
WL	Backfilled Upon Completion	

Terracon

BORING STARTED	5-1-03		
BORING COMPLETED	5-1-03		
RIG	CME 75	FOREMAN	JRH
APPROVED	SDN	JOB #	65035025

BOREHOLE 2000 65035025.GPJ TERR2000.GDT 5/19/03



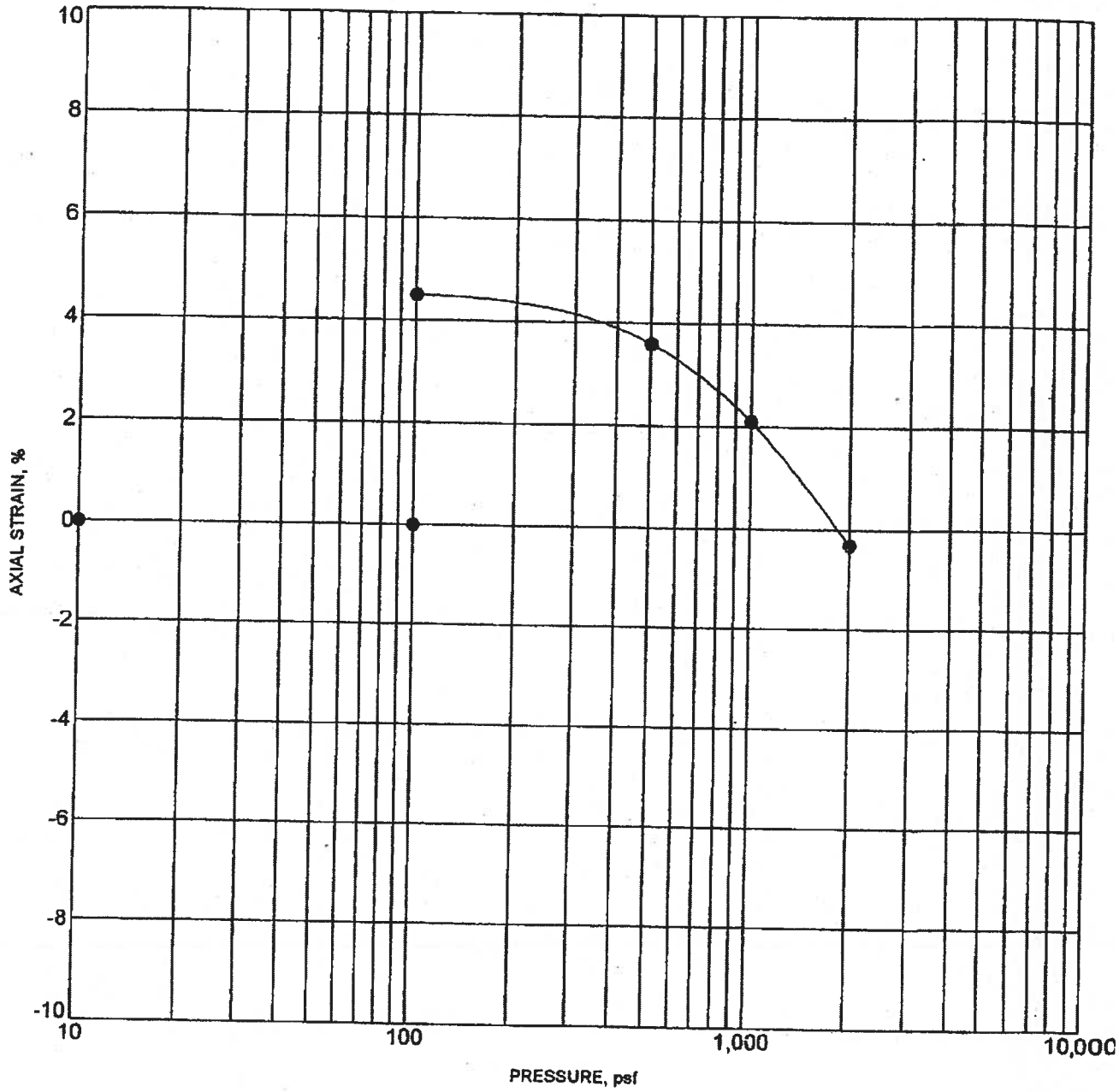
	Specimen Identification		LL	PL	PI	%Fines	Classification
●	P01	2.0ft	30	15	15	54	SANDY LEAN CLAY(CL)
⊠	P02	2.0ft	36	15	21	68	SANDY LEAN CLAY(CL)
▲	P03	2.0ft	33	15	18	60	SANDY LEAN CLAY(CL)
★	P04	2.0ft	37	18	19	64	SANDY LEAN CLAY(CL)
⊙	P05	2.0ft	34	17	17	56	SANDY LEAN CLAY(CL)
✿	P06	2.0ft	33	17	16	60	SANDY LEAN CLAY(CL)
⬡	P07	2.0ft	36	18	18	66	SANDY LEAN CLAY(CL)
△	P08	2.0ft	35	16	19	62	SANDY LEAN CLAY(CL)
⊗	P09	2.0ft	33	16	17	65	SANDY LEAN CLAY(CL)
⊕	P10	2.0ft	38	17	21	71	LEAN CLAY with SAND(CL)
□	P11	2.0ft	45	22	23	81	LEAN CLAY with SAND(CL)

TC ATTERBERG LIMITS 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

ATTERBERG LIMITS RESULTS

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P02	2.0 ft	SANDY LEAN CLAY(CL)	106	13

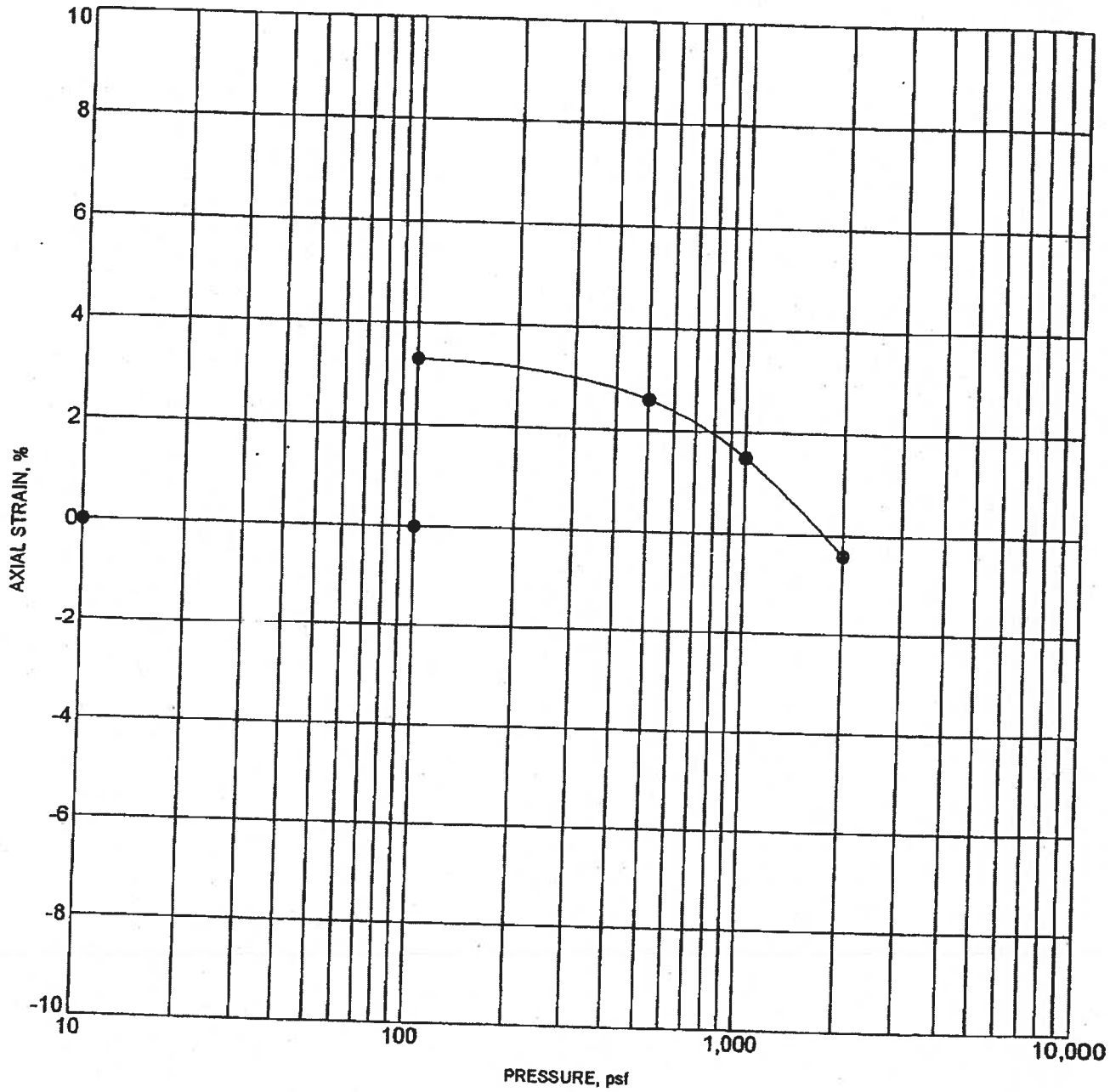
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC SWELL1 STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P03	2.0 ft	SANDY LEAN CLAY(CL)	105	14

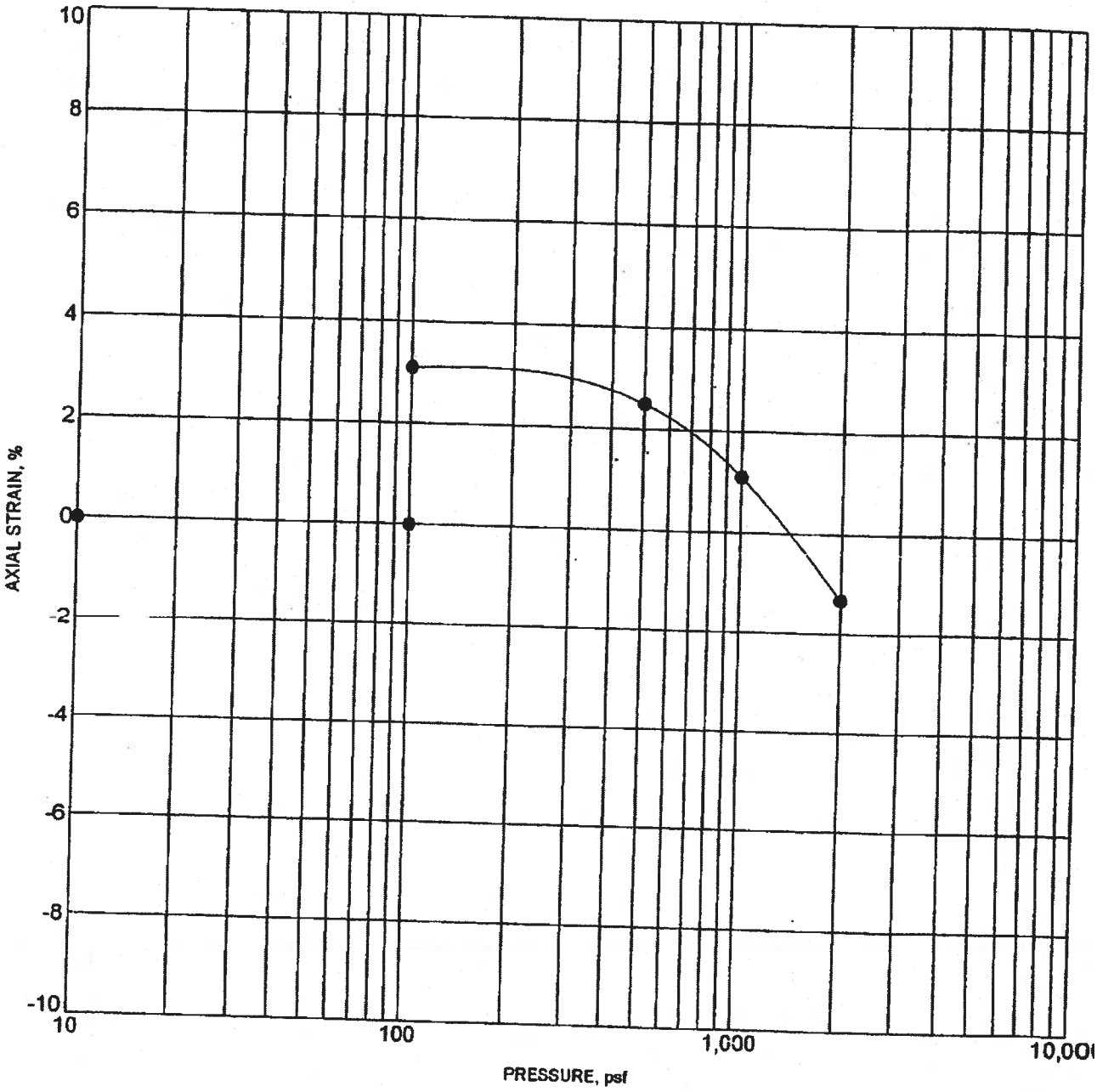
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC-SWELL1 STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P05	2.0 ft	SANDY LEAN CLAY(CL)	106	13

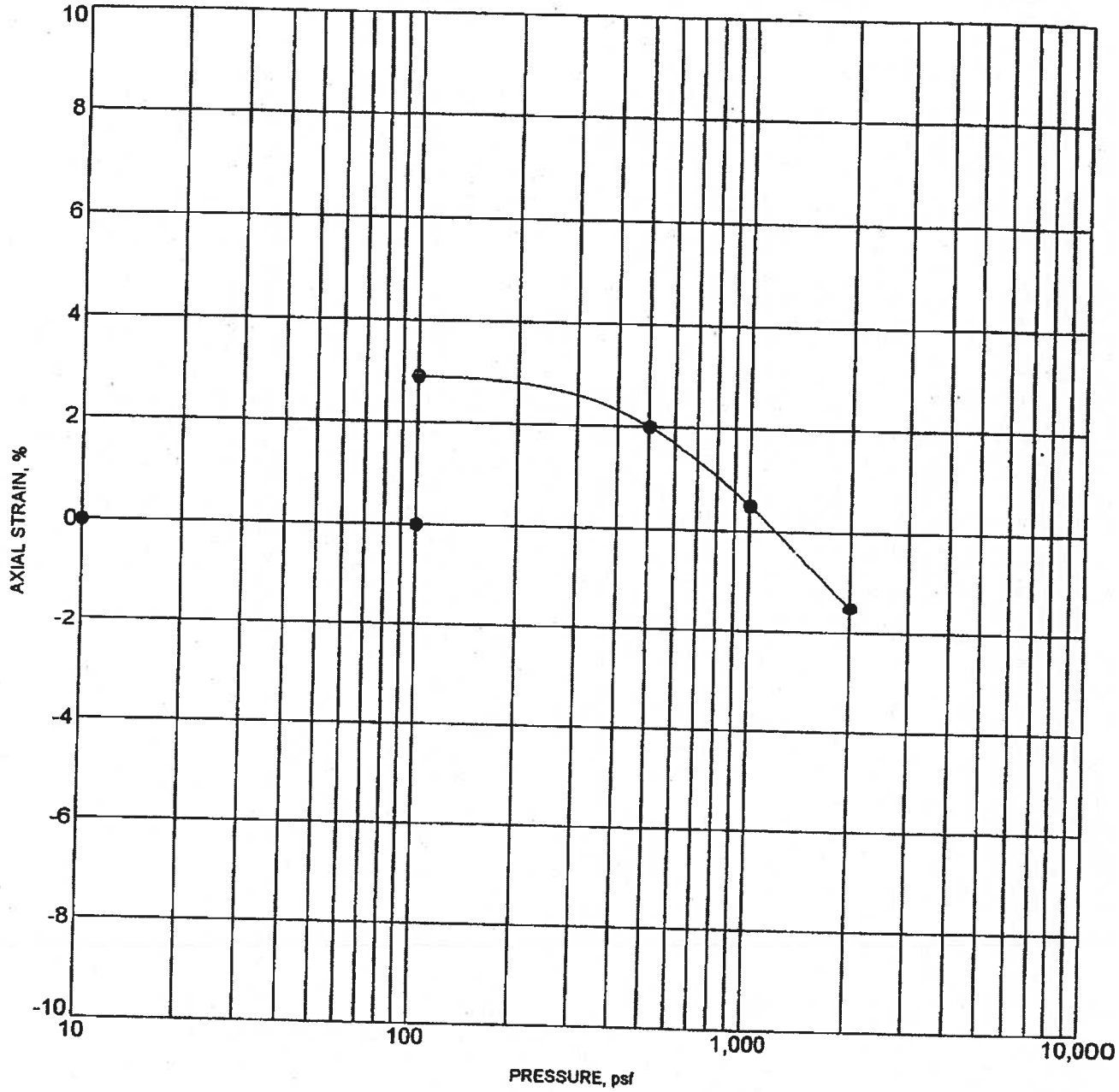
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC_SWELL1_STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P07	2.0 ft	SANDY LEAN CLAY(CL)	104	14

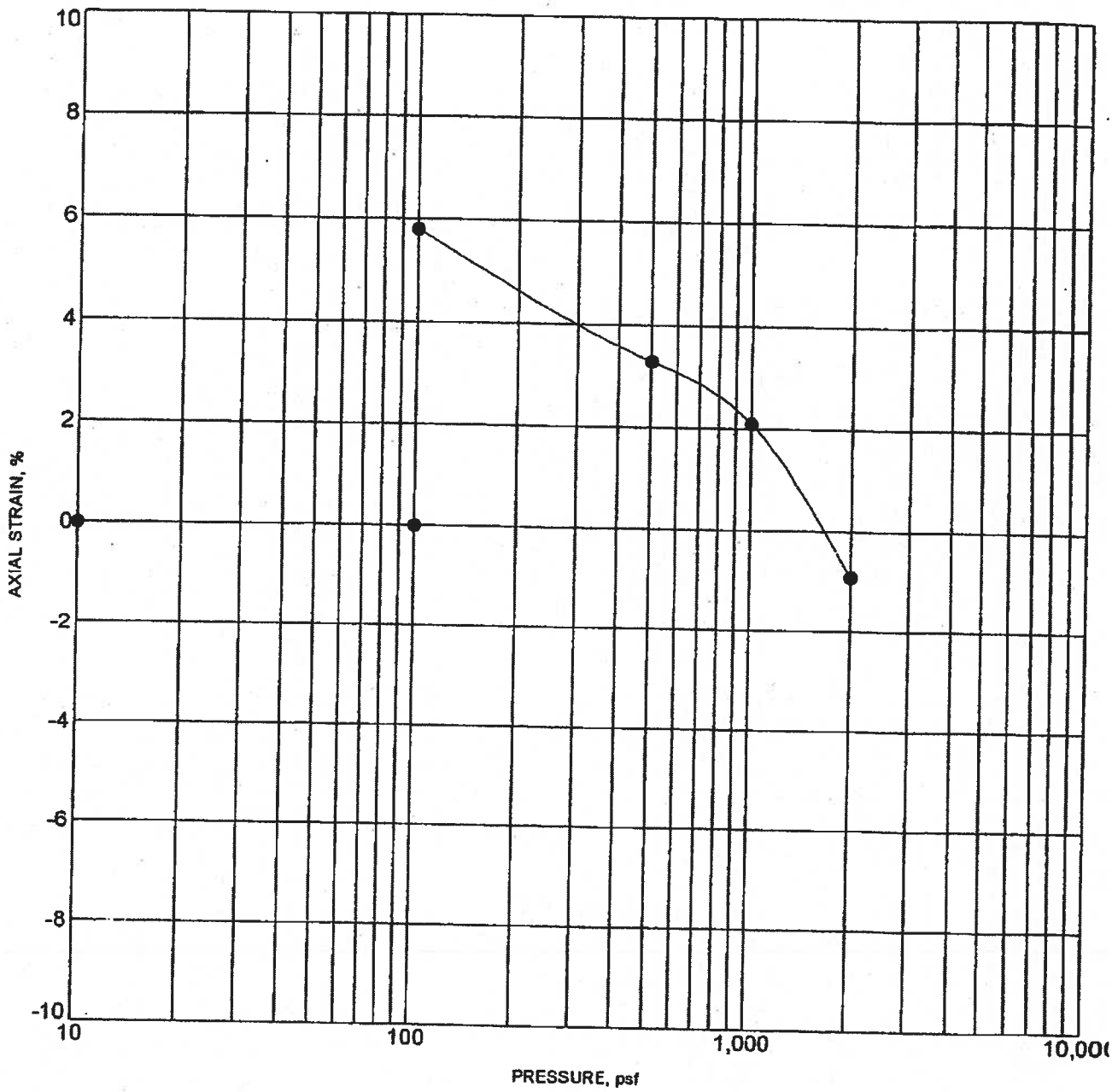
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC SWELL1 STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P08	2.0 ft	SANDY LEAN CLAY(CL)	104	14

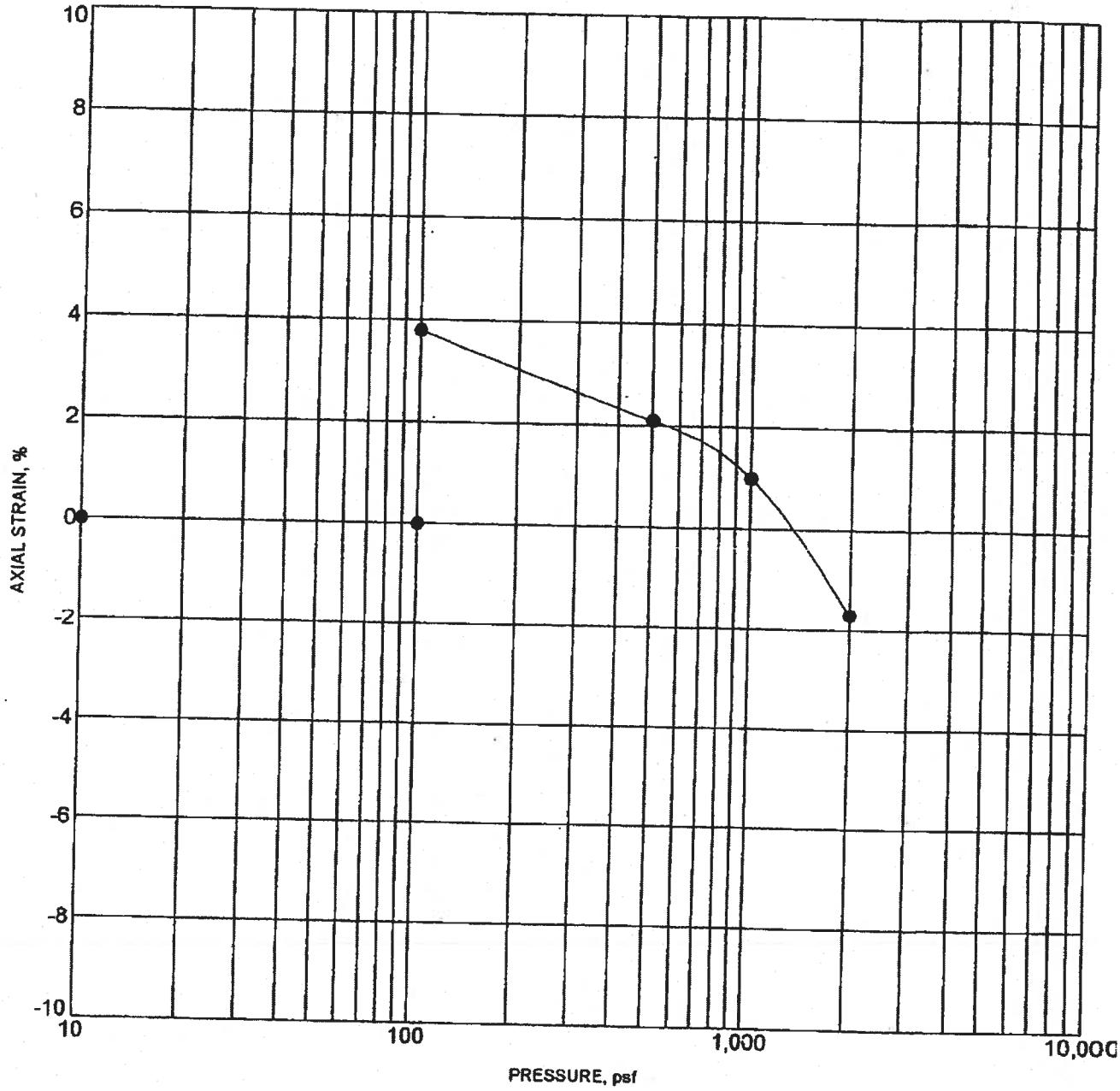
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC_SWELL1_STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P09	2.0 ft	SANDY LEAN CLAY(CL)	103	13

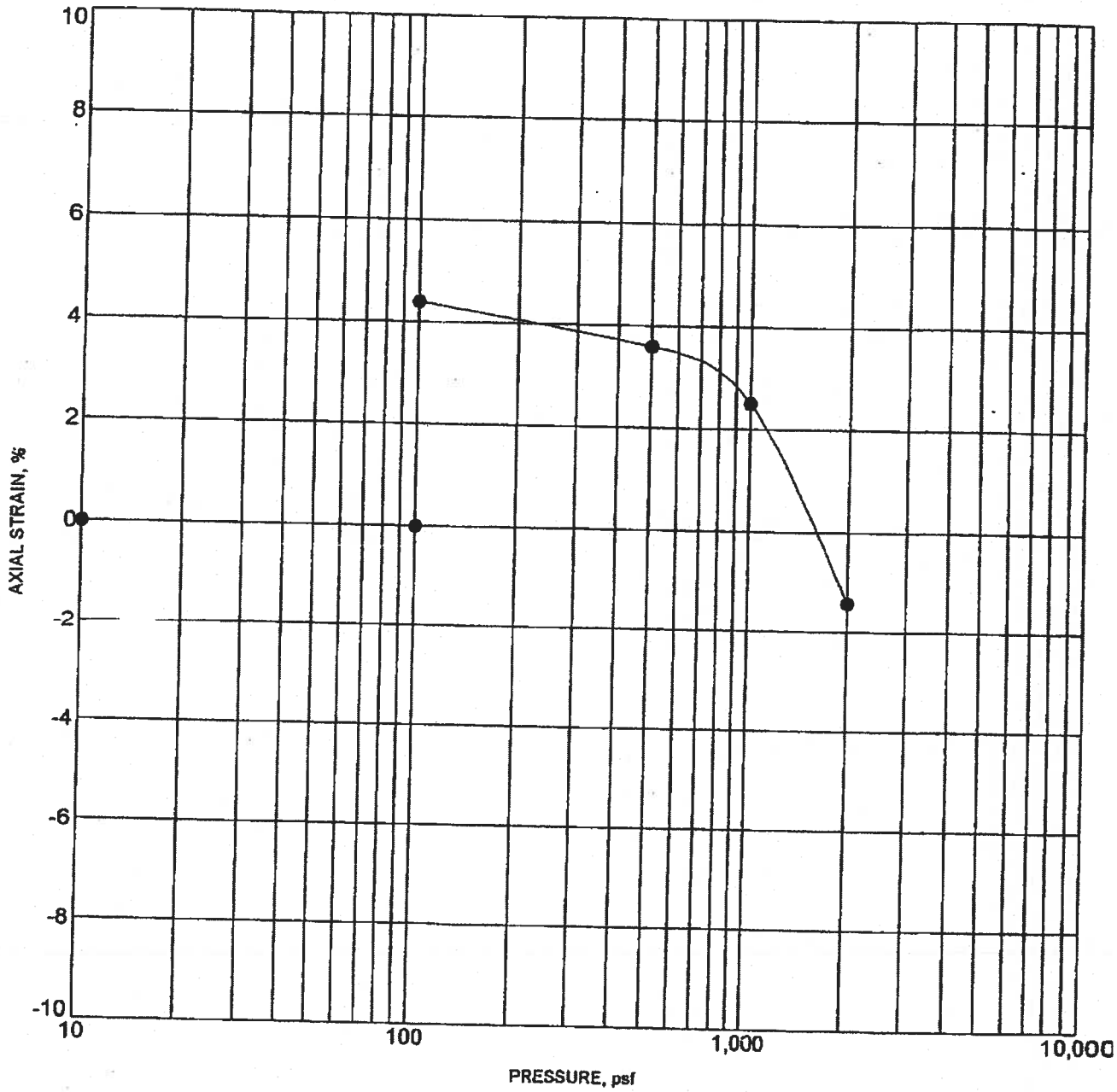
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC SWELL1 STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P10	2.0 ft	LEAN CLAY with SAND(CL)	103	15

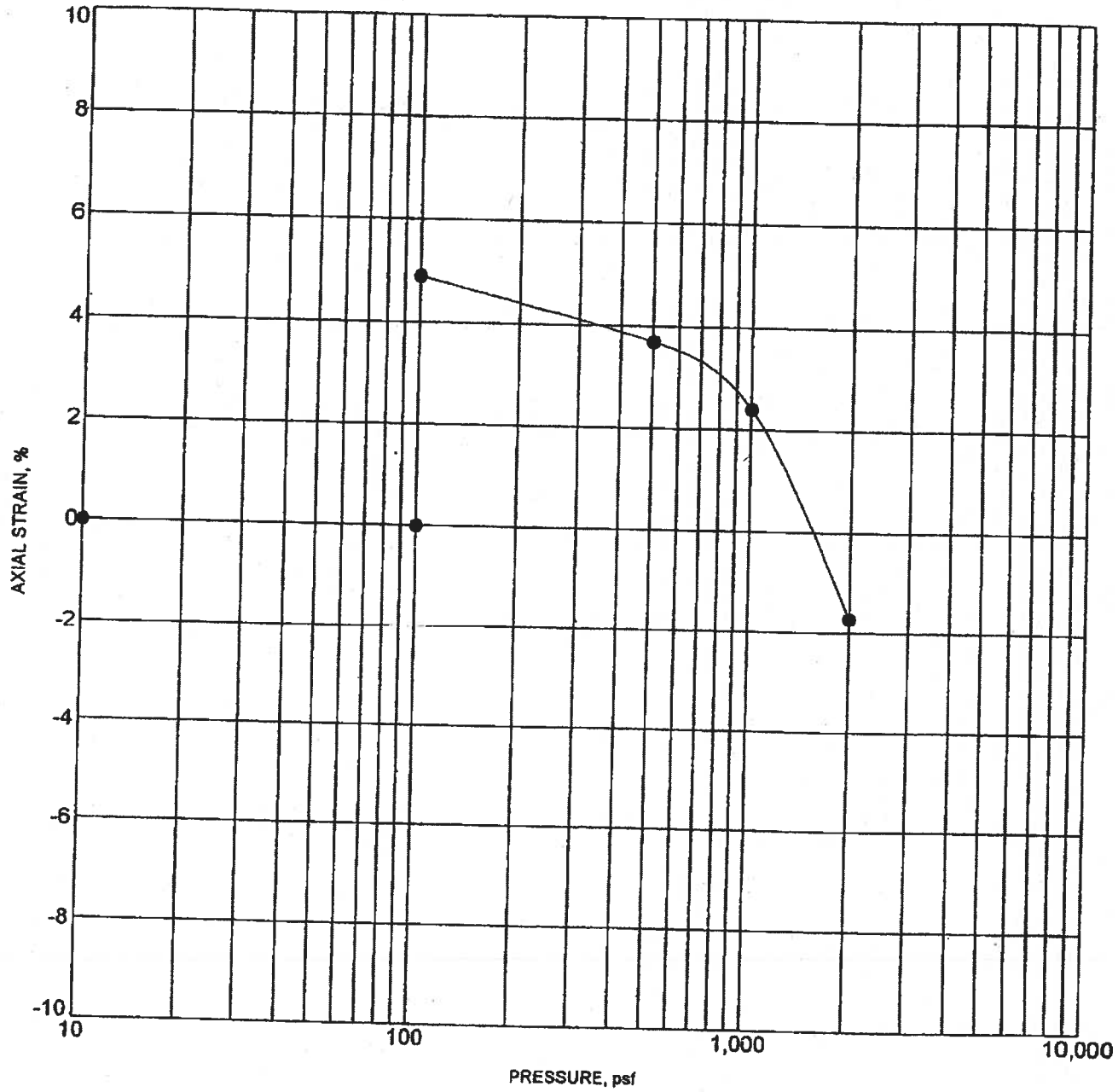
Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC_SWELL1_STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03



Specimen Identification		Classification	γ_d , pcf	WC,%
● P11	2.0 ft	LEAN CLAY with SAND(CL)	99	17

Notes: Sample remolded to the dry density and water content indicated. Water added at 100 psf.

TC_SWELL1 STRAIN 65035025.GPJ TERRACON.GDT 5/14/03

Terracon

SWELL TEST

Project: MC 85 between 75th Ave. and 91st Ave
Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona
Job #: 65035025
Date: 5-14-03

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Remolded Expansion				Corrosivity				Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Dry Density (pcf)	Water Content (%)	Surcharge (psf)	Expansion (%)	pH	Resistivity (ohm-cm)	Water Soluble Chloride (ppm)	Sulfates (%)	
						LL	PL	PI									
P01	2	CL			54	30	15	15									
P02	2	CL	102	20	68	36	15	21	106	13.4	100	4.5					1
P03	2	CL	109	15	60	33	15	18	105	13.5	100	3.3					1
P04	2	CL			64	37	18	19					8.4	1100			
P05	2	CL	107	15	56	34	17	17	106	13.3	100	3.1					1
P06	2	CL	107	16	60	33	17	16					8.4	1500			1
P07	2	CL	112	13	66	36	18	18	104	14.2	100	2.9					1
P08	2	CL	110	16	62	35	16	19	104	14.4	100	5.8					1
P09	2	CL	107	13	65	33	16	17	103	13.2	100	3.8					1
P10	2	CL	106	17	71	38	17	21	103	14.6	100	4.4					1
P11	2	CL	104	21	81	45	22	23	99	16.6	100	4.9					1

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.

Terracon

SUMMARY OF LABORATORY RESULTS

Project: MC 85 between 75th Ave. and 91st Ave

Site: MC 85 between 75th Ave. and 91st Ave. Maricopa County, Arizona

Job #: 65035025

Date: 5-14-03

SOIL PROPERTIES 65035025.GPJ TERR2000.GDT 5/14/03

SECTION 8

LIMITATIONS

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8 LIMITATIONS

8.1 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

The work performed was based on project information provided by the Client. If the Client does not retain Kleinfelder to review any plans and specifications, including any revisions or modifications to the plans and specifications, Kleinfelder assumes no responsibility for the suitability of our recommendations. In addition, if there are any changes in the field to the plans and specifications, the Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations.

This report may be used only by the Client and their representatives, and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site), or other factors may change over time, and additional work may be required with the passage of time. Any party other than the Client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. It should be recognized that definition and evaluation of geologic and environmental conditions are a difficult and inexact science. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service that provide adequate information for their purposes at acceptable levels of risk. More extensive studies, including subsurface studies or field tests, should be performed to reduce uncertainties. Acceptance of this report will indicate that the Client has reviewed the document and determined that it does not need or want a greater level of service than provided.

8.2 ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction process to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Kleinfelder would be pleased to provide additional services to further evaluate any particular item or items described in this report.
- Observations and testing during the site grading, preparation and earthwork.
- Consultation as may be required during construction.

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

APPENDIX L-A

ASFE Document

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

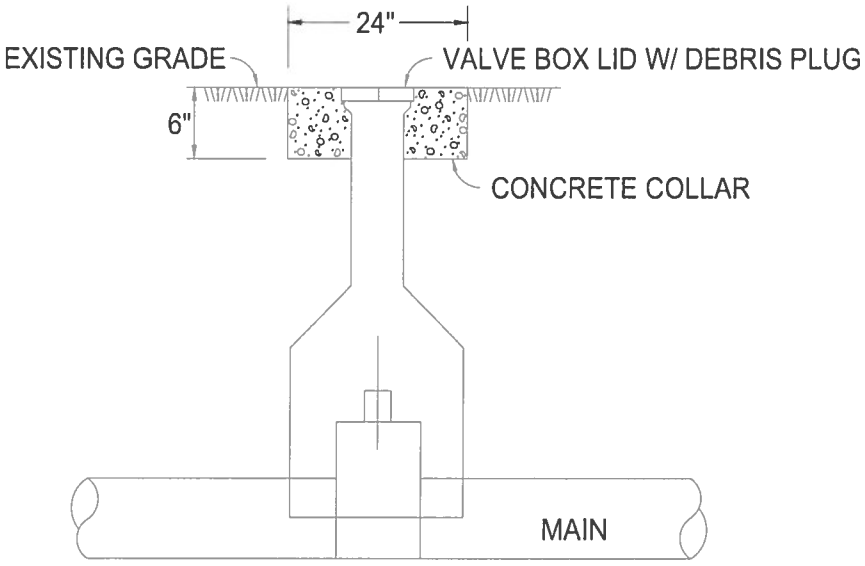
ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

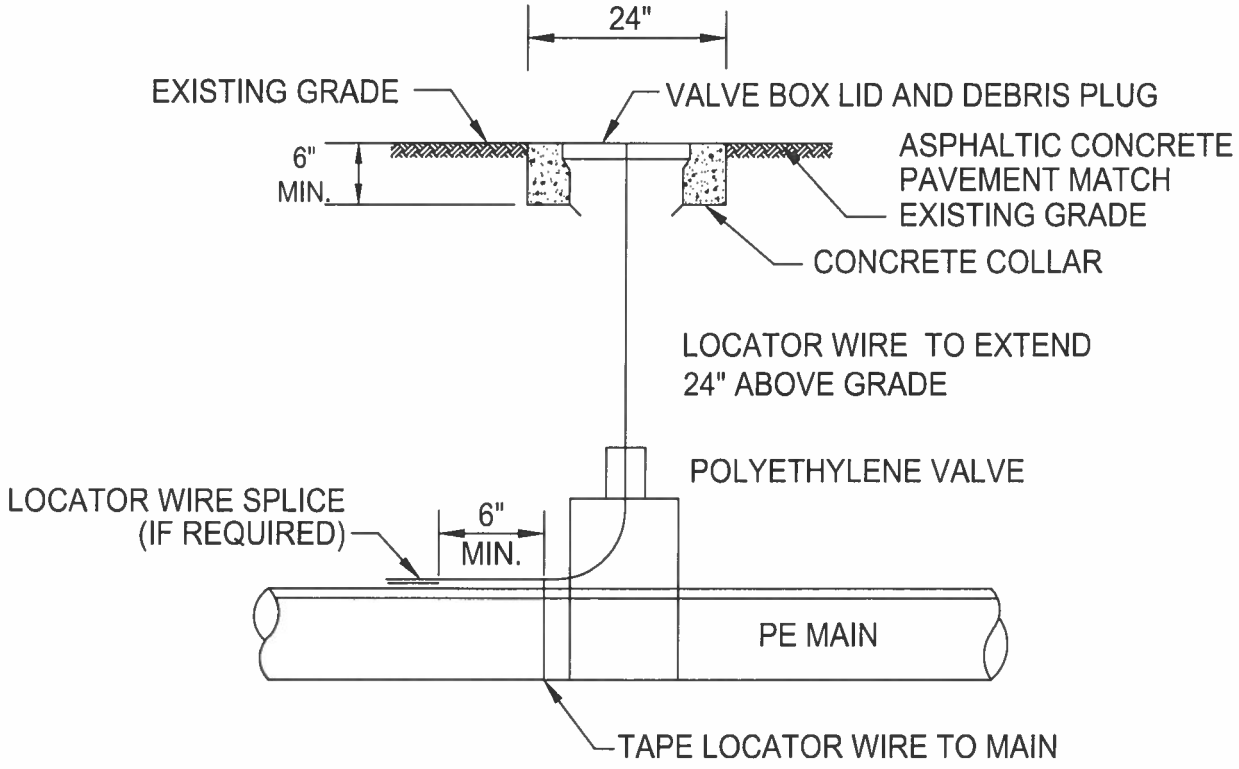
IIGER06045.0M

Appendix D –
SWG Standard Details

VALVE AND VALVE BOX INSTALLATION



POLYETHYLENE VALVE INSTALLATION WITH LOCATOR WIRE (DETAIL # 220)



* WIRES SHOULD BE LONG ENOUGH TO EXTEND AT LEAST 2 FEET ABOVE GRADE.

Appendix E –

SRPI Specs (For Information Only)

SRP
CONSTRUCTION SPECIFICATIONS AND REFERENCES

SRP
CONSTRUCTION SPECIFICATIONS
AND REFERENCES

PROVIDE THIS ENTIRE PACKAGE TO YOUR CONTRACTOR

STANDARD SPECIFICATIONS

SRP	02227	Salt River Project Standard Specification For Slurry Backfill Materials
WTR	02614	Salt River Project Water Group Standard Specification For Precast Concrete Pipe
SRP	03210	Salt River Project Standard Specification For Reinforcing Steel
SRP	03300	Salt River Project Standard Specification For Concrete
GE	03305	Salt River Project Generation Engineering Standard Specification For Concrete Formwork and Placement

REFERENCE DRAWINGS

WES-30300-001	Pipeline Bedding/Backfill Requirements
WES-30300-003	Standard Concrete Pipe Collar
WES-30300-004	Rubber Gasket Joints
WES-30350-200	45° Trashrack for Pipeline Headwall

REFERENCE LANDFILLS

SRP (Valley) Approved Landfills – Solid Waste Disposal Facilities

SRP (State) Approved Landfills – Solid Waste Disposal Facilities

STANDARD SPECIFICATIONS

SALT RIVER PROJECT

STANDARD SPECIFICATION FOR SLURRY BACKFILL MATERIALS (SRP 02227)

TABLE OF CONTENTS

Prepared By M D Voda

Reviewed By P M Kandaris
(Revised for Metric 6/7/96)

STANDARD SPECIFICATION FOR SLURRY BACKFILL MATERIALS (SRP 02227)

1.0 GENERAL

1 1 Work Included

This specification shall cover the furnishing of all labor, equipment and materials for supplying and placing slurry-type backfills

The following is a brief description of the types of slurry backfills and their intended uses

ASB - Aggregate Slurry Backfill - washed gravel and sand, no cementitious materials, for use as a backfill around wood and concrete transmission line poles and trench backfill where no structural loads will be anticipated.

LMB 1/2 SACK - Lean Mix Backfill with 1/2 Sack (21.3-kg) portland cement per cubic yard (0 84-m^3) - washed gravel and sand with cement, for use as a general trench backfill in low load areas (streets and parking areas).

LMB 1 SACK - Lean Mix Backfill with 1 Sack (42.5-kg) portland cement per cubic yard (0 84-m^3) - washed gravel and sand with cement, for use as a general trench backfill in low load areas (streets and parking areas). Use in lieu of LMB 1/2 Sack (21.3-kg) when required by municipality

LMB 1-1/2 SACK - Lean Mix Backfill with 1-1/2 Sacks (63.8-kg) portland cement per cubic yard (0 84-m^3) - washed gravel and sand with cement, for use as a structural backfill under foundations and as thermal fill and/or mechanical protection of duct banks

DBA - Duct Bank Backfill w/ Aggregate - washed gravel and sand with four sacks (170-kg) portland cement per cubic yard (0 84-m^3), used as a thermal backfill/encasement for electrical ductbank with conduits spaced greater than 2 inches (51-mm) apart.

DBS - Duct Bank Backfill w/ Sand - washed sand with four sacks (170-kg) portland cement per cubic yard (0 84-m^3), used as a thermal backfill/encasement for electrical ductbank with conduits spaced less than 2 inches (51m-mm) apart and for pumping grout around conduits run through a pipe sleeve

DEPB - Direct Embed Pole Backfill - a lean concrete with a minimum strength of 1000 psi (6 9-MPa) at 28 days, for use as backfill around direct embed steel poles.

RFG - Rock with Fly Ash Grout - a two component backfill for direct embed steel and concrete poles; the initial component, RFG-Gravel, is a uniform size, coarse gravel The gravel is placed by ready-mix truck in the annulus space of direct embedment poles. The second component, RFG-Grout is a flowable fly ash/cement/lime grout The grout is batched separately and placed afterward, filling voids in the aggregate backfill by gravity flow (no pumping).

Each of these backfill materials has an SRP Material Stock Code Number (See Table 1). All references to these materials in purchase order documents, submittals and invoices shall use the SRP material stock code Vendor may assign its own product codes in addition to those required by the Purchaser

1 2 Reference Standards

1 2.1 Reference to standards and/or specifications herein shall be interpreted to mean the latest revision unless noted otherwise.

1 2.2 The following abbreviations appear in this Specification.

ACI	American Concrete Institute
ARPA	Arizona Rock Products Association
ASTM	American Society for Testing and Materials
NRCMA	National Ready-Mixed Concrete Association
SRP	Salt River Project

1 2.3 The following standards shall be made a part of this Specification.

ASTM C25	Standard Test Method for Chemical Analysis of Limestone, Quicklime and Hydrated Lime
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C117	Standard Test Method for Materials Finer Than 75-Micrometer (No 200) Sieve in Mineral Aggregates by Washing

ASTM C136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C403	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C494	Standard Specifications for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C937	Standard Specification for Grout Fluidifer for Preplaced-Aggregate Concrete
ASTM C939	Standard Test Method for Flow of Grout for Preplaced Concrete Aggregate (Flow Cone Method)
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
ASTM D512	Standard Test Methods for Chloride Ion in Water
ASTM D516	Standard Test Method for Sulphate Ion in Water

1 2.4 Exceptions to this specification must be approved in writing by the Engineer prior to commencement of the affected work.

1 3 Definitions

One Sack of cement same as one 94 pound (42.5-kg) bag of cement.

1 4 Submittals

1 4 1 Vendor shall submit the following items for each material to be supplied

a Plant Certification
b Mix designs
c. Source and gradation of coarse and fine aggregate
d. Cement certification and mill test report
e Certification of testing of the water
f. Fly ash certification
g Admixture brand and source
h. Lime certification and chemical analysis

1.4 2 If the mix design and batch plant have been pre-approved by the Engineer, submittals under Section 1 4 1 will be waived.

1.4 3 Vendor shall refer to the mix designs by the SRP Material Stock Code Number

1 4 4 In addition to the specified materials, Vendors may submit alternate mix designs or deviations to the specifications for review and approval The Engineer may request additional test and certification documentation for alternate mixes submitted.

1 5 Quality Assurance

1 5.1 Each plant from which the Vendor intends to provide materials governed by this specification must have current NRMCA, ARPA or equivalent laboratory certification

1 5 2 Vendor shall provide access to the plant for inspection of materials and/or batch plant equipment

1 6 Storage and Handling

1 6 1 All materials shall be stored and handled in such a manner as to prevent deterioration or intrusion of foreign matter and to produce a minimum amount of segregation

1 6 2 Storage of aggregate on a natural ground surface will be permitted if bottom 6 inches (152-mm) of pile is not used in batching

2.0 PRODUCT

2.1 Cement

Cement shall conform to ASTM C150, Type II with alkali content not to exceed 0.6 percent.

2 2 Fly Ash

not deletenously reactive with alkali in cement. Fly ash shall be sampled and tested in accordance with ASTM C311

2 3 Lime

Lime shall be commercial dry hydrated lime containing a minimum 85 percent calcium hydroxide, $Ca(OH)_2$, as determined by ASTM C25. Lime shall be protected from exposure to moisture until used and shall be sufficiently dry and flow freely when handled.

2.4 Aggregate

Aggregate shall conform to ASTM C33, coarse aggregate shall be sized as noted in Table 1 of this specification.

2.5 Water

Water for washing aggregates and for mixing slurry shall be potable or shall meet requirements of ASTM C94 If water does not meet said requirements, a chemical analysis of water shall be performed in accordance with ASTM D512 and ASTM D516 by an independent testing laboratory at Vendor's expense and submitted to the Engineer for approval

2 6 Admixtures

2.6.1 Admixtures shall be approved in writing by the Engineer prior to use Admixtures shall be added at the plant at the time of batching unless noted otherwise

2 6 2 Air-entraining admixtures shall conform to ASTM C260 and shall be used only in DEPB

2.6 3 Water-reducing, retarding, and accelerating admixtures shall conform to ASTM C494 Chloride admixtures shall not be used

2 6 4 Superplasticizers shall conform to ASTM C494, Type F or G Superplasticizer may be added at batch plant or at jobsite

2 6 5 Grout Fluidifers shall conform to ASTM C937

2 7 Measurement and Mixing of Materials

2.7 1 Measurement and mixing of materials shall be in accordance with ASTM C94 and C685

2.7 2 Mixes shall be homogenous, readily placeable and uniformly workable Proportioning of ingredients shall produce consistency, durability, workability and other required properties appropriate for the intended usage

2 8 Mix Design for RFG Grout

2 8 1 Proportioning of ingredients shall produce grout with efflux (flow consistency), set, strength and shrinkage characteristics as specified herein and appropriate for intended usage Grout upon delivery shall be homogeneous, readily placeable and uniformly flowable.

2.8 2 Grout shall have an efflux time of less than 18 seconds for minimum 30 minutes after arrival at jobsite (tested in accordance with ASTM C939), shall be firm to the touch within 72 hours after placement, shall have no more than three percent volume loss (including fluid separation) seven days after batching and have a compressive strength when combined with aggregate of minimum 1000 psi (6.9-MPa) in 56 days Mix shall maximize use of fly ash General proportions for mix design are as follows.

a Solids. 5 parts fly ash to 1 part cement to 3/4 part lime

b 2 1/4 parts solids to 1 part water

c. 20 ounces (0 6-L) of high-range water-reducing admixture per 100 pounds (45.2-kg) of solids

Vendor is responsible for final mix design that meets performance requirements of this specification

2.8 3 Retarding admixtures may be added to mix to meet efflux requirements and compensate for travel time to specific jobsites Volume of retarding agent added is responsibility of Vendor, but specific type must be preapproved by the Engineer prior to batching of grout.

2 8 4 No change in source, character or mix proportions of grout shall be made without prior written approval of the Engineer For changes to be approved, affected items listed under Paragraph 1 4 1 shall be resubmitted

2 9 Batching RFG Grout

2 9 1 Mixing shall follow the procedures in ASTM C94, with all grout constituents added at the batch plant

2 9 2 Fly ash shall be added in a manner and at a rate as to minimize incompletely mixed fly ash nodules within the grout Dry fly ash nodules over one inch

diameter shall not be allowed. Grout containing non-uniform material exceeding one percent of total grout volume, as determined by the Engineer, will be rejected at full cost to the Vendor

2.10 Washed Gravel for RFG

2 10 1 Gravel shall be washed to remove dust and dirt prior to placement in mixer.

2.10.2 Washed gravel shall be sent to jobsite by ready-mix truck Maximum of two gallons (7 6-L) of water per cubic yard (0 84-m^3) of gravel may be added.

3.0 EXECUTION

3 1 Delivery

3 1 1 Deliver materials in conformance with ASTM C94

3 1.2 When materials contain cement, machine-stamp batch out time of truck on delivery ticket at Vendor's plant. A copy of delivery ticket having machine-stamped batch out time shall be given to the Engineer at the time of delivery Deliveries of materials containing cement without machine-stamped batch out time on delivery ticket will be rejected.

3 1.3 Deliver materials within 30 minutes of requested delivery time. Time lapse between successive deliveries shall not vary by more than 20 minutes from that requested The Engineer may reject any batch not meeting these requirements Vendor shall allow 30 minutes for material discharge. Standby time may be charged after 30 minutes

3 1 4 Backfill containing cement will be rejected if the Engineer determines that, on arrival at the jobsite, backfill temperature is outside the range of 50°F (10°C) to 90°F (32°C), or that backfill has attained its initial set. Rejected backfill shall be at the Vendor's cost.

3.1 5 Vendor may add water only once to bring a mix to the desired slump. Water shall not be added to RFG-Grout Mix not meeting slump requirements will be rejected

3 2 Placement

3 2 1 Slurry and Lean Mix Backfills

Discharge backfill containing cement within 1-1/2 hours after initial mixing water is added The Engineer may waive this limitation if slump is such that the material can be placed without addition of water
Place backfill so that it flows easily around and beneath conduit, pipe or other obstructions in trenches and excavations Slurry shall have consistency, workability, flow characteristics and pumpability (where required) such that the

material when placed is self-compacting and has sufficient plasticity that mechanical compaction or vibration is typically not required Mechanical compaction or vibration may be used to consolidate around obstructions.

Place slurry backfill equally on both sides of conduit or pipe to prevent displacement of conduit or pipe.

Place slurry backfill in lift depths that will not float the conduit or pipe, to place backfill in greater lift depths, provide sufficient approved anchorage so the conduit or pipe cannot float

3 2.2 Washed Gravel for RFG

Remove all excess water prior to placement of gravel by rotating mixer and directing water away from backfill area. Time for removal of excess water shall be at Vendor's cost Wet gravel must flow uniformly and readily out of truck.

Gravel that has not been washed of dust and dirt will be rejected Gravel that is not surface saturated shall not be placed.

3 2.3 RFG Grout

Discharge grout within 30 minutes after arrival at jobsite. This requirement may be waived by the Engineer if retarding admixtures are used

Grout that exceeds efflux time requirements upon arrival at jobsite (as determined by flow testing), shall be rejected at full cost to Vendor. No water shall be added at jobsite or after batching to decrease efflux time

3.3 Protection

3 3 1 Slurry backfill for trenches shall be protected from vehicular loading and shall not be covered with pavement prior to having reached initial set per ASTM C403, or for 12 hours, whichever occurs first. Set time tests shall be performed during initial placement while backfill is fluid.

3.3 2 Slurry backfill for foundation excavations shall be protected from foundation loading and placement of foundation concrete prior to having reached initial set per ASTM C403, or for six hours, whichever occurs first.

3 3 3 Where the Engineer has identified soils as being moisture sensitive, a drainage notch or drain wick shall be placed longitudinally along centerline of slurry backfill within first hour following placement. Drainage water shall be collected at end of trench or excavation and removed

3 4 Testing

3 4 1 Samples will be taken directly from transit mix truck Sampling and testing will be in accordance with the following standards

Sampling	ASTM C172
Temperature	ASTM C1064
Slump	ASTM C143
Air	ASTM C231
Gradation	ASTM C117/ ASTM C136

3 4 2 Testing of gradation shall be done for all projects in public rights-of-way and other locations as determined by the Engineer; sampling shall be done at material source prior to the start of mix production

3 4 3 Testing will be performed by the Engineer at no cost to Vendor

3 5 Acceptance of Backfill Materials

3 5.1 Backfill materials shall be considered deficient and will be rejected if
a. slump is less than specified in table
b aggregate gradation is outside specified limits

3 5 2 Rejected material shall not be used and shall be replaced with new material Cost of disposing of rejected material and replacing with new material, including Purchaser's direct and indirect costs, shall be paid by Vendor

TABLE 1 - BACKFILL MIXES

Stock Code Number	Backfill Designation	Description	Coarse Aggregate ASTM C33	Fine Aggregate	Slump Range	Minimum Cement Content (lbs/cu yd)	Required Admixtures
00-0100	ASB	Aggregate Slurry Backfill	No 67 [3/4" (19mm) nom max]	A, H	6"-9" (152-229mm)	None	
00-0101	DEPB	Direct Embed Pole Backfill	No 8 [3/8" (9 5mm) nom max]	A	6"-9" (152-229mm)	376 B (223 kg/m³)	C
00-0104	LMB 1/2 SACK	Lean Mix Backfill w/ 1/2 Sack Cement pcy	No 57 [1" (25mm) nom max]	A	6"-9" G (152-229mm)	47 (28 kg/m³)	
00-0105	LMB 1 SACK	Lean Mix Backfill w/ 1 Sack Cement pcy	No 57 [1" (25mm) nom max]	A	6"-9" G (152-229mm)	94 (56 kg/m³)	
00-0106	LMB 1-1/2 SACK	Lean Mix Backfill w/ 1-1/2 Sack Cement pcy	No 57 [1" (25mm) nom max]	A	6"-9" G (152-229mm)	141 (84 kg/m³)	
00-0108	DBA	Duct Bank Backfill w/ Large Aggregate	No 8 [3/8" (9 5mm) nom max]	A	6"-9" (152-229mm)	376 (223 kg/m³)	
00-0109	DBS	Duct Bank Backfill w/ Sand	None	A	6"-9" (152-229mm)	376 (223 kg/m³)	
00-0160	RFG GRAVEL	Washed Gravel for RFG	No 4 [1-½" (38 1mm) to 3/4" (19mm)]	None			
00-0161	RFG GROUT	Lime and Fly Ash Grout for RFG	None	None		D, E	F

NOTES
- A Fine aggregates (sand) shall be in accordance with ASTM C33
- B Maximum water/cement ratio 60
- C Air entrainment 4% +/- 1%, Superplasticizers as required to obtain slump
- D Cementitious solids 5 parts fly ash to 1 part cement to 3/4 part lime, by weight See paragraph 2 8 2
- E Limit water content to 1 part water to 2 25 parts cementitious solids by weight See paragraph 2 8 8
- F High range water reducing admixture
- G Purchaser may request material at lower slumps
- H Fine aggregates 45-50% of the total aggregate weight

5/08/97

SALT RIVER PROJECT
WATER GROUP

STANDARD SPECIFICATION FOR PRECAST CONCRETE PIPE

(WTR 02614)

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PREPARED: CHARLES W. THUMS APPROVED:

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STANDARD SPECIFICATION
FOR
PRECAST CONCRETE PIPE
(WTR 02614)

1.0 GENERAL

1.1 Work Specified

This specification covers the fabrication, furnishing and installation of precast concrete pipe.

1.2 Measurements

Both English and metric measurements are shown in this specification. The English and metric measurements shown may not be exactly equal, however, the difference between them will generally be between +/- 1.5%. The system of measurement to be used relative to this specification for a particular project will be that used in the project-specific documents and drawings.

1.3 Reference Standards

1.3.1 Reference to standards or specifications shall be interpreted to mean the latest revision unless noted otherwise.

1.3.2 The following abbreviations appear in this specification.

ASTM	American Society for Testing and Materials
CE	Civil Engineering
OSHA	Occupational Safety and Health Administration
SRP	Salt River Project
29 CFR	Code of Federal Regulations, Title 29

1.3.3 The following standards shall be made a part of this specification:

ASTM C14	Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe (reference only - for hydrostatic testing of ASTM C76 pipe)

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C207	Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
ASTM C443	Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C822	Standard Terminology Relating to Concrete Pipe and Related Products
ASTM D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor)
ASTM C924	Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C969	Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C1103	Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

SRP 02227	Salt River Project Standard Specification for Slurry Backfill Materials
SRP 02230	Salt River Project Standard Specification for Aggregate Base, Select Material and Surface Material
CE 02.272	Salt River Project Standard Specification for Geotextiles
OSHA	General Industry Occupational Safety and Health Standards (29 CFR Part 1910)
OSHA	Safety and Health Standards for Construction (29 CFR Part 1926)
SRP ESRM	Salt River Project Excavation Safety Resource Manual

1.3.4 Exceptions to this specification require approval in writing by the Engineer prior to beginning the affected work.

1.4 Quality Assurance

As part of purchase agreement for pipe, Contractor shall stipulate that the Engineer shall have access to the following:

a. Pipe manufacturing specifications.

b. Certification of pipe by others.

c. Pipe manufacturing quality control test results.

d. Manufacturing facilities to observe manufacture of pipe.

e. Testing facilities to observe testing of materials and pipe.

1.5 Delivery, Storage and Handling

1.5.1 Notify the Engineer of name and address of pipe seller a minimum of two working days before delivery of pipe.

1.5.2 Deliver only requested quantity of pipe to jobsite. Delivery of greater or lesser quantity of pipe requires advance approval of the Engineer.

1.5.3 Provide copy of D-load test documentation along with delivery for each production lot of pipe included in that delivery. Pipe shall not be installed if copy of D-load test information for that particular production lot/date is not available on site.

1.5.4 Integrity of pipe is responsibility of seller until pipe has been delivered and unloaded at jobsite. Contractor is responsible for protecting pipe from physical damage or loss after delivery at jobsite until acceptance of the Work by the Engineer.

1.6 Warranty

Contractor shall warranty material and workmanship for a period of one year from date of written final acceptance of pipeline by the Engineer; leaks, defects and deterioration shall be repaired/replaced at no cost to SRP. Contractor shall make repairs/replacements within 14 days, or if dry-up is required, during first available dry-up following notification of leak or deficiency.

2.0 PRODUCT

2.1 Type and Class of Pipe

Type and class of pipe required for project will be stated in project-specific specifications or shown on drawings.

2.2 Pipe Markings

Pipe shall be marked as required by the applicable ASTM specification.

2.3 Irrigation and Low Head Pressure Drain Pipe

2.3.1 Rubber gasketed reinforced concrete pipe (RGRCP) shall meet one of the following requirements:

a. ASTM C361 and withstand minimum 10 PSI (70 kPa) hydrostatic test pressure.

b. ASTM C76, class III, wall B and meet hydrostatic test requirements as specified in ASTM C14.

2.3.2 Reinforced concrete elliptical pipe (RCEP) shall meet requirements of ASTM C507 and withstand minimum 10 PSI (70 kPa) hydrostatic test pressure as specified in hydrostatic testing requirements of ASTM C361.

2.3.3 Premanufactured bend shall meet requirements of specification for type of pipe with which it is to be

used. Maximum angle of bend shall not exceed that shown on drawings. Premanufactured bends shall be manufactured in accordance with approved shop drawings; submit shop drawings to the Engineer for approval minimum two weeks prior to manufacture of bend.

2.4 Rubber Gasket Joints

2.4.1 Rubber gasket joints shall meet requirements of ASTM C443.

2.4.2 When pipe is supplied with gasket installed, gasket end of pipe shall be enclosed in weathertight protective covering.

2.5 Source Quality Control

2.5.1 External load crushing strength tests shall be in accordance with ASTM standard under which pipe was manufactured.

2.5.2 Pipe tests shall be performed at no cost to SRP at either pipe manufacturer's plant or at an independent testing facility acceptable to the Engineer.

2.6 Mortar/Grout

Mortar for repair of precast concrete pipe shall be composed of two parts sand to one part portland cement (by volume) and sufficient water to provide a plastic mixture. Up to one-fifth part hydrated lime may be added to adjust consistency of mix. Lime shall be in addition to and not a replacement for cement. Equal or similar mortar may be substituted with prior approval of the Engineer.

a. Sand (aggregate) shall conform to requirements of ASTM C144.

b. Portland cement shall conform to requirements of ASTM C150, Type II.

c. Hydrated lime shall conform to requirements of ASTM C207, type N.

2.7 Pipe Diaper

Pipe diaper shall be made of Typar or other suitable fabric having porosity low enough to prevent loss of cement from grout. Edges of fabric shall be hemmed; steel strapping bands for securing diaper around pipe shall be sewn into outside edges of diaper.

2.8 Geotextiles

Geotextiles used to stabilize subgrade shall conform to requirements of CE 02.272.

2.9 Bedding

Granular fill used for Class C or better bedding shall be processed aggregate base material (ABC) meeting requirements of SRP 02230.

2.10 Backfill

2.10.1 Native material used for backfill shall meet following particle size requirements:

a. Maximum 50 percent (by weight) retained on 3/4" (19 mm) sieve.

b. From bedding to finish grade, native backfill shall not contain solid material exceeding three inches (75 mm) in greatest dimension or exceeding 1/3 distance between side of pipe and trench wall.

Suitability of native material for use as backfill for specific project will be determined by the Engineer.

2.10.2 Granular backfill material shall be processed aggregate base material (ABC) meeting requirements of SRP 02230.

2.10.3 Aggregate slurry backfill shall be processed (washed) aggregate base material (ABC) in slurry form meeting requirements of SRP 02227.

2.10.4 Lean mix backfill shall meet requirements of SRP 02227.

2.10.5 Unsuitable backfill materials include, but are not limited to, the following:

a. Silt and clay soils which have moisture content significantly over optimum or which cannot be compacted to required density.

b. Expansive soils.

c. Sod, matted or decayed vegetation.

d. Deleterious materials.

3.0 EXECUTION

3.1 Protection

3.1.1 Cost of excavation protection shall be included in excavation bid price.

3.1.2 Protect excavation and safeguard personnel as required for safety and conformance to governing law, including OSHA standards and SRP ESRM. The Engineer reserves the right to stop work deemed unsafe until unsafe condition is corrected by Contractor.

3.1.3 Maintain underground and overhead utilities in continuous service unless prior approval to interrupt service has been obtained from the Engineer. Locate conflicting utilities shown on drawings and identified in field. Comply with Blue Stake requirements for locating all utilities. Contractor shall be responsible for locating, protecting and repairing private lines. Pothole for true depths. Relocate conflicting utilities to resolve conflicts. Utilities identified before excavation and subsequently damaged by Contractor shall be repaired at Contractor's expense.

3.1.4 Contractor shall protect against and shall be liable for damage to buildings, foundations and structures.

3.1.5 Keep pipe trench free of water. Berm or otherwise protect trench from surface drainage and runoff. Failure to protect trench is not grounds for extension of irrigation outage.

3.1.6 Provide safe and convenient passage for pedestrians and vehicles. Maintain access to hospitals, fire stations, and fire hydrants at all times. Barricade or bridge trenches at end of day's work as specified by governing municipality/agency. The Engineer may designate additional points at which passage shall be provided.

3.1.7 Remove excess material from jobsite within 48 hours after backfilling trench. See paragraph 3.8.1 for disposal requirements. Treat loose material to control dust and to prevent pollution of runoff water as specified by governing municipality/agency.

3.2 Excavation

3.2.1 Comply with open trench length requirements of governing municipality/agency.

3.2.2 Alignments and elevations will be surveyed and staked by SRP, unless noted otherwise. Contractor shall

be responsible for protecting stakes. Restaking shall be at Contractor's expense.

3.2.3 Excavations shall conform to alignments, elevations, dimensions and tolerances indicated on drawings or in specifications. Do not begin excavation before establishment of alignments and elevations.

3.2.4 Trench width shall be as specified in Table 1 unless otherwise indicated on drawings or in project-specific specifications. Written approval of the Engineer is required prior to substitution of other pipe or bedding for that specified. From one foot (300 mm) above top of pipe, trench may be widened as necessary to accommodate sheeting, bracing and proper installation of pipe.

Table 1

Size of Pipe (ID)	Maximum Width at Top of Pipe (Add to Barrel OD)	Minimum Width at Springline (Each Side of Pipe)
Less than 18 in (450 mm)	16 in. (400 mm)	6 in. (150 mm)
18 in. to 24 in. (450-600 mm) inclusive	19 in. (475 mm)	8 in. (200 mm)
27 in to 39 in. (675-975 mm) inclusive	22 in (550 mm)	9 in (225 mm)
42 in to 60 in. (1050-1500 mm)	1/2 OD	12 in. (300 mm)
Over 60 in. (1500 mm)	36 in. (900 mm)	12 in. (300 mm)

3.2.5 When backfill below springline of pipe is to be mechanically compacted, minimum distance from all points on pipe at springline to edge of trench shall be width of compaction shoe plus two inches (50 mm).

3.2.6 When backfill from bottom of trench to springline or above is to be aggregate slurry, minimum distance from pipe at springline to edge of trench shall be three inches (75 mm).

3.2.7 Trench bottom shall be level for full width; remove, or fill and compact tooth marks greater than two inches (50 mm) deep. In rock, bottom of trench shall be overexcavated minimum six inches (150 mm) and filled with granular bedding material to provide smooth surface; compact granular bedding material for full width of trench to requirements shown on drawings.

3.2.8 Excavation carried beyond dimensions or elevations indicated on drawings without the Engineer's approval, shall be backfilled and compacted as directed by the Engineer at Contractor's expense.

3.3 Subgrade

3.3.1 Existing subgrade material and subgrade fill material shall be compacted to a minimum of 85 percent of maximum density and moisture content shall be between four percent below and two percent above optimum moisture content as determined per ASTM D698, unless noted otherwise in specifications or drawings.

3.3.2 Suitability of subgrade will be determined by the Engineer prior to placement of bedding.

3.3.3 Unsuitable subgrade materials include, but are not limited to, the following:

a. Silt and clay soils which have moisture content significantly over optimum or which cannot be compacted to required density.

b. Expansive soils.

c. Sod, matted or decayed vegetation.

d. Deleterious materials.

3.3.4 Treatment of existing subgrade material which exceeds optimum moisture content by more than two percent must be approved by the Engineer. Method of treatment shall be submitted in writing to the Engineer for approval.

3.3.5 Remove unsuitable materials, soil that cannot be dried to meet moisture content specified in paragraph 3.3.1 and soil that cannot attain a maximum dry density of 85 percent. Overexcavate trench minimum two feet (600 mm) each side of pipe bell at springline and maximum four feet (1200 mm) below elevation indicated on drawings, or to suitable subgrade, whichever occurs first. Dispose of removed material in accordance with paragraph 3.8.1. Fill overexcavation with granular material (ABC) to grade indicated on drawings and compact to 95 percent of optimum density per ASTM D698.

3.3.6 Subgrade soils which are unsuitable only because of high moisture content may be left in place and stabilized using geotextiles, if approved by the Engineer. Geotextile shall comply with requirements of CE 02.272. Subgrade preparation, placement of geotextiles, and

placement and compaction of fill material shall be in accordance with geotextile manufacturer's recommendations.

3.4 Bedding

3.4.1 Bedding requirements shall be as called for on drawings. Class C bedding or better is required unless otherwise specified on drawings, on license or in project-specific specifications.

3.4.2 Remove loose material, rocks, deleterious material, and debris from trench bottom prior to placing bedding material.

3.4.3 Bedding material shall be at a uniform moisture content of between optimum and five percent above optimum; compact to density required in 3.6.3 Compaction in one foot (300 mm) or smaller uncompacted lifts.

3.4.4 Finish and compact bedding to elevation indicated on drawings; assure that bedding will provide continuous support for pipe.

3.4.5 Excavate bell holes with minimum two inch (50 mm) clearance to prevent point loading of laid pipe and to maintain continuous support of pipe barrel. Excavate cable holes to prevent movement of pipe when removing sling.

3.4.6 Added or disturbed bedding material shall be compacted to densities required in 3.6.3. Compaction.

3.5 Pipe Installation

3.5.1 General

a. Install pipe to alignment and elevation shown on drawings. Variation from indicated alignment and elevation shall not exceed 0.1 foot (30 mm), and the rate of departure from or return to indicated alignment and elevation shall be no more than 0.1 foot (30 mm) in ten feet (3000 mm), unless otherwise approved by the Engineer. Bends shall be within one-half pipe section of station shown on drawings All changes in station require prior approval of the Engineer. Contractor shall mark approved changes in stationing, based on measurement of installed pipe, on drawings and shall supply marked drawings to the Engineer.

b. Lay pipeline with minimum horizontal separation of two feet (600 mm) from parallel utilities and with minimum one foot (300 mm)

vertical separation from utilities which cross below pipeline. No overcrossings of SRP irrigation pipe will be allowed without approval of the Engineer. Notify the Engineer immediately if it is found that a utility will be closer to pipeline than specified minimum separation.

c. Install elliptical pipe and elliptically reinforced pipe with vertical axis within ten degrees of true vertical.

d. Gaps in pipeline during installation due to utility conflicts will not be allowed unless otherwise approved by the Engineer.

3.5.2 Joint Assembly

a. Rubber gasketed joints (C76 and C361 pipe): Lay pipe with bell ends facing in direction of laying unless otherwise approved by the Engineer. Begin laying pipe at lower end of slope and proceed upward on grades which exceed ten percent. Only use gaskets and lubricant supplied by pipe seller. Clean joint mating surfaces and gasket before joining pipes. Apply generous, uniform coating of gasket lubricant to inside surface of bell end of pipe, in groove portion of spigot, and on gasket. Install gasket in accordance with pipe seller's instructions. Keep joint from contacting ground when inserting pipe spigot into bell. Use industry approved methods to push or pull pipe to complete joint closure.

b. Tongue and groove mortar joints (C507 pipe): Clean joint mating surfaces prior to joining pipes. Thoroughly wet tongue and groove with water and keep moist until mortar is placed; use brush to apply water. Apply mortar to upper half of tongue and to bottom half of groove in a manner which will fill entire joint. Use industry approved methods to push or pull pipe into position until mortar is squeezed from both inside and outside of joint. Adjust pipe to design alignment and grade; secure pipe section firmly in position using a small amount of bedding material placed and tamped thoroughly against lower portion of pipe at midpoint of length. Remove excess mortar from interior joint and finish interior joint recess smooth and flush with inside of pipe; remove all debris.

If adjustment of position of pipe is required after it has been laid, remove pipe, clean and rejoint it.

Keep the finishing of exterior joints between five and two sections of pipe behind pipe laying operations. Complete outside of joint by covering with hand-placed mortar band extending completely around outside of pipe. As soon as mortar band has set sufficiently, coat it with white-pigmented curing compound conforming to ASTM C309, Type 2, Class A, or provide a suitable moist cure acceptable to the Engineer.

c. Pipe diaper joints: Grout bands may be placed by diapering when specifically authorized by the Engineer.

After joining pipe, center and secure diaper over the exterior joint recess. Diaper shall completely and snugly encase the exterior joint except for an opening at the top; width of diaper is governed by size of pipe. Moisten joint recess with water prior to grout placement. Form grout band around pipe by pumping grout into opening of diaper; pump grout to one side of pipe until it flows completely under bottom of pipe and partially up other side, then pump to opposite side to fill diaper and complete grout band. Close opening in diaper. Keep grout band moist until trench is backfilled and band is covered.

3.5.3 Radius Curves

a. Gasketed joints: Long radius curves shall be made by using pipe manufactured with beveled ends or by pulling pipe joints of straight sections of pipe (deflecting pipe unit from straight alignment by opening one side of the outside perimeter of the joint wider than the other side) as it is laid. Maximum opening of pulled joint is ½" (13 mm) wider than width of joint when pipe is assembled in straight alignment. Deflections requiring outside joint to be pulled more than ½" (13 mm) shall be considered to be field bends.

b. Field bends and grade changes: Use reinforced pipe collar to make joints at field bends up to and including 45° (degrees) and grade changes.

Collar for reinforced concrete pipe shall be of mechanically compacted, reinforced, minimum 3000 psi (20 MPa) concrete. Outside of collar shall be made by forming; inside of collar shall conform to inside diameter of pipe. Maintain full pipe cross-section and smoothness through length of bend or grade change. Ensure that forming material is completely removed from inside pipe.

c. Precast Bends: Shall be as shown on drawings. Submit shop drawings of precast bends to the Engineer for approval; approval of the Engineer is required before beginning fabrication of precast bends.

3.5.4 Branch Connections

Type, size, location and angle of branch connections for irrigation pipe will be shown on drawings. Shop drawings are required for all prefabricated connections; submit shop drawings for approval of the Engineer.

3.5.5 Repairs

a. Repair tie holes, minor cracks and depressions in pipe surface with cement based, rapid setting mortar such as Speed Crete 2028 (Tammis Industries Co.) or approved equal. Clean and moisten surface before applying mortar.

b. If new or existing pipe has 0.01 inch (0.3 mm) or wider crack(s) notify the Engineer and request inspection of the pipe.

Repair 0.01 inch (0.3 mm) or wider cracks in an otherwise acceptable section of pipe with epoxy grout approved by the Engineer. V-groove inside cracks minimum 1/4 inch (6 mm) deep. Clean area prior to repair.

If crack goes through pipe wall or if structural integrity of pipe is in question, the Engineer may, at his option, require removal of damaged pipe and replacement with new.

c. Finished surface of inside repairs shall be smooth and flush with inside pipe surface.

d. Repairs shall not reduce inside pipe diameter.

3.5.6 Plugs

a. Temporarily cover or plug installed piping systems each day at end of work. Covers or plugs shall prevent entry of persons, small animals or deleterious material into pipe.

b. Completely remove all temporary covers, plugs, caps or dikes installed during construction before completion of construction.

3.6 Backfilling

3.6.1 General

a. Unless otherwise noted on drawings or in project-specific specifications, backfill shall be as noted in 2.10 Backfill.

b. Moisture content of backfill shall be as noted in paragraph 3.6.2.

c. Do not disturb or damage pipe when backfilling trenches. Place backfill evenly on opposite sides of pipe to prevent movement of pipe.

d. Lift thickness shall not exceed that which can be effectively compacted by type of equipment and method used. Maximum uncompacted lift thickness for processed or native granular material shall be limited to one foot (300 mm); maximum uncompacted lift thickness for non-granular native material shall be limited to eight inches (200 mm). Do not allow mechanical compaction equipment to come into direct contact with pipe.

e. Place and consolidate lean mix backfill and aggregate slurry backfill in lift depths that will not cause pipe to move or float. Discharge backfill directly from mixer into trench with even distribution on opposite sides of pipe. Backfill shall flow freely and uniformly around and under pipe without leaving voids; vibrate backfill to consolidate when slump is less than six inches (150 mm) or whenever required to fill voids.

3.6.2 Moisture Content

a. Contractor shall have sole responsibility to control moisture content of backfill. Optimum moisture content of backfill shall be determined in accordance with ASTM D698. Moisture

content which is outside of range specified shall be sufficient cause to require removal of placed backfill.

b. Moisture condition backfill material before placement, unless otherwise approved by the Engineer.

c. Place granular material, except for aggregate slurry, at a uniform moisture content of between optimum and three percent above optimum.

d. Place aggregate slurry with water content as specified in SRP 02227. The Engineer may require increase or decrease in water content to obtain desired slump.

e. Place native material, which does not meet requirements for classification as granular material, at a uniform moisture content of between three percent below to two percent above optimum.

3.6.3 Compaction

Compact or consolidate bedding and backfill to, at minimum, density specified in Table 2. Where conflicting density requirements exist, use highest density. Test density in accordance with ASTM D698. Bedding or backfill not meeting density requirements shall be removed/reworked at Contractor's expense.

3.6.4 Field Quality Control

a. Inspection and compaction tests are required on trench backfill. Compaction tests are not required on lean mix backfill meeting requirements of SRP 02227.

b. The Engineer will verify density and moisture content of bedding and backfill material during construction. Tests will be made at discretion of the Engineer.

c. Backfill lifts shall not be covered before compaction tests are performed. If lift is covered prior to testing, Contractor is at own risk and shall excavate test holes for making density tests on lower portions of backfill at instruction of the Engineer. Refill and compact test holes in accordance with specifications. Excavating, refilling and compacting test holes shall be at Contractor's expense.

TABLE 2				
Compaction Type	Location	From Surface to 2' (600 mm) Below Surface	From 2' (600 mm) Below Surface to 1' (300 mm) Above Top of Pipe	From 1' (300 mm) Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' (600 mm) of the above	100% for granular, 95% for non-granular	90%	90%
II	On any utility easement, street, road or alley right-of-way outside limits of (I).	85%	85%	90%
III	Around any structures or exposed utilities.	95%	95%	95%

3.7 Field Test

3.7.1 The Engineer may, at his option, require Contractor to test integrity of installed pipeline or joints. Pipeline and joint tests shall be made at Contractor's expense. The Engineer will monitor field testing.

3.7.2 Pipeline tests shall be in accordance with ASTM C969. Test pressure shall correspond to maximum operating head condition stipulated by SRP Watermaster responsible for that area. Test period shall be 24 hours. The availability of water for pipeline field tests is entirely at the option and convenience of SRP.

3.7.3 Joint tests shall be in accordance with ASTM C924 for 24" (600 mm) pipe or smaller and ASTM C1103 for 27" 675 mm) pipe or larger.

3.7.4 Contractor shall repair all deficiencies revealed by field testing. Tests shall be successfully completed prior to final acceptance of the pipeline.

3.8 Cleanup

3.8.1 Remove unsuitable material and excess spoil material from jobsite and dispose of at SRP approved disposal site, unless otherwise directed by the Engineer. Removal and disposal of material shall be at Contractor's expense.

3.8.2 Dress grades adjacent to the work as needed to return site to like original condition, unless otherwise directed by the Engineer.

3.8.3 All work and property of SRP and/or others damaged or destroyed by Contractor, its employees or Subcontractors shall be repaired or replaced at Contractor's expense to the satisfaction of the Engineer.

SALT RIVER PROJECT
STANDARD SPECIFICATION
FOR
REINFORCING STEEL
(SRP 03210)

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STANDARD SPECIFICATION FOR REINFORCING STEEL (SRP 03210)

1 0 GENERAL

1.1 Work Specified

This Specification covers the furnishing of all shop drawings, plant, labor, materials, tools, equipment and performing all operations and incidentals necessary for supplying reinforcing steel, plain steel dowels and bar supports

1.2 Work Performed by Purchaser

When construction work is performed by Purchaser, the term Contractor shall mean the reinforcing steel supplier.

1 3 Standard Units

Either English or SI (metric) units may be used Whichever units are specified on the drawings shall be considered standard for that project. Substitution between English and SI products will be allowed, provided that at least equivalent cross-sectional area is furnished.

1.4 Reference Standards

1 4.1 Reference to standards or specifications shall be interpreted to mean the latest revision unless otherwise noted

1.4.2 The following abbreviations appear in this Specification:

ACI	American Concrete Institute
ASTM	American Society for Testing and Material
CRSI	Concrete Reinforcing Steel Institute

1 4 3 The following standards shall be made a part of this Specification

ACI 315	Details and Detailing of Concrete Reinforcement

ACI 318/318M	Building Code Requirements for Reinforced Concrete
ACI SP-66	ACI Detailing Manual
ASTM A36/A36M	Standard Specification for Carbon Structural Steel
ASTM A82	Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
ASTM A615/ A615M	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A775/ A775M	Standard Specification for Epoxy-Coated Reinforcing Steel Bars
CRSI Handbook	Concrete Reinforcing Steel Institute Handbook

1 4 4 Exceptions to this Specification must be approved in writing by the Engineer prior to beginning the affected work

1 5 Submittals

1 5 1 Shop Drawings

a. Two prints of each shop drawing shall be submitted to the Engineer for review and approval The Engineer will require at least three working days for review of shop drawings.

b. Shop drawings shall include placement drawings, bar list, bending details, standees and spreader bars, and schedules for fabrication and delivery of reinforcing steel

c. Shop drawings shall be checked and signed prior to submittal.

d. The Engineer will return one print of each shop drawing marked "Approved", "Approved as Noted", or "Not Approved" Submittals that are marked "Approved as Noted" or "Not Approved" shall be corrected and resubmitted. Each revision shall be dated

e. The Engineer's approval of submittals shall not relieve Contractor from responsibility for compliance with Drawings, Specifications and other Contract Documents nor from responsibility for errors in submittals.

f. Fabrication shall not begin until all shop drawings are approved by the Engineer

g. *Four sets of prints and one vellum of each final approved shop* drawing shall be provided to the Engineer The Engineer will distribute shop drawings to jobsite Foreman and Inspector when construction work is performed by Purchaser.

1 5 2 Two copies of original material manufacturer's Material Test Reports (MTR) for reinforcing steel shall be submitted to the Engineer prior to shipment.

1.5.3 Two copies of manufacturer's catalog data for each splicing device or other specialty item shall be submitted to the Engineer prior to shipment

1 6 Storage and Handling

1.6 1 Reinforcing steel shall be protected during shipping and unloading to prevent damage to material or loss of identification tags.

1.6.2 Reinforcing steel shall be stored above grade and in such a manner as to prevent contamination with dirt, rust, oil or other bond-breaking coatings

1.6 3 Damaged, misfabricated or deteriorated materials, not caused by Purchaser's actions, shall be replaced by Contractor at no additional cost to Purchaser

2.0 PRODUCT

2.1 Reinforcing Steel

2.1 1 All reinforcing steel shall comply with the following standards:

a. Bars shall conform to ASTM A615, Grade 60 (ASTM A615M, Grade 400) unless noted otherwise

b Epoxy-coated bars shall conform to ASTM A775/A775M

c. Plain steel wire reinforcement shall conform to ASTM A82.

d. Plain steel welded wire fabric shall conform to ASTM A185

e Plain steel dowels shall conform to ASTM A36/A36M.

2 1.2 All material shall be new and free from loose rust, loose mill scale, dirt, oil and paint.

2 1 3 Reinforcing steel with tightly adhered mill scale or rust or a combination of both will be acceptable provided the minimum dimensions (including deformations) and weight of a hand wire-brushed test specimen are not less than acceptable ASTM requirements.

2.2 Bar Supports

2 2 1 Chairs and bolsters shall be steel, plastic or concrete, and shall be of size and dimensions necessary to perform required function

2 2 2 Standees shall be furnished with the reinforcing steel when top and bottom mats in slabs are shown on the drawings Maximum standee spacing shall be 4 feet (1200 mm) each way.

2.2.3 Spreader bars shall be furnished with the reinforcing steel when reinforcing in both faces of walls is shown on the drawings and the concrete pour height in such walls exceeds 8 feet (2400 mm). Maximum spreader bar spacing shall be 4 feet (1200 mm) each way

2 3 Specialty Items

Materials not specifically described, but required for complete and proper installation of reinforcing steel, shall be approved by the Engineer prior to use

2 4 Drawing Requirements

2 4 1 All placement drawings shall have a clear area within the border in lower right corner for Purchaser's drawing number to be affixed by the Engineer

2 4 2 Letters, figures and line work on reproducibles shall be clear and dense enough to reproduce legibly on prints. Background shall be free of blemishes which would show on reproduction

2 4 3 Drawings and data shall be in sufficient detail to indicate the type, size, arrangement and weight of each component.

2.5 Fabrication

2 5.1 All reinforcing steel shall be shop fabricated in accordance with approved shop drawings.

2.5.2 All bars shall be bent cold.

2.5 3 Welding reinforcing steel will not be allowed

2 5 4 Fabrication details and tolerances shall comply with requirements of ACI 315.

2.6 Quality Assurance

2.6.1 All material shall be subject to inspection by the Engineer Materials not meeting the requirements of this Specification will be rejected. Reinforcing steel may be rejected at fabrication plant or at jobsite. The Contractor shall be responsible for all Purchaser's direct and indirect costs for removal and replacement of rejected reinforcing steel. Inspection may be waived by the Engineer but such waiver shall not be interpreted as releasing Contractor from responsibility for delivery of materials conforming to this Specification.

2.6 2 Each bundle shall be tagged with quantity, bar size, and piece mark in accordance with approved shop drawings A complete shipping list shall be provided for each shipment. Failure of Contractor to comply with these requirements will result in rejection of the shipment.

3.0 EXECUTION

None

SALT RIVER PROJECT
STANDARD SPECIFICATION
FOR
CONCRETE
(SRP 03300)

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PREPARED BY: K. L. CHHIBBER APPROVED BY: L. BOTTOLFSON

REVISED BY: K. L. CHHIBBER APPROVED BY: GUY LEAERY

STANDARD SPECIFICATION FOR CONCRETE (SRP 03300)

1.0 GENERAL

1.1 Work Specified

This specification covers the furnishing of all plant, labor, materials and equipment necessary for designing, mixing, and delivering normal weight Portland Cement Concrete ready for placement.

1.2 Work Performed by Purchaser

When construction work is performed by Purchaser, the term Contractor shall mean the concrete supplier.

1.3 Standard Units

English units are the standard.

1.4 Reference Standards

1.4.1 Reference to standards or specifications shall be interpreted to mean the latest revision unless noted otherwise.

1.4.2 The following abbreviations appear in this Specification:

ACI	American Concrete Institute
ARPA	Arizona Rock Products Association
ASTM	American Society for Testing and Materials
MAG	Maricopa Association of Governments
NRMCA	National Ready-Mixed Concrete Association
SRP	Salt River Project

1.4.3 The following standards shall be made a part of this Specification:

ACI 305R	Hot Weather Concreting
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 318	Building Code Requirements for Reinforced Concrete
ASTM C31	Standard Practice for Making and Curing Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C138	Standard Test Method for Unit Weight, Yield, and Air Contents (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C233	Standard Test Method for Air-Entraining Admixtures for Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete

ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
ASTM D512	Standard Test Methods for Chloride Ion in Water
ASTM D516	Standard Test Method for Sulfate Ion in Water

1.4.4 Exceptions to this specification must be approved in writing by the Engineer prior to beginning the affected work.

1.5 Submittals

1.5.1 Contractor shall submit the following items for each mix to be supplied:

a. Plant certification

b. Cement certification and mill test report

c. Fly ash certification

d. Fly ash replacement ratio

e. Source and gradation of fine and coarse aggregate

f. Admixture brand and certification

g. Source of water and certification

h. Mix design

i. Mix design performance/trial batch data

1.5.2 Concrete supplier shall use SRP Stock Code Numbers, but may assign mix design product codes in addition to SRP stock code numbers specified in Table 1.

1.6 Quality Assurance

1.6.1 Each batch plant from which concrete will be supplied must have current NRMCA, ARPA or equivalent laboratory certification.

1.6.2 Concrete supplier shall provide documentation that an Arizona-registered professional engineer has reviewed mix design and other submittals prior to submitting to Purchaser for review and approval.

1.6.3 Concrete supplier shall provide access to batch plant for sampling/inspection of materials and equipment.

1.7 Storage and Handling

1.7.1 Materials shall be stored and handled in a manner that prevents deterioration, segregation, or intrusion of foreign matter.

1.7.2 Storage of aggregate on natural ground surface will be permitted if bottom six inches of pile is not used in batching.

2.0 PRODUCT

2.1 Cement

Cement: Portland Cement, Type II, low alkali, moderate heat of hydration, ASTM C150. Equivalent alkali content shall not exceed 0.6 percent, per Table 2, ASTM C150.

2.2 Aggregate

Coarse and fine aggregate: ASTM C33.

2.3 Water

Water for washing aggregate and for mixing concrete shall be potable. If potable water is not used, chemical analysis of water certifying suitability in accordance with ASTM D512 and ASTM D516 from an independent testing laboratory shall be required.

2.4 Admixtures

2.4.1 Admixtures certified by manufacturer shall contain not more than 0.1 percent water soluble chloride ions by mass of concrete and shall be compatible with other admixtures. Do not use admixtures containing calcium chloride.

2.4.2 Air-Entraining Admixtures

a. Air-entraining admixtures: ASTM C260.

b. Air-entraining admixtures testing: ASTM C233.

c. Air content (unless specified otherwise): ACI 318, Table 4.2.1, moderate exposure. Tolerance for air content as delivered ± 1.5 percent.

2.4.3 Water-Reducing, Retarding, and Accelerating Admixtures

a. Water-reducing admixture: ASTM C494, Type A.

b. Water-reducing and accelerating admixture: ASTM C494, Type E.

c. Water-reducing and retarding admixture: ASTM C494, Type D.

2.4.4 High range, water-reducing admixture (superplasticizer): ASTM C494, Type F or G.

a. Superplasticizers shall conform to ASTM C494, Type F or G.

b. Superplasticizer may be added at batch plant or at jobsite.

2.5 Fly Ash

2.5.1 Fly ash shall be used in all mix designs, unless noted otherwise in Table 1.

2.5.2 Fly ash: ASTM C618, Class F.

2.5.3 Fly ash shall be compatible with cement and shall not react deleteriously with alkalis in cement. Concrete supplier shall have fly ash sampled and tested in accordance with ASTM C311.

2.5.4 Up to 25 percent by weight of cementicious materials required for mix design may be an approved fly ash. The rate of substitution will be 1-1 1/2 pounds of fly ash to 1 pound of cement. Concrete supplier shall be responsible to determine replacement ratio for each pound of replaced cement to maintain specified compressive strength f'c.

2.6 Proportioning of Mix

2.6.1 Source, character or gradation of materials shall not be changed without prior written approval of the Engineer.

2.6.2 Mix shall be homogeneous, readily placeable and uniformly workable. Proportioning of ingredients shall produce consistency, durability, workability, specified compressive strength f'c, and other properties as required per reference standards in Section 1.4.

2.7 Measurement of Materials: ASTM C94

2.8 Mixing

2.8.1 Mixing: ASTM C94.

2.8.2 Additional water may be added on the jobsite in accordance with Section 2.9.2 and ASTM C-94 “Tolerances in Slump” providing the slump after such water addition does not exceed the maximum allowed by Table 1, and that water so added is mixed into the batch for a minimum of 30 additional revolutions at mixing speed.

2.9 Delivery

2.9.1 Ready-mix concrete shall be produced and delivered in accordance with ASTM C94. Unless a different allowable temperature range is pre-approved by the Engineer, Concrete that is outside the temperature range of 55^{o}F to 90 ^{o}F, or has attained its initial set upon arrival at jobsite, as determined by the Engineer, will be rejected at Contractor's cost. Engineer may waive these limitations if slump is such that concrete can be placed without addition of water. Unless designed using pre-approved set delay additives, concrete shall be discharged within 1 1/2 hours after initial mixing water has been added to cement and aggregate.

2.9.2 Concrete supplier shall be responsible to make corrections to bring mix to specified slump. Only one addition of water to bring mix to specified slump shall be allowed. Mix not meeting slump requirements will be rejected.

2.9.3 Batch out time of truck shall be machine-stamped on delivery ticket at concrete supplier's plant. A copy of delivery ticket having machine-stamped batch out time shall be given to the Engineer at time of delivery. Concrete deliveries without machine-stamped batch out time on delivery ticket shall be rejected.

2.9.4 Concrete shall be delivered within 30 minutes of requested delivery time. Time lapse between successive deliveries shall not vary by more than 20 minutes from that requested. The Engineer may reject any batch not meeting these requirements.

2.10 Hot Weather Concreting

2.10.1 During conditions of high temperature, low relative humidity, or wind which might impair quality of concrete, setting time shall be delayed by using proper admixtures.

2.10.2 Hot weather concreting: ACI 305R. The concrete temperature during discharge shall not exceed 90° F.

2.11 Cold Weather Concreting

Cold weather concreting: ACI 306.1. Concrete temperature during discharge shall not be less than 55° F.

2.12 Direct and Indirect Costs

Direct and indirect costs incurred by Purchaser due to failure to meet requirements of this specification shall be paid by Contractor.

3.0 EXECUTION

3.1 Testing, Strength Compliance, and Acceptance of Concrete

3.1.1 Testing

a. Frequency for sampling concrete for strength compliance: ACI 318 or as specified by the Engineer.

b. Concrete samples will be taken directly from transit mix truck. Sampling and testing will be in accordance with the following standards:

ASTM C138	Unit Weight & Yield
ASTM C143	Slump
ASTM C172	Sampling

ASTM C231	Air
ASTM C1064	Temperature

c. Concrete strength specimens: ASTM C31. Test specimens 4” diameter by 8” long cylinders.

d. Test cylinders: ASTM C39.

3.1.2 Testing specified in subsection 3.1.1 will be performed by the Engineer at no cost to Contractor unless otherwise stated in the contract documents.

3.1.3 Compliance With Compressive Strength Provisions

Compressive strength will be considered satisfactory if test results meet following requirements:

a. 7-day average compressive strength, per strength test (average of two cylinders) equals or exceeds 70 percent specified compressive strength f'c.

b. 28-day average compressive strength of all sets of three consecutive strength tests equals or exceeds specified compressive strength f'c.

c. No individual strength test (average of two cylinders) falls more than 500 psi below specified compressive strength f'c when at least three strength tests are made.

d. When less than three strength tests are made, no individual cylinder strength falls below specified compressive strength f'c.

3.1.4 Failure to Meet Compliance Requirements

a. Failure to meet requirements of subsection 3.1.3a indicates that potentially low-strength concrete has been delivered. Contractor will be notified of potential problem for remedial action.

b. Failure to meet requirements of subsections 3.1.3b or 3.1.3c or 3.1.3d shall be basis for investigation of low-strength concrete per subsection 3.1.5.

3.1.5 Investigation of Low-Strength Concrete

a. A set of three cores representing each strength test shall be taken.

b. Cores shall be taken within 72 hours of testing for 28-day compressive strength or as specified by the Engineer, in accordance with ASTM C42 and tested in accordance with ASTM C39.

c. Contractor shall be responsible for costs associated with investigation of low-strength concrete. However, Contractor's cost will be reimbursed if requirements of subsection 3.1.6 have been satisfied.

3.1.6 Acceptance of Low-Strength Concrete

Concrete in an area represented by core tests will be considered acceptable if the average of three cores is minimum 85 percent specified compressive strength f'c and no single core is less than 75 percent specified compressive strength f'c.

When low-strength concrete is accepted by the Engineer on the basis of test results of less than 100% of the required minimum compressive strength, an adjustment in the concrete unit price may be made for the quantity of concrete represented by such strength tests in accordance with the following table.

Percent of Specified Minimum 28-day Compressive Strength Attained (Nearest 1%)	Percent of Concrete Unit Price Allowed
100% or greater	100
95-99	95
90-94	90
85-89	85

3.1.7 Rejection of Low-Strength Concrete

Concrete failing to meet acceptance requirements of subsection 3.1.6 will be rejected. Contractor shall be responsible for direct and indirect costs of removal and replacement of rejected concrete

TABLE 1
CONCRETE MIXES

SRP Stock Code Number	Description	Specified Compressive Strength @ 28 Days f'c (Psi)	Coarse Aggregate Max. Size (In.) ASTM C33 Table 2	Slump Range in.	Maximum Water/ Cementitious Material Ratio (By Wt.)	Remarks
0000220	MAG C or Canal Bottom	**2,000**	1 #57	3-5	N/A	
0000221	Slipform		1/2 #7	3-4	N/A	Min. cement 423 lbs/yd^3
0000222	Masonry Grout		3/8 #8	4-6	0.60	
0000230	MAG A or Normal SRP 3000 Mix	**3,000**	1 #57	3-5	N/A	
0000231	Flowable			6-8	0.55	Use superplasticizer
0000233	C.I.P. Pipe 36 in.& smaller		1/2 #7	3-4		
	Cable Trench					
0000234	Shotcrete		3/8 #8		0.47	75-85% Coarse aggregate passing 3/8 in. sieve & fiber for shotcrete
0000235	Ditchmix			3-5	0.60	
0000240	MAG AA or Normal SRP 4000 Mix	**4,000**	1 #57	3-5	N/A	
0000241	Normal with air				0.50	
0000242	Flowable			6-8		Use superplasticizer
0000243	Flowable with air					
0000244	Precast without flyash		1/2 #7	3-5		
0000250	Normal SRP 5000 Mix	**5,000**	1 #57	3-5	0.45	
0000251	Normal with air					
0000252	Flowable			6-8		Use superplasticizer
0000253	Flowable with air					
0000254	Normal without flyash			3-5		
0000255	Normal with small aggregate		1/2 #7			
0000256	Normal with small aggregate & without flyash					

SALT RIVER PROJECT

GENERATION ENGINEERING

STANDARD SPECIFICATION FOR CONCRETE FORMWORK AND PLACEMENT (GE 03305)

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REVISED BY K. L. CHHIBBER APPROVED BY LARRY A. BOTTOLFSON

STANDARD SPECIFICATION FOR CONCRETE FORMWORK AND PLACEMENT (GE 03305)

1 0 GENERAL

1 1 . Work Specified

This Specification covers the furnishing of labor, equipment and materials needed to form, place, consolidate, finish and cure cast-in-place concrete

1 2 Reference Standards

1 2.1 Reference to standards or specifications shall be interpreted to mean the latest revision unless noted otherwise.

1.2 2 The following abbreviations appear in this Specification

ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
CRSI	Concrete Reinforcing Steel Institute
SRP	Salt River Project

1 2 3 The following Standards shall be made a part of this Specification.

ACI 117	Standard Specification for Tolerances for Concrete Construction and Materials
ACI 302	Guide for Concrete Floor and Slab Construction
ACI 304R	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 304	Placing Concrete by Pumping Methods
ACI 305R	Hot Weather Concreting
ACI 306 1	Standard Specification for Cold Weather Concreting

ACI 308	Standard Practice for Curing Concrete
ACI 309R	Guide for Consolidation of Concrete
ACI 318/318M	Building Code Requirements for Reinforced Concrete
ACI 347R	Guide to Formwork for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C920	Standard Specification for Elastomeric Joint Sealants
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
CRSI	CRSI Recommended Practice for Placing Reinforcing Bars
SRP 03210	Salt River Project Standard Specification for Reinforcing Steel
SRP 03300	Salt River Project Standard Specification for Concrete
GE 07920	Generation Engineering Standard Specification for Caulking and Sealants

1 2 4 Exceptions to this specification must be approved in writing by the Engineer prior to beginning the affected work.

1 3 Submittals

Fabrication and placement drawings for reinforcing steel and embedded items, mix designs, and Manufacturer's Material Safety Data Sheets (MSDS) for chemicals shall be submitted to the Engineer for approval at least five working days prior to placement of concrete Work shall not proceed until submittals have been approved by the Engineer

2.0 PRODUCT

2.1 Materials

2.1 1 Concrete shall conform to SRP 03300.

2 1.2 Reinforcing steel shall conform to SRP 03210

2 1.3 Waterstop shall be dumbbell shape extruded elastomeric polyvinyl chloride of type, width and thickness specified on Drawings.

2.1 4 Expansion joint filler material shall be preformed neoprene sponge rubber conforming to ASTM D1752, Type I

2.1 5 Elastomeric sealants for expansion and control joints shall conform to GE 07920 Polyethylene foam backer rod shall be used for back-up of cold-applied elastomeric sealants.

2.1 6 Sealants in fuel or chemically active water containments shall be compatible with properties of stored material

2.2 Curing Compound

Curing compound shall conform to ASTM C309 Type 1-D, Class A clear resin compound shall be used for interior applications Type 1-D, Class A clear resin compound with fugitive dye or Type 2, Class A white-pigmented wax emulsion compound shall be used for exterior applications

2 3 Form Lumber

Form lumber in contact with exposed concrete surfaces shall be new and shall conform to the following:

a. Structural Plywood, Class I or II. High-density overlay shall be used when highly smooth, grain-free concrete surface is required

b Dimension lumber, Douglas Fir or Larch, Number 2 grade, seasoned and surfaced all sides

2 4 Metal Forms

A commercial metal forming system or combination metal and plywood forming system may be used provided it is straight, clean and assembled to manufacturer's instructions

2.5 Other Accessories

2.5 1 Form accessories such as, but not limited to, styrofoam form liners or fiberglass may be used

2 5 2 Form accessories or other embedded items which are to be partially or entirely embedded in concrete shall be of a commercially manufactured type.

2 5 3 Aluminum pipe which is to be embedded in concrete shall be completely taped with Polyken two-inch wide pipe wrap, spiral wrapped with 50% overlap

2 5 4 Reinforcing bar supports shall conform to CRSI Class 3 (bright wire) for use in contact with formed surfaces that will not be exposed, and CRSI Class 1 (plastic tipped or coated) for use in contact with formed surfaces that will be exposed

2.5.5 Concrete block or plastic reinforcing bar supports may also be used

3 0 EXECUTION

3 1 Forming

3 1.1 Contractor shall be responsible for design and construction of forms, in accordance with ACI 347R. Forms shall have adequate strength to support weight of fresh concrete and added loads imposed by workers, wind and construction equipment.

3 1 2 Forms shall be designed, constructed, braced, and maintained so that finished concrete will be true to line and elevation, and will conform to dimensions and contours specified in Contract Documents Forms shall be sufficiently tight to prevent leakage of mortar paste

3.1.3 Reusable forms shall be maintained and kept in good condition as to accuracy of shape, strength, rigidity, watertightness, and smoothness of surface Forms unsatisfactory to the Engineer shall not be used

3.1 4 Three-quarter inch chamfer shall be provided in forms at exposed corners and edges of concrete Horizontal edges of curved forms may be radiused with an edging tool

3 1 5 Forms shall be treated with form-release agent which will not adhere to or discolor concrete Form-release agent shall be cleaned from rebar and other embedded items prior to concrete placement

3.1 6 Shear keys in construction joints shall be formed prior to concrete placement.

3.2 Reinforcing Steel Placement

3.2 1 Reinforcing steel shall be positioned on supports, spacers or hangers and secured in place with wire ties or clips Welding of reinforcing steel and embedded items will not be permitted

3.2 2 Reinforcing steel shown on Drawings is the minimum required Additional bars may be added for working supports, at Contractor's expense, provided these do not interfere with concrete placement or violate concrete cover requirements

3.2.3 Solid grout or concrete blocks or non-eroding chairs or bolsters shall be used to position bottom mat of slab reinforcing steel.

3.2.4 The following minimum concrete cover shall be provided for reinforcing steel, unless noted otherwise in Contract Documents·

a. Concrete cast against and permanently exposed to earth. 3 inches

b Concrete exposed to earth or weather·

#6 through #18 bars	2 inches
#5 bar, W31 or D31 wire, and smaller	1-1/2 inches

c. Concrete not exposed to weather nor in contact with earth·

Slabs, Walls, Joists	
#11 bar and smaller	3/4 inch
#14 and #18 bars	1-1/2 inches
Beams, Columns·	
Primary Reinforcement, Ties,	
Stirrups, Spirals 1-1/2 inches	1-1/2 inches

3 2 5 Contact splices of reinforcing steel are preferred. Noncontact splices shall be spaced no farther apart transversely than 1/5 required lap splice length nor six inches clear distance

3 3 Waterstop Installation

Waterstop shall be accurately located and properly braced to prevent movement during placement of concrete. Waterstop shall be clean and free of dirt, grease or concrete splatter. Splices shall be kept minimum, but when unavoidable, splices shall be made using teflon coated splicing iron to assure watertight joints Prefabricated intersections shall be used where possible.

3 4 Concrete Placement

3.4 1 Contractor shall notify the Engineer at least 24 hours in advance of each proposed concrete placement Installation of anchor bolts, reinforcing steel, embedded items, and forms shall be approved by the Engineer prior to concrete placement.

3.4.2 Unless specifically waived by the Engineer, concrete placement shall be done in the presence of the Engineer and shall not commence until the work has been authorized to proceed.

3.4 3 Concrete slabs on grade shall be placed on undisturbed soil or compacted subgrade Frozen subgrade or subgrade that contains frozen materials will not be acceptable

3 4.4 Forms and construction joint surfaces shall be clean and free of foreign materials Sandblasting, water-blasting, or other methods specified in ACI 304R shall be used to achieve a clean interface at construction joints

3 4 5 Subgrade shall be dampened and excess water removed prior to placement of concrete on grade. Wooden forms that will be in contact with concrete shall be thoroughly moistened unless wood has been properly treated with form release agent. When ambient temperature exceeds 90°F, fog nozzles shall be used to cool reinforcing steel and forms prior to concrete placement. When temperature of reinforcing steel is greater than 120°F, steel forms and reinforcing steel shall be sprayed with water just prior to placing concrete During cold weather (mean daily temperature below 40°F), ice, snow and frost shall be removed from reinforcing steel and placement areas and temperature of all surfaces which will be in contact with fresh concrete shall be raised to minimum 40°F. Minimum concrete temperature of 50°F shall be maintained during and after placement.

3 4 6 Concrete from mixer shall be conveyed and deposited in place by methods which will prevent segregation or loss of materials Where concrete trucks cannot access jobsite, concrete shall be pumped or conveyed, or energy dissipating chutes (elephant trunks) shall be used

3.4.7 Equipment for chuting and pumping concrete shall be of a size and design that can provide a continuous flow of concrete at the delivery end. Aluminum conveying equipment shall not be used.

3.4.8 Mud, soil or foreign matter shall be prevented from entering concrete or forms during placement operations.

3 4 9 Concrete in walls shall be placed continuously in level layers not exceeding two feet thick, so that no cold joints form. Prior to concrete placement, Contractor shall make arrangements to assure uninterrupted delivery of concrete.

3.4 10 Beams and floor slabs shall be placed in one continuous operation unless noted otherwise.

3.4 11 Grade beams, pedestals, columns, and walls shall be placed monolithic, without joints, unless noted otherwise.

3.4.12 Construction joints for walls shall be placed at maximum ten feet height unless noted otherwise

3 5 Consolidation

3 5.1 Concrete shall be compacted thoroughly into a dense homogeneous mass throughout entire depth of layer being consolidated.

3.5.2 Concrete for slabs, drilled piers, footings, and walls shall be consolidated by vibration, spading or rodding so that concrete is thoroughly worked around reinforcing steel, conduit, embedded items and into corners of forms. Manual consolidation methods for structural concrete placement shall not be used Structural concrete slab surface shall not be hand tamped when concrete has four inch or greater slump

3 5 3 Adequate number of vibrators of sufficient capacity shall be provided to keep up with maximum rate of concrete placement. An adequate supply of standby equipment, including a minimum of one vibrator, shall be kept at jobsite

3.5 4 Internal vibrators shall be inserted vertically through the full depth of layer being placed, penetrating into the previous layer. Vibrator shall not be dragged, but inserted and withdrawn slowly with vibrator running continuously so that no void is left in concrete Vibrator shall not be used to flow concrete from one location to another.

3 5 5 Concrete shall be vibrated until it is thoroughly consolidated and voids are filled as evidenced by level appearance of concrete at exposed surface and embedment of surface aggregate.

3 5.6 Form vibrators may be used only where sections are too thin or inaccessible for internal vibrators

3 6 Finishing

3 6.1 Concrete for foundations shall be finished so that free water will not collect on surface

3 6 2 Threads on anchor bolts and reinforcing steel dowels shall be protected from concrete buildup and/or splatter Threads on anchor bolts shall be cleaned so that nuts turn freely without interference

3 6 3 Exposed concrete surfaces for floor slabs shall have final finish conforming to ACI 302.1R unless noted otherwise

3 6 4 Floor slabs which are to be covered with resilient flooring or coatings shall have smooth, steel trowel finish.

3 6 5 Slabs on which concrete pedestals are to be placed shall have rough, scored finish.

3 6 6 All other exposed concrete surfaces shall have formed or smooth, steel trowel finish, unless noted otherwise.

3 6.7 Control joints may be formed or sawcut Sawcutting shall be done during initial setting of concrete, but in no case later than 12 hours after completion of concrete placement. Sawcut shall extend full design length. Wall and edge conflicts will preclude use of sawcutting

3 6 8 Exposed concrete shall be free from irregularities, fins, rock pockets, or other imperfections. Defective concrete surfaces including misalignment and holes from form ties, shall be repaired. Defective surfaces shall be repaired prior to placement of backfill Repairs to defective surfaces shall be made in following manner

a. Surface shall be chipped back to minimum depth of one-half inch beyond imperfection. Edges shall be chipped perpendicular to surface, and the depression shall be pre-wetted and brushed with neat cement immediately before patching.

b. Mortar used for patching shall have same sand-cement ratio as original concrete with minimum water for placing. Color of existing concrete shall be matched at exposed surfaces.

c Mortar to patch form-tie holes shall be applied with hammer and ramming rod within 24 hours of removal of wall forms and shall be struck flush.

d. Repairs shall be cured by moistening for three days or by using curing compound.

3 7 Curing

3 7 1 Concrete surfaces shall be cured by methods recommended in ACI 308, ACI 305R or ACI 306 1 The following are acceptable methods

a Using saturated burlap, soaker hoses, or sprinklers to keep concrete continuously wet for minimum seven days.

b. Covering concrete with polyethylene sheets, other than black film, applied in full contact with surfaces and sealed around edges.

c. Applying curing compound to unformed concrete surfaces within one hour after applying finish Curing compound shall be applied to formed concrete within one hour after stripping forms. Where epoxy coating or staining of concrete is required, curing compound shall contain no waxes, paraffins or oils Curing compound shall be applied by spraying with uniform coverage, at rate recommended by manufacturer

3.7 2 Curing compound shall not be used on concrete surfaces which are to be in contact with grout, if curing compound is used, concrete surfaces shall be sandblasted prior to placing grout. Other means of surface cleaning, such as high pressure water blasting/water jetting, will also be acceptable

3 7.3 If concrete shows tendency to set and dry too rapidly, form shrinkage cracks or form cold joints, concrete shall be kept moist using fog spray, wet burlap, cotton mats, or other method(s) acceptable to the Engineer.

3 7 4 Concrete placed during cold weather shall be protected with insulating blankets or heated enclosures Fresh concrete shall not be exposed to carbon monoxide or carbon dioxide fumes from heaters or engines

3.8 Form Removal

3 8.1 Forms shall not be relieved of load or removed without approval of the Engineer. Formwork for structural slabs shall not be removed until concrete has attained 70 percent specified minimum compressive design strength (f'c) or until

seven days, whichever occurs first. Formwork for structural walls shall remain in place for minimum 24 hours after concrete placement. Side forms for nonstructural members may be removed, at Contractor's risk, after concrete has set.

3 8.2 70 percent specified minimum compressive design strength (f'c) shall be required before backfilling against walls or application of loads.

3 9 Tolerances

Tolerances for concrete construction shall conform to ACI 117. Following tolerances are maximum, noncumulative, variations from dimensions shown on Contract Documents

a Plumbness in lines and surfaces of concrete walls, columns and piers.

In any 10 feet	1/4 inch
Maximum for total structure height	1/2 inch

b Cross-sectional dimensions of columns, beams, walls and slab thickness:

Up to 12 inches	+ 3/8 inch/- 1/4 inch
More than 12 inches	+ 1/2 inch/- 3/8 inch

c Footings, Horizontal Dimensions

Formed Excavation	+ 2 inches/- 1/2 inch
Unformed Excavation	+ 3 inches

d. Minimum Concrete Cover:

Beams, Walls & Columns	- 0 inch

e Finished Slab Surfaces

Maximum depression in floors shall not exceed 3/16 inch below a 10 foot straightedge.

f Anchor bolts shall be plumb and to the following tolerances

Bolt projection	+1/4 inch/- 0 inch
Bolt location (without sleeves)	± 1/8 inch
Bolt location (with sleeves)	± 3/16 inch

Top of plastic anchor bolt sleeves shall be cut off flush with rough concrete just prior to grouting or setting equipment and base plates.

3 10 Quality Control

3.10.1 Reinforcing steel setting, embedded items, electrical grounding wires and form accessories will be inspected by the Engineer prior to concrete placement Concrete shall not be placed until all items have been approved by

the Engineer Contractor shall bear cost of delays in concrete placement caused by not providing sufficient inspection time or for making corrections to comply with requirements.

3 10.2 Concrete Testing

a The Engineer will furnish test equipment and trained personnel to perform required field tests and to make required test cylinders.

b The Engineer shall be provided access and adequate time for securing samples to determine whether materials are in accordance with Contract Documents.

c The Engineer may select and pay an independent testing laboratory to perform required laboratory tests.

d Testing, strength compliance, and acceptance of concrete will be in accordance with SRP 03300

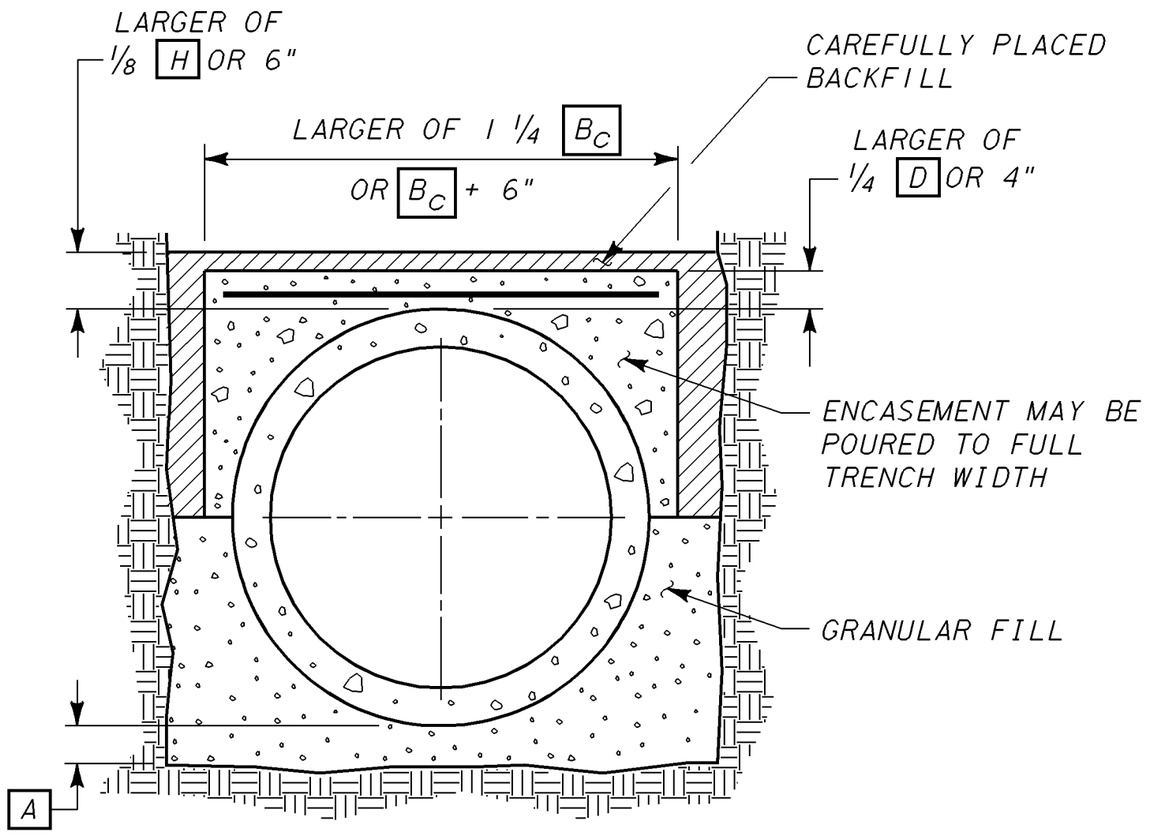
e Contractor has right to observe all phases of concrete cylinder fabrication, curing and testing Should Contractor observe deviations from the prescribed testing procedure that may be detrimental to concrete strength test results, Contractor shall immediately notify the Engineer

f. The Engineer may require modifications of materials on the basis of field or laboratory tests Contractor shall make such modifications at his own expense.

3 10 3 Contractor shall have sole responsibility for meeting concrete placement requirements Inspection by the Engineer shall not relieve Contractor of responsibility for errors or deviations from specifications

3 10 4 Concrete rejected by the Engineer for nonconformance shall be corrected to conform to specifications or removed and replaced. Contractor shall be responsible for direct and indirect costs of correction, removal and replacement of rejected concrete, including costs incurred by the Engineer

REFERENCE DRAWINGS



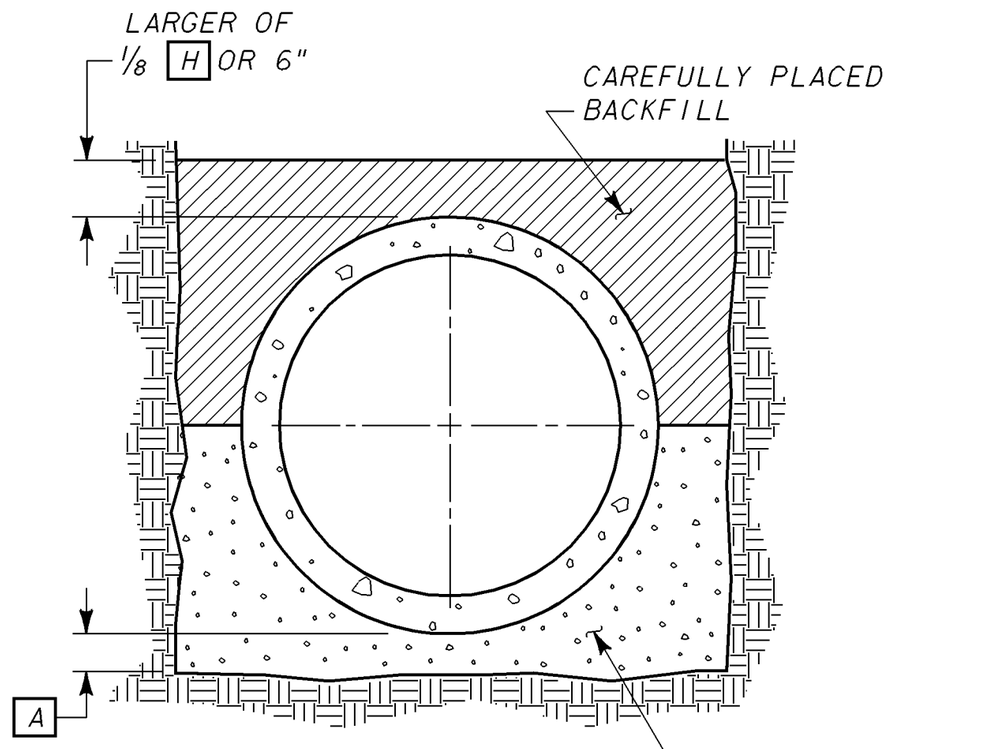
CLASS A

ARCH ENCASEMENT

LOAD FACTOR
- REINFORCED, A_S = 0.40% = 3.5
- REINFORCED, A_S = 1.00% = 4.8
- PLAIN=2.8

A_S = PERCENTAGE OF AREA OF TRANSVERSE STEEL IN THE CONCRETE ABOVE CROWN OF PIPE

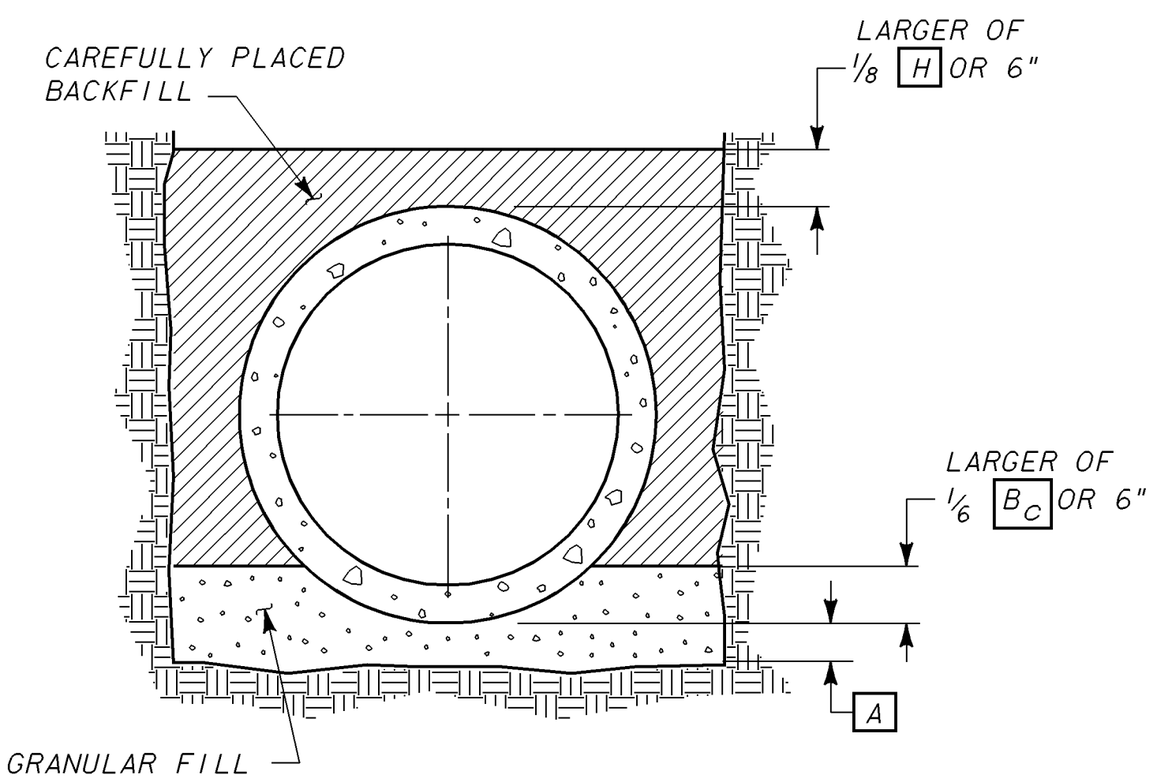
ENCASEMENT SHALL BE 2000 psi CONCRETE (MAG C)



CLASS B

FIRST- CLASS BEDDING

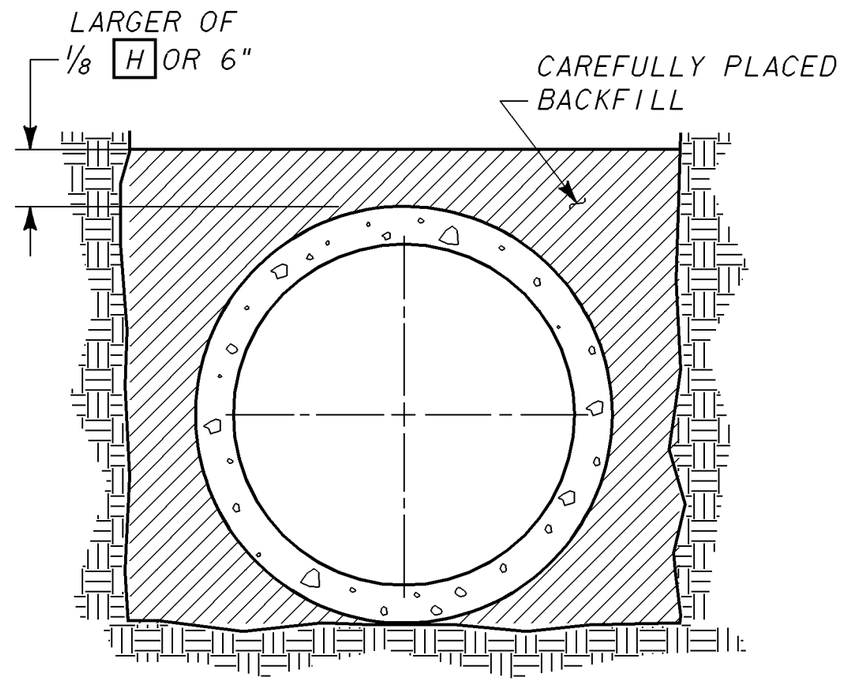
LOAD FACTOR 1.9



CLASS C

ORDINARY BEDDING

LOAD FACTOR 1.5



CLASS D

FLAT BOTTOM BEDDING

LOAD FACTOR 1.15

TABLE OF FILL DEPTHS BELOW PIPE	
D DIAMETER	A MINIMUM
36" & SMALLER	4"
OVER 36"	OF Bc

H = DEPTH OF FILL ABOVE TOP OF PIPE

Bc = OUTSIDE DIMENSION OF PIPE

REFERENCES

PRECAST CONCRETE PIPE SPECIFICATION _____ WTR 02614

REVISIONS

REV NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
ADDED CONCRETE ENCASEMENT NOTE AND REMOVED METRIC REFERENCES.						
2	10/28/03	JWS	-	CWT	-	REL
ADDED METRIC DIMENSIONS.						
1	4/97	MD	-	CWT	-	REL
INITIAL ISSUE.						
0	2/89	AK	WJC	REL	AAR	TNS

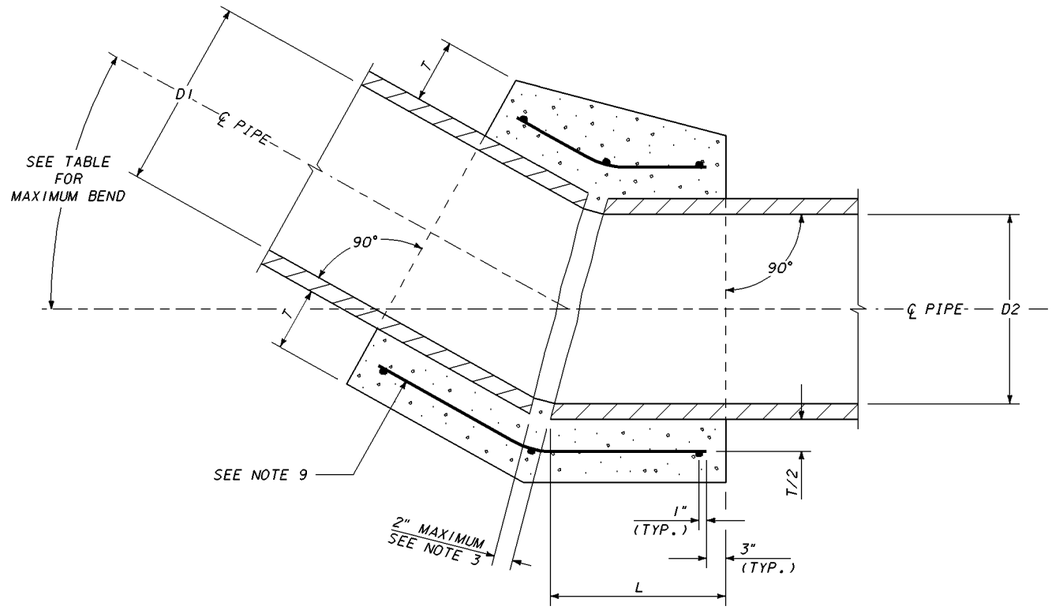
SALT RIVER PROJECT
WATER ENGINEERING STANDARDS

PIPELINE BEDDING/BACKFILL REQUIREMENTS

SCALE: NONE | 30300001.WES

DWG SIZE: 17 X 22

WES-30300-001



PIPE COLLAR DETAIL

MINIMUM REQUIREMENTS

D	L	T	REINFORCING STEEL	MAXIMUM BEND
12"	12"	6"	(3) #4 HOOPS WITH #4 @ 12" OR 6x6-W5.5xW5.5 WWF	22 ½°
18"				
24"				30°
30"	18"	8"		45°
36"				
42"		10"		
48"				
54"				
60"	24"	12"		
66"				
72"				
78"				
84"	30"			
90"				
96"				
102"	36"	14"		
108"				

D = D1 OR D2, WHICHEVER IS GREATER. (SEE NOTE 4)

NOTES

1. NO SUBSTITUTIONS AND/OR CHANGES SHALL BE MADE WITHOUT ENGINEER'S APPROVAL.
2. CONCRETE PIPE COLLAR IS REQUIRED TO JOIN TWO PLAIN END PIPES OF DIFFERENT DIAMETERS, MATERIALS, OR PIPES AT CHANGE IN ALIGNMENT OR GRADE.
3. PIPE ENDS SHALL BE TRIMMED SUCH THAT THE MAXIMUM DISTANCE BETWEEN PIPES AT ANY POINT IS TWO INCHES.
4. MINIMUM PIPE COLLAR SIZE SHALL CORRESPOND TO LARGER OF THE TWO PIPE DIAMETERS.
5. CONCRETE COLLARS SHALL BE FINISHED SMOOTH AND FLUSH WITH THE INSIDE SURFACE OF THE PIPE.
6. CONCRETE SHALL CONFORM TO REQUIREMENTS OF SRP STANDARD SPECIFICATION FOR CONCRETE (SRP 03300).
7. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI @ 28 DAYS (MAG A) AND SHALL BE CONSOLIDATED BY MECHANICAL VIBRATOR OR EQUIVALENT.
8. REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL BE ASTM 185.
9. THE DIAMETER OF WELDED WIRE FABRIC OR REBAR HOOPS SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS "T". LAP SHALL BE 12".
10. ALL FORMS SHALL BE REMOVED PRIOR TO BACKFILLING.
11. STANDARD CONCRETE PIPE COLLAR SHALL NOT BE USED UNDER PAVEMENT SURFACES.

REFERENCES

REVISIONS

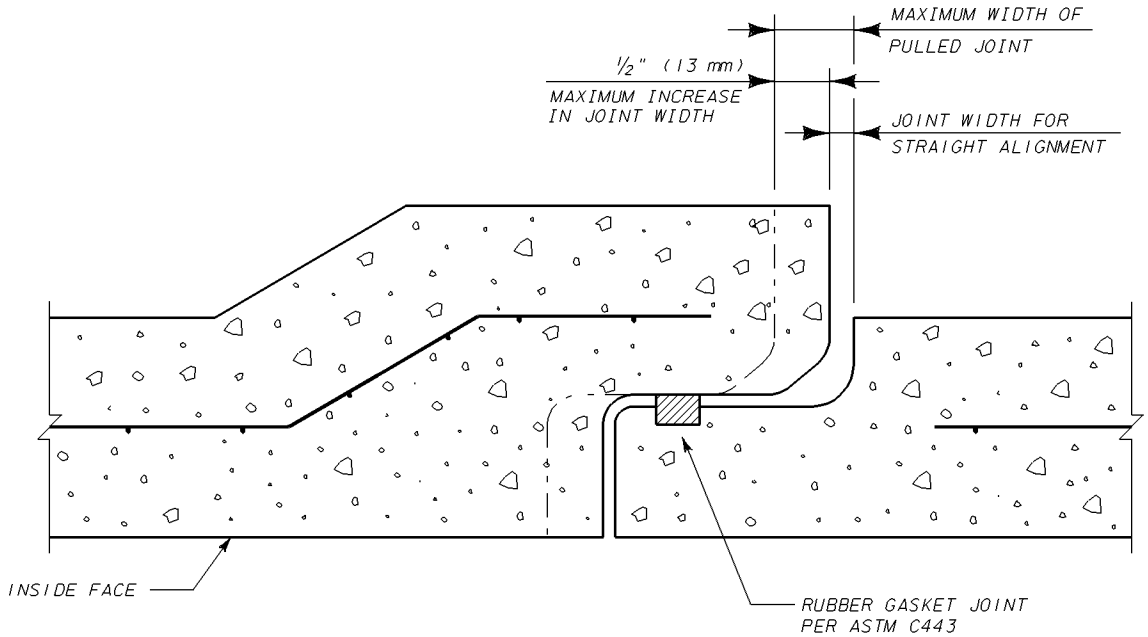
REV NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
REVISED TABLE (ADDED ANGLES) AND ADDED METRICS.					
3	MD	-	CWT	REL	05/97
	MD	-	CWT	REL	
REVISED DETAIL, NOTES, TABLE (REMOVED METRIC DIMENSIONS) & DRAWING SIZE.					
4	JWS	-	CWT	REL	02/09/01
	JWS	-	CWT	REL	

SALT RIVER PROJECT
WATER ENGINEERING STANDARD

STANDARD CONCRETE PIPE COLLAR SECTION AND DETAILS

SCALE: NONE
[120236130300003.WES
DWG SIZE 22X34
WES-30300-003

$$$$$SYTIME$$$$$



SECTION THRU PIPE JOINT

NOTES:

1. THIS DETAIL IS FOR A TYPICAL RUBBER GASKET BELL & SPIGOT ASSEMBLY. FLUSH BELL RUBBER GASKET JOINTS MUST MEET THE SAME SPECIFICATIONS.

REFERENCES
PRECAST CONCRETE PIPE SPECIFICATION _____ WTR 02614

REVISIONS

REV NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
INITIAL ISSUE						
0	2/89	AK	WJC	REL	AAR	TNS
REVISED TO ASTM C433 STANDARD						
1	5/97	MD	---	CWT	---	REL

SALT RIVER PROJECT
WATER ENGINEERING STANDARDS

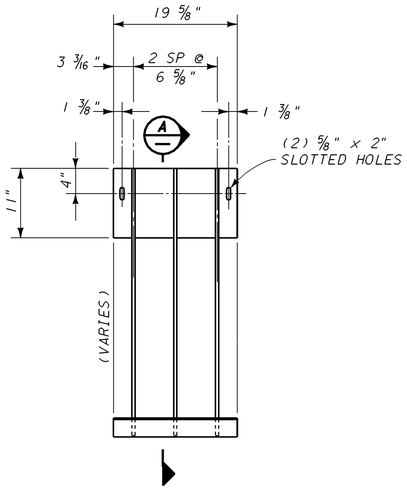
RUBBER GASKET JOINTS

SCALE: NONE

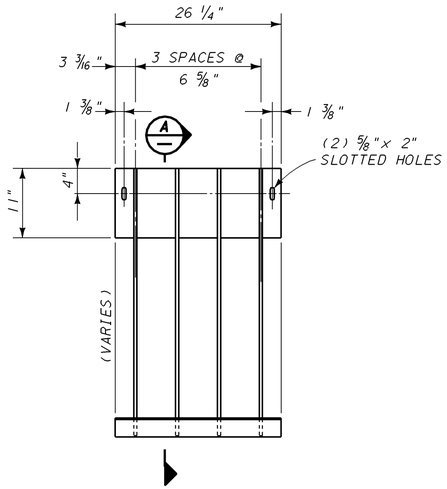
P02:[120,236]30300004.WES

DWG SIZE 17 X 22

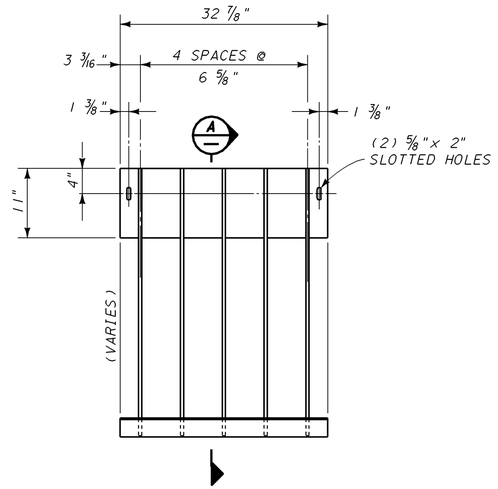
WES-30300-004



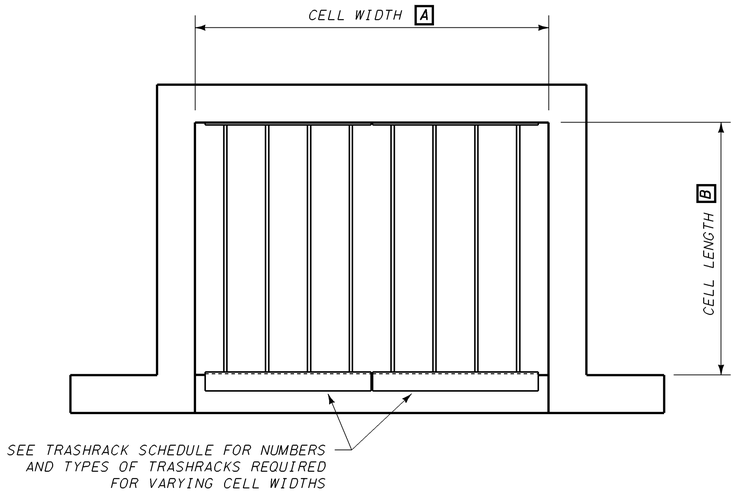
TRASHRACK-TYPE I



TRASHRACK-TYPE II



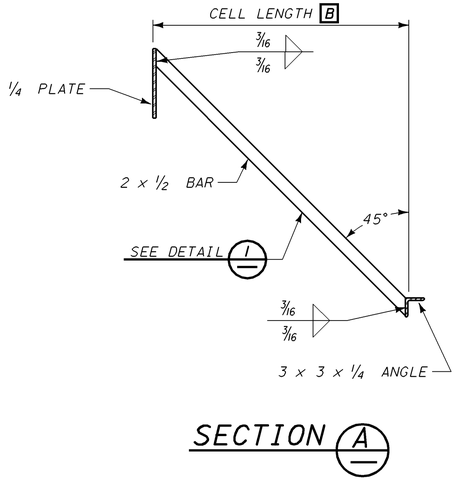
TRASHRACK-TYPE III



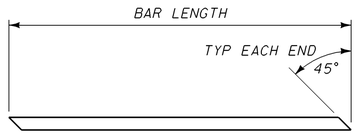
HEADWALL KEY PLAN

TRASHRACK SCHEDULE

HEADWALL CELL WIDTH [A]	NUMBER OF PANELS REQUIRED		
	TYPE I	TYPE II	TYPE III
32"	-	1	-
40"	-	-	1
48"	1	1	-
56"	-	2	-
64"	-	1	1
72"	-	-	2
80"	1	2	-
88"	-	2	1
96"	-	1	2
108"	2	-	2
120"	-	2	2
132"	-	1	3
144"	2	-	3
156"	1	-	4
168"	-	-	5
180"	1	1	4
192"	1	-	5



SECTION A



DETAIL 1

TRASHRACK BAR LENGTH SCHEDULE

HEADWALL CELL LENGTH [B]	BAR LENGTH
16"	23 15/16"
24"	35 1/4"
32"	46 9/16"
40"	57 7/8"
48"	69 3/16"
56"	80 1/2"

CONTRACTOR NOTE:

TRASHRACK(S) MUST BE MANUFACTURED PRIOR TO REQUESTING AN IRRIGATION OUTAGE FOR THIS JOB.

TRASHRACKS AND ASSOCIATED HARDWARE CAN BE SUPPLIED BY SALT RIVER PROJECT UPON REQUEST. PLEASE CALL THE MECHANICAL CONSTRUCTION & MAINTENANCE DIVISION OF SRP FOR PRICE QUOTES: (602)236-4154.

NOTES:

1. UNLESS OTHERWISE SPECIFIED, TOLERANCE DIMENSIONS SHALL BE +/- 1/32".
2. ALL STEEL SHALL BE ASTM A36 UNLESS OTHERWISE NOTED.
3. SANDBLAST TO NEAR WHITE AND ZINC METAL SPRAY OR HOT DIP GALVANIZE 5-7 MILS AFTER FABRICATION.

REFERENCES

REVISIONS

REV NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
REMOVED METRIC DIMENSIONS.					
3	JWS	-	CWT	REL	03/10/05
	JWS	-	CWT	REL	
INITIAL ISSUE.					
0	MOD	CWT	MLK	REL	02/22/95
	MOD	CWT	MLK	REL	

SALT RIVER PROJECT
WATER ENGINEERING STANDARD

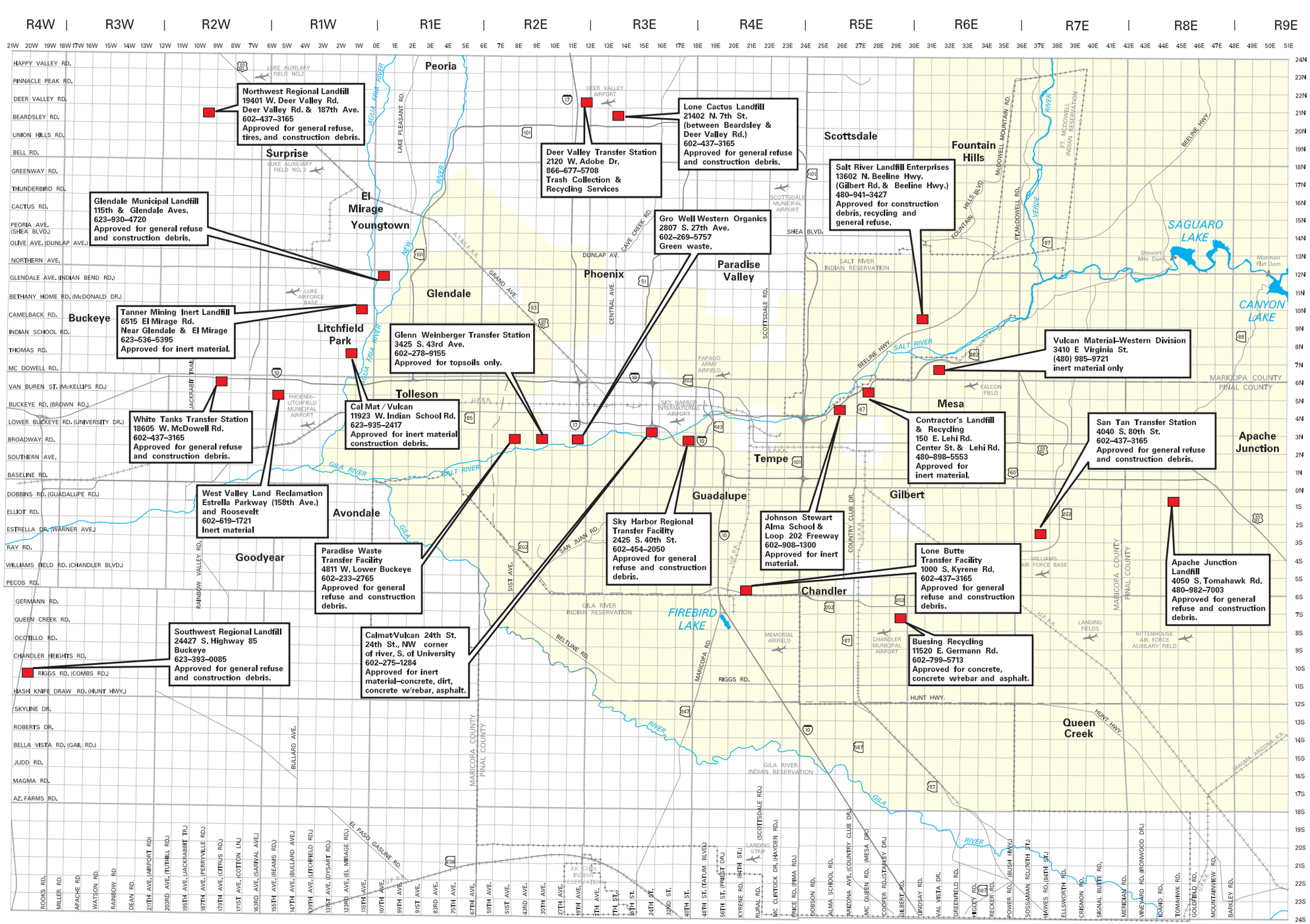
45° TRASHRACK FOR PIPELINE HEADWALL

SCALE: NONE | 30350200.WES
DWG SIZE 22X34

WES-30350-200

REFERENCE LANDFILLS

SRP APPROVED LANDFILLS 2013



LEGEND

- County Boundary
- Indian Reservation Boundary
- Approved Landfill Sites

CONSTRUCTION DEBRIS includes solid waste from construction, repair, or remodeling of buildings or other structures (Does not include asbestos–containing material or treated wood poles or crossarms)

GENERAL REFUSE /HOUSEHOLD WASTE includes solid household waste such as garbage, trash, rubbish and refuse. (Does not include construction, landscaping or demolition debris.)

GREEN WASTE solid waste from plants (leaves, limbs, grass, trees, etc. It does not include lumber, paper and other plant – derived products).

LANDSCAPE RUBBLE that may contain inert material and no more than 10% vegetative material.

INERT MATERIAL includes uncontaminated non–decomposing material such as concrete, asphalt, brick, rock, gravel, sand and soil. Can include metal but only if used as reinforcement in concrete. (Does not include glass or metal not contained in concrete.)

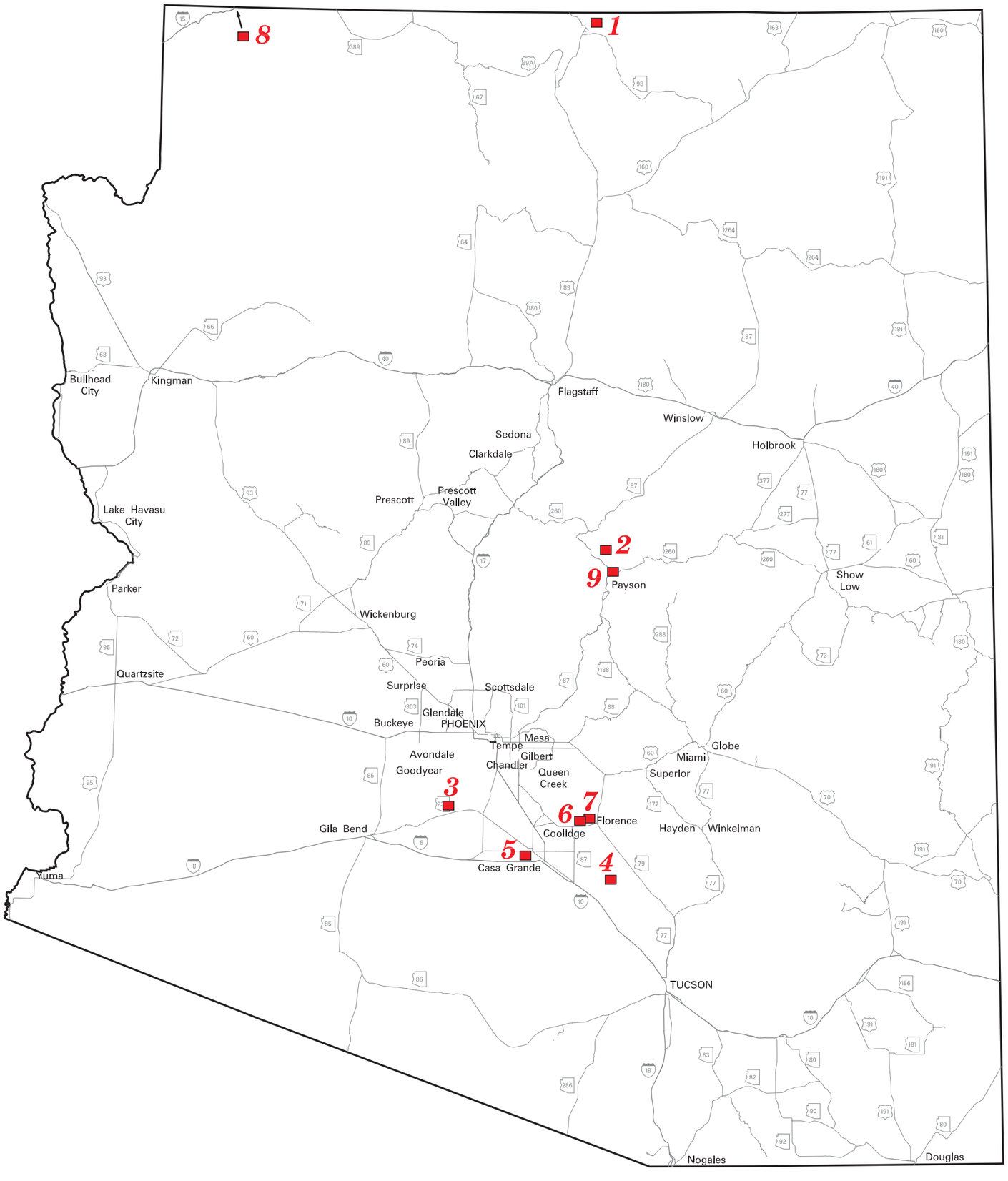
*** No Liquids or Lighting Wastes to any Landfill.**

Contact Environmental Compliance Division, for disposal of any petroleum contaminated soil or asbestos containing material.
Wendy Crites: 6–2321
Jeff Edmister: 6–8077
Dave Sultana: 6–8118
MP Environmental: 602–278–6233
800–833–7602

Contact EHS Audit for approval of any landfills not shown on map.
Lou Klejbuk: 6–8109
James Stephan: 6–8103

Cartographic & GIS Services REVISED: 05–16–2013 CAR:[140,200]SRPALF.DGN

SRP APPROVED LANDFILLS 2013



LEGEND

Approved Landfill Sites

1.) Page Transfer Station
3004 Coppermine Rd., Page, AZ
General refuse and construction debris
928–645–3885

2.) Buckhead Mesa Landfill
10 miles north of Payson Hwy. 87
928–476–3350

3.) Butterfield Landfill
40404 S. 99th Ave., Mobile, AZ
Approved for general refuse, construction debris and petroleum contaminated soils. asbestos containing material, and treated wood /crossarm materials.
LICENSED TRANSPORTERS ONLY
602–437–3165

4.) Cactus Regional Landfill
22481 E. Deep Well Ranch Rd,
15 miles s. of Florence via SR 79
General refuse and construction debris and petroleum contaminated soils, asbestos containing material.
480–797–0140

5.) Casa Grande Landfill
5200 S. Chui Chu Rd., Casa Grande, AZ
Gen. refuse and construction debris
520–421–8628

6.) Ironwood Landfill (Adamsville)
12720 E. Hwy. 287, Florence AZ
General refuse and construction debris, green waste
602–437–3165

7.) Pinal County Recycling Collection Center
12725 East Adamsville Rd., Florence, AZ
520–866–6685

8.) Washington County Landfill
557 N. Industrial Rd., St. George, Utah
435–628–2821

9.) Payson Transfer Station
902 N. Chennault Pkwy., Payson, AZ
General refuse and construction debris
928–474–1214

NORTH

SRP makes no representation as to the accuracy of this mapping product nor as to its fitness for a particular purpose.

SCALE IN MILES
0 10 20 30 40 50

Cartographic & GIS Services REVISED: 05–20–2013 CAR:[140.200]SRPALFAZ.DGN

Appendix F –

SRP Irrigation Construction Drawings

(For Information Only)

WATER ENGINEERING

SALT RIVER PROJECT

IRRIGATION IMPROVEMENTS

SRP ENGINEERING FILE NO. RD-12940

PHOENIX, ARIZONA

MC 85, 83RD AVENUE TO 91ST AVENUE, MCDOT PHASE IA

CUSTOMER: MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION, BEN MARKERT
TEL. (602) 506-8603

CUSTOMER'S ENGINEER: KIMLEY-HORN, ROBERT LYONS P.E.
TEL. (602) 678-3440

SRP DESIGNER: RICHARD JOHNSON
TEL. (602) 236-4607

SRP INSPECTOR: JEFF HYATT
TEL. (602) 236-2637

LEGEND

PLAN SYMBOLS

- BENCHMARK
- SECTION CORNER
- SURVEY POINT (CALLOUT)
- SECTION LINE
- CONSTRUCTION BASELINE
- PROPERTY OR RIGHT OF WAY LINE
- EASEMENT LINE
- CENTERLINE
- EXISTING EDGE OF PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- SLIPFORM LINING
- EXISTING DITCH
- EXISTING PIPE
- PROPOSED PIPE
- EXISTING HEADWALL WITH AND WITHOUT SLIPFORM
- PROPOSED HEADWALL WITH SLIPFORM
- EXISTING HEADWALL/ TRASHRACK WITH AND WITHOUT SLIPFORM
- PROPOSED HEADWALL/ TRASHRACK WITH SLIPFORM
- EXISTING TURNOUT STRUCTURE
- PROPOSED TURNOUT STRUCTURE
- EXISTING MANHOLE
- PROPOSED MANHOLE
- FIRE HYDRANT
- WATER VALVE
- METER (WATER-W /GAS-G)
- W — WATER LINE
- S — SEWER LINE
- G — GAS LINE
- T — TELEPHONE (DUCT OR CABLE)
- E — UNDERGROUND ELEC (DUCT OR CABLE)
- MANHOLE (NON WUA)
- SD — STORM DRAIN
- CB CATCH BASIN
- UTILITY POLE
- DOWN GUY
- FENCE (WOOD)
- FENCE (WIRE/NOT SPECIFIED)
- FENCE (MASONRY)
- PALM TREE
- TREE (TYPE)
- STUMP
- MB MAIL BOX
- EXISTING FACILITIES (CALLOUT)
- PROPOSED FACILITIES (CALLOUT)

PROFILE SYMBOLS

- LOW BANK
- BED
- AVERAGE GROUND LEFT
- AVERAGE GROUND RIGHT
- AVERAGE GROUND (ONE GIVEN)
- HIGH WATER
- BED (PRIVATE DELIVERY)
- HIGH GROUND
- LOW GROUND
- CENTERLINE OF ROAD
- BED (DRAIN DITCH)
- CATCH BASIN
- PROPOSED UTILITY
- EXISTING UTILITY
- PH POTHOLED UTILITY
- PROPOSED PIPE

NO	DATE	BY	CHK	APPD	AUTH
17	10.13.06	JWS	-	CWT	REL
REVISED EXISTING DITCH AND PIPE SYMBOLOGY.					
18	04.10.07	JWS	-	CWT	REL
REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.					

FORM NO

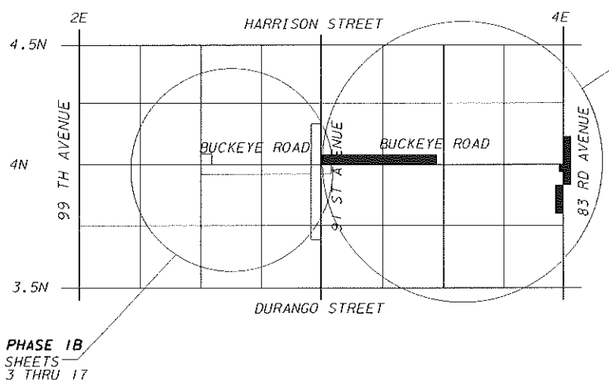
IRRIGFS.WDF

WDF-IRRIGFS

GENERAL NOTES

1. THE CUSTOMER/CONTRACTOR IS RESPONSIBLE TO OBTAIN A PERMIT FOR WORK WITHIN PUBLIC AGENCY R/W AND ASSURE THAT ALL WORK IS PERFORMED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL SAFETY AND ENVIRONMENTAL REGULATIONS.
2. THE WORK SPECIFIED ON THESE PLANS MAY INVOLVE THE USE OF AREAS LOCATED BOTH WITHIN SRP RIGHTS-OF-WAY AND PUBLIC AGENCY RIGHTS-OF-WAY. IF THE PUBLIC AGENCY ISSUES A PERMIT FOR WORK WITHIN ITS RIGHTS-OF-WAY, IT WILL APPLY ONLY TO THE AREA WITHIN THE PUBLIC AGENCY RIGHTS-OF-WAY. SUCH PERMIT SHALL NOT APPLY TO WORK WITHIN SRP RIGHTS-OF-WAY HAVING PRIOR RIGHTS.
3. THE CONTRACTOR SHALL CONTACT BLUE STAKE AT (602) 263-1100 AND SUCH OTHER LOCATORS/UTILITIES AS NECESSARY TO LOCATE AND FLAG ALL EXISTING UNDERGROUND UTILITIES BEFORE FIELD CONSTRUCTION BEGINS.
4. THE CUSTOMER'S CONTRACTOR IS REQUIRED TO CALL THE SRP INSPECTOR FOR A PRECONSTRUCTION CONFEPENCE IN ACCORDANCE WITH THE APPLICABLE SRP LICENSE OR CONSTRUCTION AGREEMENT BEFORE OBTAINING CONSTRUCTION CLEARANCE AND STARTING CONSTRUCTION. CONTRACTOR MUST SIGN A TEMPORARY IRRIGATION OUTAGE AGREEMENT, IF REQUIRED, BEFORE CONSTRUCTION CAN BEGIN.
5. ALL CONSTRUCTION WATER AND POWER SHALL BE OBTAINED, HANDLED, AND PAID FOR BY THE CONTRACTOR. THE CONTRACTOR SHALL MAKE ARRANGEMENTS TO PROCURE AND TRANSPORT WATER TO THE CONSTRUCTION SITE. ALL TEMPORARY FACILITIES SHALL BE REMOVED BEFORE FINAL ACCEPTANCE BY SRP.
6. ANY QUESTIONS RELATIVE TO THE ACCURACY OF THE IMPROVEMENT INSTALLATION SHALL BE SUBMITTED IN WRITING IMMEDIATELY AND BEFORE COMPLETION OF THE WORK. IF ALL SURVEY STAKES ARE MAINTAINED INTACT AS ORIGINALLY PLACED, SHOULD SUCH STAKES NOT BE PRESENT AND VERIFIED AS TO THEIR ORIGIN, NO CLAIM FOR ADDITIONAL COMPENSATION FOR CORRECTION SHALL BE PRESENTED TO ANY PARTY AND SUCH WORK SHALL BE CORRECTED AND PAID FOR BY BY THE CONTRACTOR.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL QUANTITIES AND ANY OTHER ITEMS AFFECTING THE BID TO COMPLETE THE WORK SHOWN ON THE PLANS, AND TO BASE THE BID SOLELY UPON VERIFIED QUANTITIES, IRRESPECTIVE OF THE INFORMATION FURNISHED AS NOTED ABOVE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE SRP INSPECTOR BEFORE CONSTRUCTION, OF ANY SIGNIFICANT DISCREPANCIES BETWEEN THE CONTRACTOR'S ESTIMATED QUANTITIES AND THOSE SHOWN ON THE PLANS.
8. THE CUSTOMER IS RESPONSIBLE FOR CLEARING THE PROPOSED SRP IRRIGATION SYSTEM ALIGNMENT BEFORE SRP CONSTRUCTION BEGINS. CLEARING SHALL INCLUDE REMOVAL OF PAVEMENT, CURBS, GUTTERS, SIDEWALKS, SIGNS, UTILITY POLES, STREETLIGHTS, FENCING AND ANY OTHEP EXISTING CONFLICTS.
9. CONTACT SRP CUSTOMER SERVICE AT (602) 236-8888 FOR REQUIREMENTS FOR PROTECTING, RELOCATING OR REMOVING SRP OVERHEAD POLES (INCLUDING DOWN GUYS), UNDERGROUND POWER LINES AND OTHER ELECTRICAL EQUIPMENT. THE CUSTOMER IS RESPONSIBLE FOR ALL COSTS OF COMPLYING WITH THESE REQUIREMENTS.
10. FOR IRRIGATION OUTAGE INFORMATION, CONTACT THE SRP INSPECTOR.
11. IF THERE ARE CONFLICTS BETWEEN SRP'S PLANS AND SPECIFICATIONS AND LOCAL GOVERNING REQUIREMENTS, THE MOST STRINGENT REQUIREMENT SHALL APPLY, AS DETERMINED BY THE SRP INSPECTOR.
12. ALL TRENCHING SHALL BE DONE IN ACCORDANCE WITH OSHA CONSTRUCTION STANDARDS FOR EXCAVATIONS.
13. BACKFILL MATERIAL, PLACEMENT AND COMPACTION SHALL CONFORM TO REQUIREMENTS OF MAG 601 EXCEPT THAT COMPACTION DENSITY SHALL BE 100% FOR GRANULAR MATERIAL AND 95% FOR NON-GRANULAR MATERIAL. BACKFILL SHALL BE ABC WHERE SO REQUIRED BY THE GOVERNING PUBLIC AGENCY. WATER CONSOLIDATION IS NOT PERMITTED.
14. ALL DELIVERY STRUCTURES WILL BE INSTALLED BY SRP FORCES. ALLOW A MINIMUM OF 30 DAYS BETWEEN ISSUANCE OF THE SRP LICENSE OR NOTICE TO PROCEED, AND THE INSTALLATION OF THE STRUCTURE.
15. SRP WILL PROVIDE STUBOUT FOR PRIVATE CONNECTION. CUSTOMER IS RESPONSIBLE FOR DESIGN, CONSTRUCTION, AND CONNECTION OF PRIVATE IRRIGATION FACILITIES. CONNECTION TO SRP STUBOUT SHALL BE MADE USING MAG STANDARD IRRIGATION STAND PIPE (MAG 503), JUNCTION BOX (MAG 504), OR HEADWALL (MAG 501-1). JUNCTION BOX AND HEADWALL SHALL PROJECT MINIMUM 12" ABOVE FINISH GRADE. CUSTOMER SHALL COMPLETE CONNECTION TO SRP STUBOUT PRIOR TO DATE SET BY SRP FOR SYSTEM ACTIVATION.
16. PIPE BEDDING SHALL BE CLASS "C" OR BETTER, AND BACKFILL SHALL BE PER SRP SPECIFICATIONS FOR PRECAST PIPE, UNLESS OTHERWISE NOTED.
17. ALL PRECAST CONCRETE PIPE SHALL BE IN ACCORDANCE WITH ASTM C76 CLASS III WALL B OR WALL C UNLESS OTHERWISE NOTED, AND MEET SRP SPECIFICATIONS FOR PRECAST PIPE.
18. ALL EXISTING IRRIGATION FACILITIES DISTURBED BY NEW CONSTRUCTION SHALL BE RECONSTRUCTED TO CURRENT SRP STANDARDS.
19. ALL WORK AND MATERIALS THAT DO NOT CONFORM TO THESE PLANS, SPECIFICATIONS AND SRP LICENSES/CONSTRUCTION AGREEMENTS, ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
20. ALL DUST AND TRAFFIC CONTROLS REQUIRED BY THE LOCAL GOVERNING AGENCY WILL BE OBTAINED, COORDINATED, AND PAID FOR BY THE CONTRACTOR.
21. SRP DOES NOT GUARANTEE THE LOCATION OR ELEVATION OF UTILITIES AND WILL NOT BE RESPONSIBLE FOR THEIR RELOCATION.
22. THE UTILITIES IDENTIFIED ON THE PLANS MAY NOT REPRESENT ALL EXISTING AND/OR CONFLICTING UTILITIES WITHIN THE PROJECT LIMITS.
23. ALL UTILITIES WHICH HAVE BEEN POTHOLED (GENERALLY ALL PIPES OR CONDUITS 2 INCHES OR LARGER IN DIAMETER AND ALL CABLES WITH 25 PAIRS OR GREATER) ARE DESIGNATED IN THE PROFILE WITH THE TERM "PH".
24. ALL UTILITIES MUST UNDERCROSS THE PROPOSED SRP PIPELINE AND MAINTAIN A MINIMUM CLEARANCE OF ONE FOOT, UNLESS NOTED OTHERWISE.
25. MAINTAIN MINIMUM TWO FOOT HORIZONTAL CLEARANCE BETWEEN OUTSIDE BELL DIAMETER OF SRP PIPE AND PARALLEL UTILITY. LOCATE PARALLEL UTILITY OUTSIDE AREA SRP EXCAVATES TO MAINTAIN ITS PIPE. TYPICAL EXCAVATION INCLUDES AREA ABOVE AND TO EACH SIDE OF SRP PIPE. SIDE EXCAVATION EXTENDS UP AND OUT AT ONE-TO-ONE SLOPE FROM POINT THAT IS LEVEL WITH BOTTOM OF SRP PIPE AND A MINIMUM OF TWO FEET BEYOND ITS OUTSIDE BELL DIAMETER.
26. LOCATION AND ELEVATION OF ALL BLUE STAKED UTILITIES ARE TO BE FIELD VERIFIED. ALL CONFLICTING UTILITIES ARE TO BE RELOCATED PRIOR TO SRP PIPE INSTALLATION. CONTACT THE UTILITY COMPANY FOR COST AND SCHEDULE REQUIREMENTS FOR RELOCATION.
27. VERTICAL CONTROLS ARE BASED ON SEA LEVEL DATUM AS DEFINED BY THE BENCHMARK ON EACH PLAN/PROFILE. VERTICAL CONTROLS MAY DIFFER BETWEEN PLAN/PROFILES. CHECK PLANS FOR ELEVATION EQUATIONS.
28. STATIONS SHOWN ON THE PLAN/PROFILE ARE ALONG THE SECTION LINE, UNLESS OTHERWISE NOTED.
29. DIMENSIONS LOCATING IRRIGATION MANHOLES AND DELIVERY STRUCTURES ARE FROM THE SECTION LINE TO THE CENTERLINE OF THE MANHOLE, AND TO THE FACE OF THE DELIVERY STRUCTURE RESPECTIVELY, UNLESS OTHERWISE NOTED.
30. FACILITIES WHICH ARE NOT SPECIFICALLY LOCATED WITH ACTUAL HORIZONTAL AND VERTICAL CONTROLS ARE LOCATED ONLY APPROXIMATELY AND WITH THE BEST AVAILABLE KNOWLEDGE.
31. ALL STAKING CONTROLS SHALL BE LEFT UNDISTURBED. THE CONTRACTOR SHALL CALL THE SRP INSPECTOR TO REFERENCE AND RESET ANY CONTROL POINTS THAT HAVE TO BE DISTURBED. THE CONTRACTOR WILL BE CHARGED FOR RESTAKING COSTS IF ANY STAKES ARE DESTROYED AND REQUIRE REPLACEMENT.
32. ELEVATIONS SHOWN FOR IRRIGATION MANHOLES ARE AT THE TOP OF THE PROPOSED SIDEWALK OR FINISHED ROADWAY GRADE AT THE CENTERLINE OF THE MANHOLE (TWO CORNER POINTS FOR THE 5-SIDED MANHOLE), UNLESS OTHERWISE NOTED. THE TOP OF THE MANHOLE SHALL BE STAKED BY THE CUSTOMER'S ENGINEER, AND THE HORIZONTAL OFFSET CHECKED TO VERIFY THAT THE LOCATION IS IN CONFORMANCE WITH THE LATEST REVISIONS TO THE GOVERNING AUTHORITY'S PAVING PLANS. ALL OTHER SRP IRRIGATION STAKING SHALL BE BY SRP FORCES, UNLESS OTHERWISE NOTED.
33. THE CUSTOMER'S ENGINEER SHALL VERIFY OR RE-ESTABLISH SECTION CORNERS TO BE USED AS THE BASELINE FOR IRRIGATION FACILITIES AND ALSO STAKE RIGHT-OF-WAY LINES AND TEMPORARY CONSTRUCTION AND PERMANENT EASEMENT LINES. SIDEWALKS AND BACK OF CURBS SHALL BE STAKED AT PROPOSED SRP MANHOLES AND STRUCTURES. ALL STAKING SHALL BE DONE PRIOR TO SRP STAKING NEW IRRIGATION FACILITIES. THE CUSTOMER'S ENGINEER SHALL MAINTAIN REFERENCE STAKES AS REQUIRED FOR THE DURATION OF SRP IRRIGATION SYSTEM CONSTRUCTION.

KEY PLAN



IMPORTANT NOTE:
PART A: SRP LAND RIGHTS REQUIRED
PART B: USA LAND RIGHTS REQUIRED

PLAN INDEX-SHEETS BROKEN OUT FOR PROJECT PHASING

IRRIGATON GEOMETRY/KEY MAP SHEETS 2 & 2A
PLAN/PROFILE(S) SHEET 18A THRU SHEET 28B
MANHOLE DETAIL(S) SHEET 31 THRU SHEET 34
HEADWALL W/TRASHRACK(S) SHEET 35
UTILITY POTHOLE SHTS 63,64,72,73,74 75,77 &78
OFFSET MANHOLE DETAIL(S) SHEET 79 THRU SHEET 80

PHASE IA DESIGN FOR CONSTRUCTION — / /

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	REJ	REJ	RMP	RMP	12/29/17
		REJ	REJ	RMP	RMP	

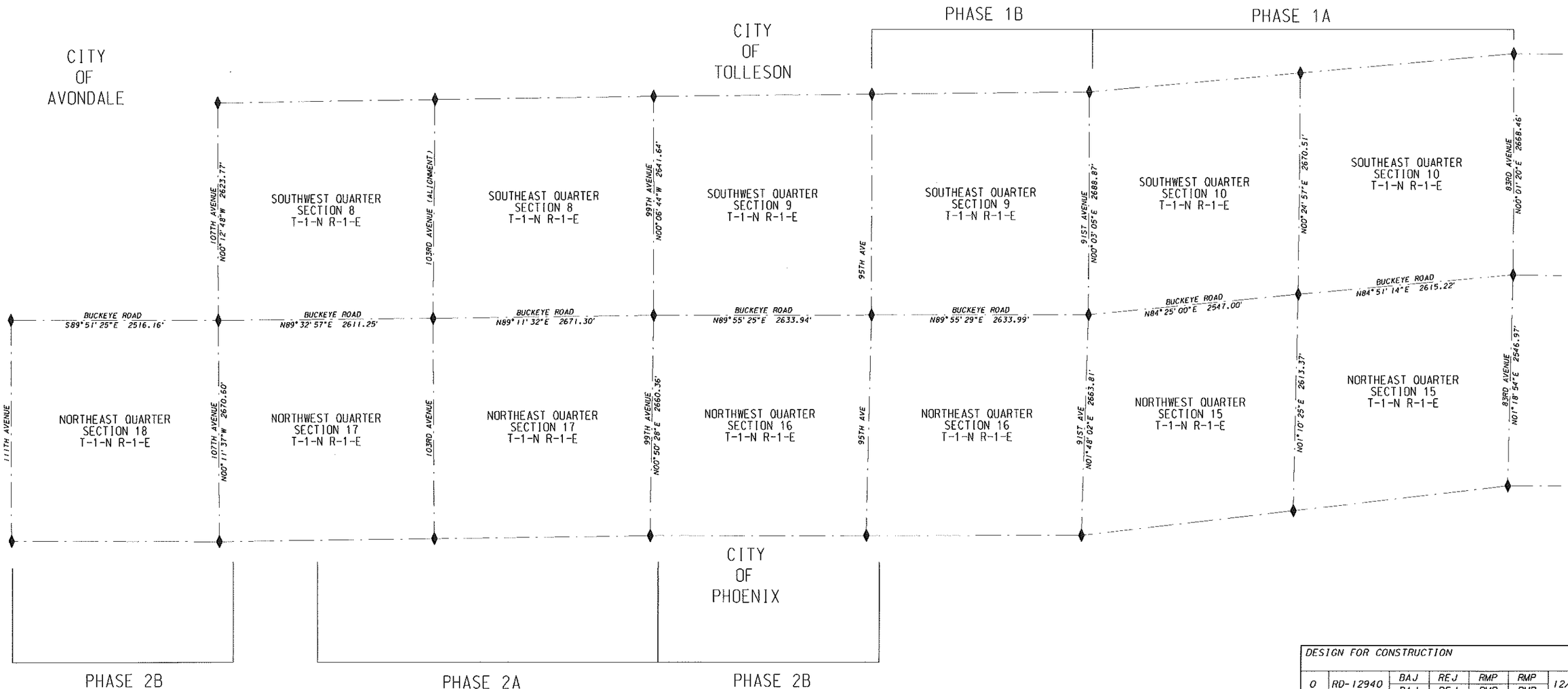
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL
DRAIN & LATERAL 21.0,
SEC 10,11,14 & 15
T1N R1E

SCALE: NONE			TEMPORARY - 12940FSH1.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	12940FSH1	1
CV	Y3	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

MC 85 75TH AVENUE TO 107TH AVENUE
SRP CONTROL (GEOMETRIC) SHEET



NO	DATE	BY	CHK	APPD	AUTH
17	10.13.05	JWS	-	CWT	-	REL
REVISED EXISTING DITCH AND PIPE SYMBOLOGY.						
18	04.10.07	JWS	-	CWT	-	REL
REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.						
FORM NO						

IRRIGFS.WDF

WDF-IRRIGFS

CONTROL NOTES:

ALL SRP PLAN & PROFILE DRAWINGS ARE BASED ON MARICOPA COUNTY SECTION CORNERS.

All Coordinates Shown are "GROUND COORDINATES"
Bearings are based on Grid North, AZSPCS, Central Zone, NAD83(CORS)
Vertical Datum: (NGVD29)

Benchmark: BRASS CAP ON TOP OF STRUCTURE (POINTS #8001)
Elevation: 996.48'

Northing offset: 800,000
Easting offset: 500,000
CPI Grid to Ground Scale Factor: 1.000131472127 56

Ex.: (Ground Coordinate "+" Offset "x" CPI Grid to Ground Scale Factor reciprocal + Original Grid Coordinate)

N

DESIGN FOR CONSTRUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	TSSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/1
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL
LATERAL 21.0, 22.0 & 23.0
SEC 8,9,10,15,16,17,18
T1N R1E
GEOMETRIC SHEET

SCALE: NONE			TEMPORARY - 12940GE01.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	12940GE01	2
CV	Y3	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

WATER SRP ENGINEERING

SALT RIVER PROJECT

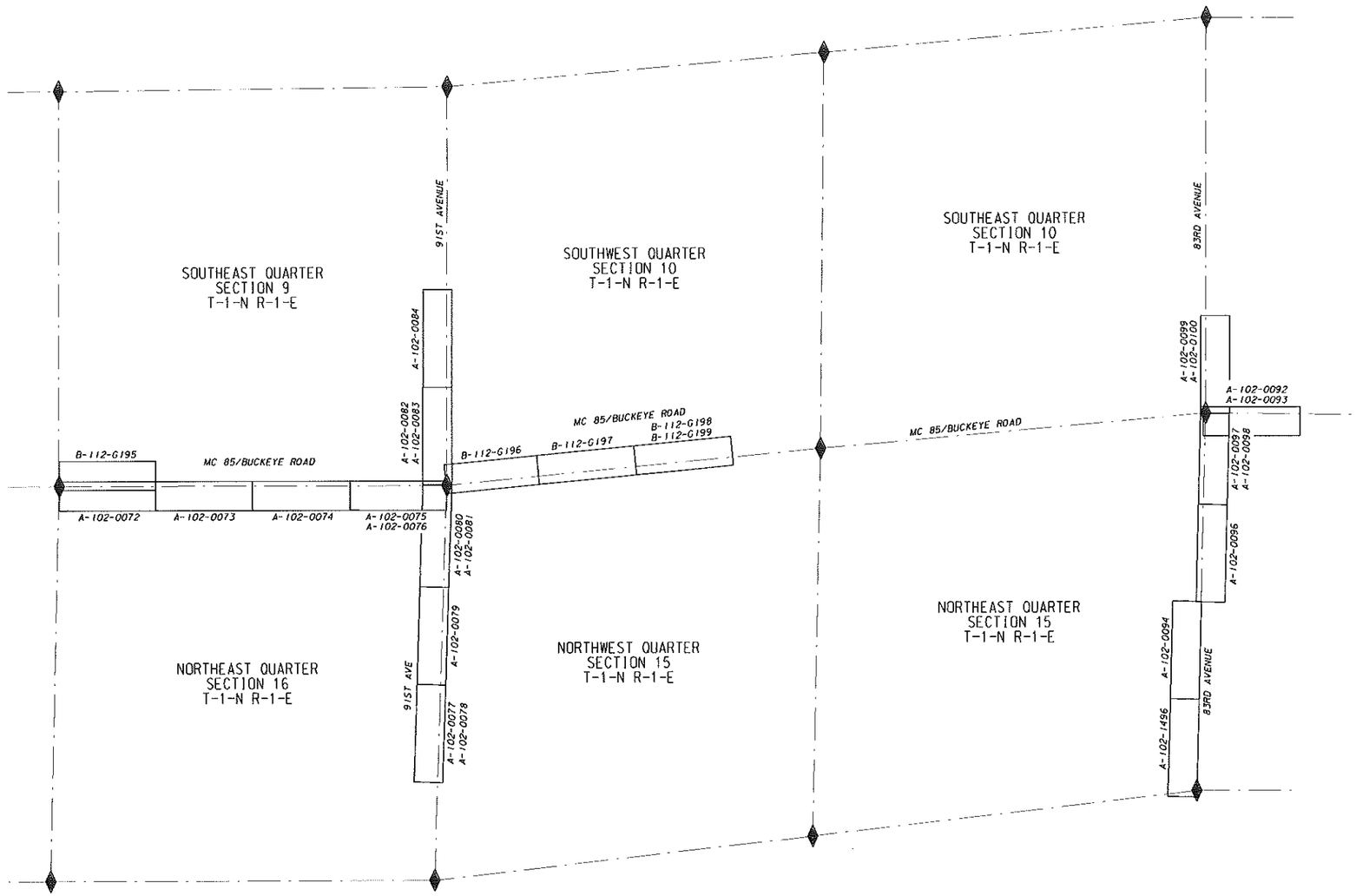
IRRIGATION IMPROVEMENTS

SRP ENGINEERING FILE NO. RD-12940

MC 85 91ST AVENUE TO 95TH AVENUE

KEY PLAN PHASE 1A & 1B

PHOENIX, ARIZONA



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NO	DATE	REVISED	CHK	APPD	AUTH
17	10.13.05	REVISED EXISTING DITCH AND PIPE SYMBOLOGY.	JWS	-	REL
18	04.10.07	REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.	JWS	-	REL

FORM NO

IRRIGFS.WDF

WDF-IRRIGFS

DESIGN FOR CONSTRUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

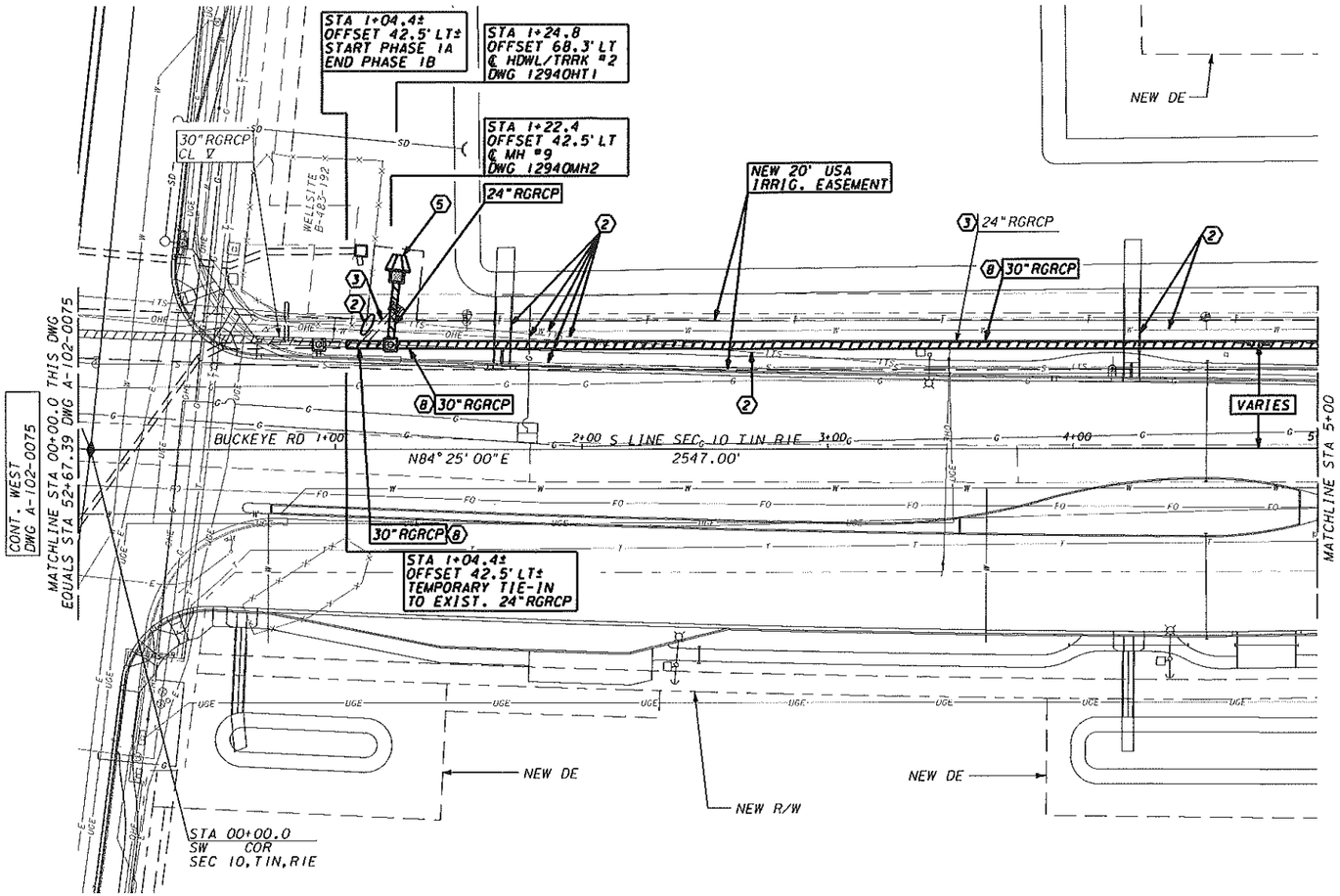
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

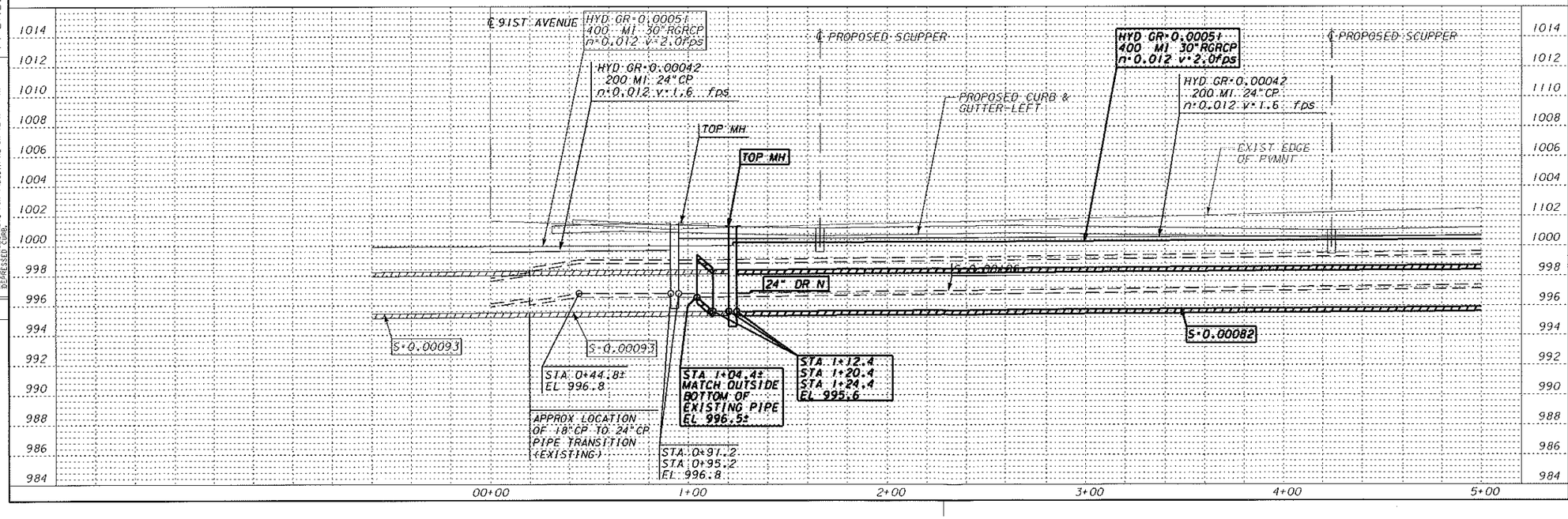
GRAND CANAL
DRAIN & LATERAL 21.0, 22.0
SEC 9, 10 & 16
T 1N R 1E
KEY PLAN PHASE 1A & 1B

SCALE: NONE			KEY PLAN PHASE 1.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	KEY PLAN	2A
CV	Y3	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

REFERENCE FILES USED:
REF #1: M48M1.DGN
REF #2: M48M1.DGN
REF #3: ----------
REF #4: ----------



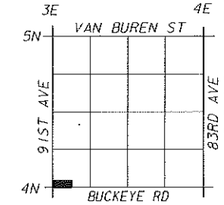


CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 1+04.4 AND STATION 5+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
2. SEE SHEETS PHG196 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

REDRAWN FROM B-112-G005, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 1+04.4 TO STA 5+00

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	/ /

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN SEC 10 T1N R1E SW COR TO 500' E

SCALE: PLAN 1"=30', PROFILE 1"=4'			B112G196.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	B-112-G196A	18
PP	Y2	22X34		

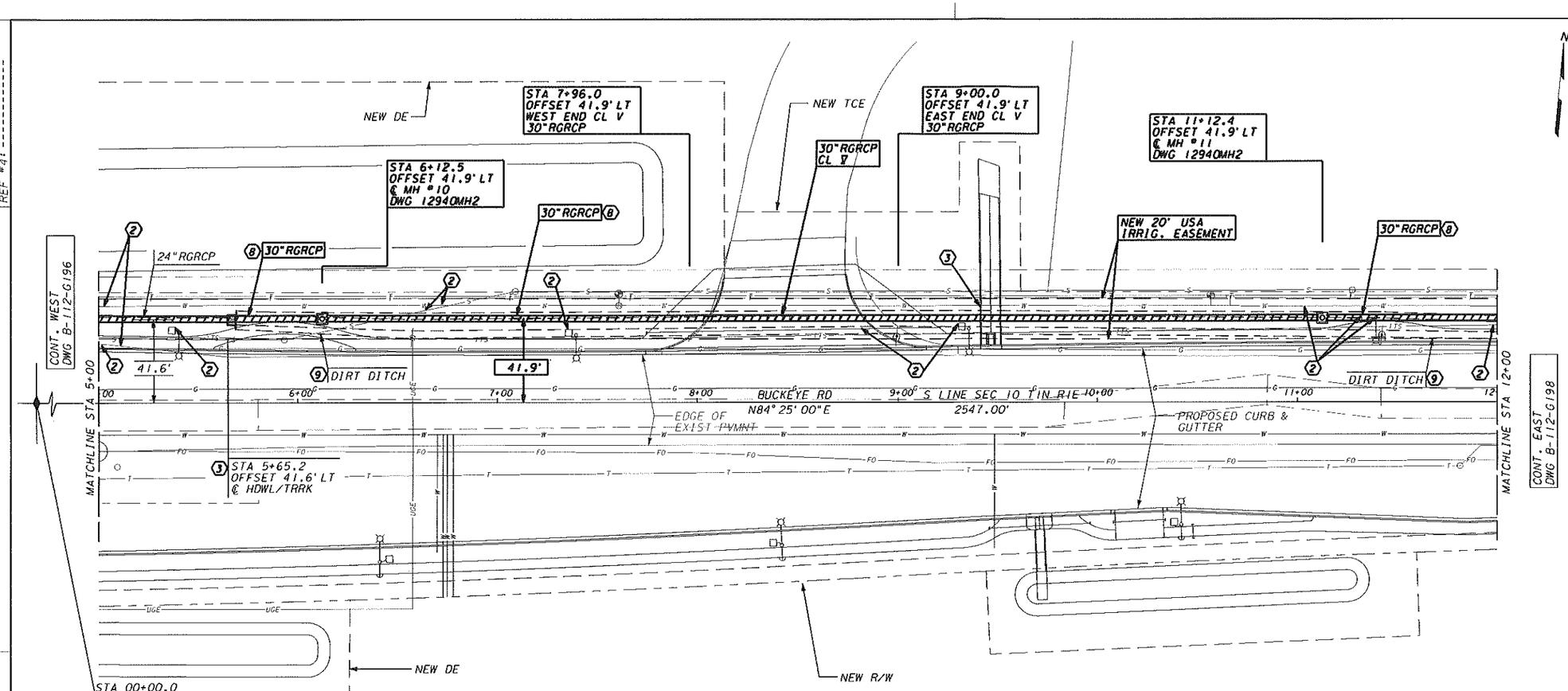
REV	DATE	BY	DESCRIPTION
7	04.03.08	JWS	ADDED HEX NOTE 3.6 CABLE NOTES FOR BRIDGE RECOVERY AND STEP PAD INSTALLATION.
8	04.10.07	JWS	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH ASSOCIATED CURB.

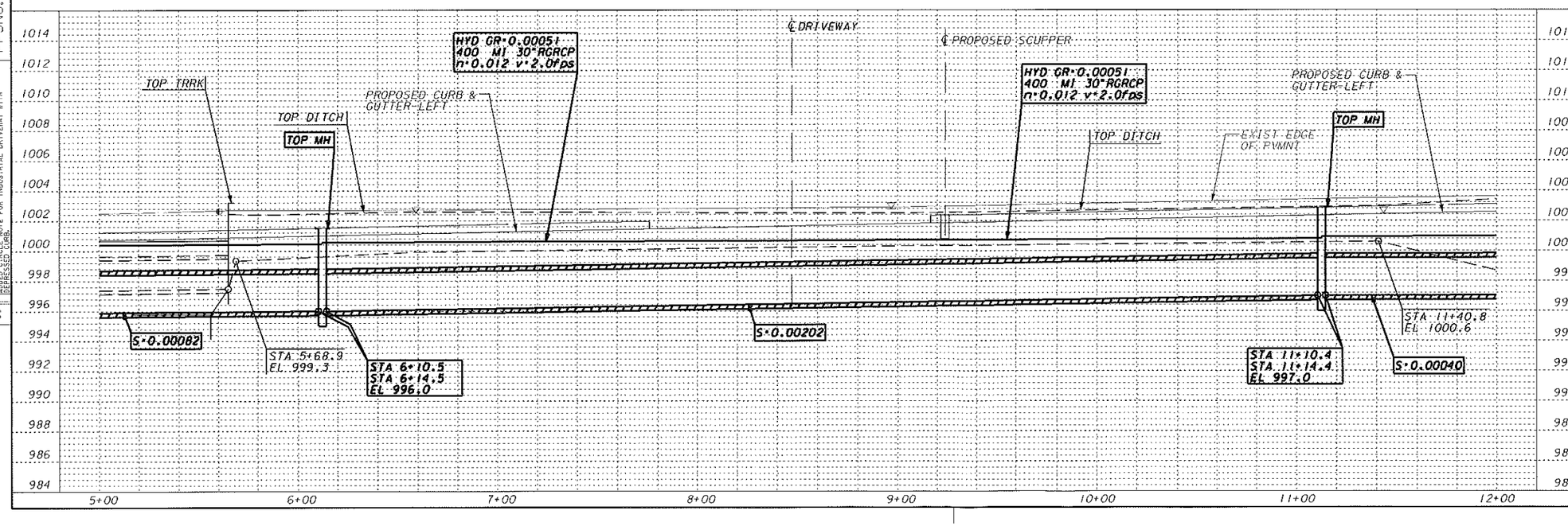
FORM NO
WDF-PPSNG

PPSNG.WDF

PRINTED BY GR
25 January 2018
NOT FOR CONSTRUCTION

REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3:
REF #4:



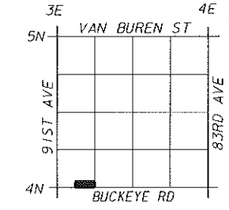


CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501177(1), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 5+00.0 AND STATION 12+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
9. REMOVE ALL LOOSE AND DELETERIOUS MATERIAL AND ALL MATERIAL NOT SUITABLE AS SUBGRADE. FILL DITCH TO PROPOSED GRADE OR TO EXISTING ADJACENT GRADES WITH CLEAN BACKFILL AND COMPACT AS REQUIRED. BACKFILL MATERIAL, PLACEMENT AND COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SRP STANDARD SPECIFICATION WTR 02614 OR TO THE REQUIREMENTS OF THE LOCAL GOVERNING AGENCY, WHICHEVER IS MORE STRINGENT.
1. SEE SHEET PHG197 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

REDRAWN FROM B-112-G005, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 5+00.0 TO STA 12+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN
SEC 10 T1N R1E 500' E/O SW COR TO 16/5 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			B112G197.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	B-112-G197	19
PP	Y2	22X34		

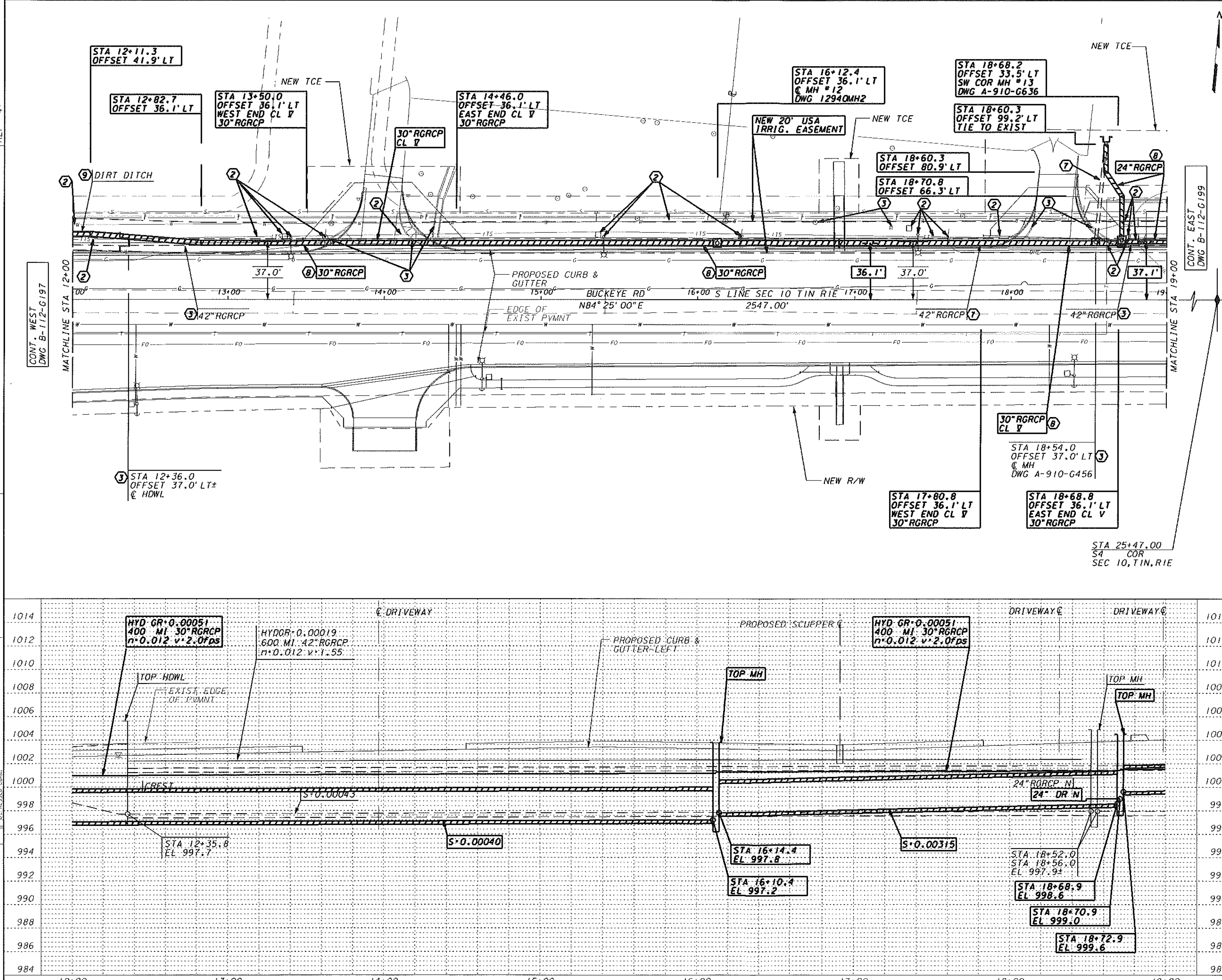
NO	DATE	BY	CHK	APPD	AUTH
2	04.03.05	JWS	DRT	-	REL
-	-	-	-	-	-
8	04.10.07	JWS	CWT	-	REL

FORM NO

WDF-PPSNG

PPSNG.WDF

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR



CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(2) UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.

(3) REMOVE AS REQUIRED FOR CONSTRUCTION.

(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

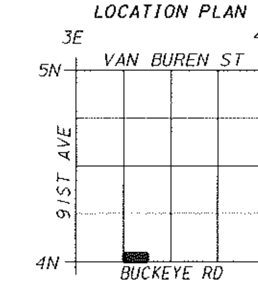
(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 12+00.0 AND STATION 19+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(9) REMOVE ALL LOOSE AND DELETERIOUS MATERIAL AND ALL MATERIAL NOT SUITABLE AS SUBGRADE. FILL DITCH TO PROPOSED GRADE OR TO EXISTING ADJACENT GRADES WITH CLEAN BACKFILL AND COMPACT AS REQUIRED. BACKFILL MATERIAL, PLACEMENT AND COMPACTION SHALL CONFORM TO THE REQUIREMENTS OF SRP STANDARD SPECIFICATION WTR 02614 OR TO THE REQUIRMENTS OF THE LOCAL GOVERNING AGENCY, WHICHEVER IS MORE STRINGENT.

(I) SEE SHEET PHG198 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

REDRAWN FROM B-112-G006, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 12+00.0 TO STA 19+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/11
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN SEC 10 T1N R1E 16/5 COR TO 650' W/O S4 COR

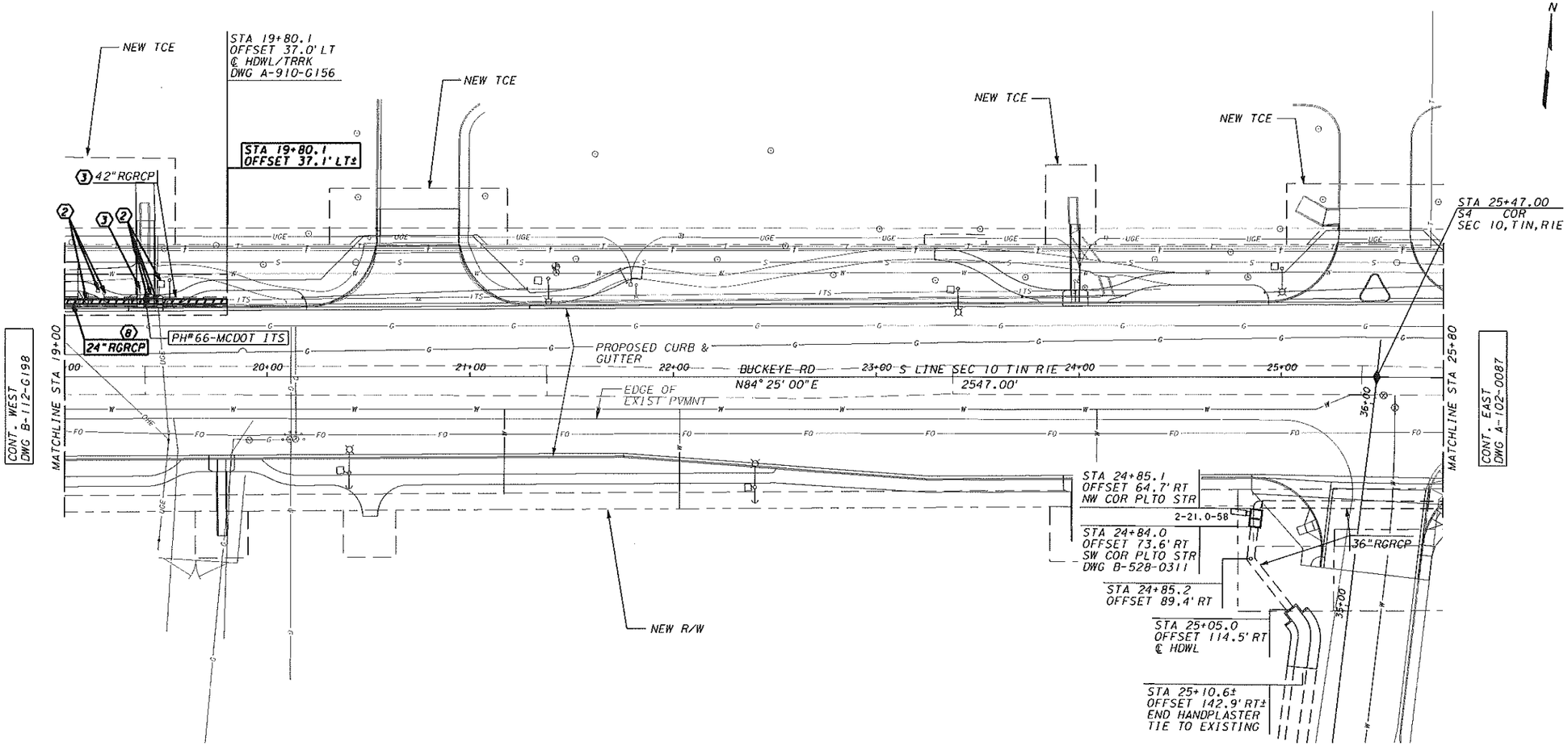
SCALE: PLAN 1"=30', PROFILE 1"=4' | B112G198.DGN | SHEET NO.
SUBJ CODE PP | DIST CODE Y2 | DWG SIZE 22X34 | B-112-G198 | 20

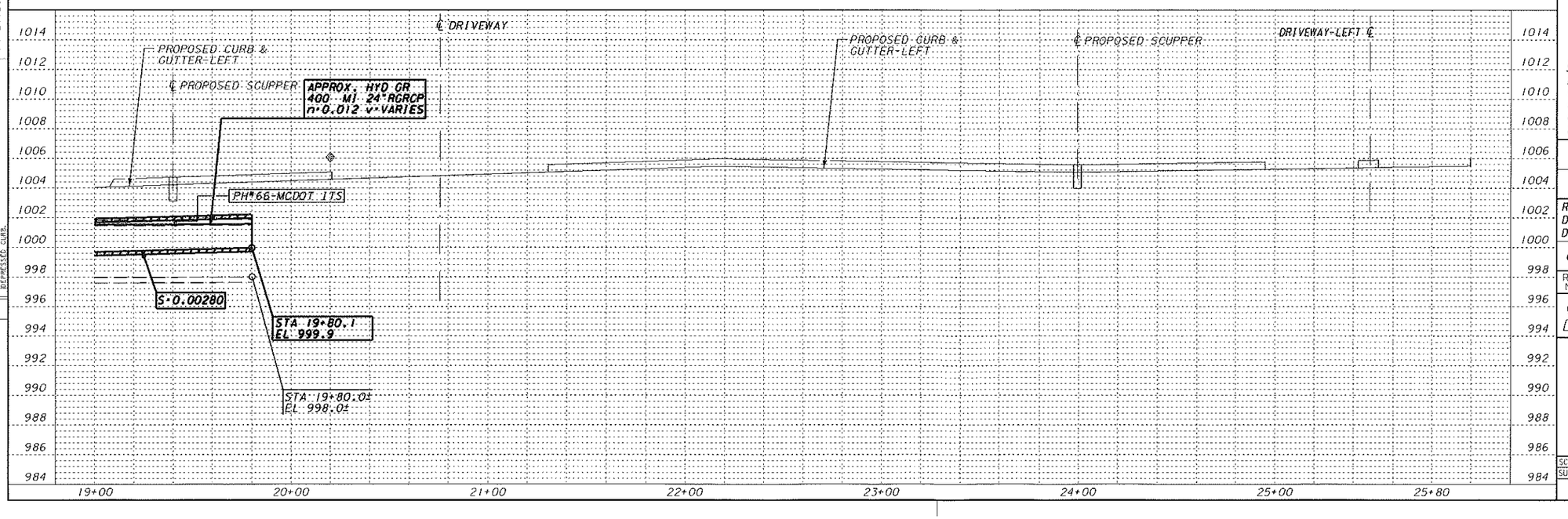
REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3: -----------
REF #4: -----------

PPSNG.WDF
WDF-PPSNG

NO	DATE	BY	CHK	APPD	AUTH	REV
7	04.03.06	JWS	CMT			ADDED HEX NOTE 7 & CIRCLE NOTES FOR BRIDGE RECOVERY AND STEP PAD INSTALLATION
8	04.10.07	JWS	CMT			ADDED REFERENCE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB

REFERENCE FILES USED:
REF #1: M48M.DGN
REF #2: M48M.DGN
REF #3: ----------
REF #4: ----------



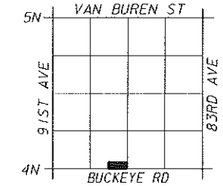


CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501177.1), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 19+00.0 AND STATION 19+80.1 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
						/ /
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

REDRAWN FROM B-112-G006, SRP SURVEY W13-53393-01 &
DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 19+00 TO STA 19+80.1

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN
SEC 10 T1N R1E
650' W/O S4 COR TO S4 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			B1126199.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	B-112-G199	21
PP	Y2	22X34		

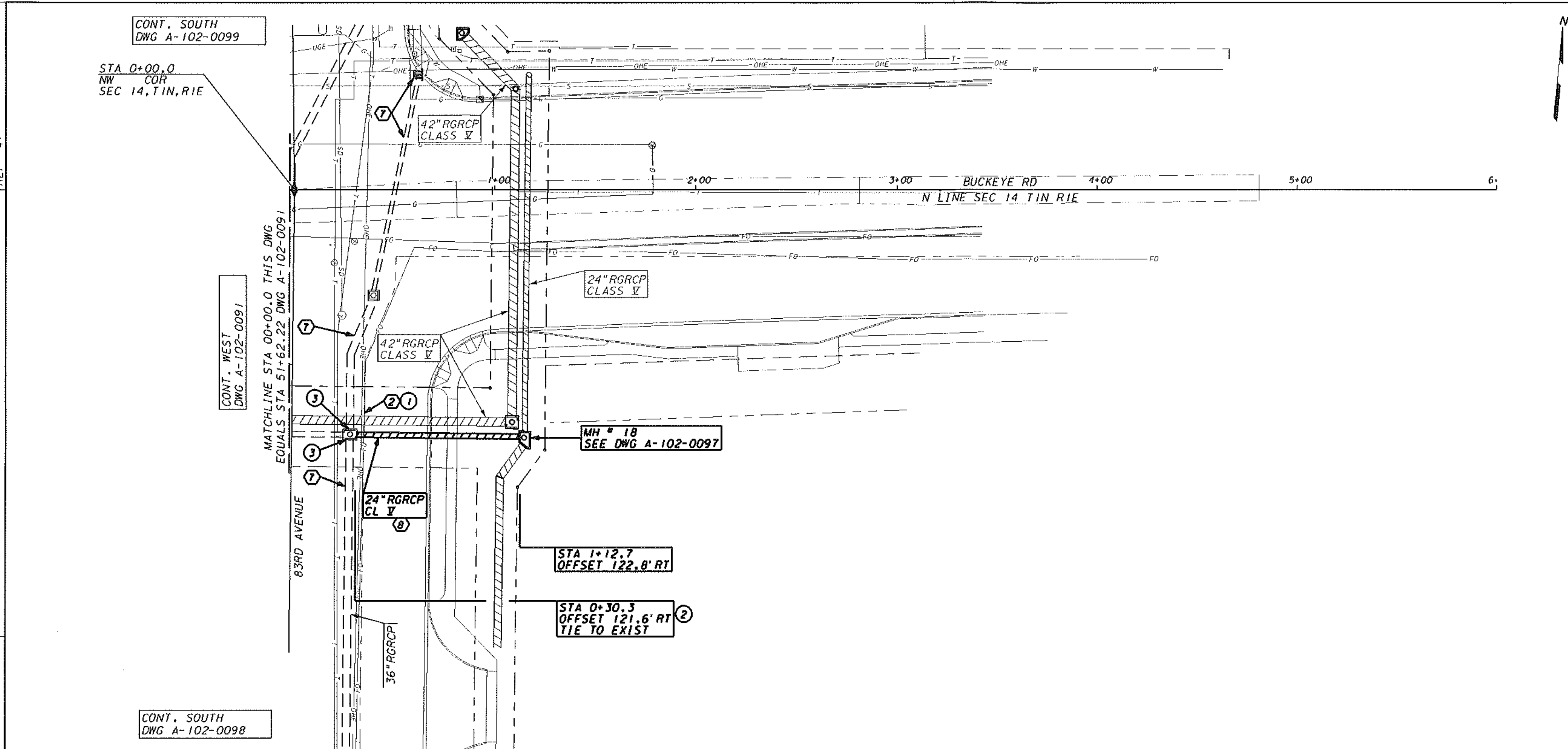
NO	DATE	BY	APPD	APPLI AUTH
7	04.03.06	JWS	CMT	REL
ADDED KEY NOTE 7, CIRCLE NOTES FOR BRIDGE RECOVERY AND STOP PAD INSTALLATION.				
8	04.10.07	JWS	CMT	REL
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH APPROPRIATE SCUPPER.				

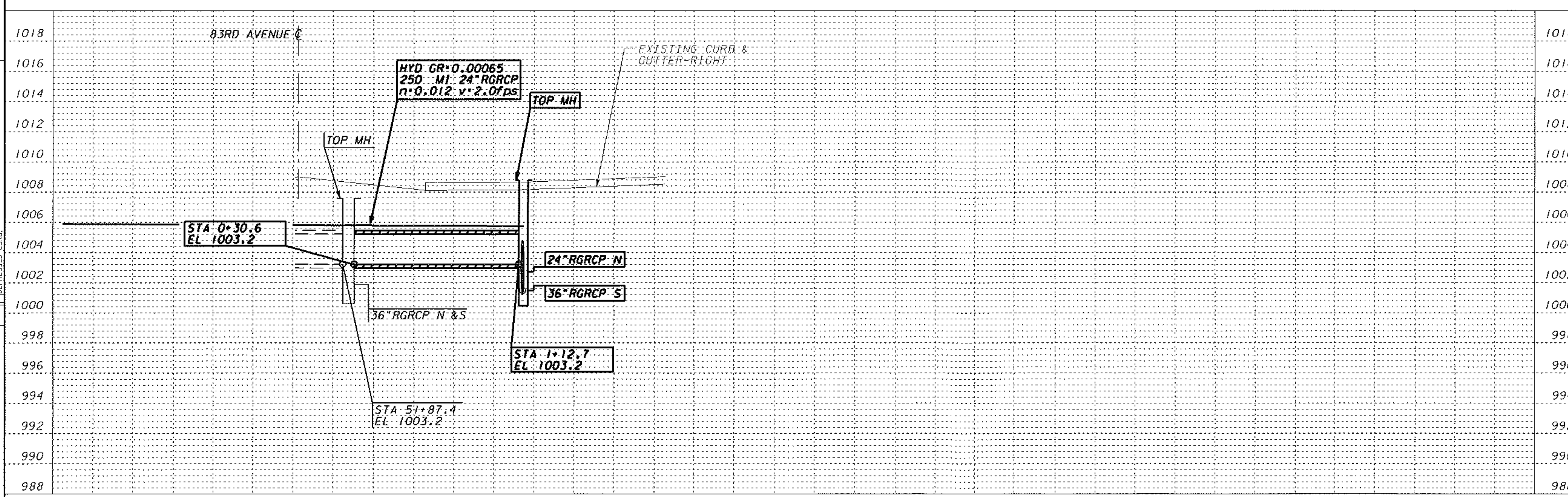
FORM NO
WOF-PPSNG

PPSNG.WOF

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3: --------
REF #4: --------





PPSNG.WDF

NO	DATE	BY	CKD	APPD	AUTH	REL
8	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.	04.10.07	JWS	CNT	-	-
7	ADDED OHE NOTE & CIRCLE NOTES FOR BRIDGE RECOVERY AND STRUCTURE INSTALLATION	04.03.06	JWS	CNT	-	-

FORM NO
WDF-PPSNG

CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(2) UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.

(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 0+30.6 AND STATION 1+12.7 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

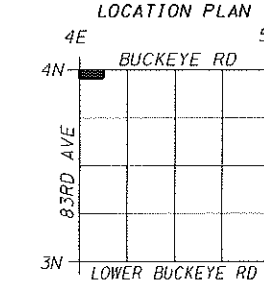
(1) SEE SHEET PH0097 FOR UTILITY POTHOLE INFORMATION.

(2) TIE TO EXIST. MANHOLE IN ACCORDANCE WITH SRP STD. DWG. WES-30300-005.

(3) PLUG MANHOLE WALL IN ACCORDANCE WITH SRP STD.DWG. WES-WALLPLUG.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E. ELEVATION 996.48'

DRAWN FROM SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 0+30.6 TO STA 1+12.7

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ / BAJ	REJ / REJ	RMP / RMP	RMP / RMP	12/29/1

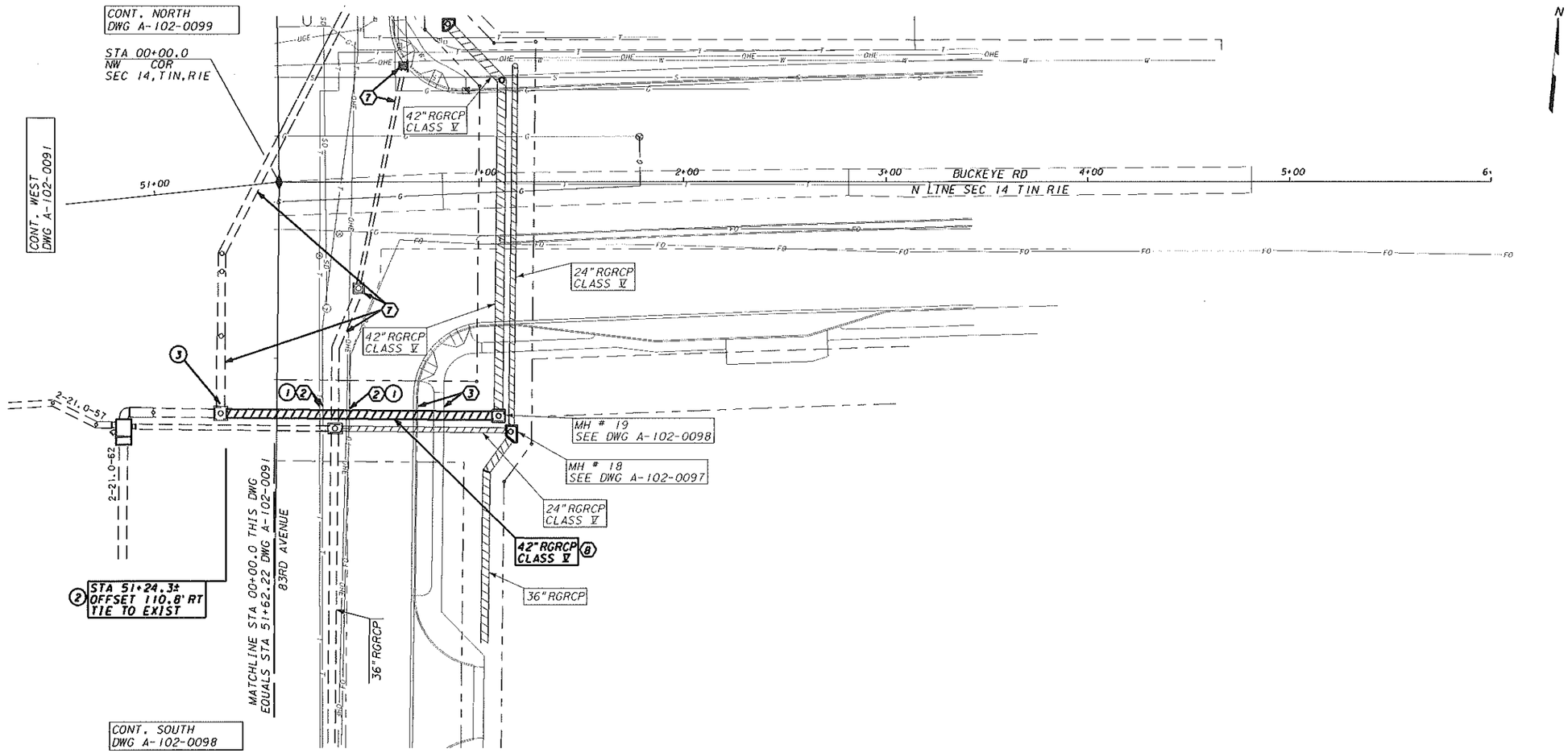
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

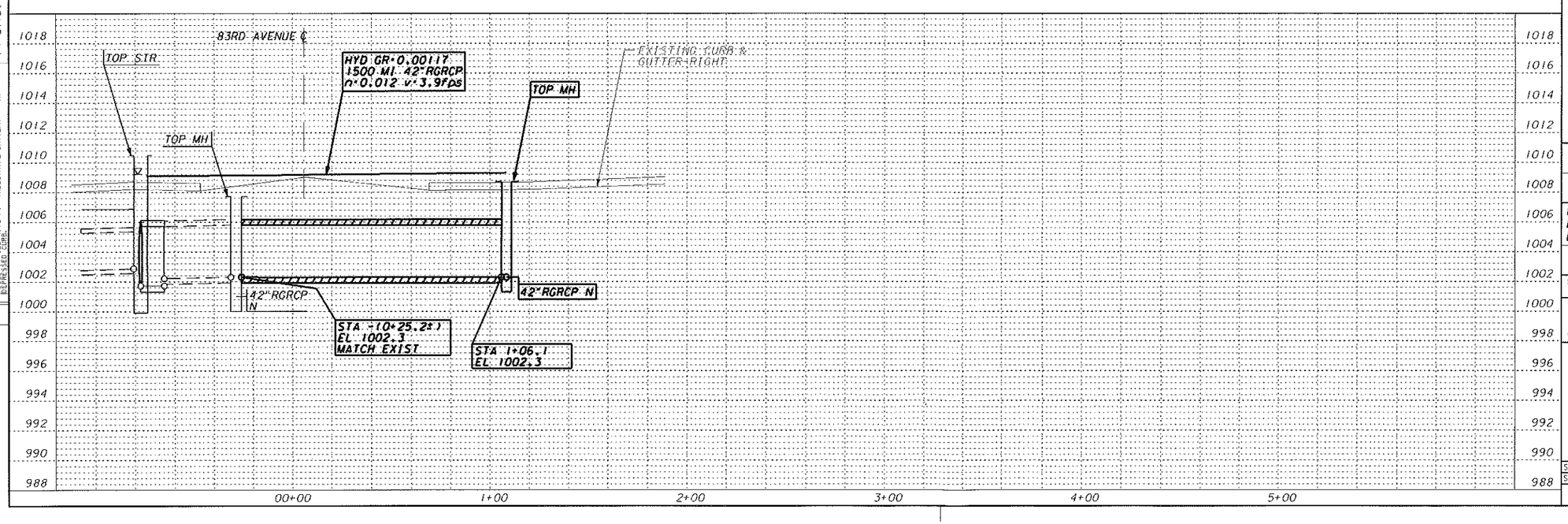
GRAND CANAL LATERAL 21.0 SEC 14 T1N 1E NW COR TO 100' E

SCALE: PLAN 1"=30', PROFILE 1"=4'	A1020092.DGN		SHEET NO
SUBJ CODE: PP	DIST CODE: Y2	DWG SIZE: 22X34	A-102-0092	22

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M48M.DGN
REF #2: M48M.DGN
REF #3: ----------
REF #4: ----------





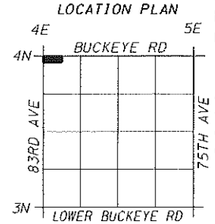
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 51+24.3 AND STATION 1+06.1 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(1) SEE SHEET PH0097 FOR UTILITY POTHOLE INFORMATION.
(2) TIE TO EXIST. MANHOLE IN ACCORDANCE WITH SRP STD. DWG. WES-30300-005.
(3) PLUG MANHOLE WALL IN ACCORDANCE WITH SRP STD.DWG. WES-WALLPLUG.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM SRP SURVEY W13-53393-01 &
DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 51+24.3 TO STA 1+06.1

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 14 T1N 1E NW COR TO 100'E

SCALE: PLAN 1"=30', PROFILE 1"=4'	A1020093.DGN	SHEET NO.
SUBJ CODE / DIST CODE / DWG SIZE		
PP / Y2 / 22X34	A-102-0093	23

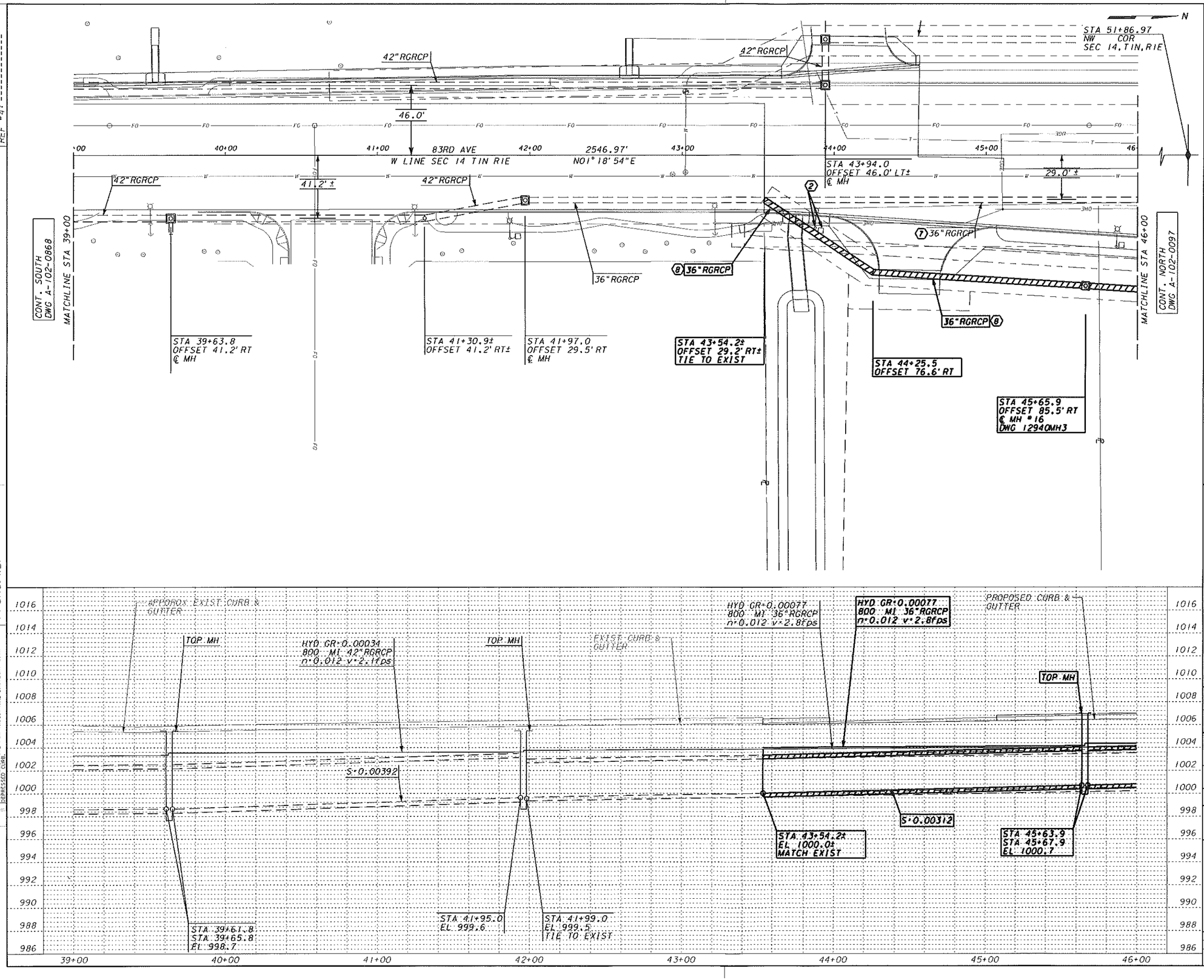
NO.	DATE	DSN	APPD	AUTH	REL
7	04.03.06	JWS	CMT	-	-
ADDED THE NOTE "SEE GENERAL NOTES FOR BRIDGE RECOVERY"					
8	04.10.07	JWS	CMT	-	-
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAYS WITH DEPRESSED CURB.					

FORM NO WDF-PPSNG

PPSNG.WDF

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: W58M.DGN
REF #2: W58M.DGN
REF #3: ----------
REF #4: ----------

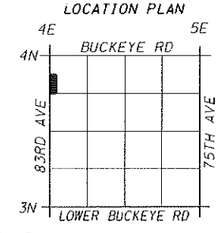


CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 43+54.2 AND STATION 46+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM A-102-1034 , SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 43+51.2± TO STA 46+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 14 T1N R1E 16/3 COR TO 600' S/O NW COR

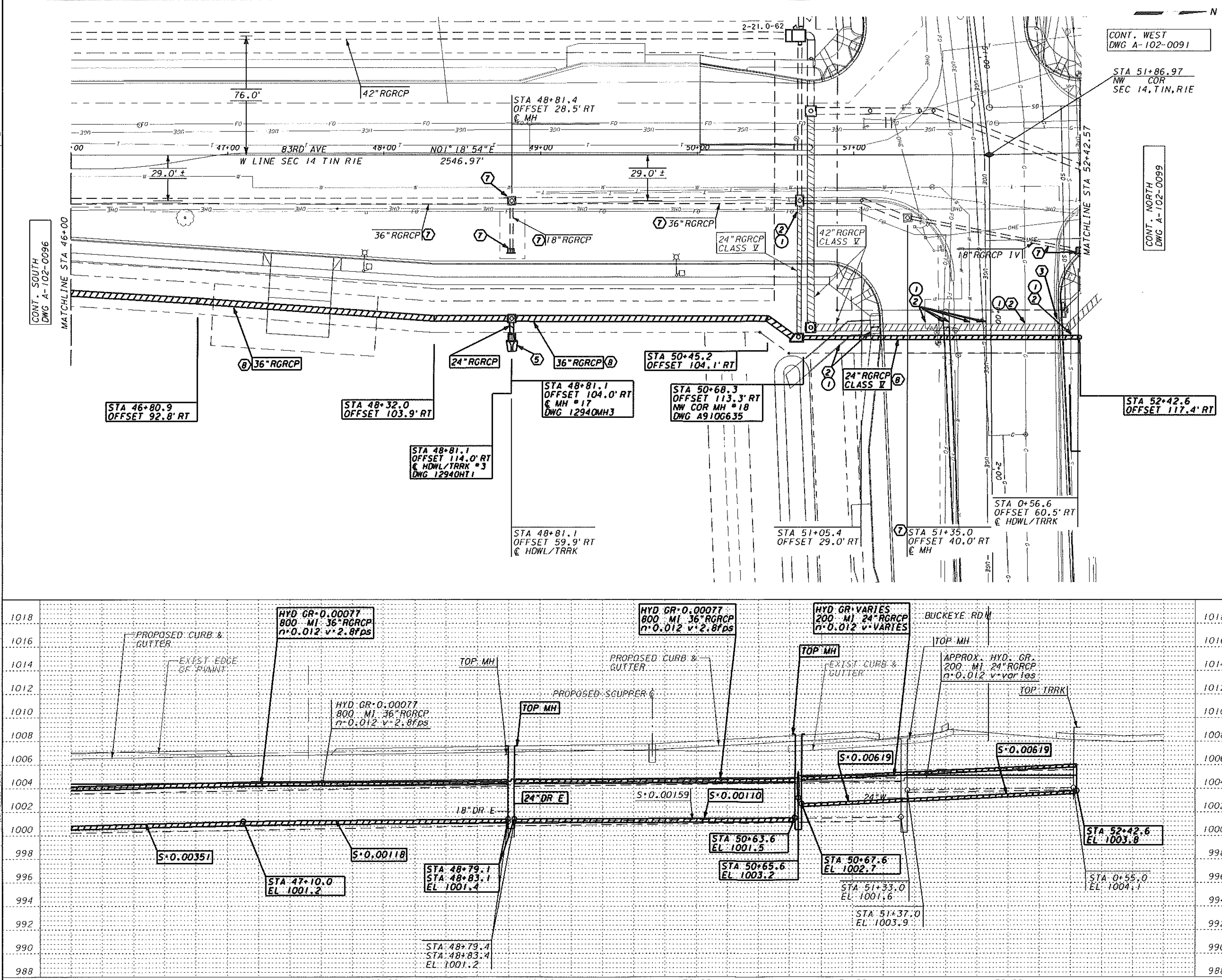
SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020096.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0096	24
PP	Y2	22X34		

NO	DATE	BY	DESCRIPTION
1	04.02.06	JWS	ADDED KEY NOTE 9 & CIRCLE NOTES FOR BRIDGE RECOVERY AND STEP PAD INSTALLATION.
8	04.10.07	JWS	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB

FORM TSD
WDF-PPSNG
PPSNG.WDF

PLOTTED BY GR
PRINTED 25 January 2018
NOT FOR CONSTRUCTION

REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
REF #3: ------
REF #4: ------



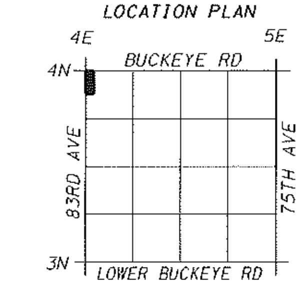
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501177), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 46+00.0 AND STATION 0+55.6 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(I) SEE SHEET PH0097 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM A-102-1034, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 46+00.0 TO STA 0+55.6

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ / BAJ	REJ / REJ	RMP / RMP	RMP / RMP	12/29/1_

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 14 T1N R1E 600' S/O NW COR TO 50' N/O NW COR

SCALE: PLAN 1"=30', PROFILE 1"=4' | A1020097.DGN | SHEET NO.

SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	A-102-0097	25

PPSNG.WDF
WDF-PPSNG

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: MSBM.DGN
REF #2: MSBM.DGN
REF #3:
REF #4:

CONT. SOUTH DWG A-104-0094

CONT. WEST DWG A-102-0091

CONT. NORTH DWG A-102-0099

N

2-21.0-62

76.0'

42"RGRCP

STA 48+81.4
OFFSET 28.5' RT
℄ MH

47+00 83RD AVE 48+00 N01° 18' 54"E 49+00 50+00 51+00

W LINE SEC 14 TIN R1E 2546.97'

STA 51+86.97
NW COR
SEC 14, T1N, R1E

29.0'±

29.0'±

MATCHLINE STA 46+00

MATCHLINE STA 51+86.97

36"RGRCP

18"RGRCP

36"RGRCP

24"RGRCP CLASS V

42"RGRCP CLASS V

109.7'

18"RGRCP

36"RGRCP

36"RGRCP

STA 50+45.2
OFFSET 104.1' RT

24"RGRCP CLASS V

STA 46+80.9
OFFSET 92.8' RT

STA 48+32.0
OFFSET 103.9' RT

STA 48+81.1
OFFSET 104.0' RT
℄ MH #17
DWG 12940MH3

NW COR MH #18
DWG 129405MH1

BUCKEYE RD

STA 48+81.1
OFFSET 114.0' RT
℄ HDWL/TRRK #3
DWG 12940HT1

STA 50+72.7
OFFSET 97.7' RT
NW COR MH #19
DWG 12940MH3

STA 48+81.1
OFFSET 59.9' RT
℄ HDWL/TRRK

STA 51+05.4
OFFSET 29.0' RT

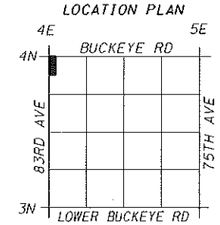
STA 51+35.0
OFFSET 40.0' RT
℄ MH

CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE NO. 501177(1), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 50+72.7 AND STATION 51+87.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
1. SEE SHEET PH0097 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

1018
1016
1014
1012
1010
1008
1006
1004
1002
1000
998
996
994
992
990
988

HYD GR=0.00052
1000 MI 42"RGRCP
n=0.012 v=2.6fps

EXISTING CURB & GUTTER

S=0.00295

42"RGRCP W

STA 50+56.8
STA 50+68.8
EL 1001.7

STA 50+72.7
42"RGRCP W

STA 50+75.4±
EL 1001.0±
MATCH EXIST

HYD GR=0.00118
1500 MI 42"RGRCP
n=0.012 v=3.9fps

TOP STR

TOP MH

TOP MH

CREST

S=0.00053

STA 51+42.6±
EL 1002.5±
MATCH EXIST

STA 51+10.6±
INV 36" 1001.9±
MATCH CROWNS

STA 50+75.0
EL. 1002.3

46+00 47+00 48+00 49+00 50+00 51+00 52+00

DRAWN FROM A-102-1034, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 50+72.7 TO STA 51+87.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 14 T1N R1E 120' S/O NW COR TO NW COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A102O098.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0098	26
PP	Y2	22X34		

PPSNG.WDF

NO	DESCRIPTION	BY	DATE	APPD
1	ADDED HEX NOTE 7 & CIRCLE NOTES FOR BRIDGE RECOVERY AND STA# PAD INSTALLATION.	JWS	04.03.08	CWT
9	REVISED SEE CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH CURB RETURNS	JWS	04.10.07	CWT

FORM NO

WDF-PPSNG

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M58M.DGN
REF #2: M58M.DGN
REF #3:
REF #4:

STA 00+00.0
SW COR
SEC 11, T1N, R1E

CONT. SOUTH
DWG A-102-0098

MATCHLINE STA 00+00 THIS DWG
EQUALS STA 51+86.97 DWG A-102-0098

CRCP IV

BUCKEYE ROAD

STA 0+56.6
OFFSET 60.5' RT
℄ HDWL/TRRK

42"RGRCP CLASS V (8)

STA 52+42.6
OFFSET 117.4' RT (5)

STA 0+48.7
OFFSET 110.8' RT

42"RGRCP (8)

STA 0+73.1
OFFSET 81.7' RT
SW COR MH #20
DWG A-910-G634

STA 1+55.0±
OFFSET 48.0' RT±
N END 36"RGRCP CL IV (7)

1+00 83RD AVE 2+00 3+00 4+00 5+00 6

W LINE SEC 11 T1N R1E

N00°01'20"E
2668.46'

PROPOSED CURB & GUTTER

EXIST CURB & GUTTER

VARIES 36"CIPP (7)

48.0'

BLOCKWALL

STA 4+68.6
OFFSET 84.0' RT
℄ MH #21
DWG 12940MH3

(3) BLOCKWALL

36"RGRCP CL V (8)

STA 5+87.7
OFFSET 78.8' RT
N END 36"RGRCP
CL V

(8) 36"RGRCP

MATCHLINE STA 6+00

CONT. NORTH
DWG A-102-0100

N

CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(2) UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.

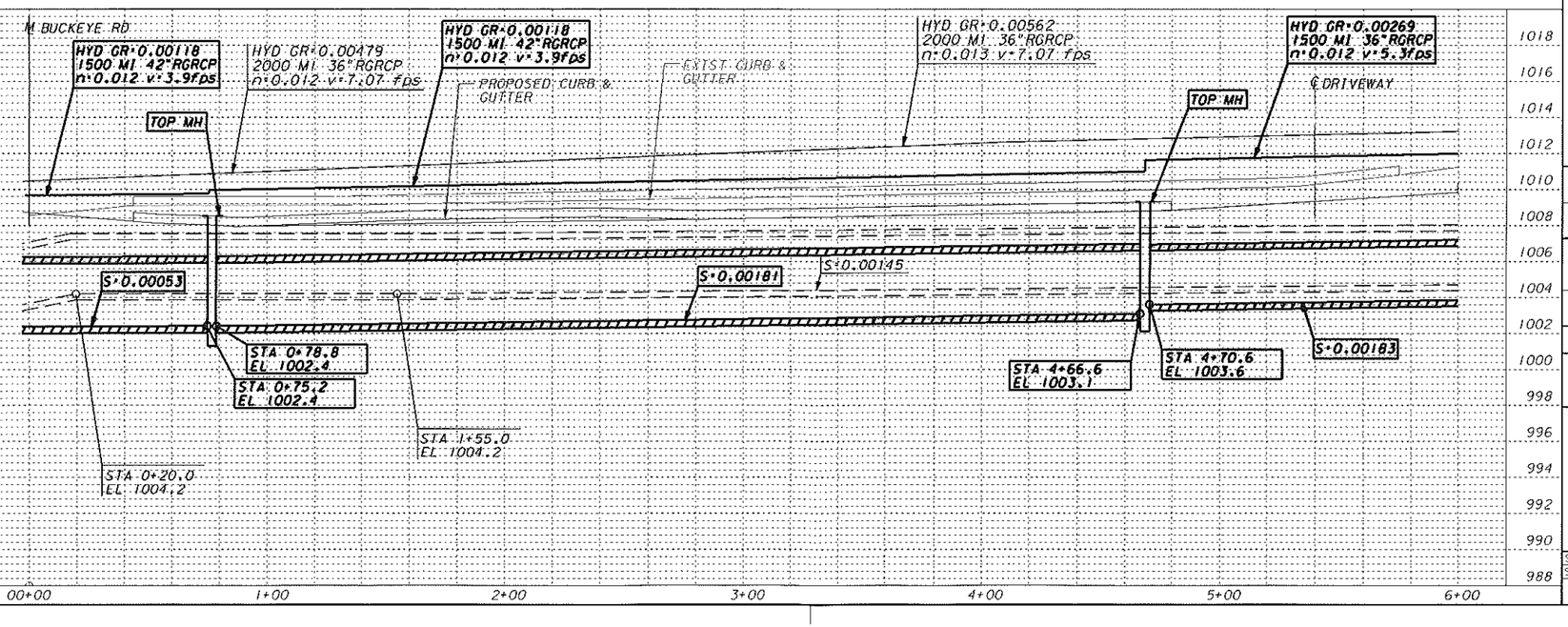
(3) REMOVE AS REQUIRED FOR CONSTRUCTION.

(5) PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.

(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

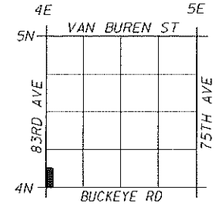
(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP. BETWEEN STATION 0+00.0 AND STATION 6+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(1) SEE SHEET PH0097 & PH0099 FOR UTILITY POTHOLE INFORMATION.



ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

DRAWN FROM A-102-546, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 0+00.0 TO STA 6+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 11 T1N R1E SW COR TO 600' N/O SW COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020099.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0099	27
PP	Y2	22X34		

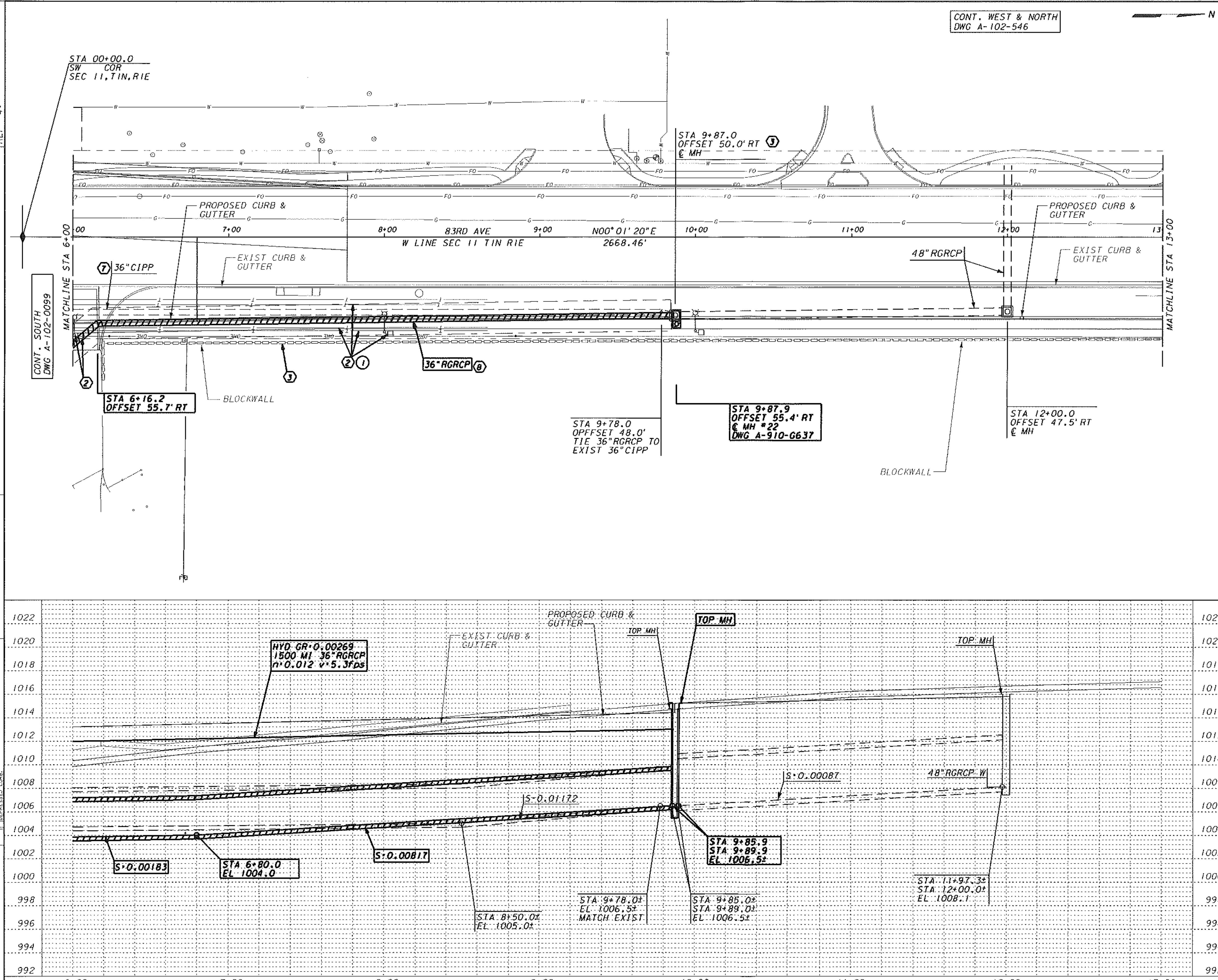
NO.	DATE	BY	REVISION
7	04.03.06	JWS	ADDED VER NOTE 9 & 2 CIRCLE NOTES FOR BR-JOE RECOVERY AND STEP PAD INSTALLATION
8	04.10.07	JWS	ADDED CIRCLE NOTE FOR TRUCK/TRAC DRIVEWAY WITH DEPRESSED CURB

FORM NO.

WDF-PPSNG

PPSNG.WDF

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR



CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(2) UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.

(3) REMOVE AS REQUIRED FOR CONSTRUCTION.

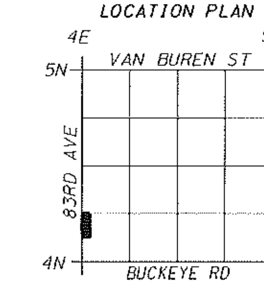
(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 6+00.0 AND STATION 9+85.9 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(1) SEE SHEET PH0100 FOR UTILITY POTHOLE INFORMATION.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM A-102-546, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 6+00.0 TO STA 9+89.9

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

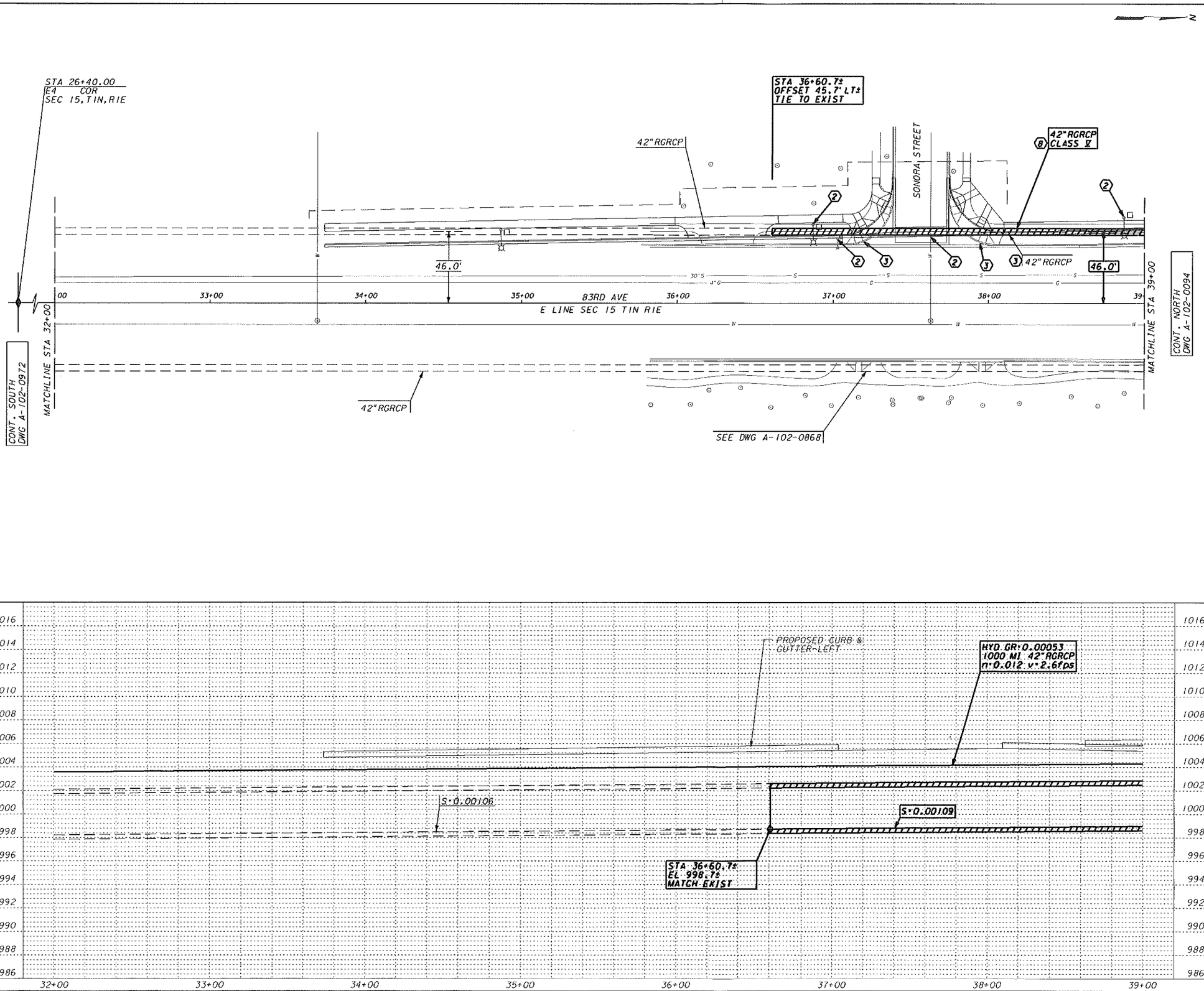
GRAND CANAL LATERAL 21.0 SEC 11 T1N R1E 600' N/O SW COR 16/4 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020100.DGN	SHEET
SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	A-102-0100	28

REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
REF #3:
REF #4:

PPSNG.WDF
WDF-PPSNG

REFERENCE FILES USED:
REF #1:
REF #2:
REF #3:
REF #4:



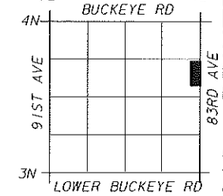
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 36+60.7 AND STATION 39+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

ELEVATION EQUATION:

ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:

NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

NO	DATE	APP'D	CHK	REVISION
9	06.28.16	JMS	-	REVISED NOTE 8 STOCK CODE REFERENCE AND CONTACT FOR TIE-OUT ON MARKER BALL ACQUISITION.
8	04.16.07	JMS	CWT	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO

PPSNG.MDF

DRAWN FROM SRP SURVEY W13-53393-01 & DWG A-102-0972
DESIGN FROM STA 36+60.7 TO STA 39+00.0.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	REJ	REJ	RMP	RMP	12/29/17
		REJ	REJ	RMP	RMP	

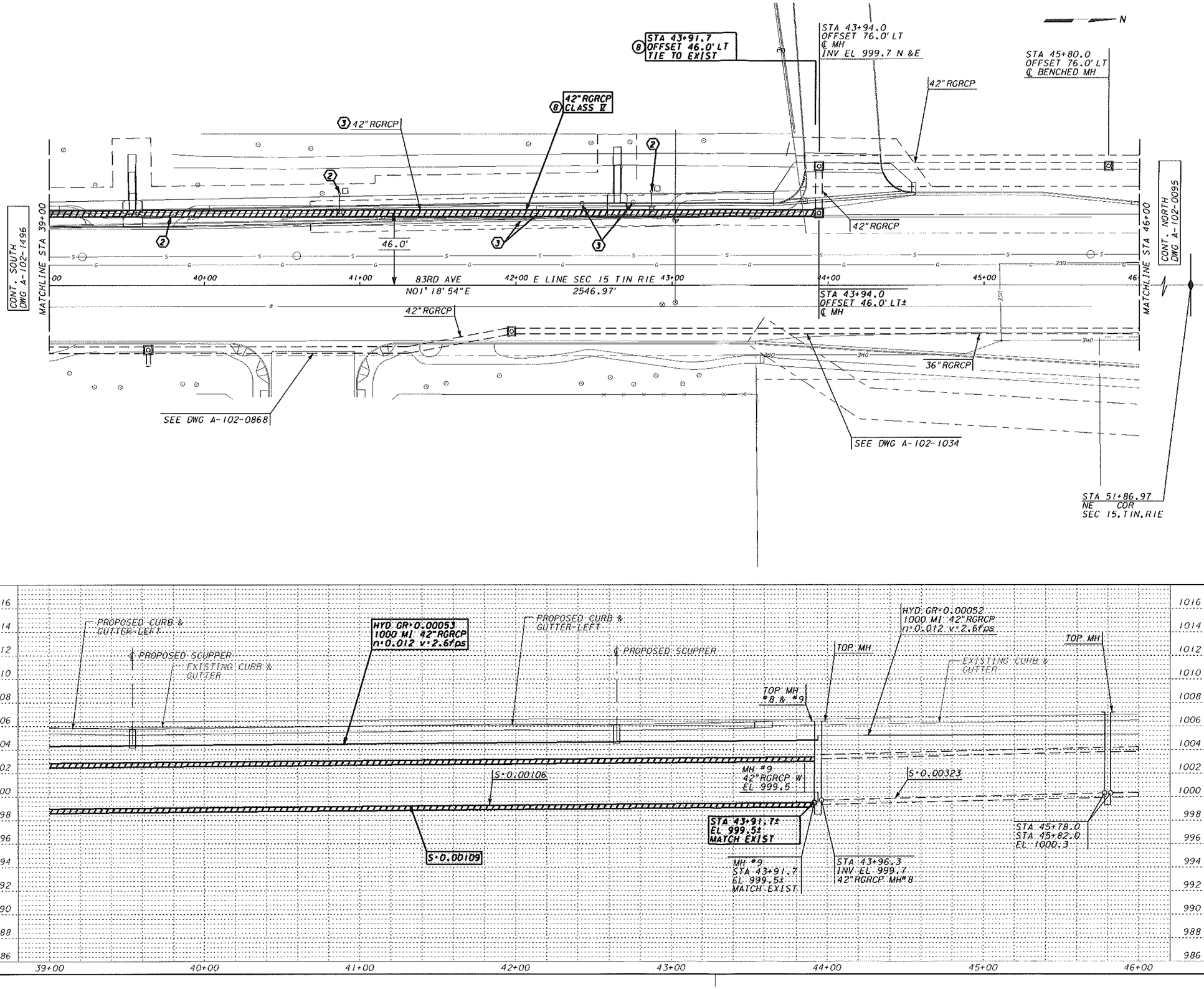
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 15 T1N R1E 600' N/O E4 COR TO 16/8 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A-102-1496.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-1496	28
PP	Y2	22X34		

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3: ----------
REF #4: ----------



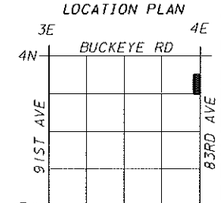
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501177††), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 39+00.0 AND STATION 43+91.7 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
8. TIE TO EXIST MANHOLE IN ACCORDANCE WITH SRP STANDARD DWG. WES-30300-005

ELEVATION EQUATION:

ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:

NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

DRAWN FROM SRP SURVEY W13-53393-01 & DESIGN FROM STA 39+00.0 TO STA 43+91.7

3	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

INSTALLATION RECORD DRAWING

2	RD-22954	BAJ	---	GWB	---	09/07/17
		BAJ	---	GWB	---	

ADDED SOUTHWEST GAS LINE RUNNING N/S.

1	RD-22954	BAJ	GWB	RMP	RMP	08/29/17
		BAJ	GWB	RMP	RMP	

DRAWN FROM SRP SURVEY W13-53393-01 & DESIGN FROM STA 43+19.5± TO STA 46+96.3.

0	RD-22954	BAJ	GWB	RMP	RMP	08/22/17
		BAJ	GWB	RMP	RMP	

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 15 T1N R1E 16/8 COR TO 600' S/O NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020094.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0094	28
PP	Y2	22X34		

NO	REV	DATE	DESCRIPTION	INIT	APPD	AUTH
7	-	04.03.06	ADDED "REF NOTE 9 & CIRCLE" NOTES FOR GRADE RECOVERY AND STOP PAD INSTALLATION.	CWT	-	REL
8	-	04.10.07	ADDED NOTE FOR INDUSTRIAL DRIVEWAY WITH CURB & GUTTER.	JWS	CWT	REL

FORM NO

WDF-PPSNG

PPSNG.WDF

PRINTED BY:GR

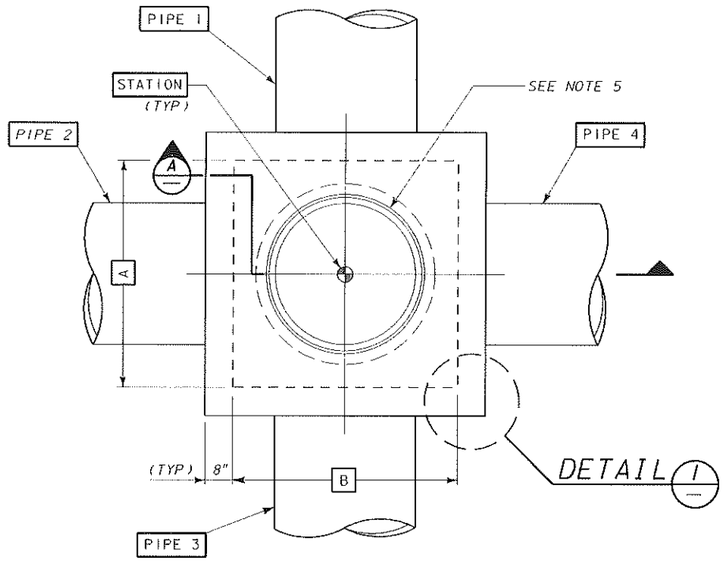
NOT FOR CONSTRUCTION 25 January 2018 PR

MANHOLE CONSTRUCTION DATA

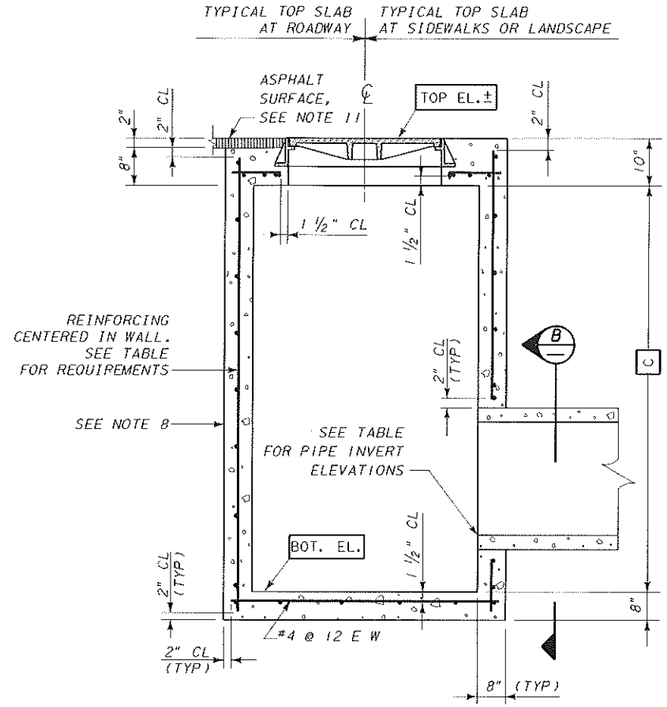
MANHOLE NUMBER	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL.± (SEE NOTE 6)	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	PIPE 4 TYPE	PIPE 4 INV. EL.	MANHOLE DIMENSIONS (SEE NOTE 9) A	B	C	MANHOLE LOCATION ROADWAY	SIDEWALKS/ LANDSCAPE
~~8~~	~~0+80.2~~	~~B-112-G196~~	~~1001.5~~	~~994.5~~	~~18"RGRCP~~	~~996.8~~	~~30"RGRCP~~	~~995.5~~	---------	------	~~30"RGRCP~~	~~995.5~~	~~48"~~	~~48"~~	~~74"~~	-	~~X~~
9	1+22.4	B-112-G196	1001.3	994.6	24"RGRCP	996.8	30"RGRCP	995.6	---------	------	30"RGRCP	995.6	48"	48"	70 ½"	-	X
10	6+12.5	B-112-G197	1001.5	995.0	---------	------	30"RGRCP	996.0	---------	------	30"RGRCP	996.0	48"	48"	68"	-	X
11	11+12.4	B-112-G197	1002.9	996.0	---------	------	30"RGRCP	997.0	---------	------	30"RGRCP	997.0	48"	48"	73"	-	X
12	16+12.4	B-112-G198	1003.8	996.2	---------	------	30"RGRCP	997.2	---------	------	30"RGRCP	997.8	48"	48"	81"	-	X
13	18+60.3	B-112-G198	1004.4	997.6	24"RGRCP	999.0	30"RGRCP	998.6	---------	------	24"RGRCP	999.6	48"	48"	71 ½"	-	X

MINIMUM REQUIREMENTS

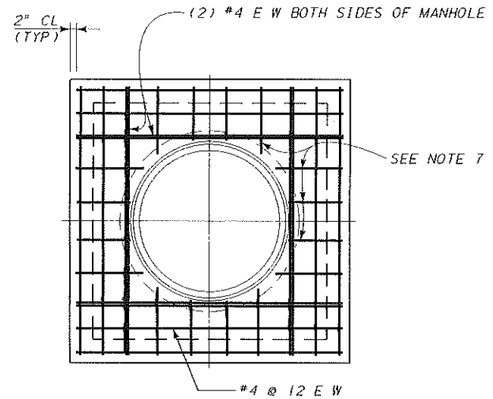
WALL LENGTH PIPE DIAMETER	WALL LENGTH A OR B	REINFORCING STEEL
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	



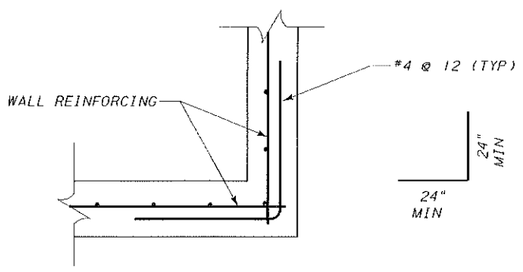
PLAN



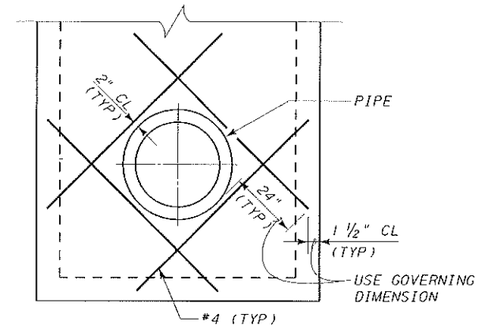
SECTION A



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

DESIGN CRITERIA

HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE, OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

1. STRUCTURAL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (MAG A) PER SRP 03300.
2. REINFORCING STEEL SHALL COMPLY WITH REQUIREMENTS OF SRP 03210; BARS SHALL BE ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 004-0424) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
6. NOT TO BE USED FOR STAKING. EXACT TOP ELEVATION TO BE SET BY CUSTOMER'S ENGINEER BASED ON CUSTOMER'S PAVING & GRADING PLANS.
7. FIELD CUT REBAR AT MANHOLE.
8. CONCRETE SHALL BE PLACED WITH NO COLD JOINTS. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
9. DIMENSIONS A AND B SHALL NOT EXCEED 104", AND DIMENSION C SHALL NOT EXCEED 180".
10. FOR PRESSURE MANHOLES, MAXIMUM HEAD SHALL NOT EXCEED 60" ABOVE TOP ELEVATION.
11. PROVIDE ASPHALT SURFACE AS REQUIRED.

REFERENCES

REINFORCING SPECIFICATION ____ SRP 03210
CONCRETE SPECIFICATION ____ SRP 03300
CONCRETE PLACEMENT SPECIFICATION ____ GE 03305

NO	DATE	DFTR	CHK	APPD	AUTH	REVISION
10	-		CWT	-	REL	
9	08/31/05	JWS	CWT	-	REL	REVISED NOTE 5.
1	-		CWT	-	REL	
0	09/26/07	JWS	CWT	-	REL	ADDED NOTE 11, AND REVISED ASSOCIATED CALLOUTS.

FORM NO WDF-NEWMH

NEWMH.WDF

						/ /
DESIGN FOR CONSRTUCTION						
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
REV NO.	JOB NO.	BAJ DFTR	REJ DSGN	RMP ENGR CHK	RMP TSSUE AUTH	DATE

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

MANHOLE PLANS, SECTIONS AND DETAILS

SCALE: NONE			TEMPORARY - 12940MH2.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	12940MH2	3
MH	Y3	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

MANHOLE CONSTRUCTION DATA

MANHOLE NUMBER	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL.± (SEE NOTE 6)	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	PIPE 4 TYPE	PIPE 4 INV. EL.	MANHOLE DIMENSIONS (SEE NOTE 9) A	B	C	MANHOLE LOCATION ROADWAY	SIDEWALKS/ LANDSCAPE
14	21+22.5	B-112-G199	1005.5	999.4	--------	------	24"RGRCP	1000.4	--------	------	24"RGRCP	1000.4	48"	48"	63"	-	X
15	25+90.2	B-112-G199	1006.0	999.8	24"RGRCP	1000.8	24"RGRCP	1000.8	--------	------	--------	------	48"	48"	74 ½"	-	X
16	45+65.9	A-102-0096	1007.0	999.7	--------	------	36"RGRCP	1000.7	--------	------	36"RGRCP	1000.7	48"	48"	77 ½"	-	X
17	48+81.1	A-102-0097	1007.6	1000.4	--------	------	36"RGRCP	1001.4	24"RGRCP	1002.7	36"RGRCP	1001.4	48"	48"	76 ½"	-	X
19	50+72.7	A-102-0099	1008.6	1000.6	42"RGRCP CLASS 5	1002.3	--------	------	--------	------	42"RGRCP CLASS 5	1001.6	56"	56"	86"	-	X
21	4+68.6	A-102-0099	1009.3	1002.1	--------	------	42"RGRCP	1003.1	--------	------	36"RGRCP	1003.6	56"	48"	76 ½"	-	X
22	48+50.0	A-102-0080	1000.2	991.7	--------	------	48"RGRCP	992.7	--------	------	42"RGRCP	993.2	68"	48"	92"	-	X

MINIMUM REQUIREMENTS

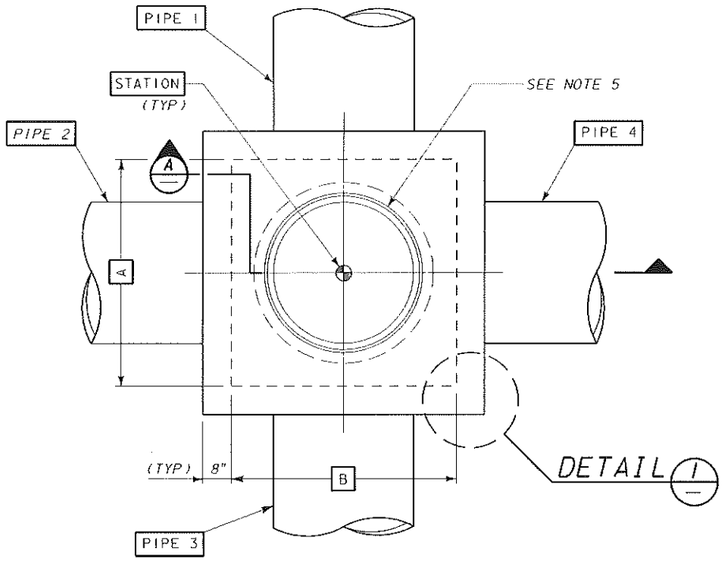
WALL LENGTH PIPE DIAMETER	WALL LENGTH A OR B	REINFORCING STEEL
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	

DESIGN CRITERIA

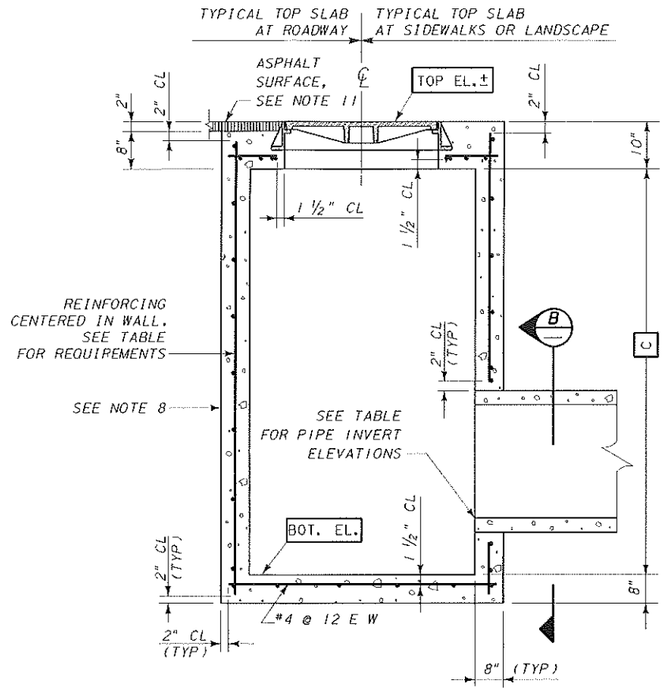
HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE, OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

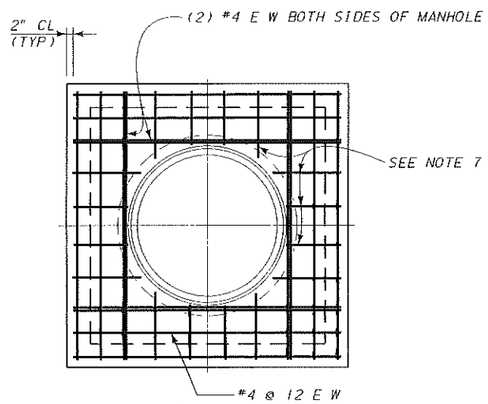
1. STRUCTURAL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (MAG A) PER SRP 03300.
2. REINFORCING STEEL SHALL COMPLY WITH REQUIREMENTS OF SRP 03210; BARS SHALL BE ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 004-0424) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
6. NOT TO BE USED FOR STAKING. EXACT TOP ELEVATION TO BE SET BY CUSTOMER'S ENGINEER BASED ON CUSTOMER'S PAVING & GRADING PLANS.
7. FIELD CUT REBAR AT MANHOLE.
8. CONCRETE SHALL BE PLACED WITH NO COLD JOINTS. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
9. DIMENSIONS [A] AND [B] SHALL NOT EXCEED 104", AND DIMENSION [C] SHALL NOT EXCEED 180".
10. FOR PRESSURE MANHOLES, MAXIMUM HEAD SHALL NOT EXCEED 60" ABOVE TOP ELEVATION.
11. PROVIDE ASPHALT SURFACE AS REQUIRED.



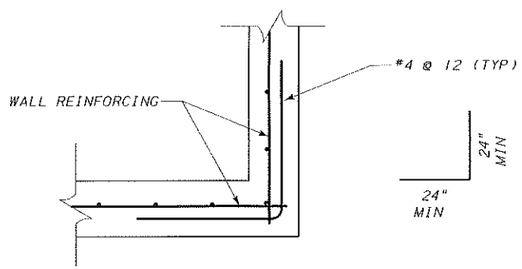
PLAN



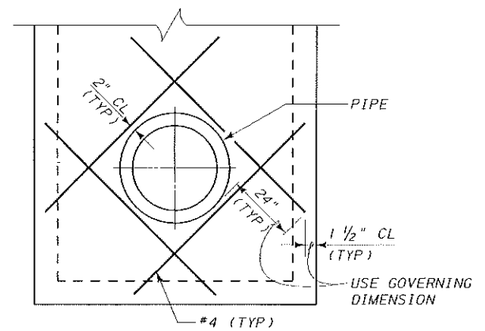
SECTION A



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

REFERENCES

REINFORCING SPECIFICATION	SRP 03210
CONCRETE SPECIFICATION	SRP 03300
CONCRETE PLACEMENT SPECIFICATION	GE 03305

DESIGN FOR CONSRTUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

MANHOLE PLANS, SECTIONS AND DETAILS

SCALE: NONE			TEMPORARY - 12940MH3.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	12940MH3	32
MH	Y3	22X34		

NO	DATE	BY	REVISED PER	CHK	APPD	AUTH
10	-			-		REL
11	08/31/05	JMS	REVISED NOTE 5.	CWT		
11	-		ADDED NOTE 11. AND REVISED ASSOCIATED CALLOUTS.	CWT		REL
11	09/26/07	JMS		CWT		REL

FORM NO

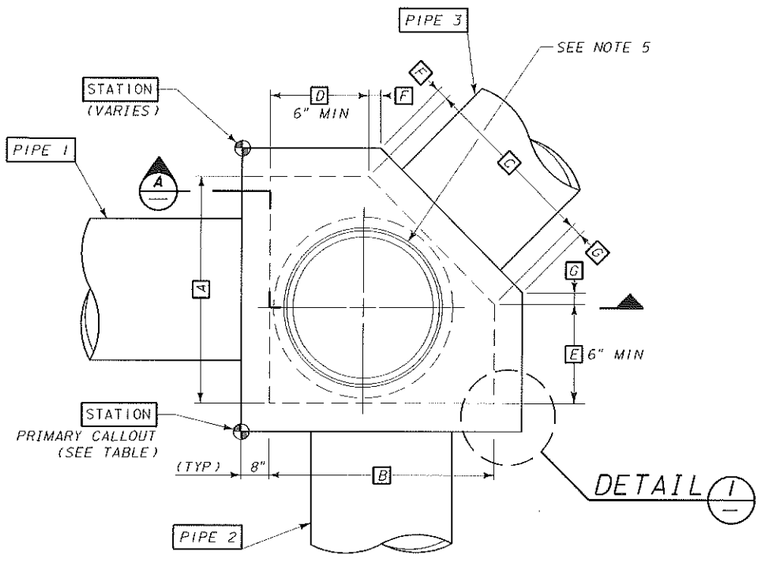
WDF-NEWMH

NEWMH.WDF

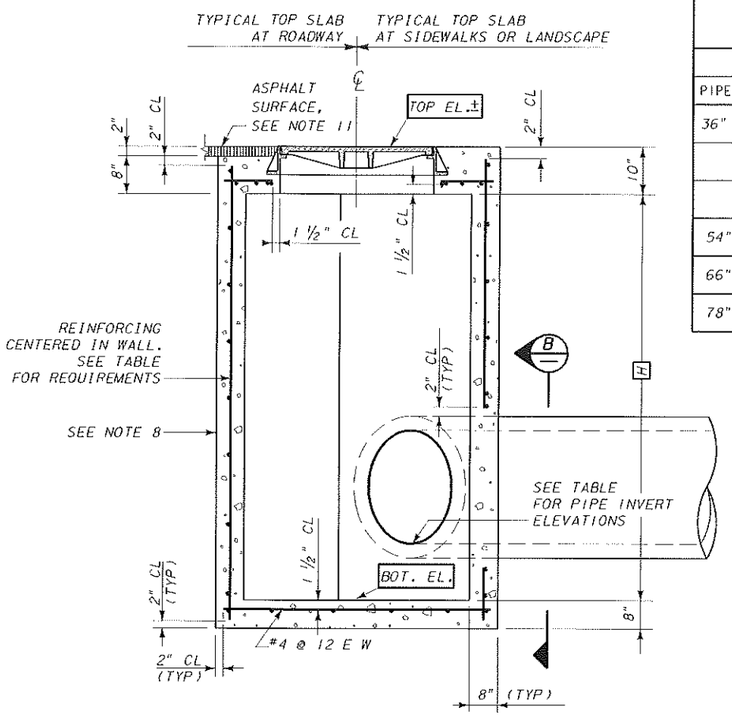
NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY CR

MANHOLE CONSTRUCTION DATA

MANHOLE NUMBER	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL.± (SEE NOTE 6)	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	MANHOLE DIMENSIONS (SEE NOTE 9) A	B	C	D	E	F	G	H	MANHOLE LOCATION ROADWAY	MANHOLE LOCATION SIDEWALKS/ LANDSCAPE
7	0+77.0	A-102-0082	1001.5	992.9	24"RGRCP CLASS 5	996.0	48"RGRCP	993.9	48"RGRCP CLASS 5	993.9	60"	72"	72"	18"	12 3/8"	3"	3 3/4"	93"	-	X
20	0+73.1	A-102-0099	1008.5	1001.3	42"RGRCP	1002.3	--------	------	42"RGRCP CLASS 5	1002.4	60"	60"	56"	24"	17 1/8"	3 5/8"	2 7/8"	76 1/2"	-	X



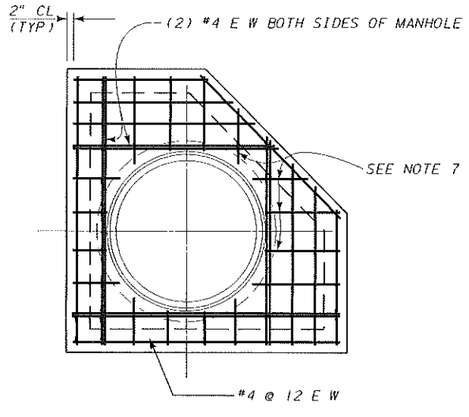
PLAN



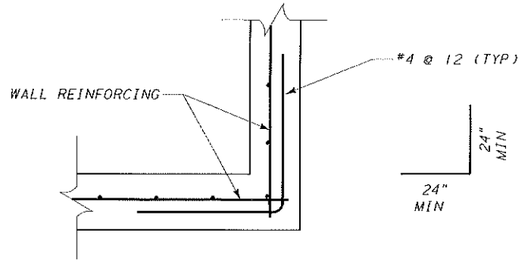
SECTION A

MINIMUM REQUIREMENTS

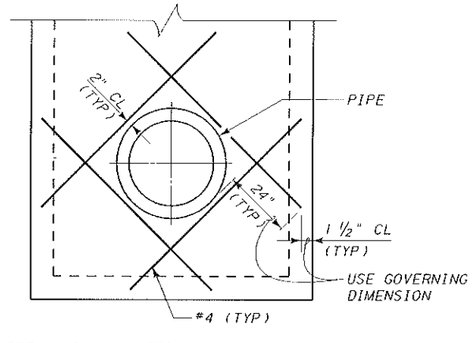
WALL LENGTH PIPE DIAMETER	A, B & C	REINFORCING STEEL
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

DESIGN CRITERIA

HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE, OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

1. STRUCTURAL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (MAG A) PER SRP 03300.
2. REINFORCING STEEL SHALL COMPLY WITH REQUIREMENTS OF SRP 03210; BARS SHALL BE ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 004-0424) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
6. NOT TO BE USED FOR STAKING. EXACT TOP ELEVATION TO BE SET BY CUSTOMER'S ENGINEER BASED ON CUSTOMER'S PAVING & GRADING PLANS.
7. FIELD CUT REBAR AT MANHOLE.
8. CONCRETE SHALL BE PLACED WITH NO COLD JOINTS. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
9. DIMENSIONS A, B & C SHALL NOT EXCEED 104", AND DIMENSION H SHALL NOT EXCEED 180".
10. FOR PRESSURE MANHOLES, MAXIMUM HEAD SHALL NOT EXCEED 60" ABOVE TOP ELEVATION.
11. PROVIDE ASPHALT SURFACE AS REQUIRED.

REFERENCES

REINFORCING SPECIFICATION ____ SRP 03210
CONCRETE SPECIFICATION ____ SRP 03300
CONCRETE PLACEMENT SPECIFICATION ____ GE 03305

NO	DATE	BY	CHK	APPD	AUTH
7	-	04.09.08	JWS	-	REL
REVISED "D" "PERMANENT DWG NUMBER REQUIRED" STATUS.					
0	RAD-01803	09/97	MOD	CWT	-
INITIAL ISSUE.					

FORM NO
DF-5SIDEDMH

5SIDEDMH.WDF

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
						/ /
DESIGN FOR CONSTRUCTION						
0	12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

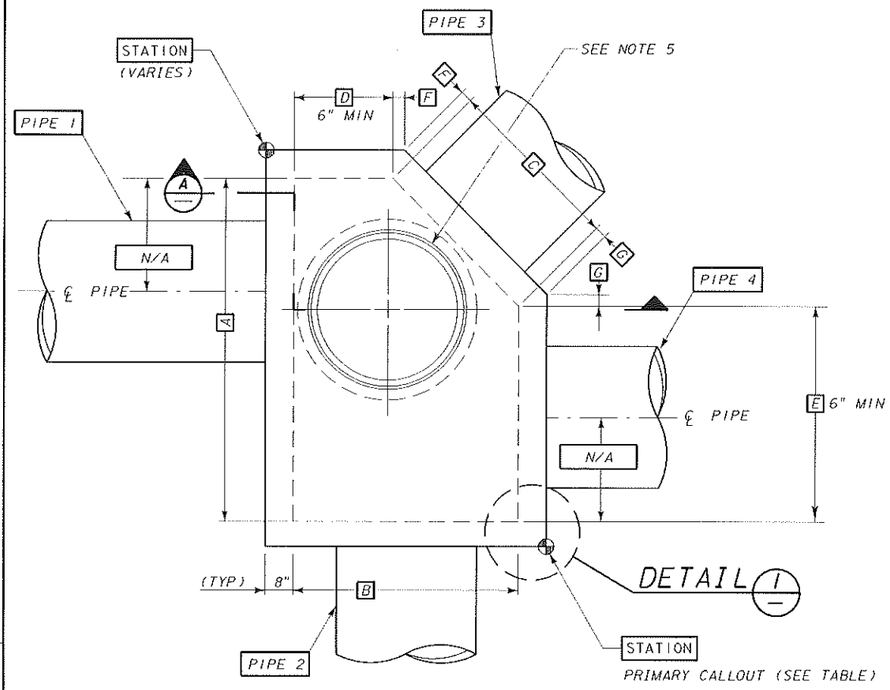
FIVE-SIDED MANHOLE PLANS, SECTIONS AND DETAILS

SCALE: NONE			A910G634.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-910-G634	33
MH	Y3	22X34		

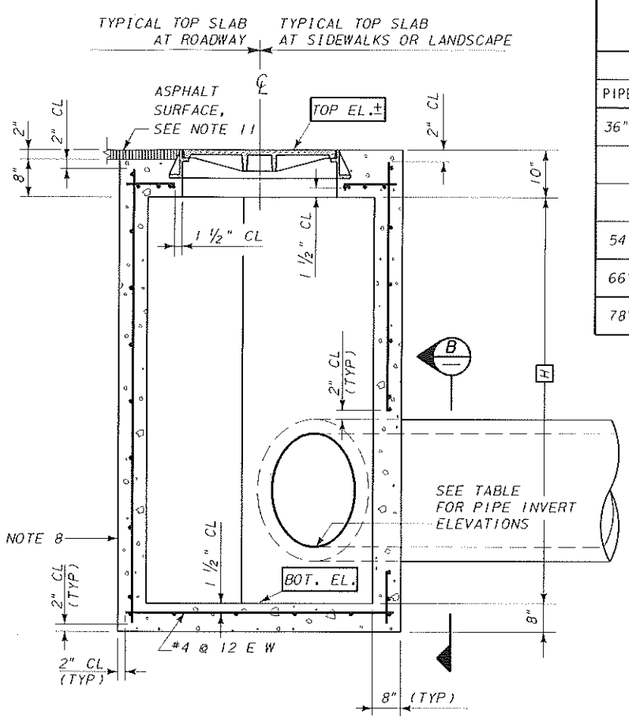
NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

MANHOLE CONSTRUCTION DATA

MANHOLE NUMBER	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL.± (SEE NOTE 6)	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	PIPE 4		MANHOLE DIMENSIONS (SEE NOTE 9)								MANHOLE LOCATION	
													A	B	C	D	E	F	G	H	ROADWAY	SIDEWALKS/ LANDSCAPE
18	50+68.3	A-102-0097	1008.6	1000.5	--------	------	24"RGRCP CLASS 5	1002.7	36"RGRCP	1001.5	24"RGRCP CLASS 5	1003.2	90"	54"	57"	6"	59 1/4"	2 3/8"	4 1/2"	87 1/2"	-	X



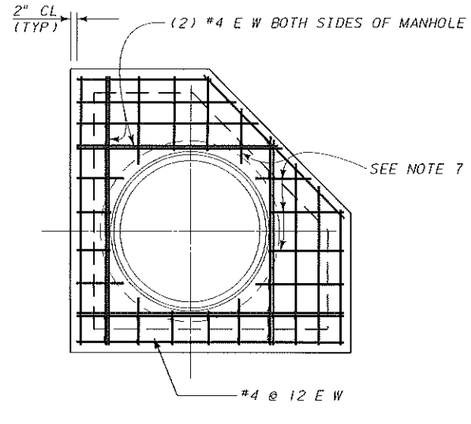
PLAN



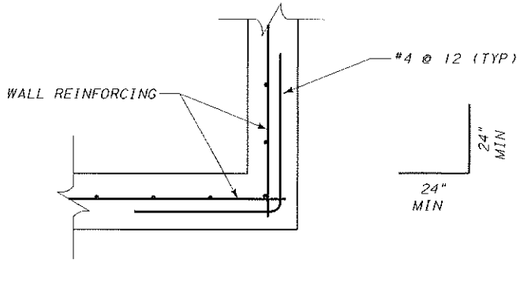
SECTION A

MINIMUM REQUIREMENTS

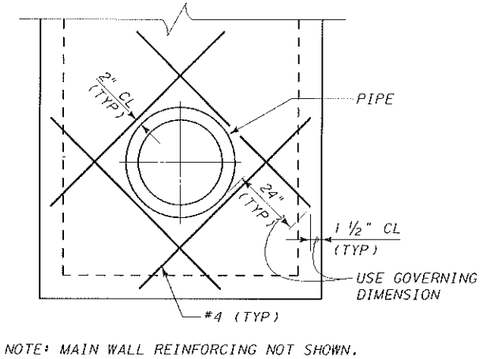
WALL LENGTH		REINFORCING STEEL
PIPE DIAMETER	A, B & C	
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

DESIGN CRITERIA

HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE. OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

1. STRUCTURAL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (MAG A) PER SRP 03300.
2. REINFORCING STEEL SHALL COMPLY WITH REQUIREMENTS OF SRP 03210; BARS SHALL BE ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 5011703) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
6. NOT TO BE USED FOR STAKING. EXACT TOP ELEVATION TO BE SET BY CUSTOMER'S ENGINEER BASED ON CUSTOMER'S PAVING & GRADING PLANS.
7. FIELD CUT REBAR AT MANHOLE.
8. CONCRETE SHALL BE PLACED WITH NO COLD JOINTS. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
9. DIMENSIONS A, B & C SHALL NOT EXCEED 104", AND DIMENSION H SHALL NOT EXCEED 180".
10. FOR PRESSURE MANHOLES, MAXIMUM HEAD SHALL NOT EXCEED 60" ABOVE TOP ELEVATION.
11. PROVIDE ASPHALT SURFACE AS REQUIRED.
12. TIE IN INTO THIS PIPE IS A TEMPORARY PROVISION ONLY. AFTER USE REMOVE ALL TEMPORARY PIPE AND COLLARS AND INSTALL A PERMANENT HARD PLUG IN THE THE 4' PIPE JOINT PER SRP CONSTRUCTION SPECIFICATIONS AND REQUIREMENTS.

REFERENCES

REINFORCING SPECIFICATION ____ SRP 03210
CONCRETE SPECIFICATION ____ SRP 03300
CONCRETE PLACEMENT SPECIFICATION ____ GE 03305

NO	DATE	CHK	APPD	AUTH
B	01.20.15	JWS	-	REL
UPDATED MH STOCK CODE NUMBER FROM 004-024 TO 5011703.				
0	RAD-0180	09/97	MOD	CMT
INITIAL ISSUE.				

FORM NO DF-5SIDEDMH

5SIDEDMH.WDF

DESIGN FOR CONSTRUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	REJ	REJ	RMP	RMP	12/29/11
		REJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

MODIFIED FIVE-SIDED MANHOLE PLANS, SECTIONS AND DETAILS

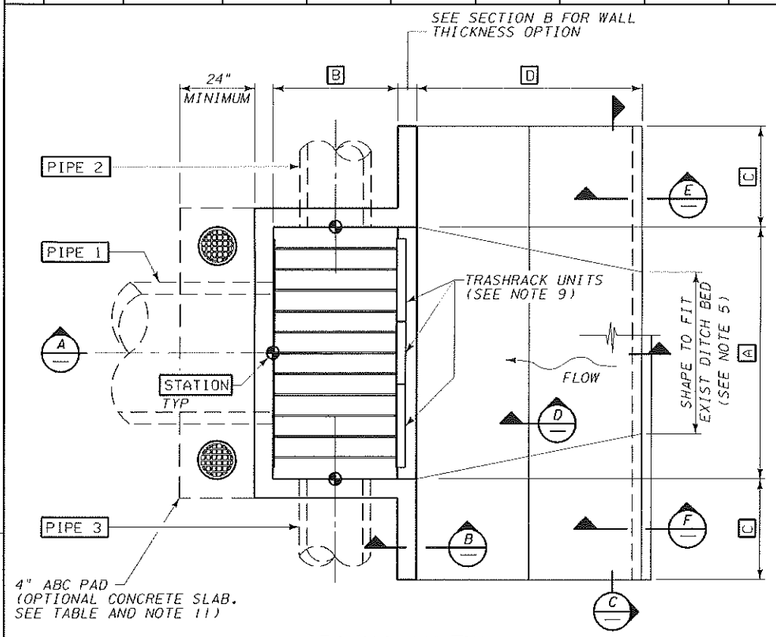
SCALE: NONE		A9100635.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	
MH	Y3	22X34	A-910-G635	34

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

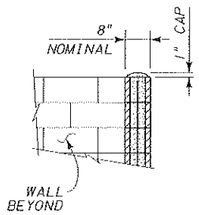
CONSTRUCTION DATA FOR HEADWALL WITH TRASHRACK

SEE NOTE 12

HOWL No.	STATION	PLAN/PROFILE REF DWG	PIPE 1 TYPE	PIPE 1 EL. 1	PIPE 2 TYPE	PIPE 2 EL. 1	PIPE 3 TYPE	PIPE 3 EL. 1	EL. 2	EL. 3	EL. 4	A	B	C	D	E	F	ABC PAD	CONC SLAB	DRAIN REQ'D LEFT	DRAIN REQ'D RIGHT	TABLE 1 SEE WES-CHKBDGDE CHECKBOARD REQUIRED	TABLE 1 SEE WES-CHKBDGDE DIM 1A & 1B
1	27+26.9	B-112-G195	24"RGRCP	993.8	--------	------	--------	------	999.9	995.7	998.1	48"	48"	24"	48"	84"	38 1/8"	X	-	-	-	-	-
2	1+24.8	B-112-G196	24"RGRCP	997.7	--------	------	24"RGRCP	994.8	1002.5	998.3	1001.3	48"	48"	24	72"	68 5/8"	15 1/4"	X	-	-	-	-	-
3	48+81.1	A-102-0097	24"RGRCP	1002.7	--------	------	--------	------	1008.1	1004.0	1007.1	48"	48"	24"	72"	76 1/4"	30 1/2"	X	-	-	-	-	-

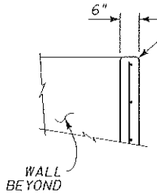


PLAN VIEW



BLOCK WALL TO HAVE ONE #4 REINFORCING BAR CENTERED IN EACH CORE FOR FULL HEIGHT AND CORES FILLED WITH CONCRETE OR SAND/CEMENT GROUT (3:1 RATIO). ALL BLOCKS TO BE LAID IN STAGGERED COURSES (COMMON BOND) WITH OR WITHOUT MORTAR JOINTS, PLASTERED ON EXPOSED SURFACES AND INCLUDING A 1" CAP ON TOP OF WALLS.

BLOCK WALL OPTION

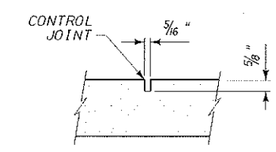


CAST-IN-PLACE WALL OPTION TO HAVE #4 REBAR @ 12" ON CENTER EACH WAY, CENTERED IN WALL. PROVIDE 18" X 18" CORNER BARS AT ALL CORNERS TO MATCH HORIZONTAL REINFORCING. PROVIDE (2) EXTRA #4 BARS ABOVE, BELOW, AT EACH SIDE OF PIPE AND AT EACH DIAGONAL.

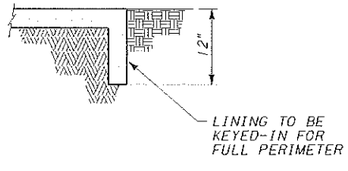
CAST-IN-PLACE WALL OPTION

SECTION B

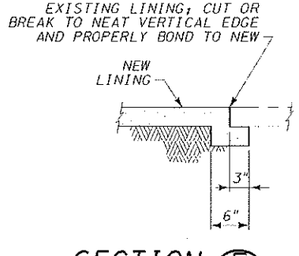
SECTION C



SECTION D
SEE NOTE 8



SECTION E
CONNECTION TO UNLINED DITCH



SECTION F
CONNECTION TO EXISTING LINED DITCH

SECTION A

NOTES

1. SEE PLAN/PROFILE DRAWING(S) FOR ORIENTATION OF HEADWALL(S).
2. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE 3000 PSI (MAG A). SPRAY CONCRETE WITH WHITE CURING COMPOUND.
3. REINFORCING STEEL TO BE ASTM A615 GRADE 60.
4. TOP OF CONCRETE FLOOR TO MATCH THE LOWEST PIPE INVERT (EL. 1).
5. MATCH WIDTH, ELEVATION, AND SLOPE OF EXISTING DITCH, OR AS DIRECTED BY SRP ENGINEERING.
6. SHAPE AND COMPACT TRANSITION LINING SUBGRADE FROM HEADWALL TO 36" PAST UNDISTURBED UNLINED DITCH, OR TO UPSTREAM END OF TRANSITION, WHICHEVER IS GREATER.
7. EXTEND TRANSITION LINING FROM FACE (EL. 4) OF WINGWALLS TO EXISTING DITCH OR CONCRETE LINING BY LENGTH (D), AND MATCH FINISH WITH EXISTING SLIPFORM LINING (IF APPLICABLE).
8. IF TRANSITION LENGTH (D) EXCEEDS 120", TRANSVERSE CONTROL JOINTS ARE REQUIRED AT EQUAL SPACING NOT TO EXCEED 120".
9. TRASHRACKS MAY BE INSTALLED IN ANY SEQUENCE OR ORDER, MAINTAINING THE 6 3/8" SPACING BETWEEN BARS OF ADJACENT UNITS AND EQUAL DISTANCE FROM EACH SIDE OF THE HEADWALL. SEE TRASHRACK REFERENCE DRAWING.
10. INSTALL TRASHRACKS WITH 1/2" DIA. x 3 3/4" EXPANSION ANCHORS, USING THE SLOTTED HOLES AS A TEMPLATE.
11. OPTIONAL CONCRETE SLAB - 4" THICK, MINIMUM 24" WIDE, LENGTH TO MATCH HEADWALL. BROOM FINISH. SLOPE SLAB TO DRAIN AWAY FROM HEADWALL. TOP OF SLAB TO BE LEVEL WITH ADJACENT FINISH GRADE.
12. INSTALL SLAB DRAIN PER STANDARD DRAWING WES-SLABDRAIN.

CONTRACTOR NOTE

TRASHRACK(S) MUST BE MANUFACTURED PRIOR TO REQUESTING AN IRRIGATION OUTAGE FOR THIS JOB.

TRASHRACK(S) AND ASSOCIATED HARDWARE CAN BE SUPPLIED BY SRP UPON REQUEST. PLEASE CALL THE MECHANICAL CONSTRUCTION & MAINTENANCE DIVISION OF SRP FOR PRICE QUOTES: (602) 236-4154

REFERENCES

TRASHRACK DETAILS ____ WES-30350-200

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
						/ /
DESIGN FOR CONSTRUCTION						
0	RD-12940	BAJ BAJ	REJ REJ	RMP RMP	RMP RMP	12/29/17

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

STANDARD HEADWALL WITH TRASHRACK

SCALE: NONE			TEMPORARY - 12940HT1.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	12940HT1	35
HOWL	Y3	22X34		

NO.	DATE	BY	CHK	APPD	AUTH	REL.
8	01.23.08	JWG	-	CWT	-	REL.
ADDED SLAB DRAIN REFERENCE TO DRAWING.						
7	04.14.06	JWS	-	CWT	-	REL.
UPDATED ANCHOR REFERENCE NOTE 10 SECTION A.						

FORM 120

HOWL_TRRK.WDF

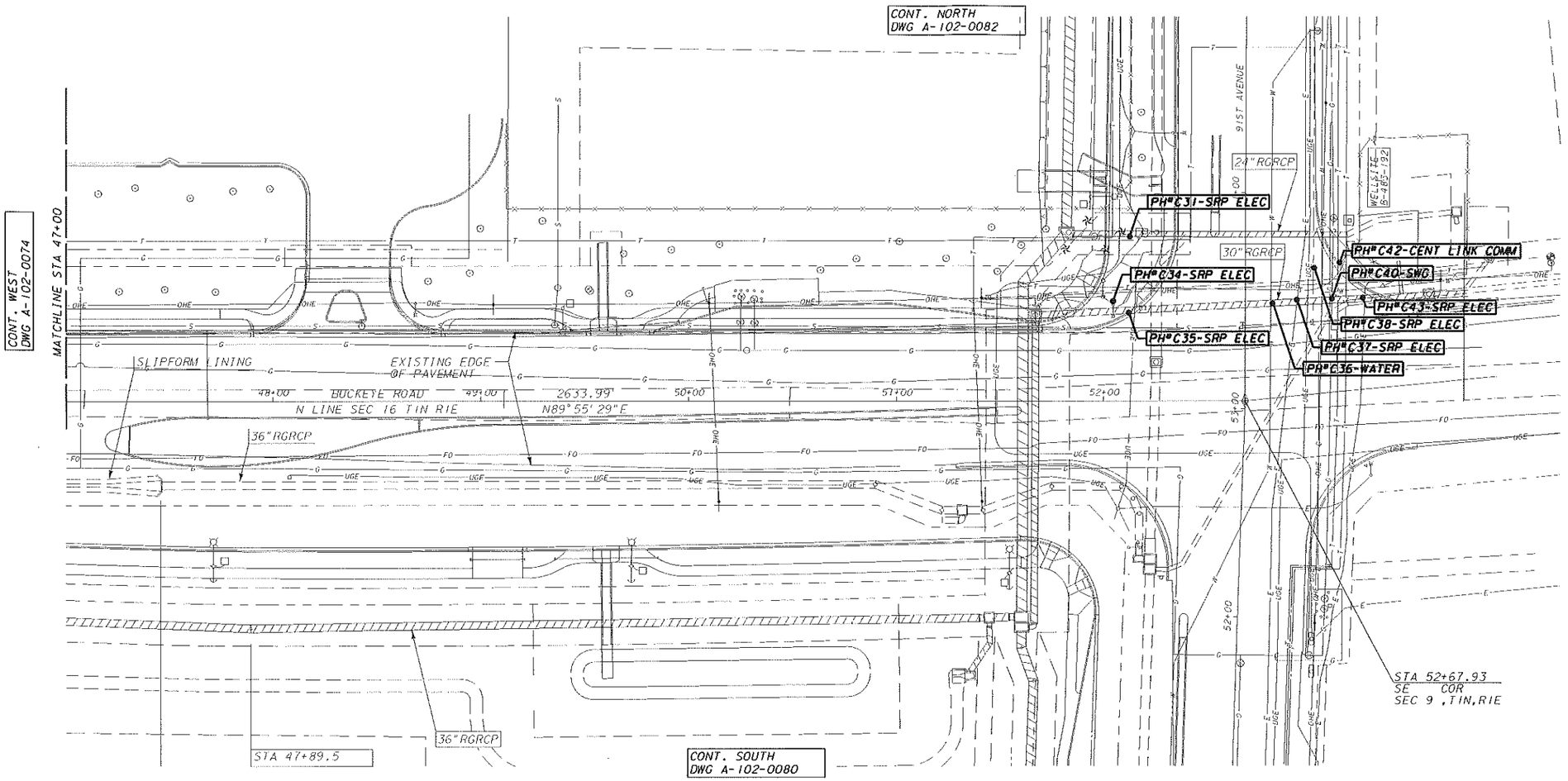
DF-HOALTRRK

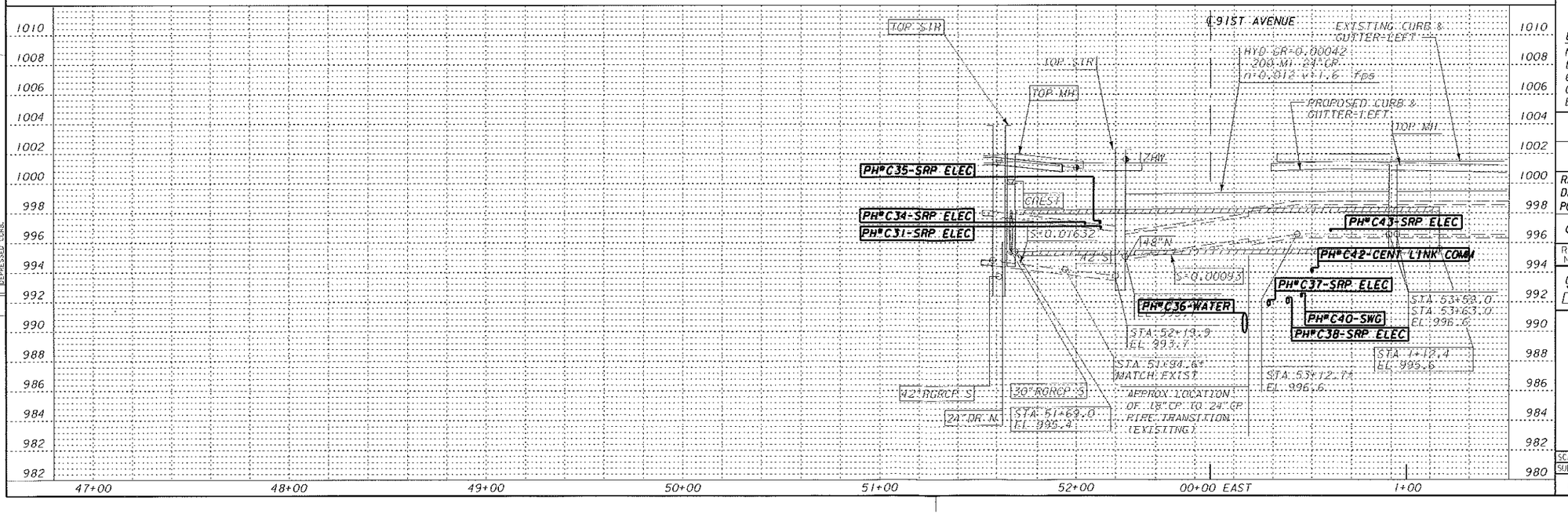
PRINTED 25 January 2018

NOT FOR CONSTRUCTION

REVISED BY GR

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3:
REF #4:





POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

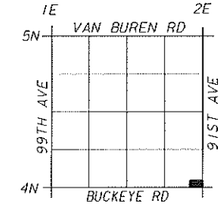
   THIS INFORMATION IS REQUIRED TO BE ADDED TO THE CONSTRUCTION PLAN DRAWINGS.

2. BY CORPORATE POLICY AND DUE TO INTERRUPTIONS TO SRP SERVICE, ALL CONFLICTING UTILITIES ISSUES ARE REQUIRED TO BE RESOLVED AND UTILITIES RELOCATED PRIOR TO ANY PROJECT RELEASE FOR CONSTRUCTION.

   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR SEC 9 POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PHG214 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PHG214	63
PP	Y2	22X34		

NO	DATE	BY	REVISION
8	04.10.27	JWS	ADD NOTE FOR TRADITIONAL DRIVEWAY WITH DEPRESSED CURB
7	04.03.26	JWS	ADDED NEW NOTE-9 & CIRCLE NOTES FOR "BRIDGE RECOVERY AND STEP PAD INSTALLATION"

FORM 140

WDF-PPSNG

PPSNG.WDF

PRINTED BY GR

NOT FOR CONSTRUCTION 25 January 2018 PM

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------

CONT. NORTH
DWG A-102-0082

CONT. WEST
DWG A-102-0074

MATCHLINE STA 47+00

SLIPFORM LINING

EXISTING EDGE OF PAVEMENT

48+00 BUCKEYE ROAD 49+00 2633.39' 50+00 51+00

N LINE SEC 16 T1N R1E N89°55'29"E

36"RGRCP

STA 47+89.5

36"RGRCP

CONT. SOUTH
DWG A-102-0080

91ST AVENUE

24"RGRCP

30"RGRCP

WELL 17E
55-605192

PH#C31-SRP ELEC

PH#C34-SRP ELEC

PH#C35-SRP ELEC

PH#C42-CENT LINK COMM

PH#C40-SWG

PH#C43-SRP ELEC

PH#C38-SRP ELEC

PH#C37-SRP ELEC

PH#C36-WATER

52+00

53+00

STA 52+67.93
SE COR
SEC 9 ,T1N,R1E

CONT. NORTH
DWG B-112-G1964

N

POTHOLING NOTES

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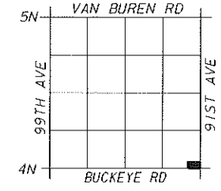
ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

1010 1008 1006 1004 1002 1000 998 996 994 992 990 988 986 984 982 980

47+00 48+00 49+00 50+00 51+00 52+00 00+00 EAST 1+00

TOP STR
TOP MH
91ST AVENUE
EXISTING CURB & GUTTER-LEFT
HYD GR-0.00042
200 MI. 24"CP.
n=0.012 v=1.6 fps
PROPOSED CURB & GUTTER-LEFT
TOP MH
TOP STR
PH#C35-SRP ELEC
PH#C34-SRP ELEC
PH#C31-SRP ELEC
CREST
S=0.07632
18"N
S=0.00083
PH#C43-SRP ELEC
PH#C42-CENT LINK COMM
PH#C37-SRP ELEC
PH#C36-WATER
PH#C40-SWG
PH#C38-SRP ELEC
STA 52+19.9
EL 993.7
STA 51+94.6
MATCH EXIST
STA 53+03.0
STA 53+63.0
EL 996.6
STA 54+12.4
EL 995.6
STA 53+12.74
EL 996.6
42"RGRCP S
30"RGRCP S
24"DR N
STA 51+69.0
EL 995.3
APPROX LOCATION OF 18"CP TO 24"CP PIPE TRANSITION (EXISTING)

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR SEC 9 POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PHG196 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PHG196	64
PP	Y2	22X34		

NO	DESCRIPTION	APPD	AUTH
7	ADDED "HEX" NOTE & CIRCLE NOTES FOR BRIDGE RECOVERY AND S.S.P. PAD INSTALLATION. 04.03.06 JMS	CMT	REL
8	ADDED CIRCLE NOTE FOR INDUSTRIAL DIFFERENT WITH DEPRESSED CURB. 04.10.07 JMS	CMT	REL

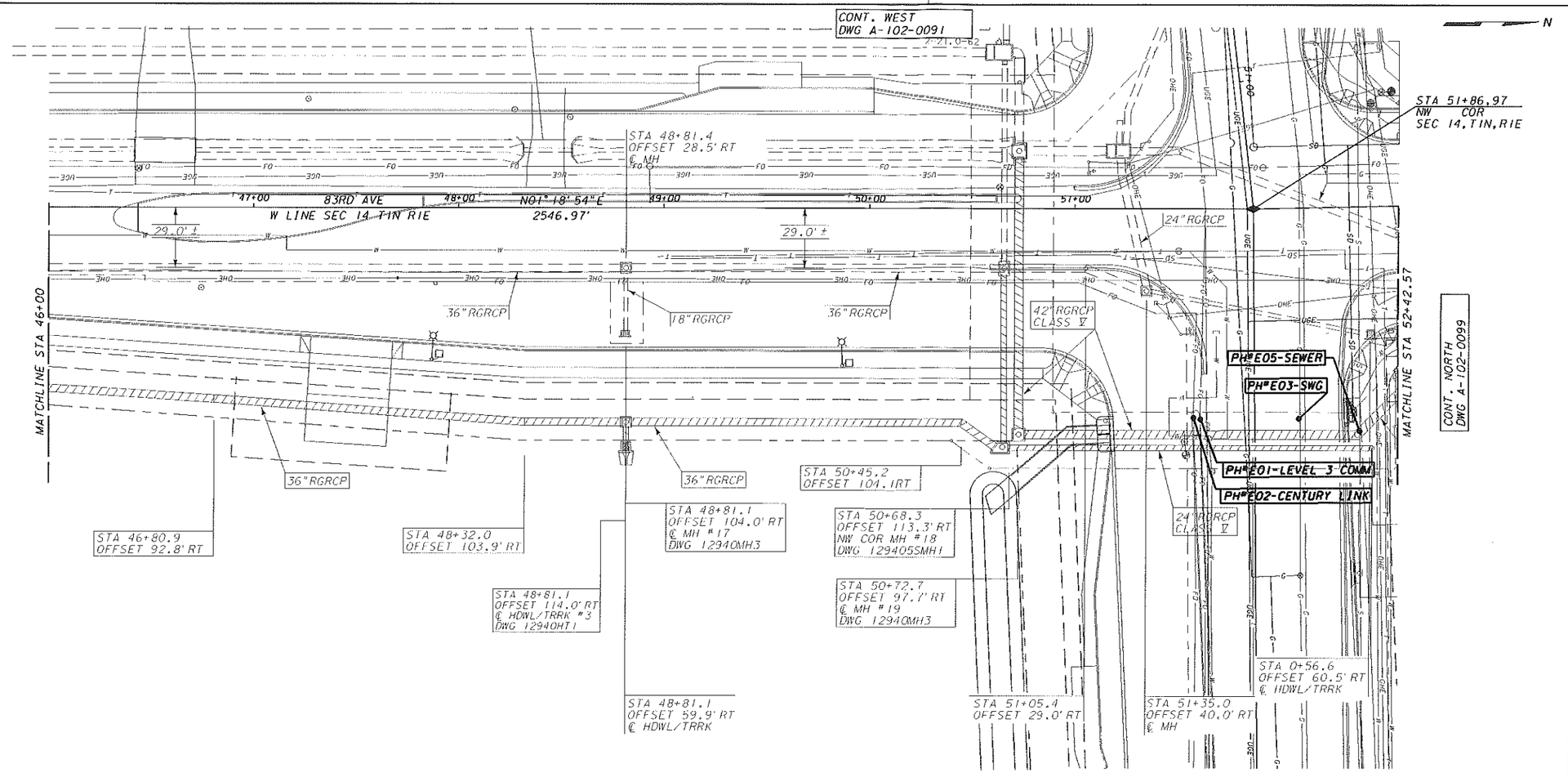
FORM NO

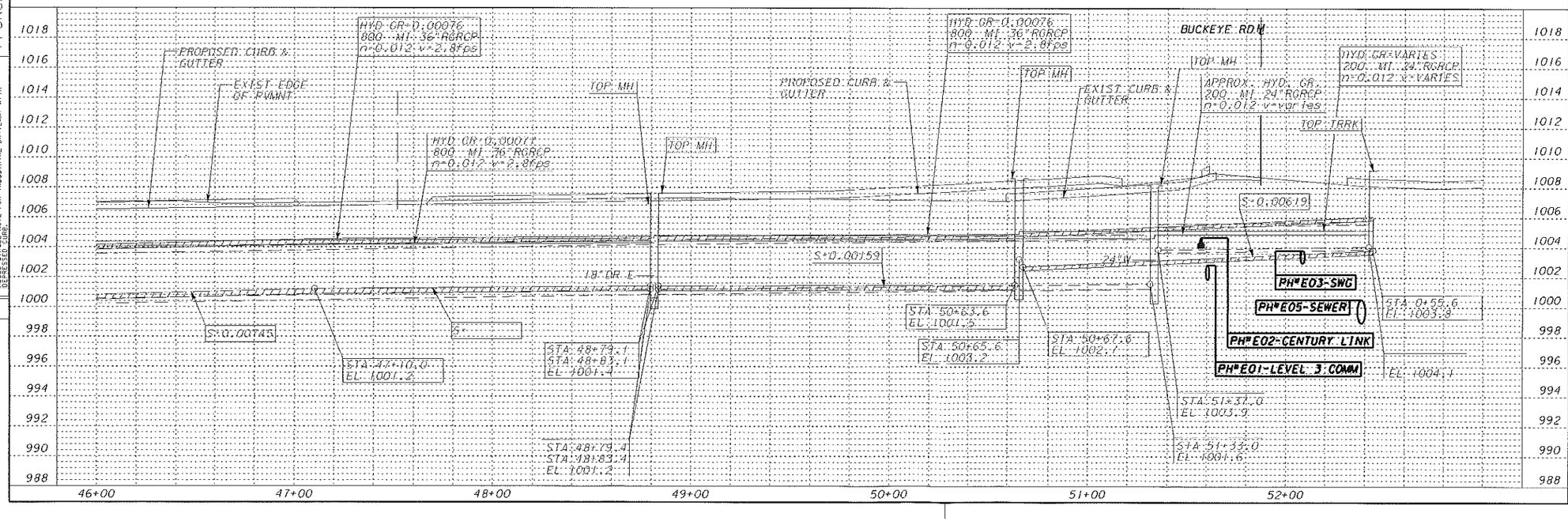
WDF-PPSNG

PPSNG.WDF

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
REF #3:
REF #4:





POTHOLING NOTES

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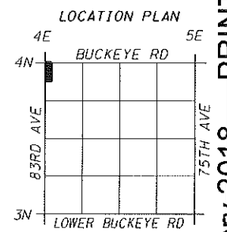
ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEVATION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

DRAWN FROM A-102-1034 , SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 14 T1N R1E 600' S/O NW COR TO 50' N/O NW COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0097 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0097	72
PP	Y2	22X34		

NO	REVISION	BY	DATE	APPV'D	AUTH
7	CHECK KEY NOTES FOR INSTALLATION AND STEP PAD INSTALLATION	JWS	04.02.06	CWT	-
8	CA NO. 07	JWS	04.10.07	CWT	-

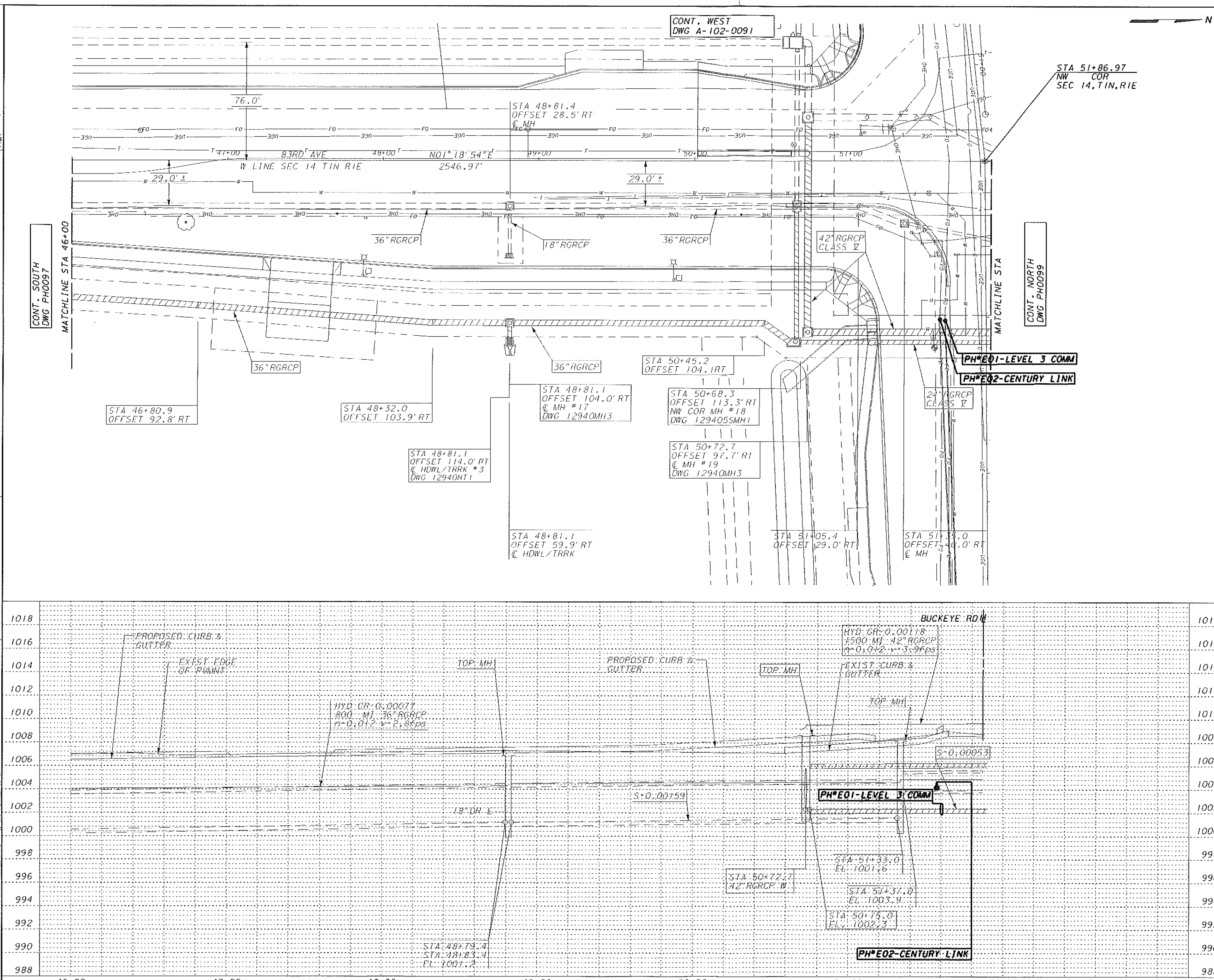
ADDED CIRCLE NOTE FOR INDUSTRIAL DR'VEWAY WITH DEPRESSED CURB.

FORM 310
WDF-PPSNG

PPSNG.WDF

PRINTED BY GR

NOT FOR CONSTRUCTION — 25 January 2018 — PR



REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
REF #3:
REF #4:

PPSNG.WDF

WDF-PPSNG

POTHOLING NOTES

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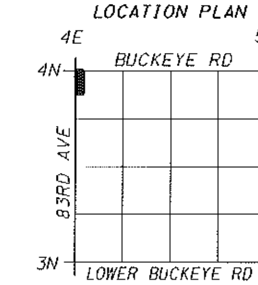
ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM A-102-1034, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/11

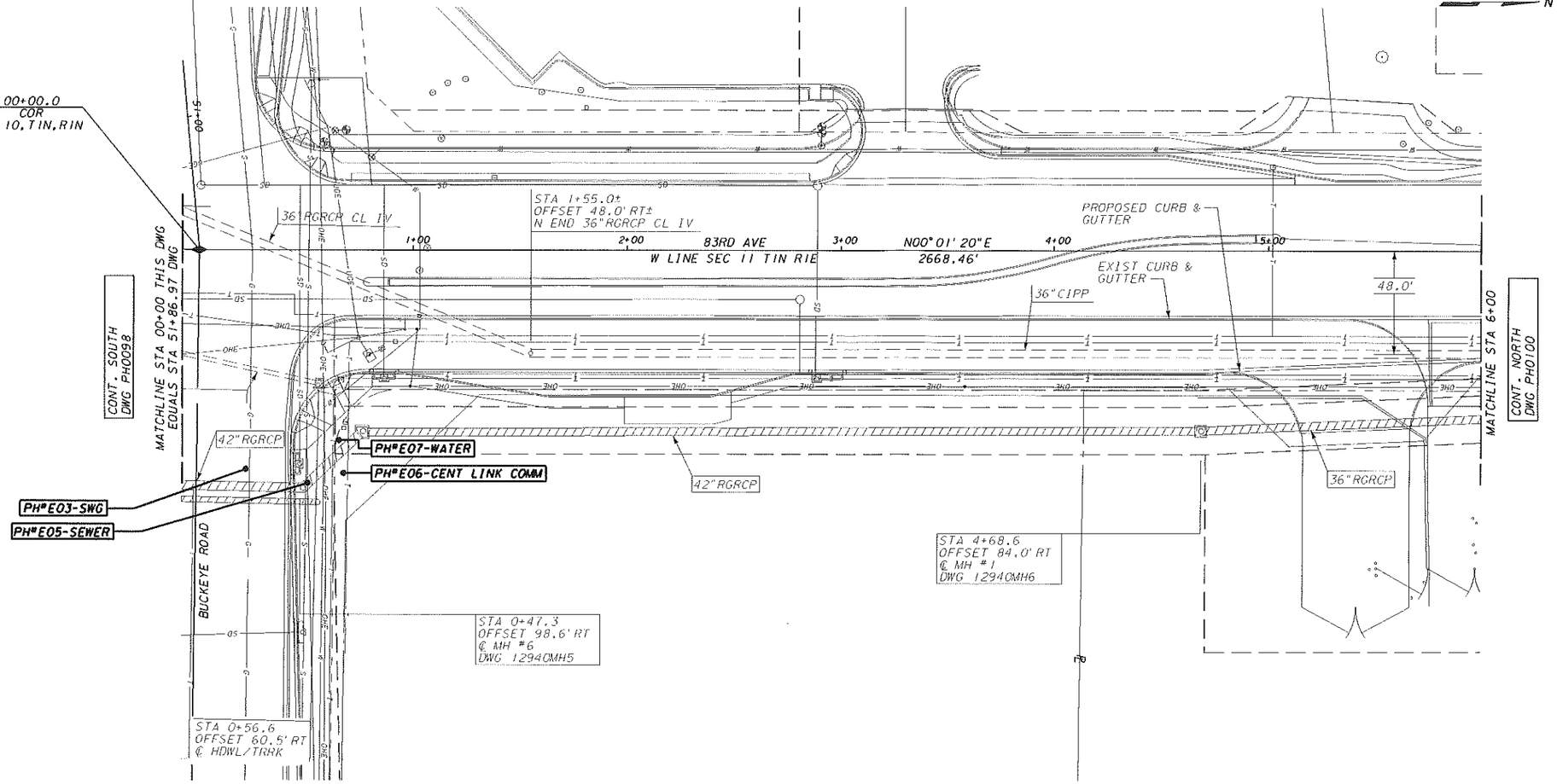
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

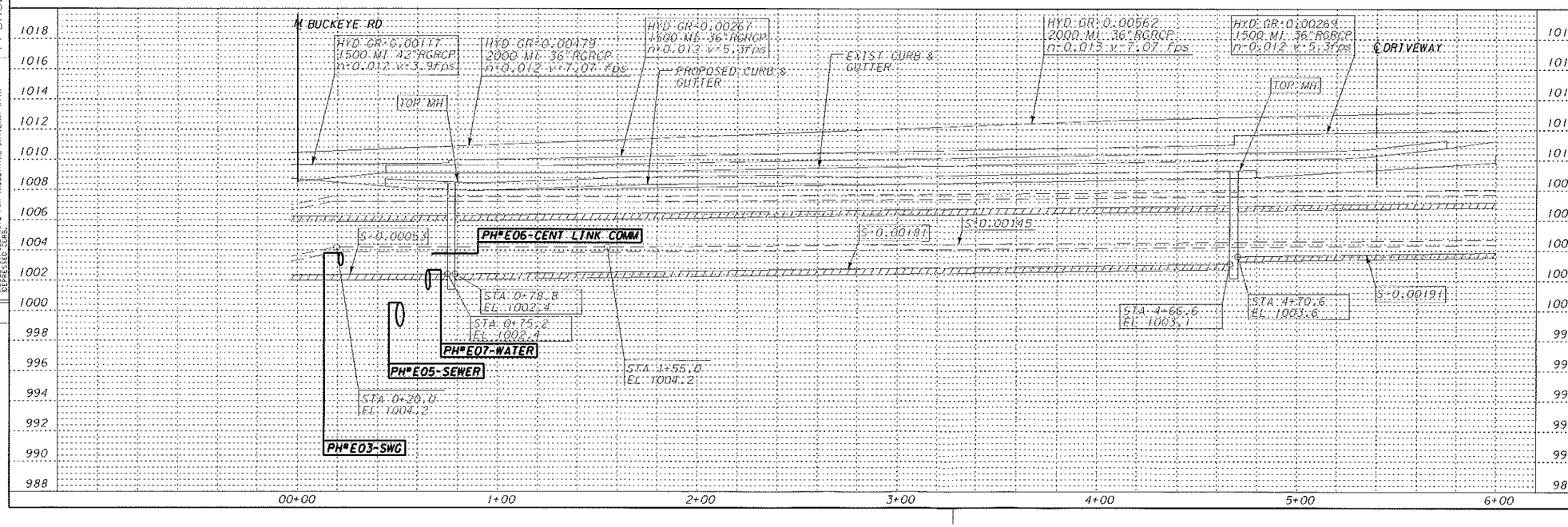
GRAND CANAL LATERAL 21.0 SEC 14 T1N R1E 120' S/O NW COR TO NW COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0098 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	PH0098	73

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
REF #3:
REF #4:





POTHOLING NOTES

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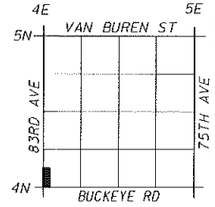
ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

DRAWN FROM A-102-546, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0 SEC 11 T1N R1E SW COR TO 600' N/O SW COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0099 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0099	74
PP	Y2	22X34		

NO.	DESCRIPTION	APPD	AUTH
7	ADDED HEX NOTE & CIRCLE NOTES FOR BRIDGE RECOVERY AND STOP PAD INSTALLATION.	04.03.06 JMS	CMT - REL
8	ADDED NOTE FOR INDUSTRIAL DRIVEWAY WITH CURB RETURNS AND CURB CUT.	04.10.07 JMS	CMT - REL

FORM 1/0
WDF-PPSNG

PPSNG.WDF

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M5BM.DGN
REF #2: M5BM.DGN
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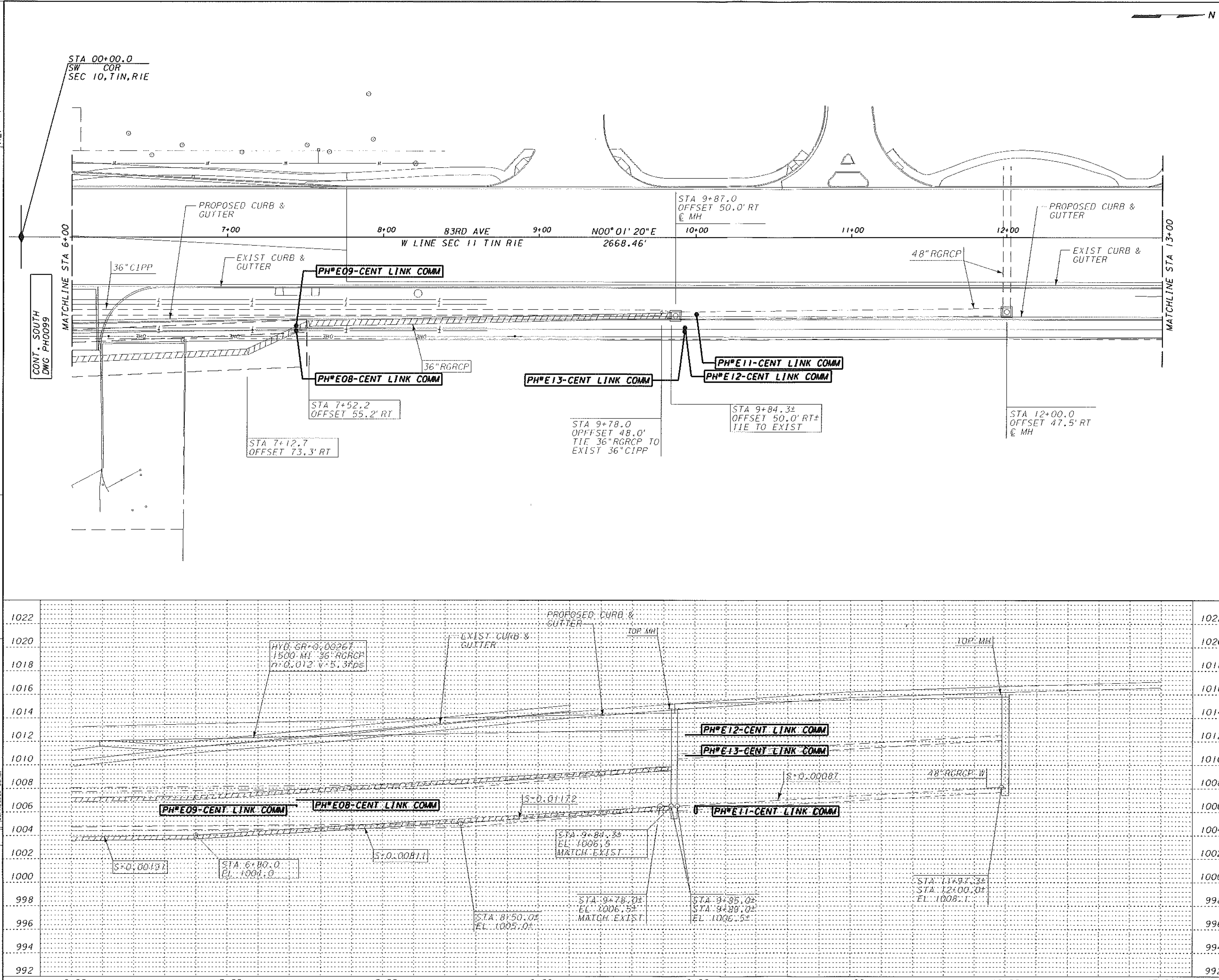
REF #4: -----



POTHOLING NOTES

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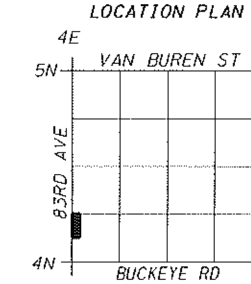
ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

DRAWN FROM A-102-546, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ / BAJ	REJ / REJ	RMP / RMP	RMP / RMP	12/29/11

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

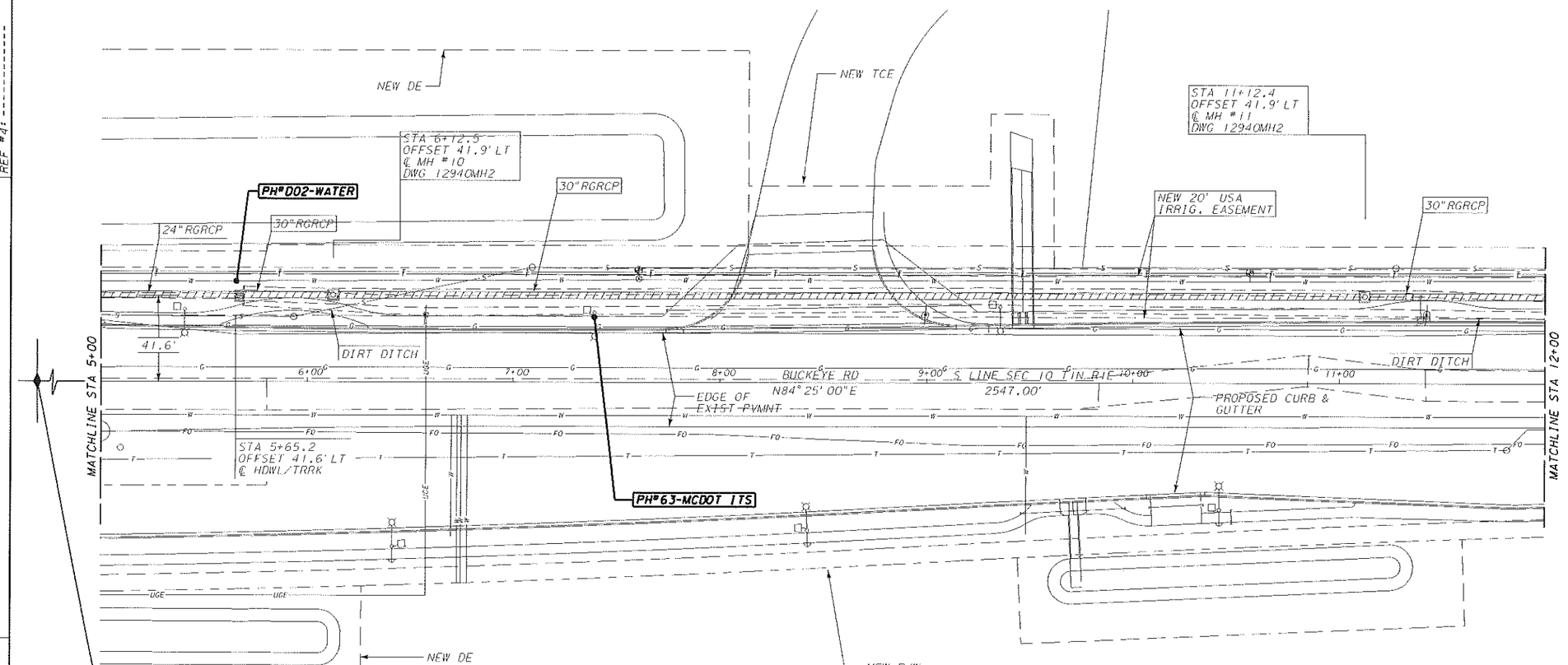
GRAND CANAL LATERAL 21.0 SEC 11 T1N R1E 600' N/O SW COR 16/4 COR POTHOLE LOCATIONS

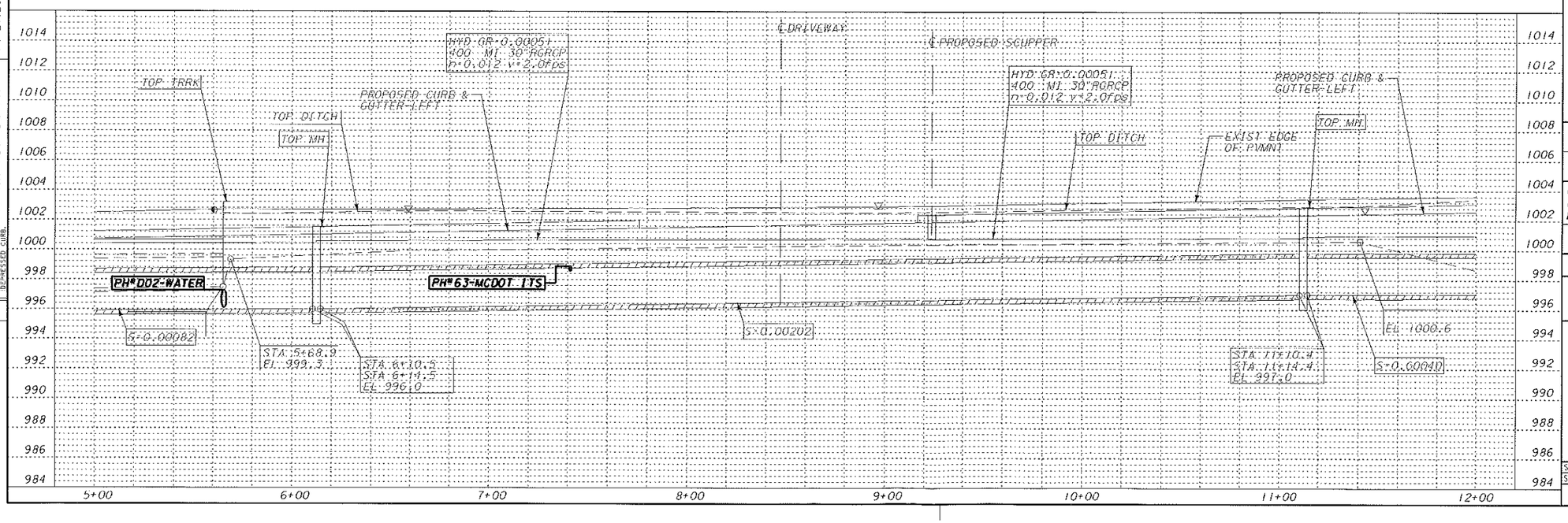
SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0100 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	PH0100	75

PPSNG.WDF
WDF-PPSNG

NOT FOR CONSTRUCTION 25 January 2018 PRINTED BY GR

REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3:
REF #4:





POTHOLING NOTES

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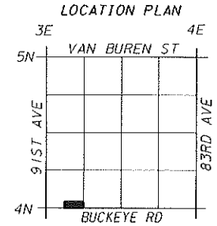
ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,RIE.
ELEVATION 996.48'

REDRAWN FROM B-112-G005, SRP SURVEY W13-53393-01 &
DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/29/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN
SEC 10 T1N R1E
500' E/O SW COR
TO 16/5 COR
POTHOLE LOCATIONS

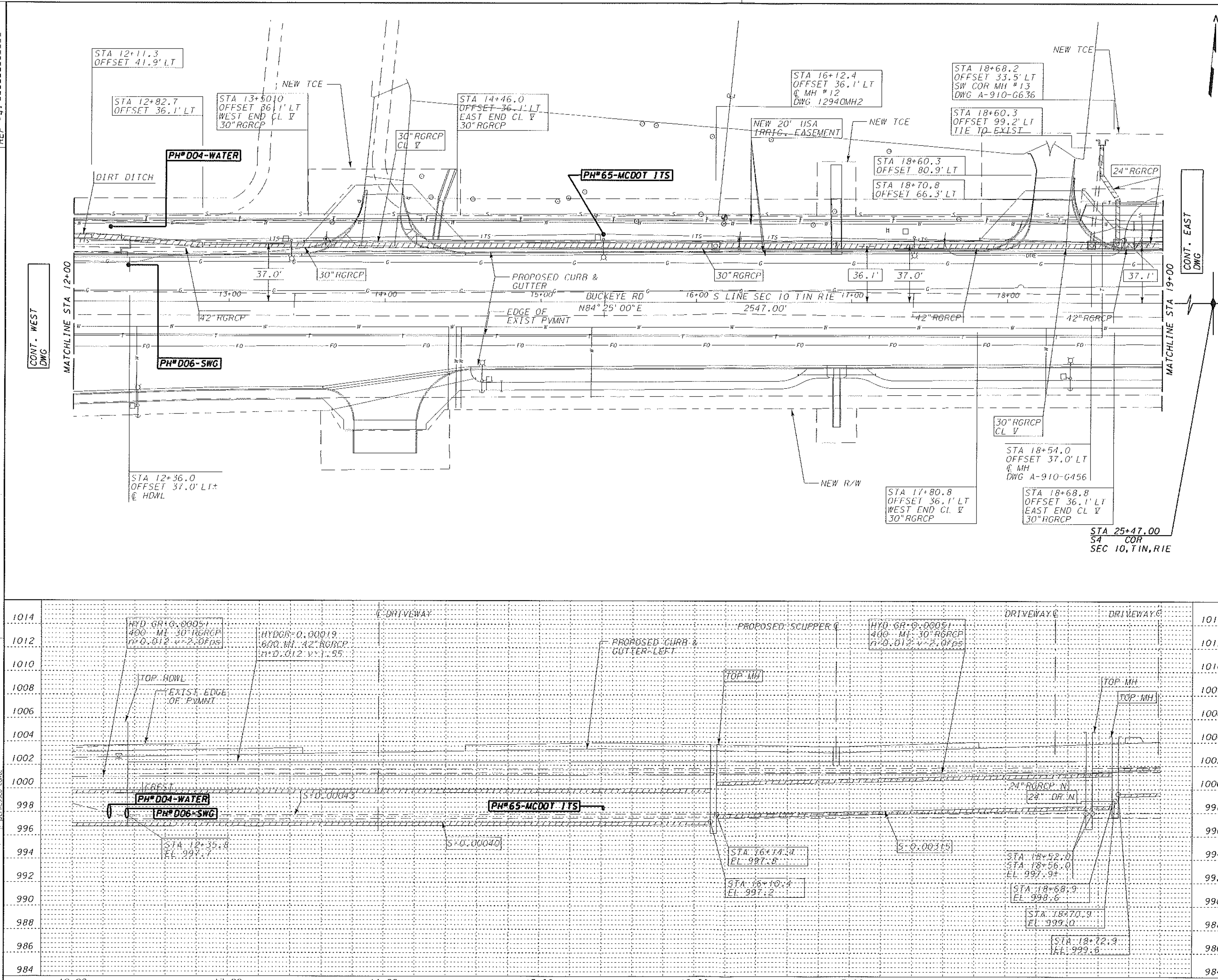
SCALE: PLAN 1"=30', PROFILE 1"=4'			PHG197 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PHG197	77
PP	Y2	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

NO.	DATE	APPD	DESCRIPTION
1	04.03.06	JWS	REL
2	04.10.07	JWS	CNT
3	04.10.07	JWS	REL

ADDED "RS" NOTE
ADDED "3:1 CABLE NOTES FOR BRIDGE RECOVERY"
ADDED CHECK NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB

FORM NO
WDF-PPSNG
PPSNG.WDF



REFERENCE FILES USED:
REF #1: M4BM.DGN
REF #2: M4BM.DGN
REF #3: ---------
REF #4: ---------

POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

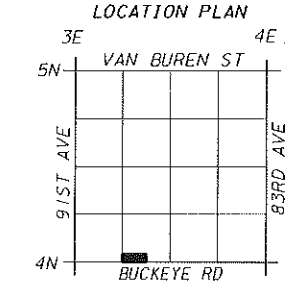
   THIS INFORMATION IS REQUIRED TO BE ADDED TO THE CONSTRUCTION PLAN DRAWINGS.

2. BY CORPORATE POLICY AND DUE TO INTERRUPTIONS TO SRP SERVICE, ALL CONFLICTING UTILITIES ISSUES ARE REQUIRED TO BE RESOLVED AND UTILITIES RELOCATED PRIOR TO ANY PROJECT RELEASE FOR CONSTRUCTION.

   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEVATION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

REDRAWN FROM B-112-G006, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ / BAJ	REJ / REJ	RMP / RMP	RMP / RMP	12/29/11

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN SEC 10 T1N R1E 16/5 COR TO 650' W/O S4 COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PHG198 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	PHG198	78

PPSNG.WDF
WDF-PPSNG

MANHOLE CONSTRUCTION DATA

MH No.	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL. 1± (SEE NOTE 6)	TOP EL. 2	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	PIPE 4 TYPE	PIPE 4 INV. EL.	MANHOLE DIMENSIONS (SEE NOTE 9) A1	A2	A3	B	C	D	E	MANHOLE LOCATION (SEE NOTE 11) ROADWAY	SIDEWALK OR LANDSCAPE
13	18+68.2	B-112-G198	1004.5	1003.2	997.6	24"RGRCP	999.0	30"RGRCP CLASS 5	998.6	--------	-------	24"RGRCP	999.6	48"	72"	24"	48"	73"	48"	37"	X	X

MINIMUM REQUIREMENTS

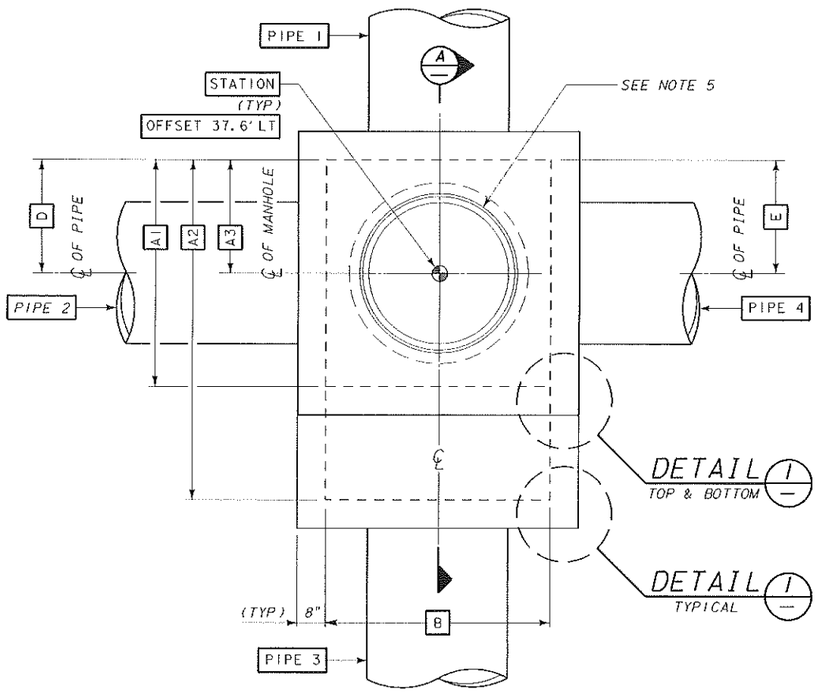
WALL LENGTH PIPE DIA	A2 OR B	REINFORCING STEEL
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	

DESIGN CRITERIA

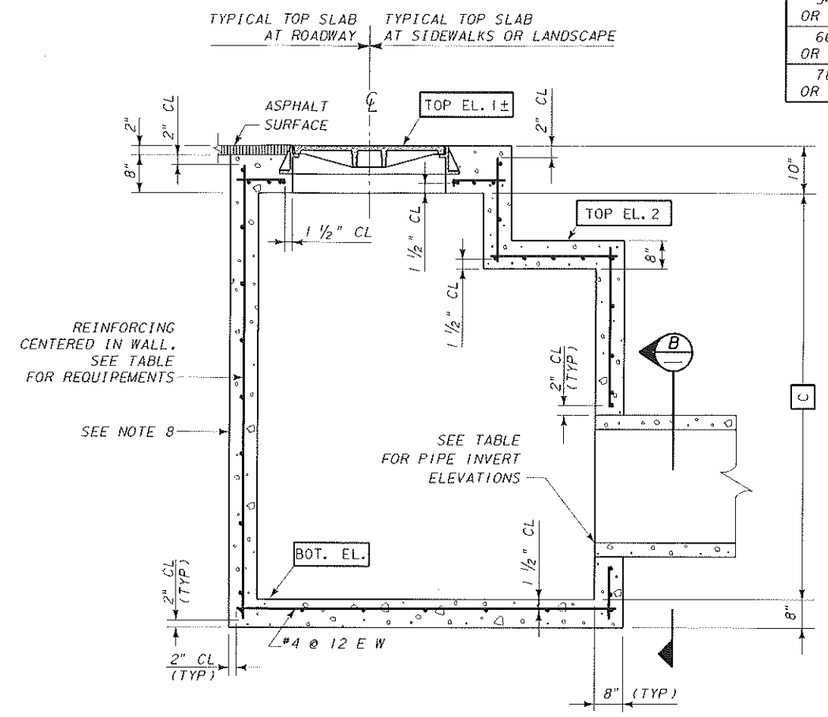
HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE, OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

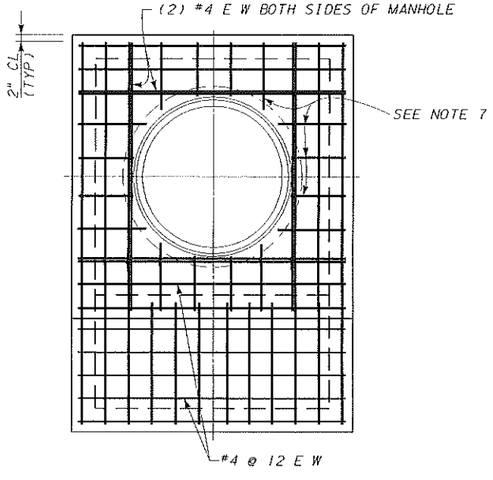
1. STRUCTURAL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (MAG A) PER SRP 03300.
2. REINFORCING STEEL SHALL COMPLY WITH REQUIREMENTS OF SRP 03210; BARS SHALL BE ASTM A615 GRADE 60 AND WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185.
3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 5011703) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
6. NOT TO BE USED FOR STAKING. EXACT TOP ELEVATION TO BE SET BY CUSTOMER'S ENGINEER BASED ON CUSTOMER'S PAVING & GRADING PLANS.
7. FIELD CUT REBAR AT MANHOLE.
8. CONCRETE SHALL BE PLACED WITH NO COLD JOINTS. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
9. DIMENSIONS A2 AND B SHALL NOT EXCEED 104", AND DIMENSION C SHALL NOT EXCEED 180".
10. FOR PRESSURE MANHOLES, MAXIMUM HEAD SHALL NOT EXCEED 60" ABOVE TOP ELEVATION.
11. CUSTOMER TO STAKE PROPOSED CURB AND GUTTER PRIOR TO LOCATING MANHOLE RISER, FRAME, AND COVER. RISER, FRAME, AND COVER MAY BE LOCATED IN EITHER ROADWAY OR SIDEWALK AS APPROPRIATE.



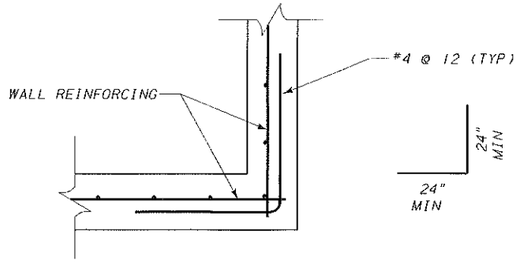
PLAN



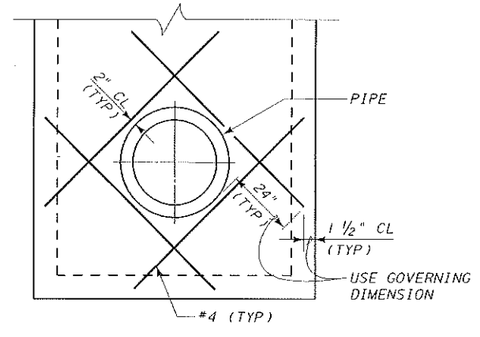
SECTION A



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

REFERENCES

REINFORCING SPECIFICATION ____ SRP 03210
CONCRETE SPECIFICATION ____ SRP 03300
CONCRETE PLACEMENT SPECIFICATION ____ GE 03305

NO	DATE	DFTR	CHK	APPD	AUTH
2	01.07.15	JWS	-	-	REL
	ADDED MANHOLE DIM A3 TO PLAN DETAIL & MH DATA TABLE.				
0	08/31/07	JWS	-	-	REL
	INITIAL ISSUE.				

FORM NO

OFFSETMH.WDF

'DF-OFFSETMH

						/ /
DESIGN FOR CONSTRUCTION						
0	RD-12940	REJ REJ	REJ REJ	RMP RMP	RMP RMP	12/29/1
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	TSSUE AUTH	DATE

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

OFFSET MANHOLE PLANS, SECTIONS AND DETAILS

SCALE: NONE			A910G636.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	A-910-G636	79
MH	Y3	22X34		

NOT FOR CONSTRUCTION — 25 January 2018 — PRINTED BY GR

MANHOLE CONSTRUCTION DATA

MH No.	STATION (SEE NOTE 4)	REFERENCE DRAWING	TOP EL. 1 ± (SEE NOTE 6)	TOP EL. 2	BOT. EL.	PIPE 1 TYPE	PIPE 1 INV. EL.	PIPE 2 TYPE	PIPE 2 INV. EL.	PIPE 3 TYPE	PIPE 3 INV. EL.	PIPE 4 TYPE	PIPE 4 INV. EL.	MANHOLE DIMENSIONS (SEE NOTE 9) A1	A2	A3	B	C	D	E	MANHOLE LOCATION (SEE NOTE 11) ROADWAY	SIDEWALK OR LANDSCAPE
22	9+87.9	A-102-0100	1015.2	1013.0	1005.5	--------	-------	36"RGRCP	1006.5	--------	-------	EXIST. 48"RGRCP	1006.5±	41 ½"	120"	20 ¾"	48"	106 ½"	86"	86"	-	X

MINIMUM REQUIREMENTS

WALL LENGTH PIPE DIA	WALL LENGTH A2 OR B	REINFORCING STEEL
36" OR LESS	48"	#4 @ 12" E.W. OR (1) LAYER 6x6-W5.5xW5.5 WWF
42"	56"	
48"	68"	
54" OR 60"	80"	#4 @ 12" E.W. OR 6x6-W10xW10 WWF
66" OR 72"	92"	
78" OR 84"	104"	

DESIGN CRITERIA

HS20 HIGHWAY LOADING, 32 KIPS ON REAR AXLE (16 KIPS/WHEEL), WHEEL SPACING 6', 30% IMPACT. ONE WHEEL CENTERED ON MANHOLE, OTHER WHEEL ADJACENT TO MANHOLE.

NOTES

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3. CONCRETE PLACEMENT SHALL BE PER GE 03305.
4. SEE PLAN AND PROFILE DRAWING FOR CORRECT ORIENTATION OF MANHOLE.
5. STANDARD SRP 30" CAST IRON MANHOLE FRAME AND COVER (STOCK CODE No. 5011703) CENTERED IN TOP OF MANHOLE. CONTACT SRP INVESTMENT RECOVERY DEPARTMENT AT (602) 236-2908, TO PURCHASE SRP MANHOLE FRAME AND COVER.
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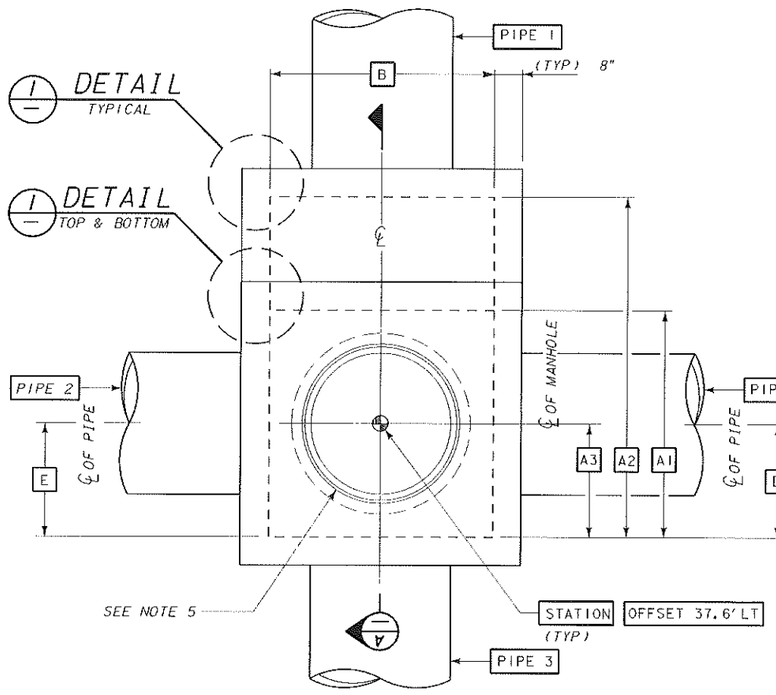
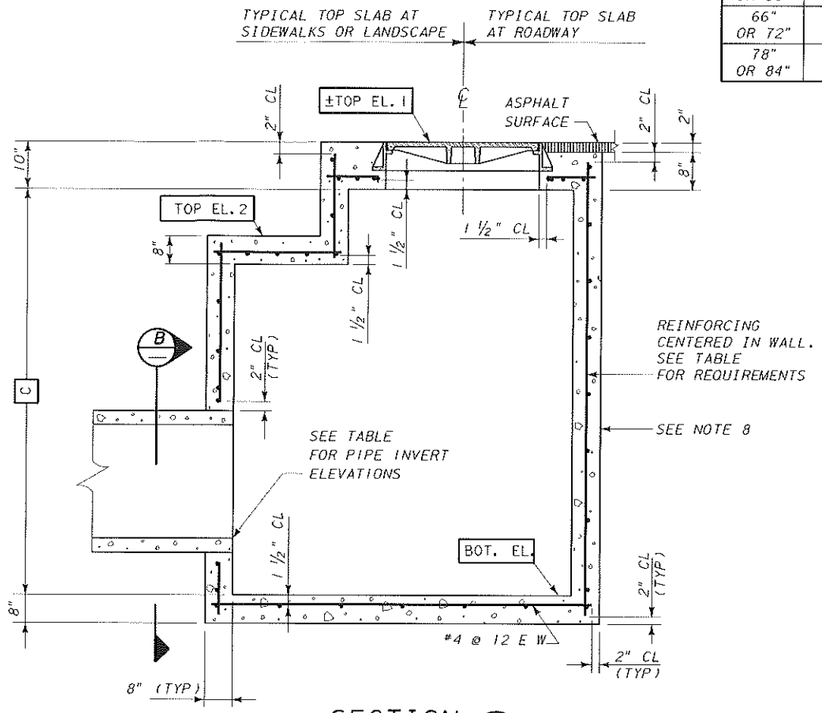
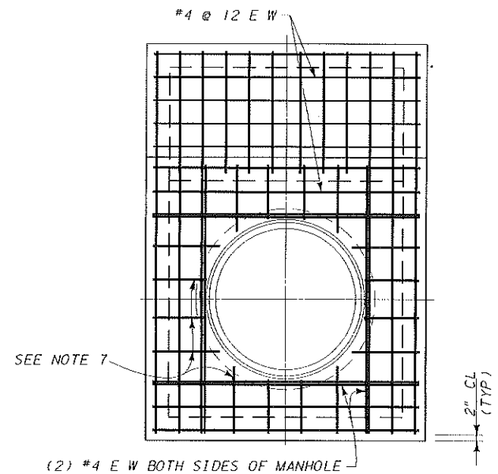
11. CUSTOMER TO STAKE PROPOSED CURB AND GUTTER PRIOR TO LOCATING MANHOLE RISER, FRAME, AND COVER. RISER, FRAME, AND COVER MAY BE LOCATED IN EITHER ROADWAY OR SIDEWALK AS APPROPRIATE.



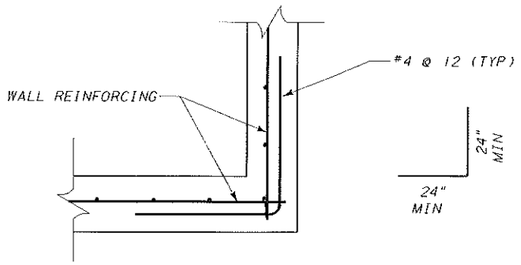
PLAN



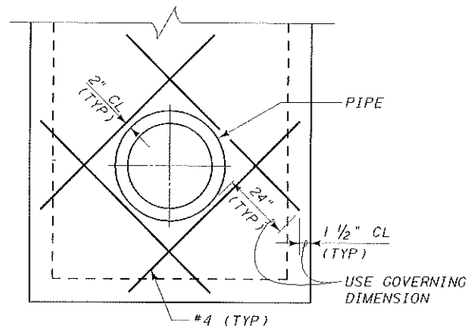
SECTION A



TOP SLAB REINFORCING PLAN



DETAIL 1



NOTE: MAIN WALL REINFORCING NOT SHOWN.

SECTION B

REFERENCES

REINFORCING SPECIFICATION	SRP 03210
CONCRETE SPECIFICATION	SRP 03300
CONCRETE PLACEMENT SPECIFICATION	GE 03305

NO	DATE	INITIAL	CHK	APPD	AUTH	DESCRIPTION
2	01.07.15	JMS	-	-	REL	ADDED MANHOLE DIM A3 TO PLAN DETAIL & MH DATA TABLE.
1	-	-	-	-	-	
0	-	JMS	-	CMT	REL	INITIAL ISSUE.
FORM NO		08/01/07				

OFFSETMH.WOF

DF-OFFSETMH

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
						/ /
DESIGN FOR CONSTRUCTION						
0	RD-12940	REJ	REJ	RMP	RMP	12/29/1
		REJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

OFFSET MANHOLE PLANS, SECTIONS AND DETAILS

SCALE: NONE			A910G637.DGN	SHEET NO
SUBJ CODE	DIST CODE	DWG SIZE	A-910-G637	80
MH	Y3	22X34		

PRINTED BY GR 25 January 2018 NOT FOR CONSTRUCTION

WATER SRP ENGINEERING

SALT RIVER PROJECT

IRRIGATION IMPROVEMENTS

SRP ENGINEERING FILE NO. RD-12940

PHOENIX, ARIZONA

MC 85, 91ST AVENUE TO 95TH AVENUE, MCDOT PHASE IB

CUSTOMER: MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION, BEN MARKERT
TEL. (602) 506-8603

CUSTOMER'S ENGINEER: KIMLEY-HORN, ROBERT LYONS P.E.
TEL. (602) 678-3440

SRP DESIGNER: RICHARD JOHNSON
TEL. (602) 236-4607

SRP INSPECTOR: JEFF HYATT
TEL. (602) 236-2637

LEGEND

PLAN SYMBOLS

- BENCHMARK
- SECTION CORNER
- SURVEY POINT (CALLOUT)
- SECTION LINE
- CONSTRUCTION BASELINE
- PROPERTY OR RIGHT OF WAY LINE
- EASEMENT LINE
- CENTERLINE
- EXISTING EDGE OF PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- SLIPFORM LINING
- EXISTING DITCH
- EXISTING PIPE
- PROPOSED PIPE
- EXISTING HEADWALL WITH AND WITHOUT SLIPFORM
- PROPOSED HEADWALL WITH SLIPFORM
- EXISTING HEADWALL/ TRASHRACK WITH AND WITHOUT SLIPFORM
- PROPOSED HEADWALL/ TRASHRACK WITH SLIPFORM
- EXISTING TURNOUT STRUCTURE
- PROPOSED TURNOUT STRUCTURE
- EXISTING MANHOLE
- PROPOSED MANHOLE
- FIRE HYDRANT
- WATER VALVE
- METER (WATER-W /GAS-G)
- W — WATER LINE
- S — SEWER LINE
- G — GAS LINE
- T — TELEPHONE (DUCT OR CABLE)
- E — UNDERGROUND ELEC (DUCT OR CABLE)
- MANHOLE (NON WUA)
- SD — STORM DRAIN
- CB — CATCH BASIN
- UTILITY POLE
- DOWN GUY
- FENCE (WOOD)
- X X — FENCE (WIRE/NOT SPECIFIED)
- FENCE (MASONRY)
- PALM TREE
- TREE (TYPE)
- STUMP
- MB — MAIL BOX
- EXISTING FACILITIES (CALLOUT)
- PROPOSED FACILITIES (CALLOUT)

PROFILE SYMBOLS

- LOW BANK
- BED
- AVERAGE GROUND LEFT
- AVERAGE GROUND RIGHT
- AVERAGE GROUND (ONE GIVEN)
- HIGH WATER
- BED (PRIVATE DELIVERY)
- HIGH GROUND
- LOW GROUND
- Ⓒ — CENTERLINE OF ROAD
- BED (DRAIN DITCH)
- CATCH BASIN
- PROPOSED UTILITY
- EXISTING UTILITY
- PH — POTHOLED UTILITY
- PROPOSED PIPE

REV NO	DATE	DFTR	DSGN	ENGR CHK	SUPV APPD	ISSUE AUTH
17	10. 13. 05	JWS	-	CWT	-	REL
		REVISED EXISTING DITCH AND PIPE SYMBOLOGY.				
18	04. 10. 07	JWS	-	CWT	-	REL
		REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.				

FORM NO

IRRIGFS.WDF

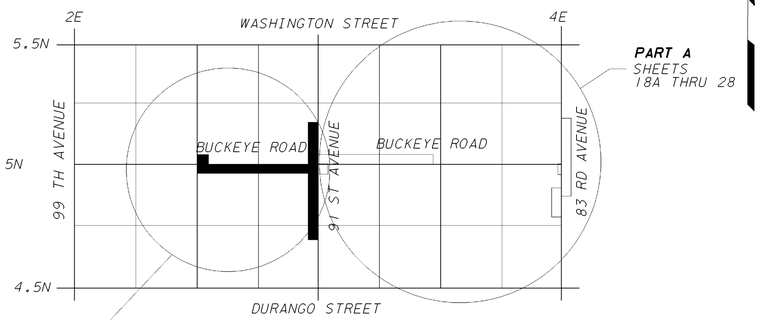
WDF-IRRIGFS

GENERAL NOTES

1. THE CUSTOMER/CONTRACTOR IS RESPONSIBLE TO OBTAIN A PERMIT FOR WORK WITHIN PUBLIC AGENCY R/W AND ASSURE THAT ALL WORK IS PERFORMED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL SAFETY AND ENVIRONMENTAL REGULATIONS.
2. THE WORK SPECIFIED ON THESE PLANS MAY INVOLVE THE USE OF AREAS LOCATED BOTH WITHIN SRP RIGHTS-OF-WAY AND PUBLIC AGENCY RIGHTS-OF-WAY. IF THE PUBLIC AGENCY ISSUES A PERMIT FOR WORK WITHIN ITS RIGHTS-OF-WAY, IT WILL APPLY ONLY TO THE AREA WITHIN THE PUBLIC AGENCY RIGHTS-OF-WAY. SUCH PERMIT SHALL NOT APPLY TO WORK WITHIN SRP RIGHTS-OF-WAY HAVING PRIOR RIGHTS.
3. THE CONTRACTOR SHALL CONTACT BLUE STAKE AT (602) 263-1100 AND SUCH OTHER LOCATORS/UTILITIES AS NECESSARY TO LOCATE AND FLAG ALL EXISTING UNDERGROUND UTILITIES BEFORE FIELD CONSTRUCTION BEGINS.
4. THE CUSTOMER'S CONTRACTOR IS REQUIRED TO CALL THE SRP INSPECTOR FOR A PRECONSTRUCTION CONFERENCE IN ACCORDANCE WITH THE APPLICABLE SRP LICENSE OR CONSTRUCTION AGREEMENT BEFORE OBTAINING CONSTRUCTION CLEARANCE AND STARTING CONSTRUCTION. CONTRACTOR MUST SIGN A TEMPORARY IRRIGATION OUTAGE AGREEMENT, IF REQUIRED, BEFORE CONSTRUCTION CAN BEGIN.
5. ALL CONSTRUCTION WATER AND POWER SHALL BE OBTAINED, HANDLED, AND PAID FOR BY THE CONTRACTOR. THE CONTRACTOR SHALL MAKE ARRANGEMENTS TO PROCURE AND TRANSPORT WATER TO THE CONSTRUCTION SITE. ALL TEMPORARY FACILITIES SHALL BE REMOVED BEFORE FINAL ACCEPTANCE BY SRP.
6. ANY QUESTIONS RELATIVE TO THE ACCURACY OF THE IMPROVEMENT INSTALLATION SHALL BE SUBMITTED IN WRITING IMMEDIATELY AND BEFORE COMPLETION OF THE WORK IF ALL SURVEY STAKES ARE MAINTAINED INTACT AS ORIGINALLY PLACED. SHOULD SUCH STAKES NOT BE PRESENT AND VERIFIED AS TO THEIR ORIGIN, NO CLAIM FOR ADDITIONAL COMPENSATION FOR CORRECTION SHALL BE PRESENTED TO ANY PARTY AND SUCH WORK SHALL BE CORRECTED AND PAID FOR BY THE CONTRACTOR.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL QUANTITIES AND ANY OTHER ITEMS AFFECTING THE BID TO COMPLETE THE WORK SHOWN ON THE PLANS, AND TO BASE THE BID SOLELY UPON VERIFIED QUANTITIES, IRRESPECTIVE OF THE INFORMATION FURNISHED AS NOTED ABOVE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE SRP INSPECTOR BEFORE CONSTRUCTION, OF ANY SIGNIFICANT DISCREPANCIES BETWEEN THE CONTRACTOR'S ESTIMATED QUANTITIES AND THOSE SHOWN ON THE PLANS.
8. THE CUSTOMER IS RESPONSIBLE FOR CLEARING THE PROPOSED SRP IRRIGATION SYSTEM ALIGNMENT BEFORE SRP CONSTRUCTION BEGINS. CLEARING SHALL INCLUDE REMOVAL OF PAVEMENT, CURBS, GUTTERS, SIDEWALKS, SIGNS, UTILITY POLES, STREETLIGHTS, FENCING AND ANY OTHER EXISTING CONFLICTS.
9. CONTACT SRP CUSTOMER SERVICE AT (602) 236-8888 FOR REQUIREMENTS FOR PROTECTING, RELOCATING OR REMOVING SRP POWER POLES (INCLUDING DOWN GUYS), UNDERGROUND POWER LINES AND OTHER ELECTRICAL EQUIPMENT. THE CUSTOMER IS RESPONSIBLE FOR ALL COSTS OF COMPLYING WITH THESE REQUIREMENTS.
10. FOR IRRIGATION OUTAGE INFORMATION, CONTACT THE SRP INSPECTOR.
11. IF THERE ARE CONFLICTS BETWEEN SRP'S PLANS AND SPECIFICATIONS AND LOCAL GOVERNING REQUIREMENTS, THE MOST STRINGENT REQUIREMENT SHALL APPLY, AS DETERMINED BY THE SRP INSPECTOR.
12. ALL TRENCHING SHALL BE DONE IN ACCORDANCE WITH OSHA CONSTRUCTION STANDARDS FOR EXCAVATIONS.
13. BACKFILL MATERIAL, PLACEMENT AND COMPACTION SHALL CONFORM TO REQUIREMENTS OF MAG 601 EXCEPT THAT COMPACTION DENSITY SHALL BE 100% FOR GRANULAR MATERIAL AND 95% FOR NON-GRANULAR MATERIAL. BACKFILL SHALL BE ABC WHERE SO REQUIRED BY THE GOVERNING PUBLIC AGENCY. WATER CONSOLIDATION IS NOT PERMITTED.
14. ALL DELIVERY STRUCTURES WILL BE INSTALLED BY SRP FORCES. ALLOW A MINIMUM OF 30 DAYS BETWEEN ISSUANCE OF THE SRP LICENSE OR NOTICE TO PROCEED, AND THE INSTALLATION OF THE STRUCTURE.
15. SRP WILL PROVIDE STUBOUT FOR PRIVATE CONNECTION. CUSTOMER IS RESPONSIBLE FOR DESIGN, CONSTRUCTION, AND CONNECTION OF PRIVATE IRRIGATION FACILITIES. CONNECTION TO SRP STUBOUT SHALL BE MADE USING MAG STANDARD IRRIGATION STAND PIPE (MAG 503), JUNCTION BOX (MAG 504), OR HEADWALL (MAG 501-1). JUNCTION BOX AND HEADWALL SHALL PROJECT MINIMUM 12" ABOVE FINISH GRADE. CUSTOMER SHALL COMPLETE CONNECTION TO SRP STUBOUT PRIOR TO DATE SET BY SRP FOR SYSTEM ACTIVATION.
16. PIPE BEDDING SHALL BE CLASS "C" OR BETTER, AND BACKFILL SHALL BE PER SRP SPECIFICATIONS FOR PRECAST PIPE, UNLESS OTHERWISE NOTED.
17. ALL PRECAST CONCRETE PIPE SHALL BE IN ACCORDANCE WITH ASTM C76 CLASS III WALL B OR WALL C UNLESS OTHERWISE NOTED, AND MEET SRP SPECIFICATIONS FOR PRECAST PIPE.
18. ALL EXISTING IRRIGATION FACILITIES DISTURBED BY NEW CONSTRUCTION SHALL BE RECONSTRUCTED TO CURRENT SRP STANDARDS.
19. ALL WORK AND MATERIALS THAT DO NOT CONFORM TO THESE PLANS, SPECIFICATIONS AND SRP LICENSES/CONSTRUCTION AGREEMENTS, ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
20. ALL DUST AND TRAFFIC CONTROLS REQUIRED BY THE LOCAL GOVERNING AGENCY WILL BE OBTAINED, COORDINATED, AND PAID FOR BY THE CONTRACTOR.
21. SRP DOES NOT GUARANTEE THE LOCATION OR ELEVATION OF UTILITIES AND WILL NOT BE RESPONSIBLE FOR THEIR RELOCATION.
22. THE UTILITIES IDENTIFIED ON THE PLANS MAY NOT REPRESENT ALL EXISTING AND/OR CONFLICTING UTILITIES WITHIN THE PROJECT LIMITS.
23. ALL UTILITIES WHICH HAVE BEEN POTHOLED (GENERALLY ALL PIPES OR CONDUITS 2 INCHES OR LARGER IN DIAMETER AND ALL CABLES WITH 25 PAIRS OR GREATER) ARE DESIGNATED IN THE PROFILE WITH THE TERM "PH".
24. ALL UTILITIES MUST UNDERCROSS THE PROPOSED SRP PIPELINE AND MAINTAIN A MINIMUM CLEARANCE OF ONE FOOT, UNLESS NOTED OTHERWISE.
25. MAINTAIN MINIMUM TWO FOOT HORIZONTAL CLEARANCE BETWEEN OUTSIDE BELL DIAMETER OF SRP PIPE AND PARALLEL UTILITY. LOCATE PARALLEL UTILITY OUTSIDE AREA SRP EXCAVATES TO MAINTAIN ITS PIPE. TYPICAL EXCAVATION INCLUDES AREA ABOVE AND TO EACH SIDE OF SRP PIPE. SIDE EXCAVATION EXTENDS UP AND OUT AT ONE-TO-ONE SLOPE FROM POINT THAT IS LEVEL WITH BOTTOM OF SRP PIPE AND A MINIMUM OF TWO FEET BEYOND ITS OUTSIDE BELL DIAMETER.
26. LOCATION AND ELEVATION OF ALL BLUE STAKED UTILITIES ARE TO BE FIELD VERIFIED. ALL CONFLICTING UTILITIES ARE TO BE RELOCATED PRIOR TO SRP PIPE INSTALLATION. CONTACT THE UTILITY COMPANY FOR COST AND SCHEDULE REQUIREMENTS FOR RELOCATION.
27. VERTICAL CONTROLS ARE BASED ON SEA LEVEL DATUM AS DEFINED BY THE BENCHMARK ON EACH PLAN/PROFILE. VERTICAL CONTROLS MAY DIFFER BETWEEN PLAN/PROFILES. CHECK PLANS FOR ELEVATION EQUATIONS.
28. STATIONS SHOWN ON THE PLAN/PROFILE ARE ALONG THE SECTION LINE, UNLESS OTHERWISE NOTED.
29. DIMENSIONS LOCATING IRRIGATION MANHOLES AND DELIVERY STRUCTURES ARE FROM THE SECTION LINE TO THE CENTERLINE OF THE MANHOLE, AND TO THE FACE OF THE DELIVERY STRUCTURE RESPECTIVELY, UNLESS OTHERWISE NOTED.
30. FACILITIES WHICH ARE NOT SPECIFICALLY LOCATED WITH ACTUAL HORIZONTAL AND VERTICAL CONTROLS ARE LOCATED ONLY APPROXIMATELY AND WITH THE BEST AVAILABLE KNOWLEDGE.
31. ALL STAKING CONTROLS SHALL BE LEFT UNDISTURBED. THE CONTRACTOR SHALL CALL THE SRP INSPECTOR TO REFERENCE AND RESET ANY CONTROL POINTS THAT HAVE TO BE DISTURBED. THE CONTRACTOR WILL BE CHARGED FOR RESTAKING COSTS IF ANY STAKES ARE DESTROYED AND REQUIRE REPLACEMENT.
32. ELEVATIONS SHOWN FOR IRRIGATION MANHOLES ARE AT THE TOP OF THE PROPOSED SIDEWALK OR FINISHED ROADWAY GRADE AT THE CENTERLINE OF THE MANHOLE (TWO CORNER POINTS FOR THE 5-SIDED MANHOLE), UNLESS OTHERWISE NOTED. THE TOP OF THE MANHOLE SHALL BE STAKED BY THE CUSTOMER'S ENGINEER, AND THE HORIZONTAL OFFSET CHECKED TO VERIFY THAT THE LOCATION IS IN CONFORMANCE WITH THE LATEST REVISIONS TO THE GOVERNING AUTHORITY'S PAVING PLANS. ALL OTHER SRP IRRIGATION STAKING SHALL BE BY SRP FORCES, UNLESS OTHERWISE NOTED.
33. THE CUSTOMER'S ENGINEER SHALL VERIFY OR RE-ESTABLISH SECTION CORNERS TO BE USED AS THE BASELINE FOR IRRIGATION FACILITIES AND ALSO STAKE RIGHT-OF-WAY LINES AND TEMPORARY CONSTRUCTION AND PERMANENT EASEMENT LINES. SIDEWALKS AND BACK OF CURBS SHALL BE STAKED AT PROPOSED SRP MANHOLES AND STRUCTURES. ALL STAKING SHALL BE DONE PRIOR TO SRP STAKING NEW IRRIGATION FACILITIES. THE CUSTOMER'S ENGINEER SHALL MAINTAIN REFERENCE STAKES AS REQUIRED FOR THE DURATION OF SRP IRRIGATION SYSTEM CONSTRUCTION.

KEY PLAN

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.



IMPORTANT NOTE:

PART A: SRP LAND RIGHTS REQUIRED
PART B: USA LAND RIGHTS REQUIRED

PLAN INDEX

/ /

DESIGN FOR CONSTRUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	REJ	REJ	RMP	RMP	12/19/17
		REJ	REJ	RMP	RMP	

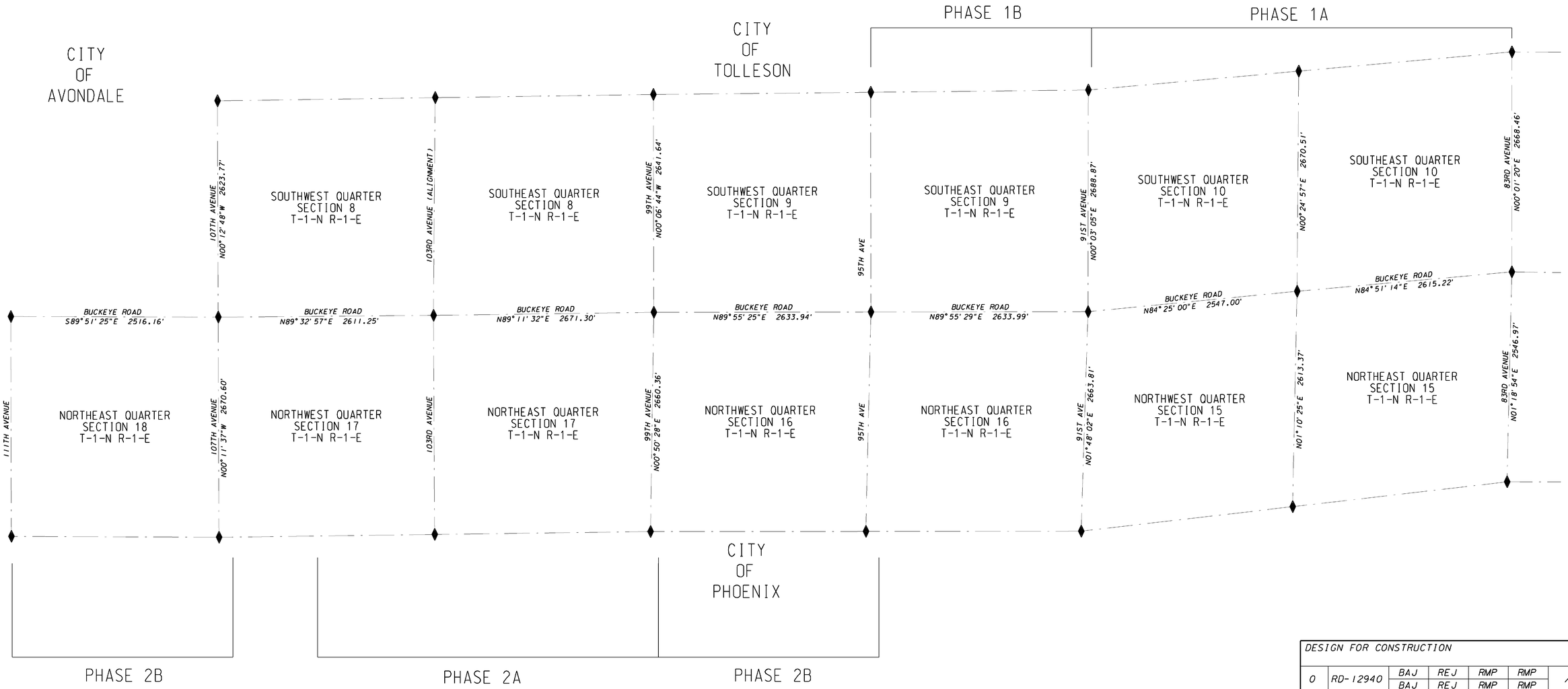
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 21.0, 22.0 & 23.0 SEC 9,10 & 16 T1N R1E

SCALE: NONE			TEMPORARY - 12940FSH1.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	12940FSH1	1
CV	Y3	22X34		

DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.

MC 85 75TH AVENUE TO 107TH AVENUE
SRP CONTROL (GEOMETRIC) SHEET



CONTROL NOTES:

ALL SRP PLAN & PROFILE DRAWINGS ARE BASED ON MARICOPA COUNTY SECTION CORNERS.

All Coordinates Shown are "GROUND COORDINATES"
Bearings are based on Grid North, AZSPCS, Central Zone, NAD83(CORS)
Vertical Datum: (NGVD29)

Benchmark: BRASS CAP ON TOP OF STRUCTURE (POINTS #8001)
Elevation: 996.48'

Northing offset: 800,000
Easting offset: 500,000
CPI Grid to Ground Scale Factor: 1.00013147212756

Ex.: (Ground Coordinate "+" Offset "x" CPI Grid to Ground Scale Factor reciprocal = Original Grid Coordinate)

N

REV NO	DATE	DFTR	DSGN	ENGR CHK	SUPV APPD	ISSUE AUTH
17	10. 13. 05	JWS	-	CWT	-	REL
REVISED EXISTING DITCH AND PIPE SYMBOLOGY.						
18	04. 10. 07	JWS	-	CWT	-	REL
REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.						

FORM NO
WDF-IRRIGFS

IRRIGFS.WDF

DESIGN FOR CONSTRUCTION

0	RD-12940	BAJ	REJ	RMP	RMP	/ /
		BAJ	REJ	RMP	RMP	
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL
LATERAL 21.0, 22.0 & 23.0
SEC 8,9,10,15,16,17,18
T1N R1E
GEOMETRIC SHEET

SCALE: NONE			TEMPORARY - 12940GE01.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE		
CV	Y3	22X34	12940GE01	2

WATER ENGINEERING

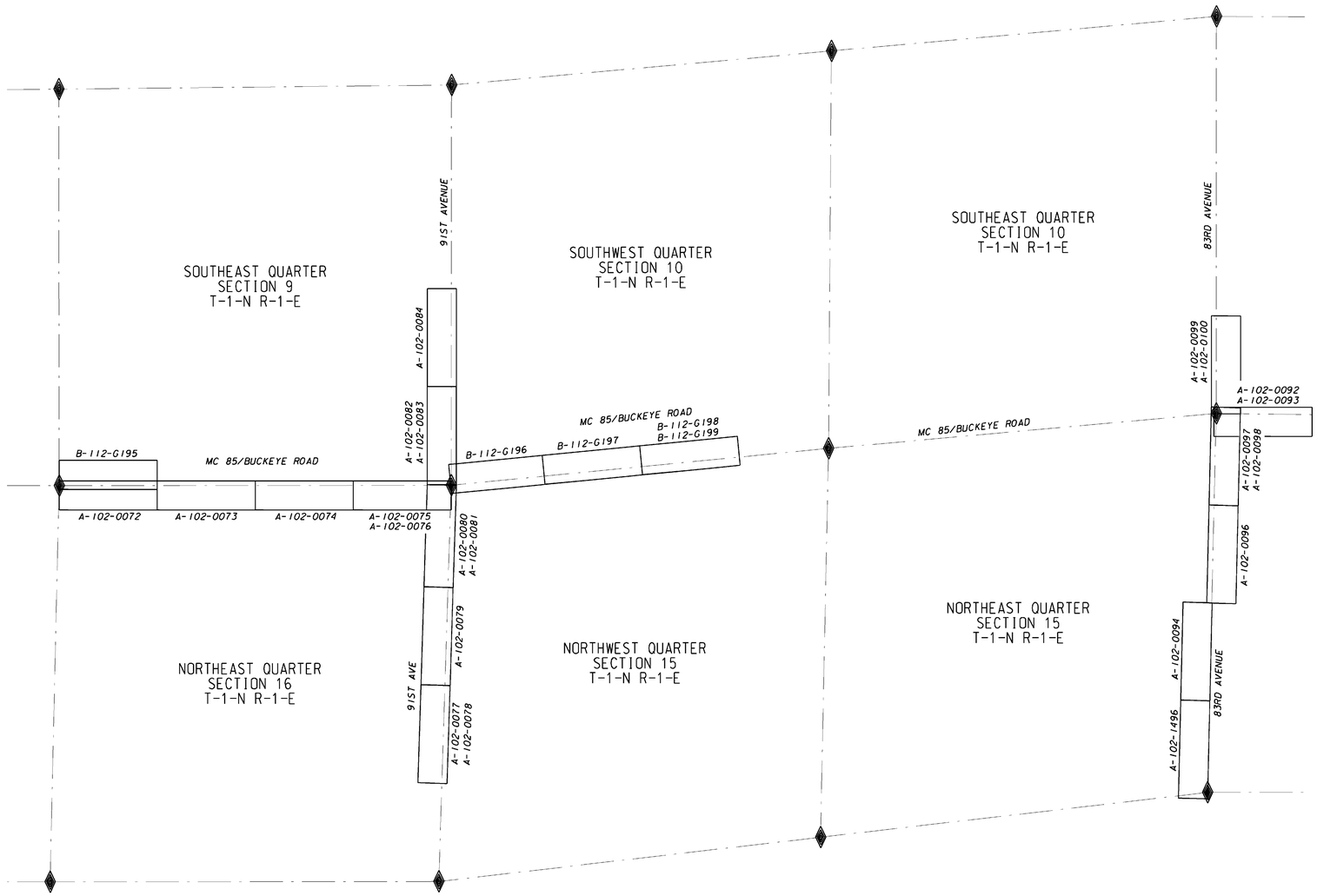
SALT RIVER PROJECT

PHOENIX, ARIZONA

IRRIGATION IMPROVEMENTS

SRP ENGINEERING FILE NO. RD-12940

MC 85 91ST AVENUE TO 95TH AVENUE
KEY PLAN PHASE 1A & 1B



DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.

REV NO	DATE	DFTR	DSGN	ENGR CHK	SUPV APPD	ISSUE AUTH
17	10.13.05	JWS	–	CWT	–	REL
REVISED EXISTING DITCH AND PIPE SYMBOLOGY.						
18	04.10.07	JWS	–	CWT	–	REL
REVISED BENCHMARK SYMBOLOGY TO BE A SOLID TRIANGLE.						

FORM NO

IRRIGFS.WDF

WDF-IRRIGFS

DESIGN FOR CONSTRUCTION

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ BAJ	REJ REJ	RMP RMP	RMP RMP	12/19/17

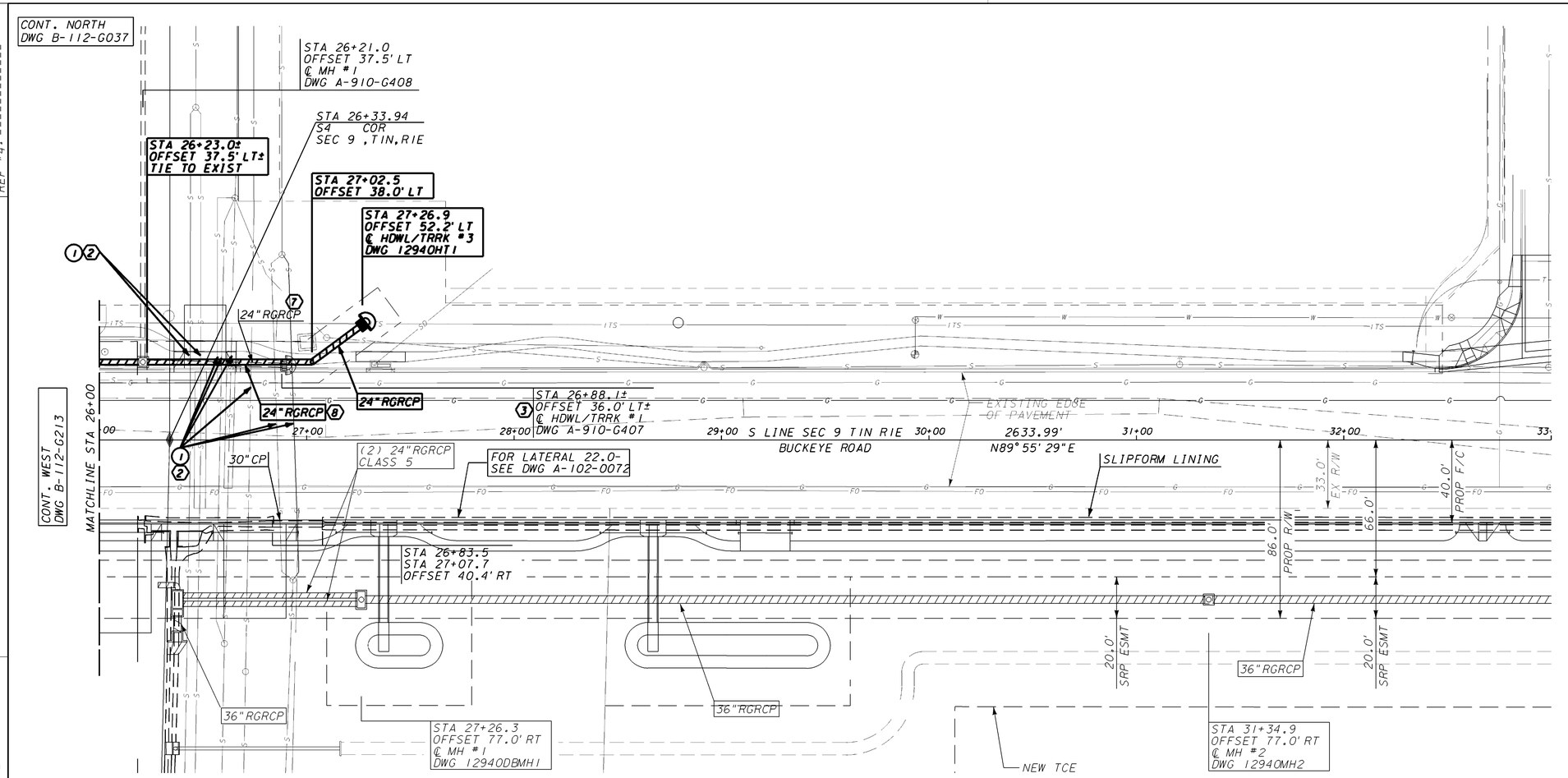
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

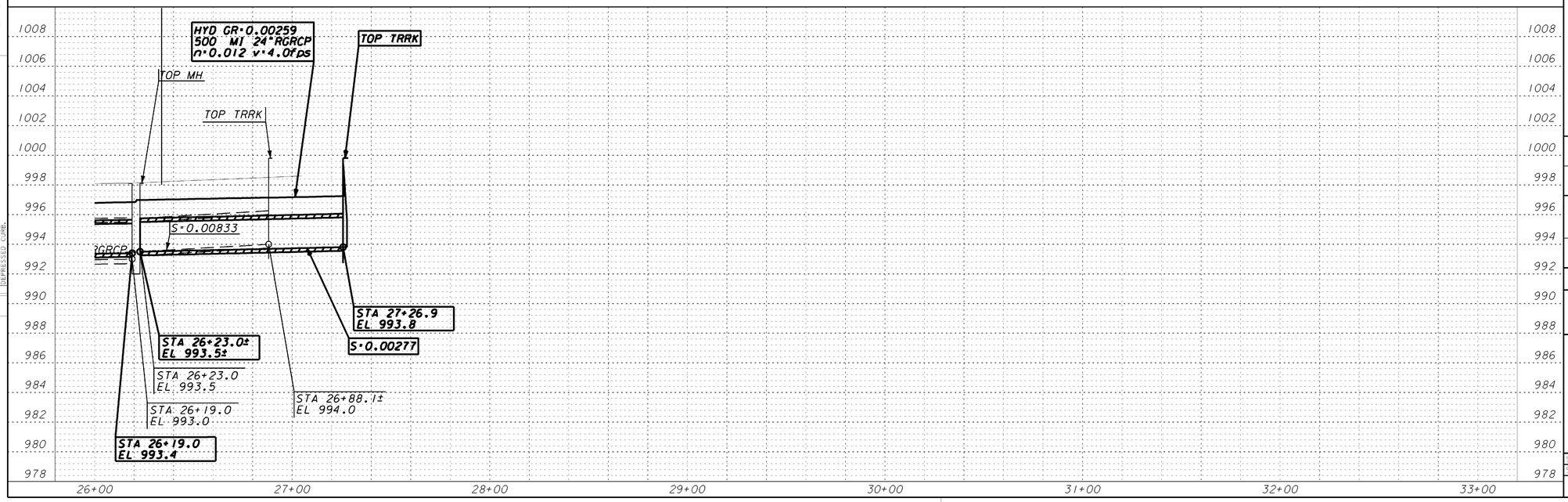
N

GRAND CANAL
DRAIN & LATERAL 21.0, 22.0
SEC 9, 10 & 16
T 1N R 1E
KEY PLAN PHASE 1A & 1B

SCALE: NONE			KEY PLAN PHASE 1.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	KEY PLAN	2A
CV	Y3	22X34		

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





CONSTRUCTION NOTES

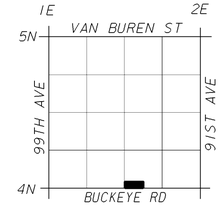
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 26+23.0 AND STATION 27+26.9 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

1. SEE SHEET PH0195 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
BRASS CAP ON NORTHWEST CORNER OF TOP OF STRUCTURE LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,TIN,RIE. ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD	AUTH
7	-	04.03.06	JWS	CWT	-	-	HEL
8	-	04.10.07	JWS	CWT	-	-	REL

7 ADDED NOTE FOR INDUSTRIAL DRIVEWAY WITH RECESSED CURB.
8 ADDED CIRCLE NOTE FOR BRIDGE RECOVERY

FORM NO WDF-PPSNG

PPSNG.WDF

REDRAWN FROM B-112-G018, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 26+23.0± TO STA 27+26.9

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	/ /
		BAJ	REJ	RMP	RMP	/ /

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN
SEC 9 TIN RIE
S4 COR TO 660' E

SCALE: PLAN 1"=30', PROFILE 1"=4'			B112G195.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	B-112-G195	3
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3:
REF #4:

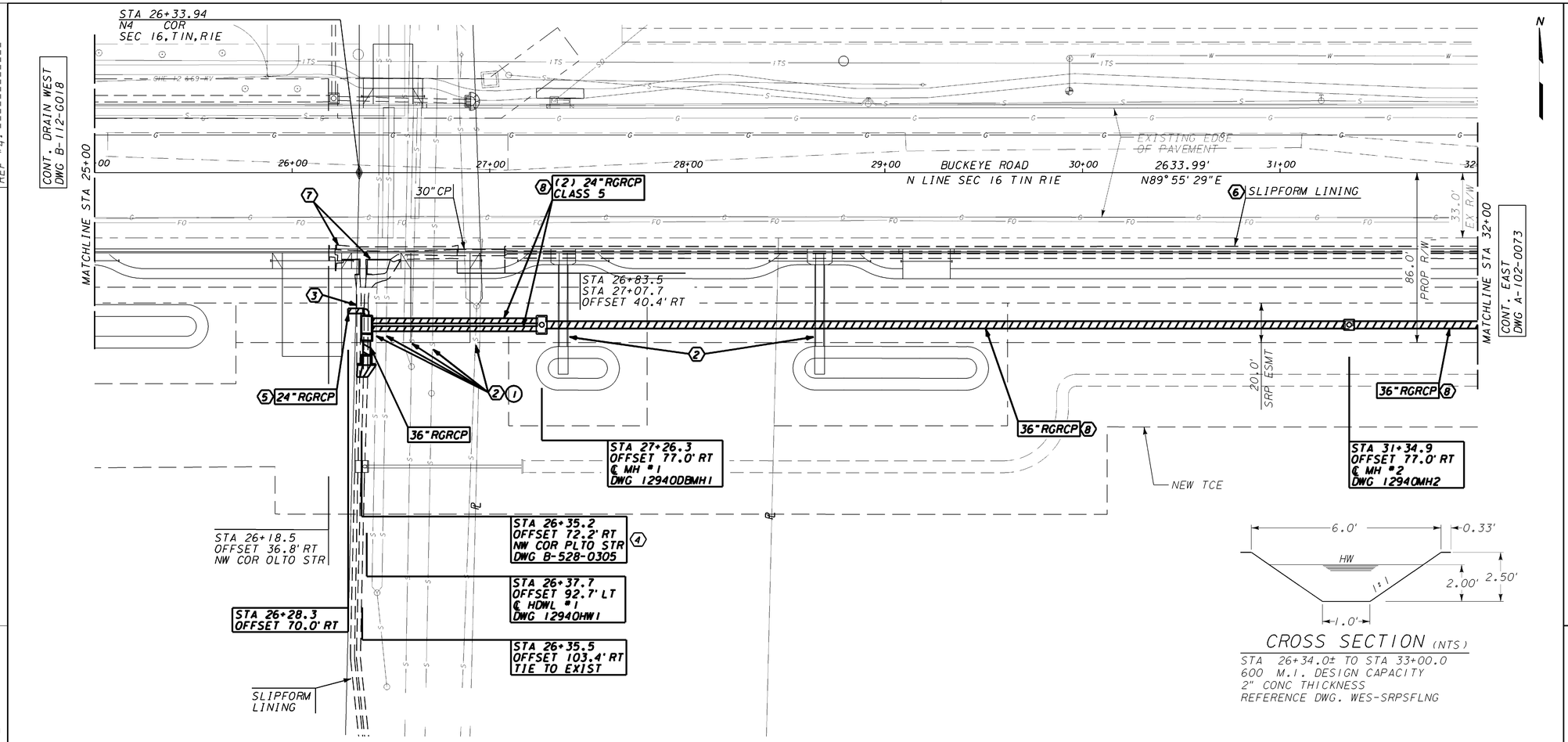
PPSNG.WDF

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH	REL
7	-	04.03.08	JWS	CWT	-	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	-	REL

ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

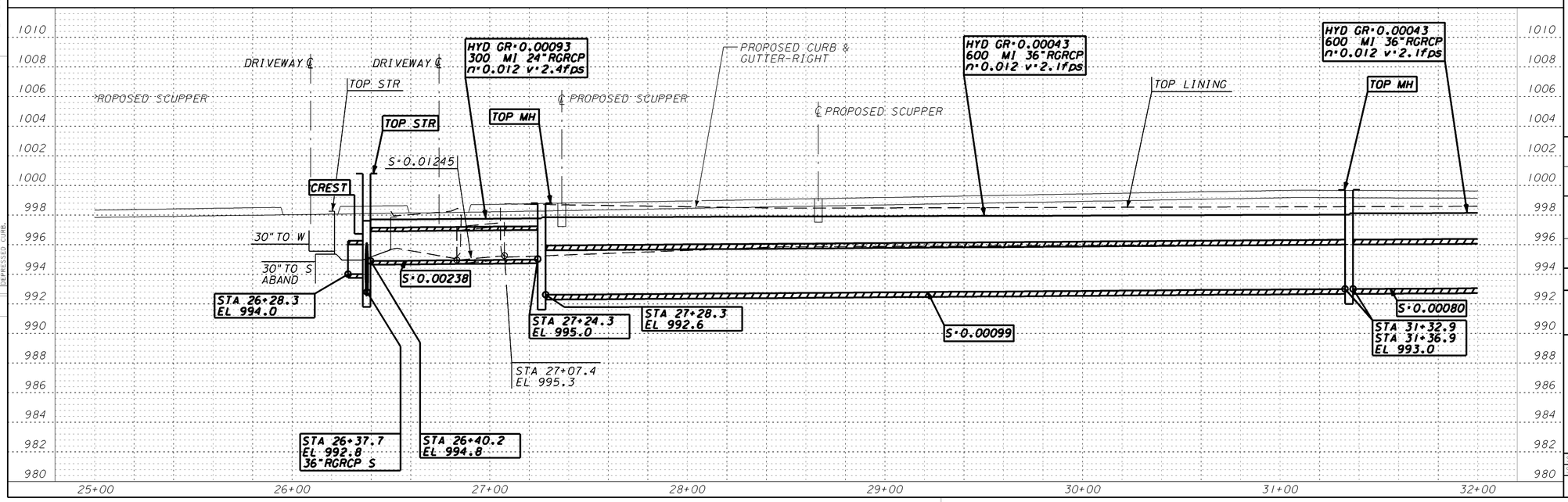
FORM NO

WDF-PPSNG



CROSS SECTION (NTS)

STA 26+34.0± TO STA 33+00.0
600 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG



CONSTRUCTION NOTES

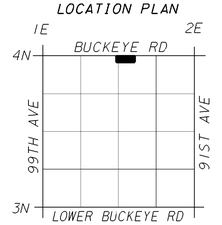
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
4. TURNOUT STRUCTURES AND PIPE STUBOUTS TO BE CONSTRUCTED BY SRP.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 501177!), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 26+28.3 AND STATION 32+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

1. SEE SHEET PH0072 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REDRAWN FROM A-102-1277, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 26+28.3 TO STA 32+00.0

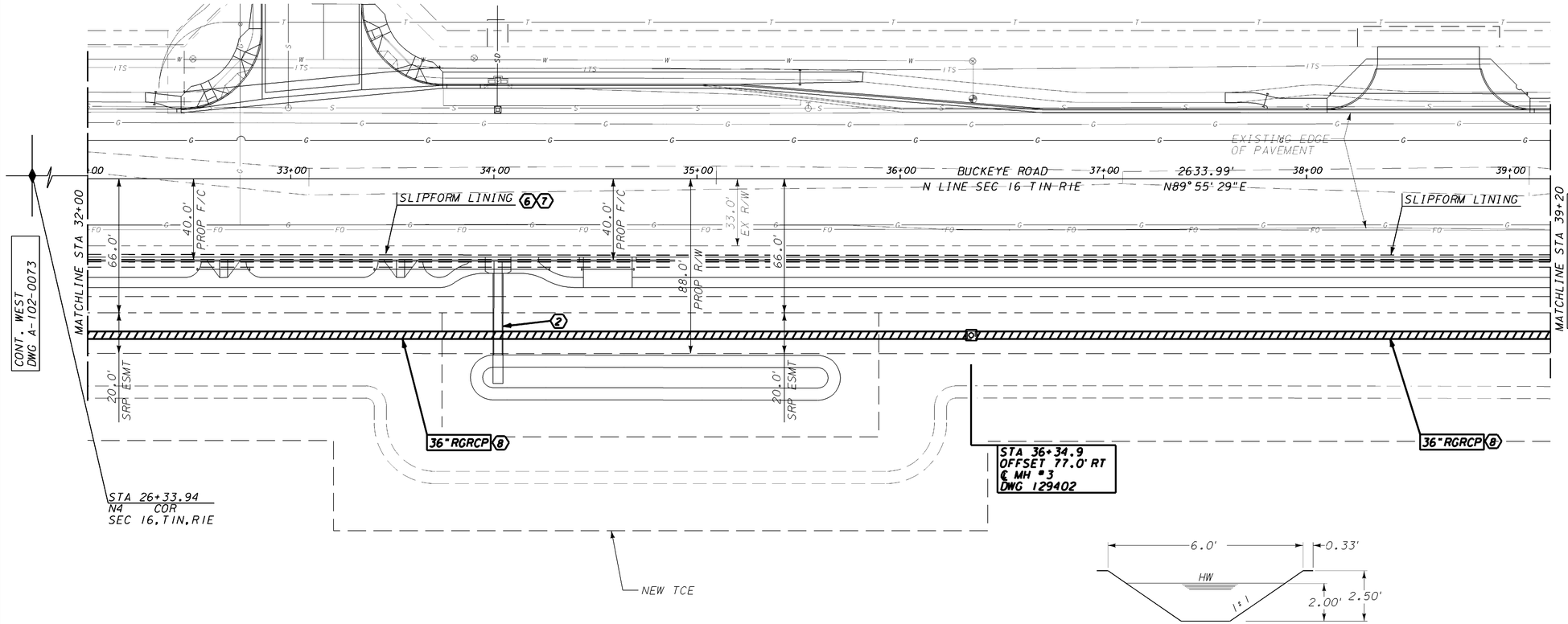
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

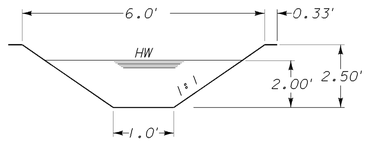
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E N4 COR TO 660' E

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020072.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0072	4
PP	Y2	22X34		

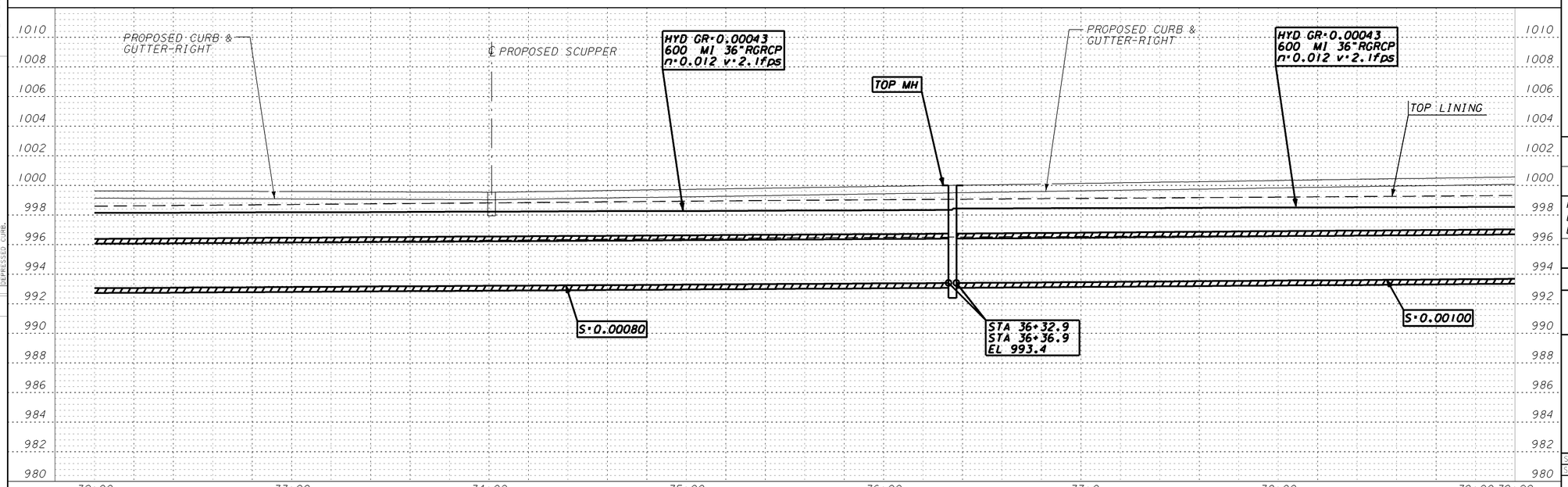
REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3:
REF #4:





CROSS SECTION (NTS)

STA 33+00.0 TO STA 40+00.0
600 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG



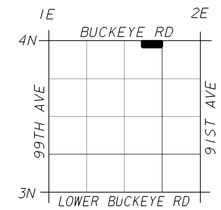
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 32+00.0 AND STATION 39+20.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD AUTH	DEL
7	-	04.03.08	JWS	CMT	-	REL	
8	-	04.10.07	JWS	CMT	-	DEL	

ADDED PER NOTE 5 & CIRCLE NOTES FOR BRIDGE RECOVERY AREA
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB

FORM NO WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-1278, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 32+00.0 TO STA 39+20.0

REV NO.	JOB NO.	DFTR	DSGN.	ENGR CHK	TSSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E 660' E/O N4 COR TO 16/1 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'		A1020073.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	
PP	Y2	22X34	A-102-0073 5

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3:
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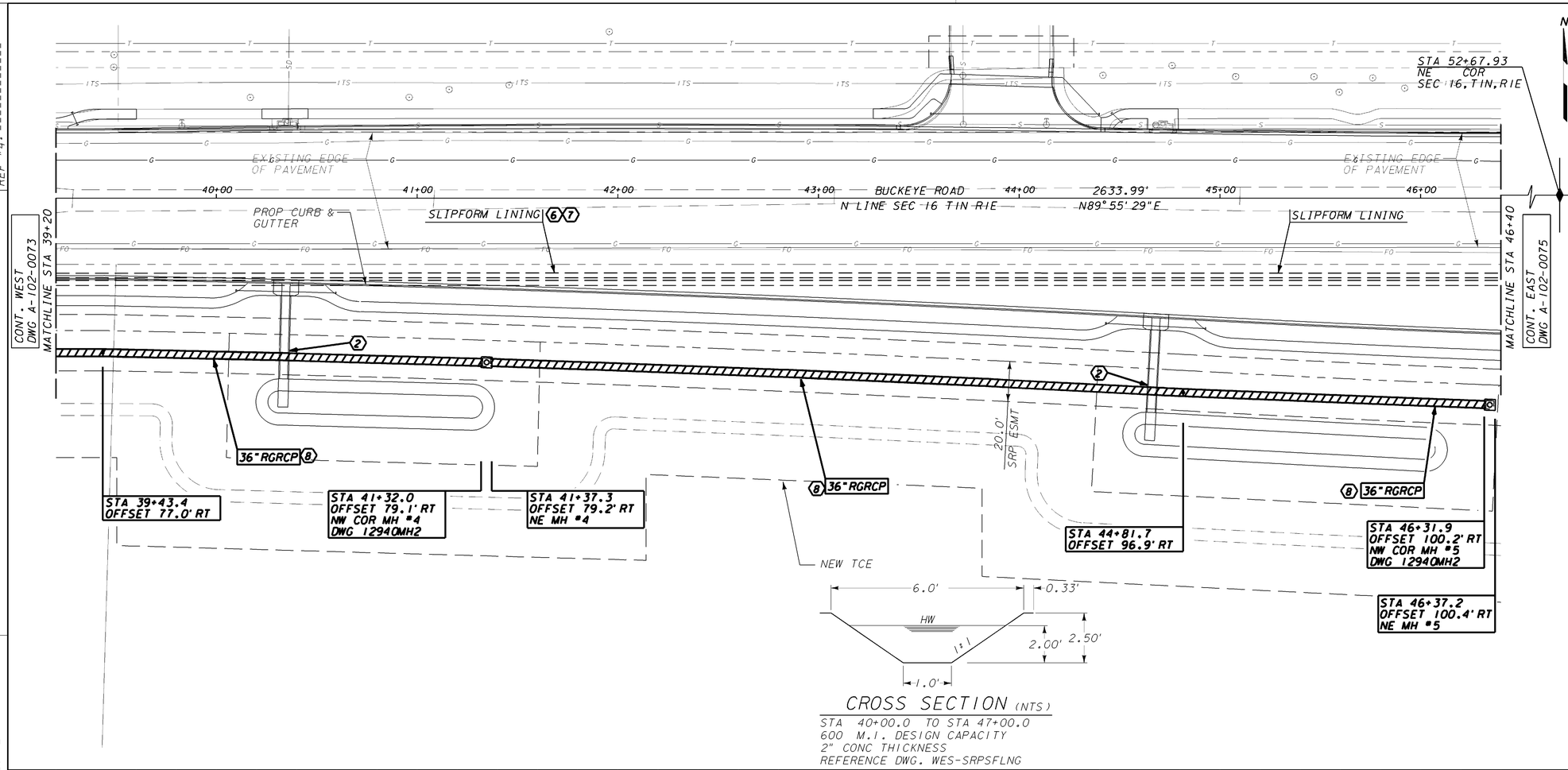
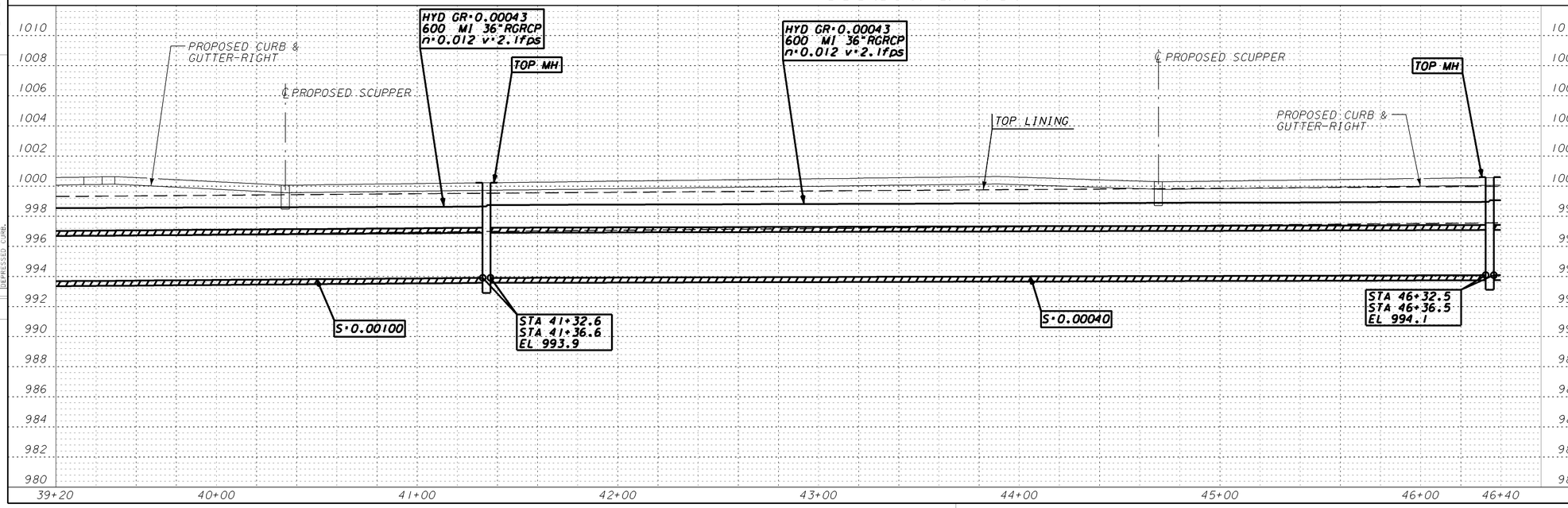


CROSS SECTION (NTS)

STA 40+00.0 TO STA 47+00.0
600 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG



CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
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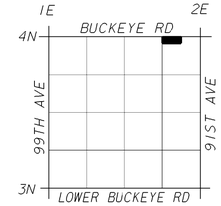
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 39+20.0 AND STATION 46+40.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO.	JOB/LOG NO.	DATE	DFTR	CHKR	ENGR CHK	SUPV APPS	ISSUE AUTH
7	-	04.03.06	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

ADDED TEMP NOTES FOR BRIDGE RECOVERY
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO

WDF-PPSNG

PPSNG.WDF

/ /

REDRAWN FROM A-102-1279, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 39+20.0 TO STA 46+40.0

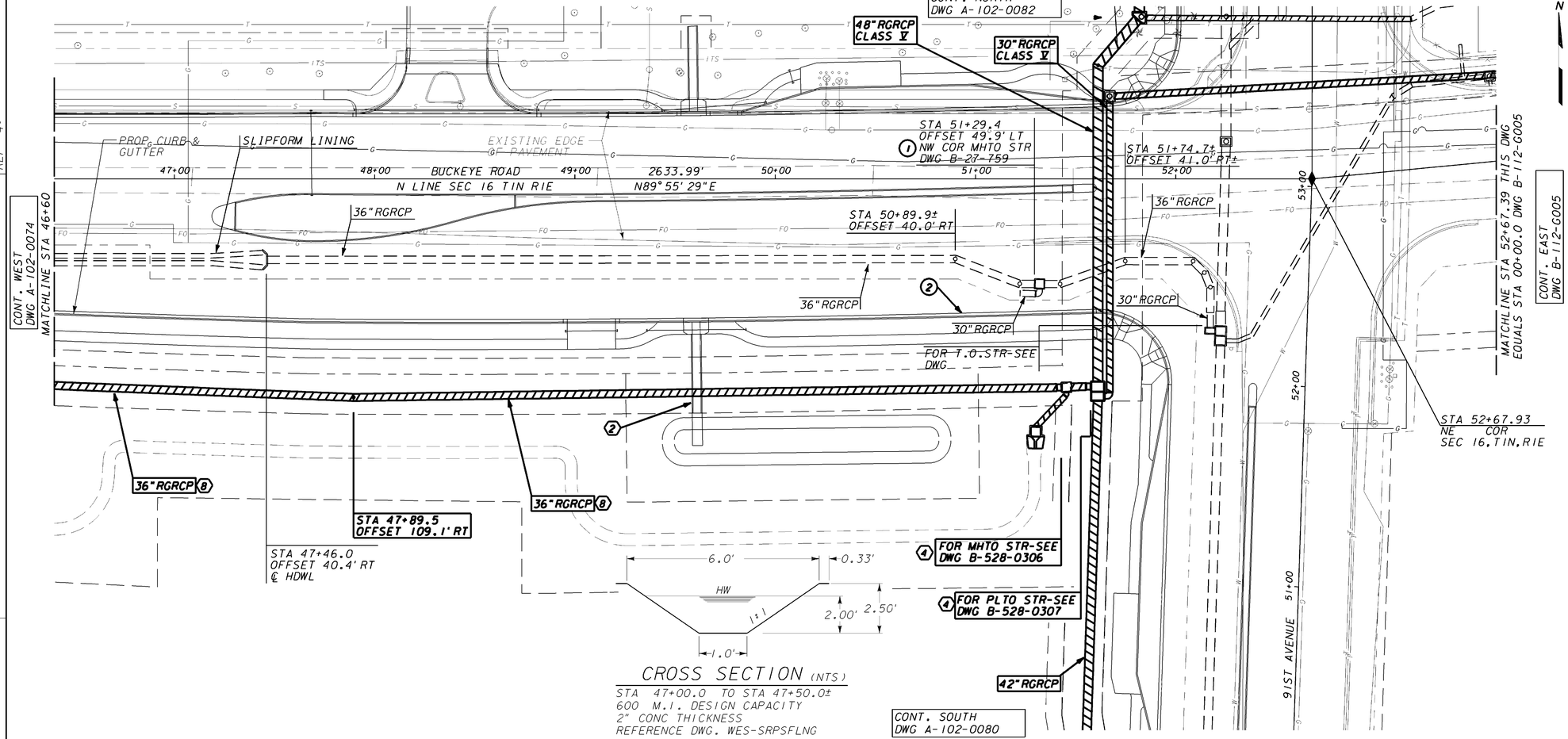
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E 16/1 COR TO 450' W/O NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020074.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0074	6
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------



CROSS SECTION (NTS)

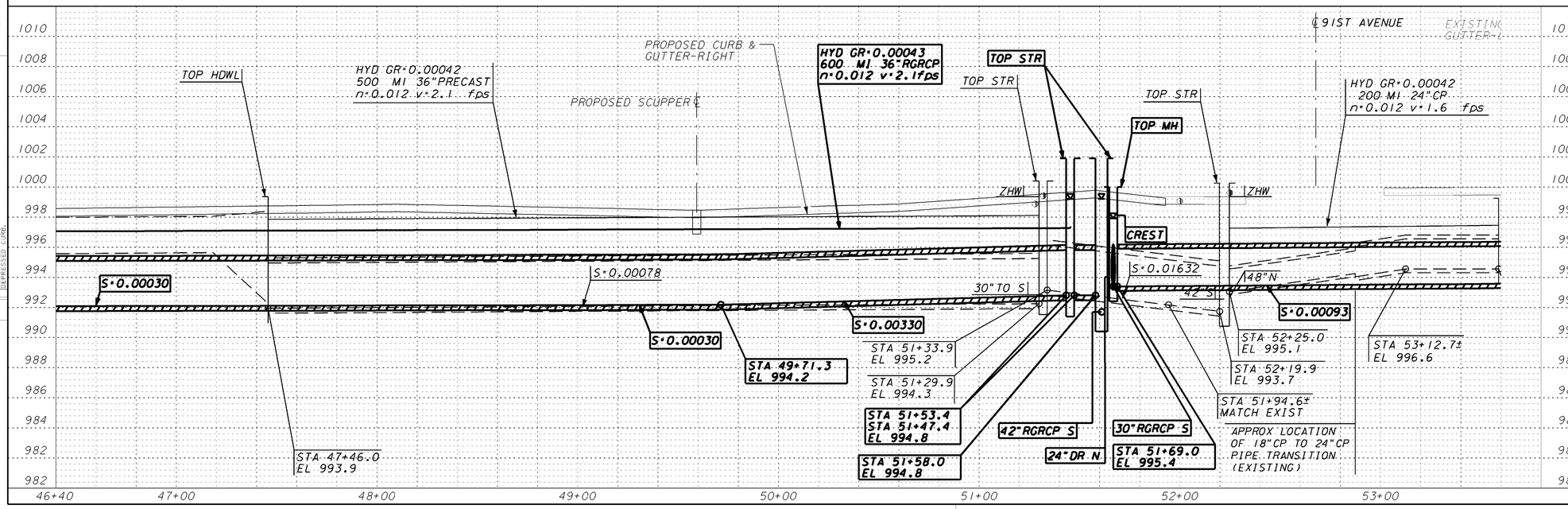
STA 47+00.0 TO STA 47+50.0±
600 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG

CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
4. TURNOUT STRUCTURES AND PIPE STUBOUTS TO BE CONSTRUCTED BY SRP.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011171), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 46+60.0 AND STATION 51+53.4 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

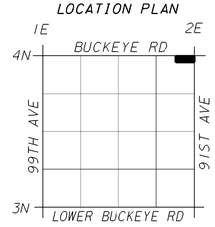
1. NOTIFY THE SRP INSPECTOR A MINIMUM OF 72 HOURS PRIOR TO REMOVING SRP IRRIGATION STRUCTURE, SO SRP CAN SALVAGE HARDWARE.
2. CUSTOMER SHALL PROVIDE 20'-0" WIDE INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB PER MAG STANDARD DETAIL 250.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.



ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'

/ /

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 46+40.0 TO STA 51+58.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 450' W/O NE COR TO NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020075.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0075	7
PP	Y2	22X34		

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.06	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

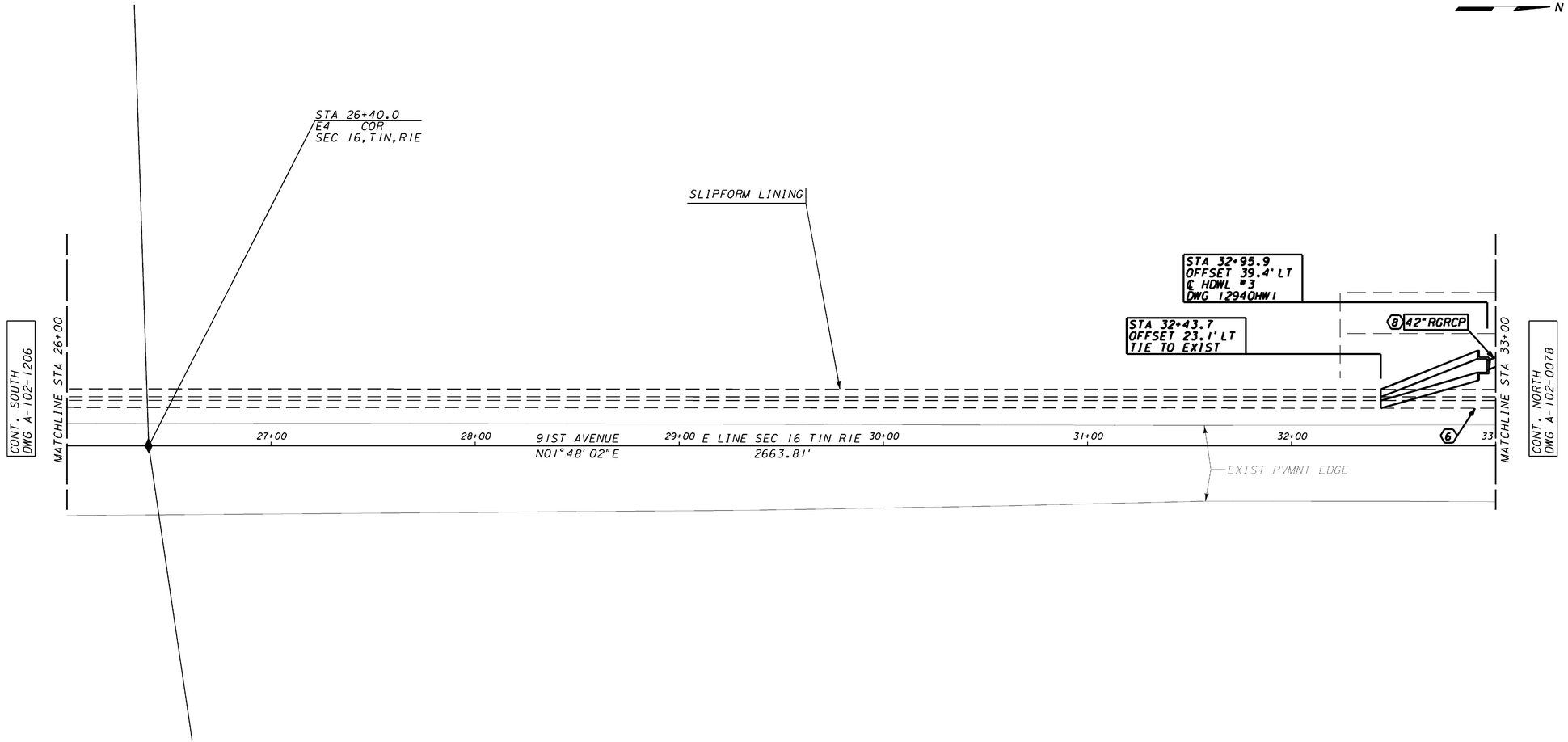
FORM NO

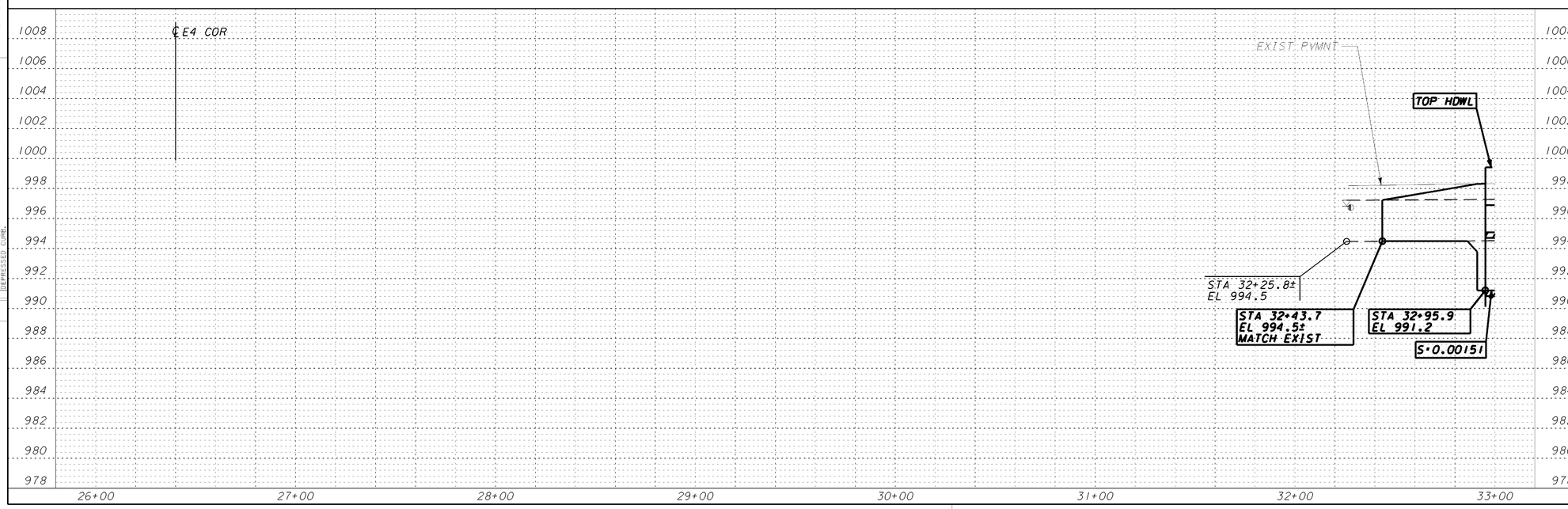
ADDED NOTES FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.
ADDED CIRCLE NOTE 8 FOR SRP IRRIGATION MARKER BALLS.
ADDED NOTES FOR BRIDGE RECOVERY

WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





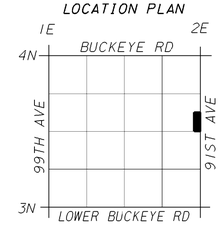
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 32+95.9 AND STATION 33+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD AUTH
7	-	04.03.08	JWS	CWT	-	REL
8	-	04.10.07	JWS	CWT	-	REL

FORM NO

7 ADDED NOTE & CIRCLE, NOTES FOR BRIDGE RECOVERY
8 ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

PPSNG.WDF

WDF-PPSNG

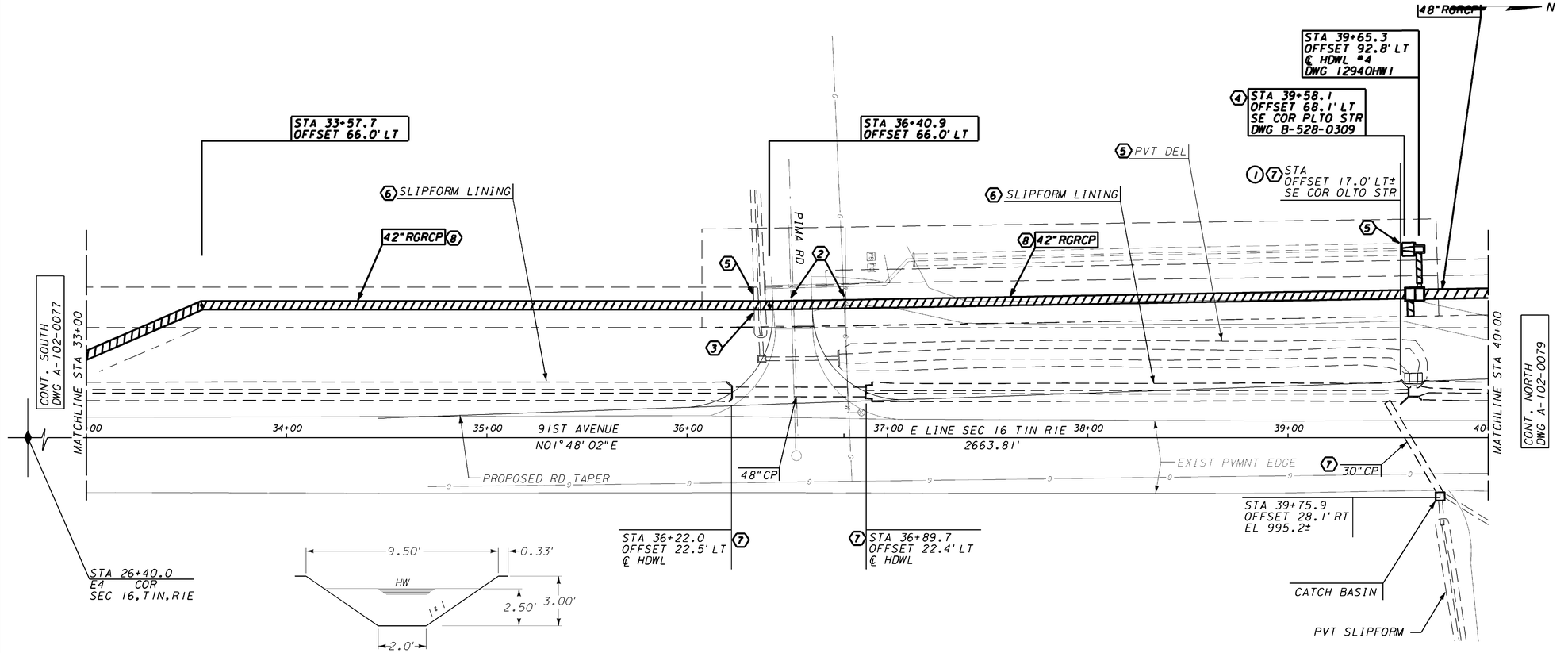
							/ /
REDRAWN FROM A-102-305.2, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 32+43.7 TO STA 33+00.0							
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17	
		BAJ	REJ	RMP	RMP		
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E E4 COR TO 650' N

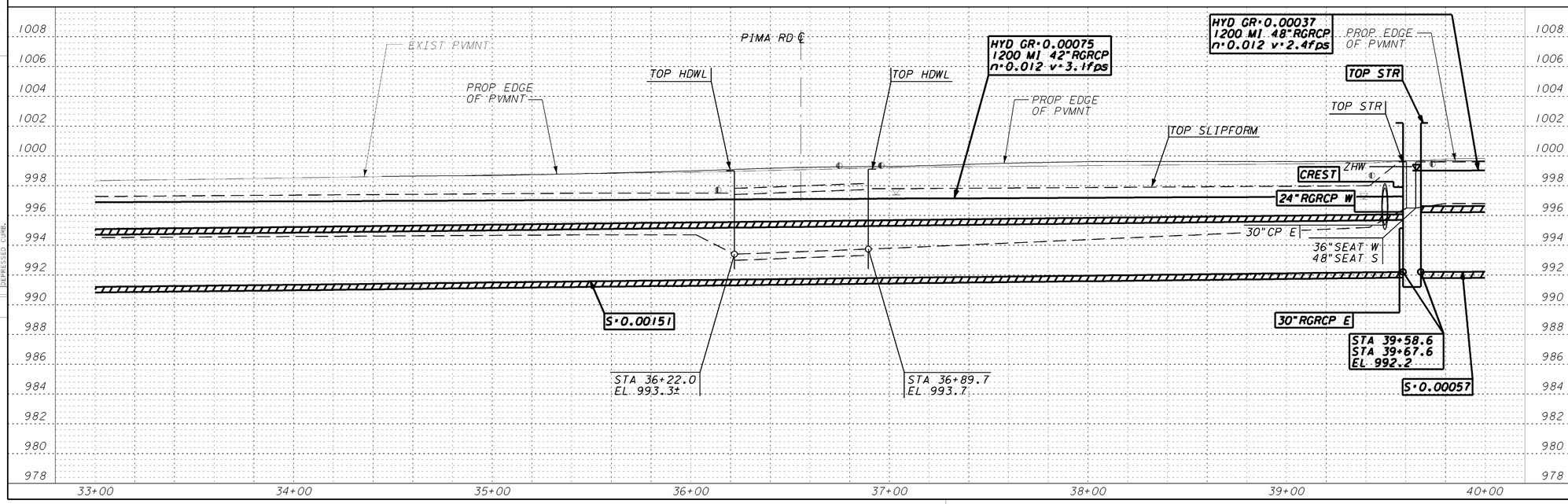
SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020077.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0077	8
PP	Y2	22X34		

REFERENCE FILES USED:
REF # 1: M38M.DGN
REF # 2: M38M.DGN
REF # 3: ----------
REF #4: ----------



CROSS SECTION (NTS)

STA 33+00.0 TO STA 36+20.0±
STA 36+90.0± TO STA 40+00.0
1200 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG



CONSTRUCTION NOTES

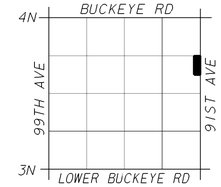
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
4. TURNOUT STRUCTURES AND PIPE STUBOUTS TO BE CONSTRUCTED BY SRP.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
6. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 50117711), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 33+00.0 AND STATION 40+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

1. NOTIFY THE SRP INSPECTOR A MINIMUM OF 72 HOURS PRIOR TO REMOVING SRP IRRIGATION STRUCTURE, SO SRP CAN SALVAGE HARDWARE.
2. SEE SHEET PH0078 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO.	JOB/LOG NO.	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD AUTH
7	-	04.03.08	JWS	CWT	-	REL
8	-	04.10.07	JWS	CWT	-	REL

ADDED NOTES FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.
ADDED CIRCLE NOTE 8 & CIRCLE NOTES FOR BRIDGE RECOVERY
FORM NO

WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-1300, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 33+00.0 TO STA 40+00.0

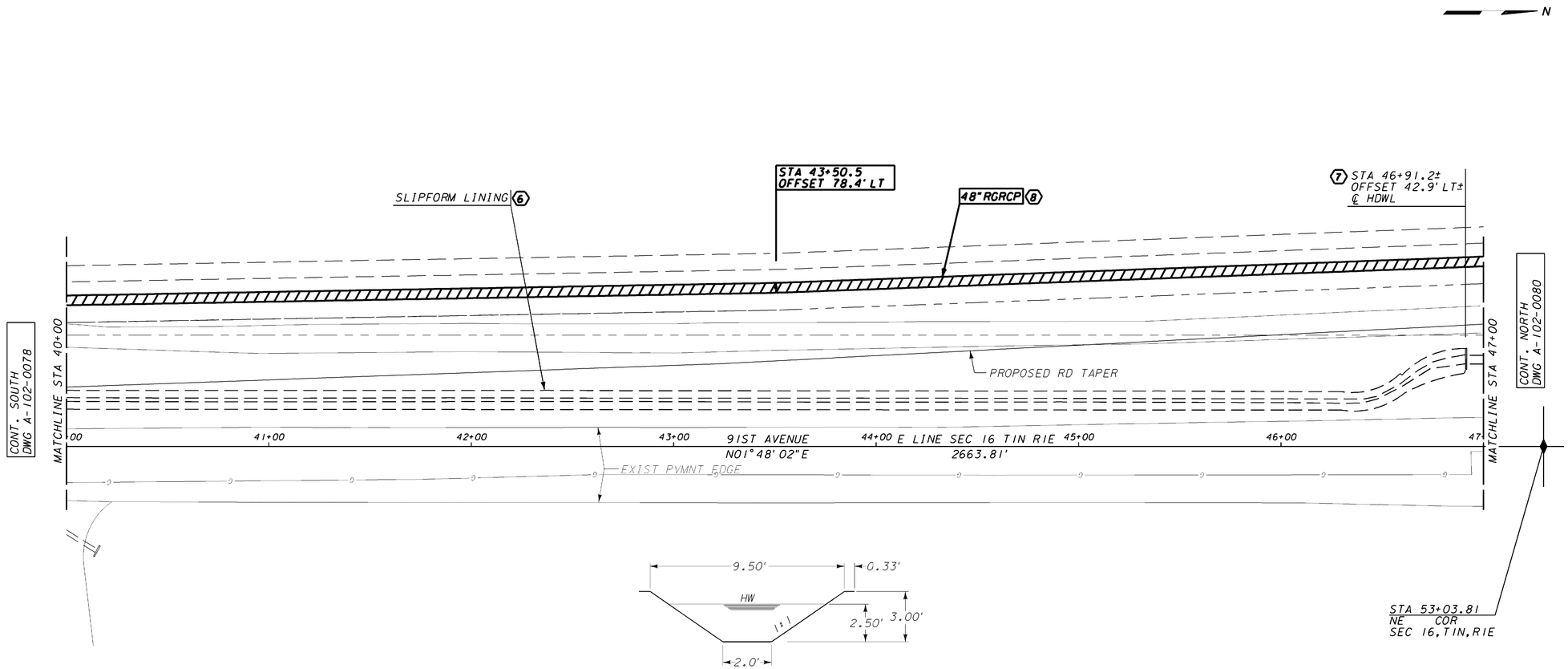
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E 650' N/O E4 COR TO 16/8 COR

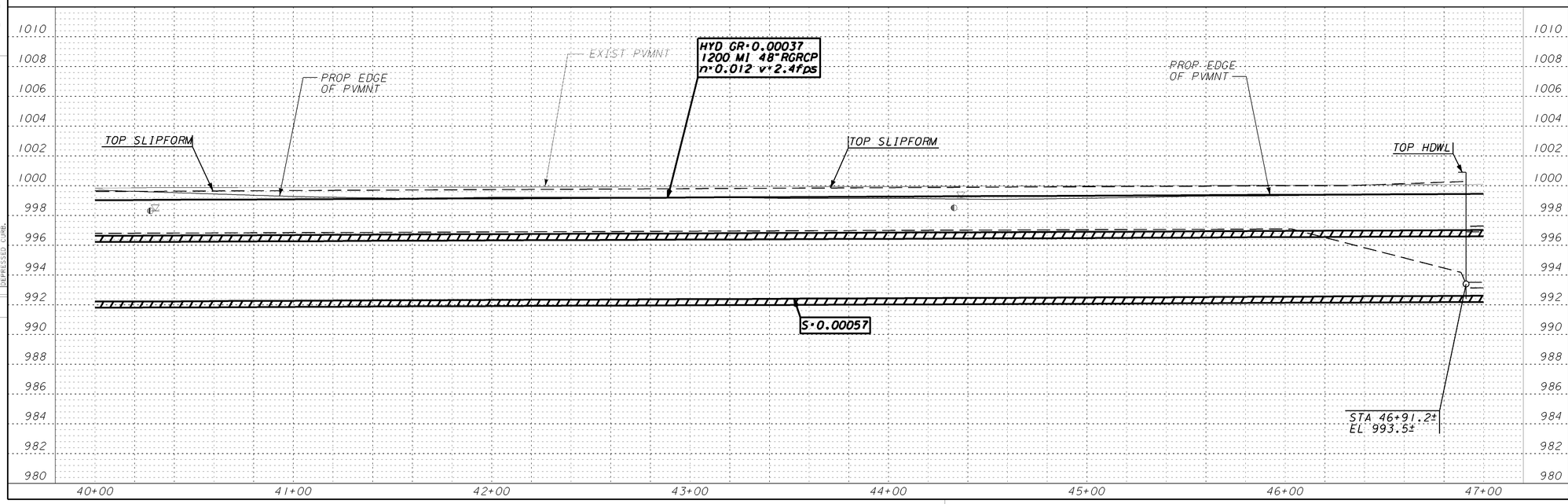
SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020078.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0078	9
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------



CROSS SECTION (NTS)

STA 40+00.0 TO STA 46+90.0±
1200 M.I. DESIGN CAPACITY
2" CONC THICKNESS
REFERENCE DWG. WES-SRPSFLNG



CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(6) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF EXISTING SRP CONCRETE DITCH LINING. AFTER REMOVING LINING, BACKFILL DITCH TO DESIGN GRADE.

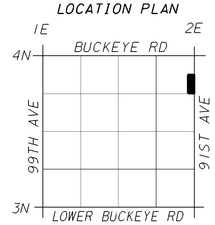
(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 40+00.0 AND STATION 47+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

/ /

REDRAWN FROM A-102-1301, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 40+00.0 TO STA 47+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E 16/8 COR TO 600' S/O NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020079.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0079	10
PP	Y2	22X34		

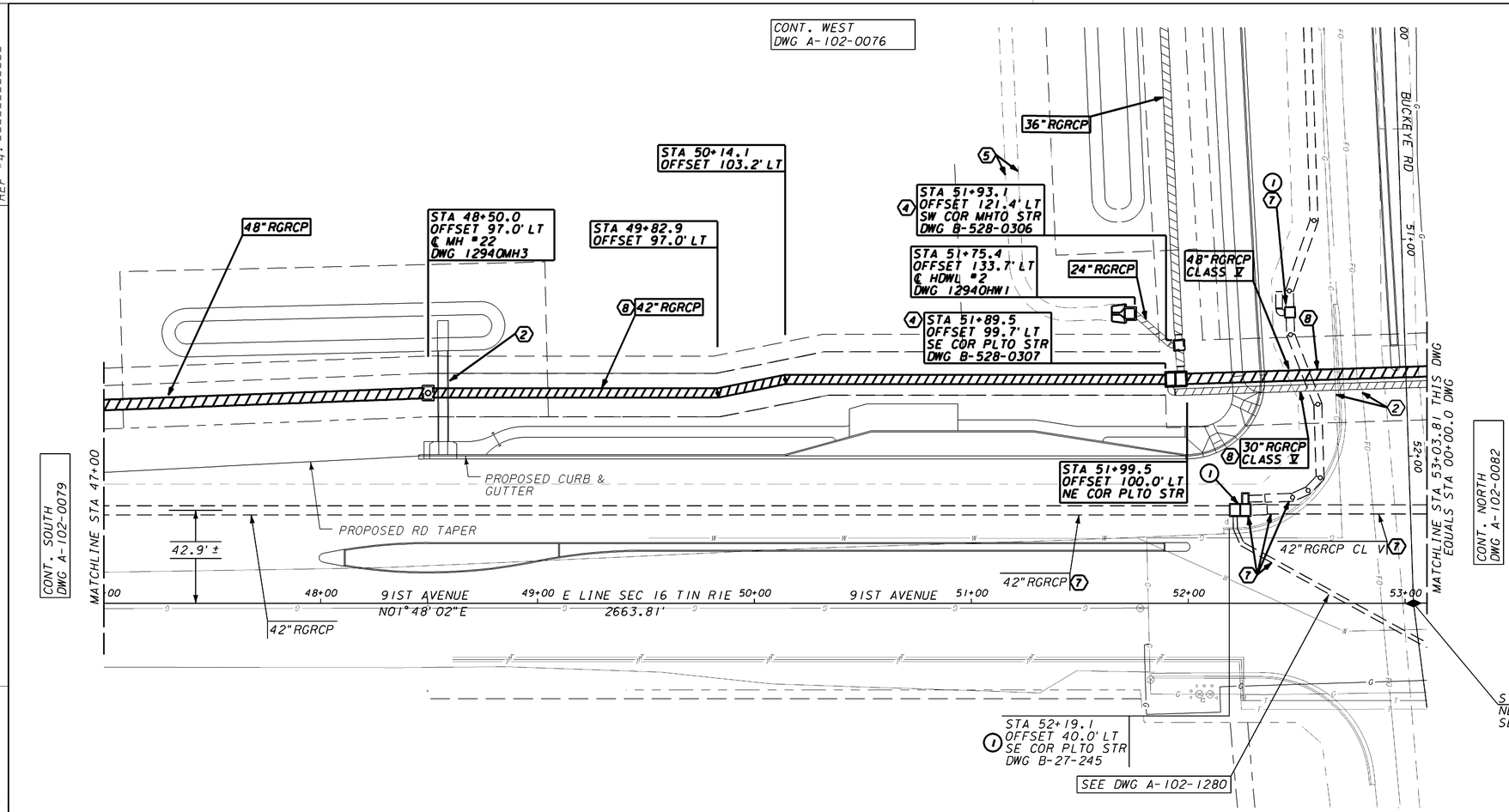
REV NO	JOB/LOG NO	DATE	DFTR	CHK'R	ENGR CHK	SUPV ISSUE APPS AUTH	
7	-	04.03.06	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

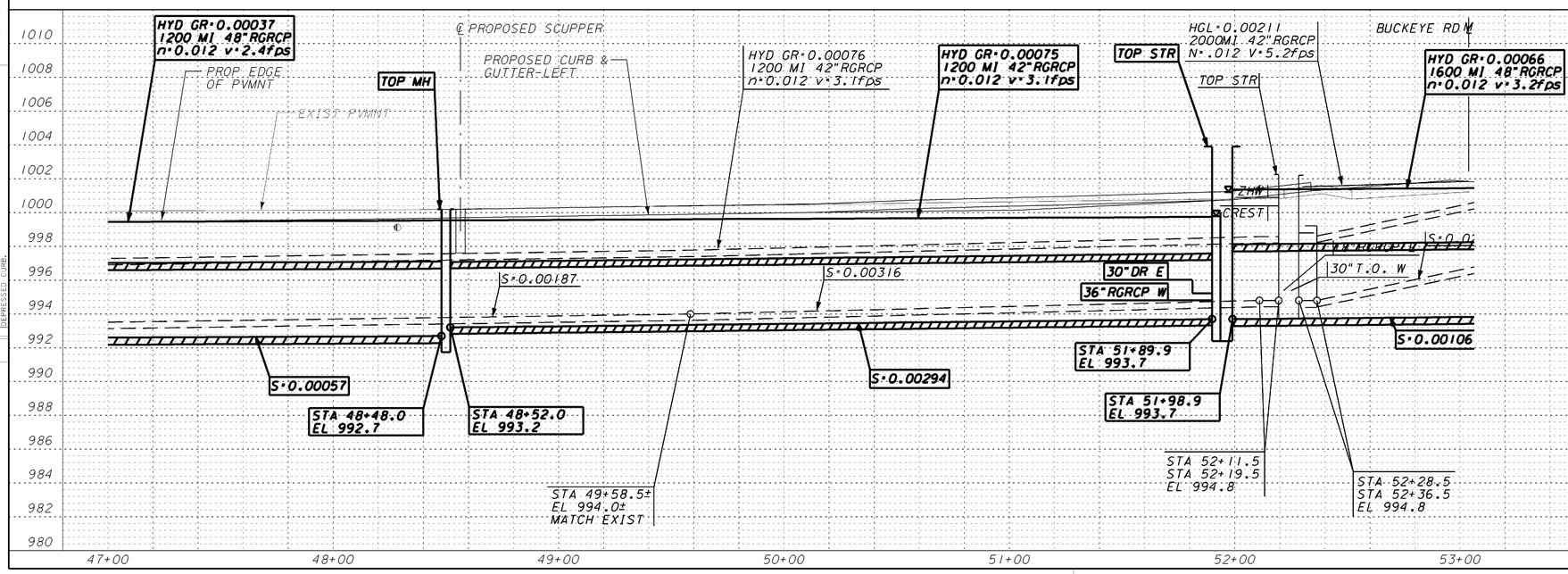
ADDED "NOT FOR INSTALL" NOTES FOR BRIDGE RECOVERY AREA
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO
WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------





CONSTRUCTION NOTES

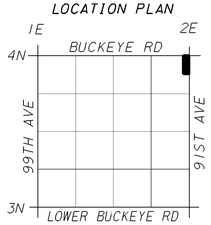
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
4. TURNOUT STRUCTURES AND PIPE STUBOUTS TO BE CONSTRUCTED BY SRP.
5. PRIVATE IRRIGATION SYSTEM CONNECTION TO BE DESIGNED AND CONSTRUCTED BY CUSTOMER.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 47+00.0 AND STATION 53+03.1 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

1. NOTIFY THE SRP INSPECTOR A MINIMUM OF 72 HOURS PRIOR TO REMOVING SRP IRRIGATION STRUCTURE, SO SRP CAN SALVAGE HARDWARE.
2. SEE SHEET PH0080 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHKR	SUPV APPD	ISSUE AUTH	
7	-	04.03.08	JWS	CWT	-	-	REL	ADDED KEY NOTES & CIRCLE NOTES FOR BRIDGE RECOVERY
8	-	04.10.07	JWS	CWT	-	-	REL	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO

WDF-PPSNG

PPSNG.WDF

							/ /

REDRAWN FROM A-102-1281, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 47+00.0 TO STA 53+03.8

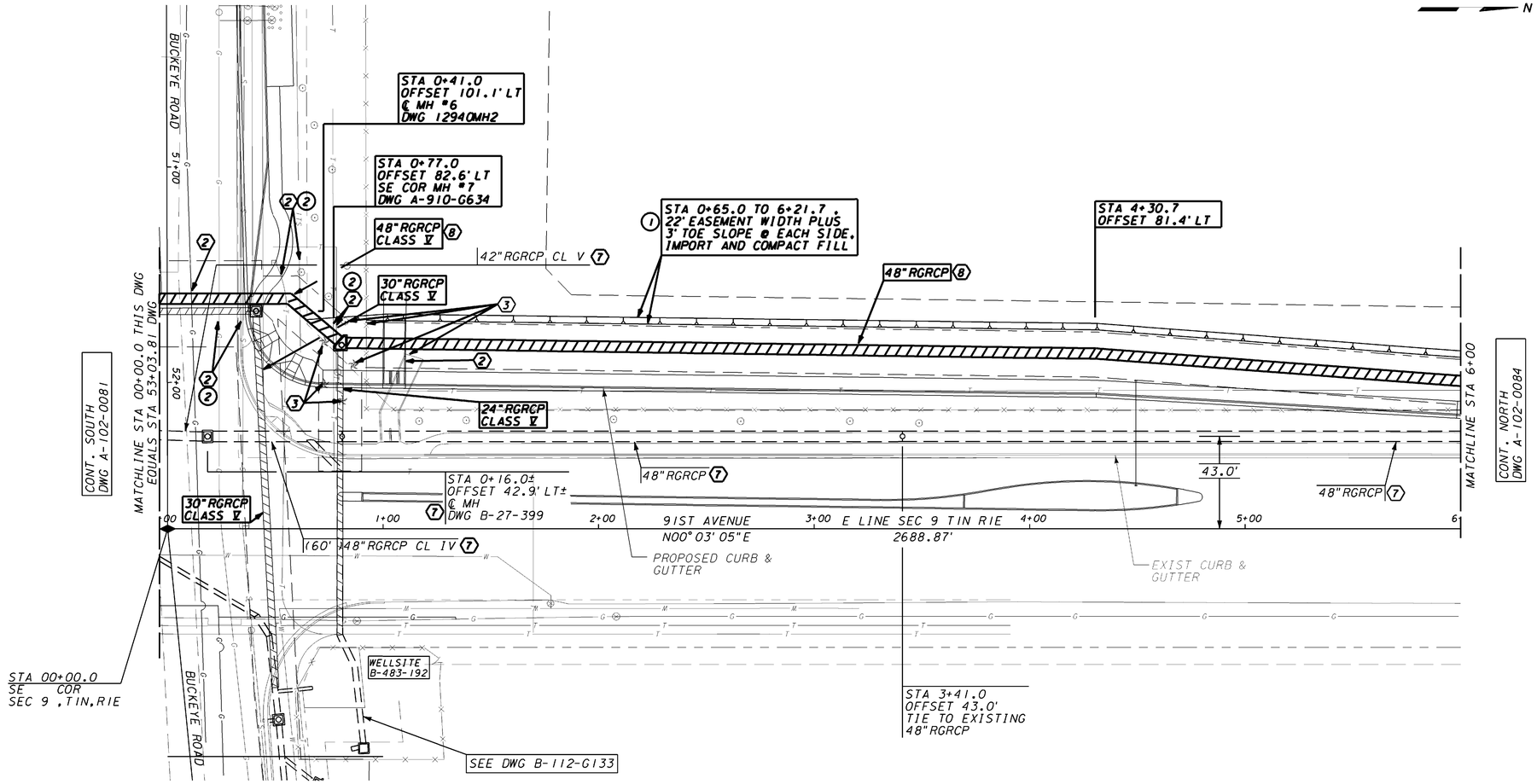
REV NO.	JOB NO.	DFTR	DSGN.	ENGR CHK	TSSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

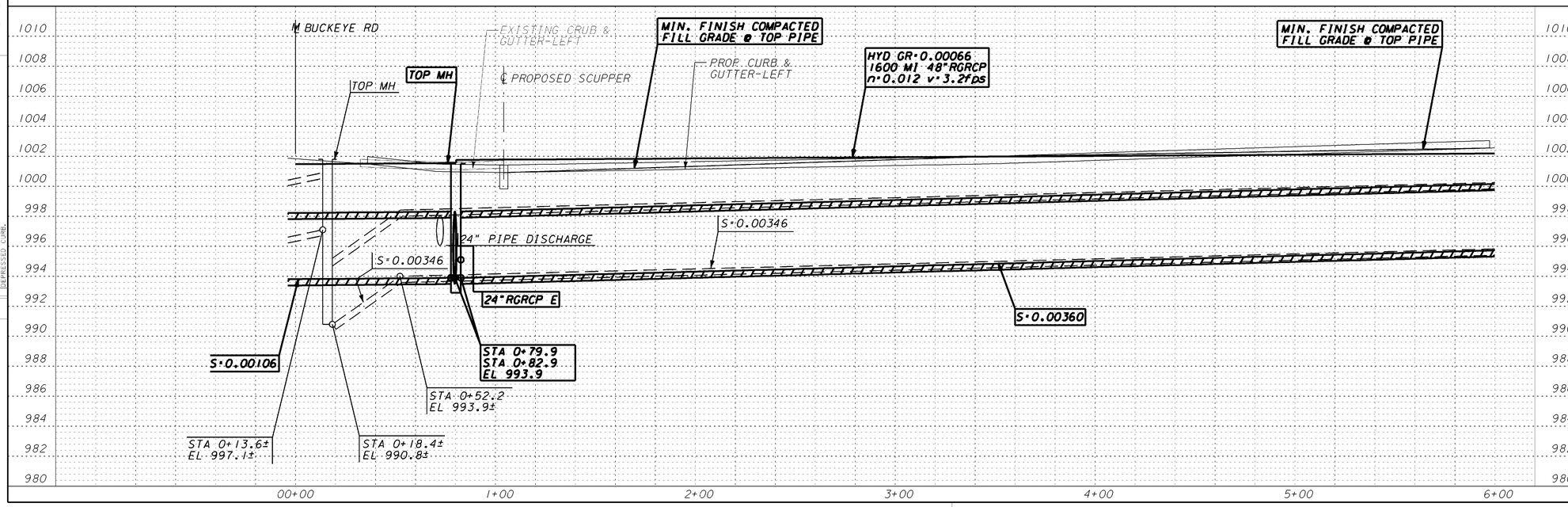
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 600' S/O NE COR TO NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020080.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0080	11
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





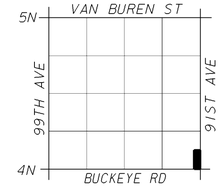
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 50117711), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 0+00.0 AND STATION 6+00.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
1. IRRIGATION CONTRACTOR TO IMPORT, COMPACT BACKFILL MATERIAL FOR PREPARATION PIPE INSTALLATION AND NEW EASEMENT. RESTORATION OF EXISTING RETENTION SHALL BE THE RESPONSIBILTY OF MCDOT.
2. SEE SHEET PH0082 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

/ /

REDRAWN FROM A-102-0845, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 0+00.0 TO STA 6+00.0

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	REJ	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR TO 600' N

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020082.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0082	12
PP	Y2	22X34		

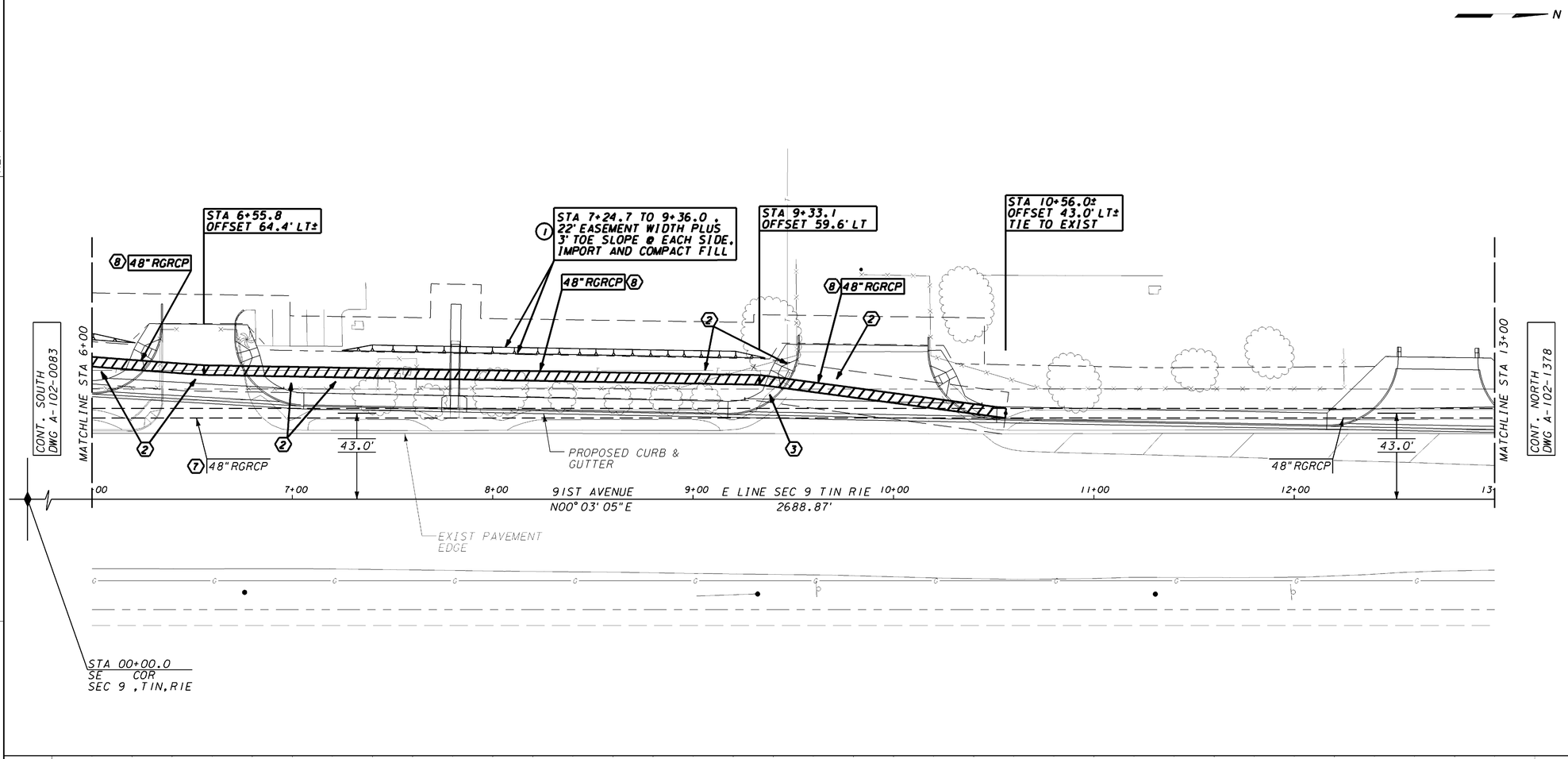
REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.08	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

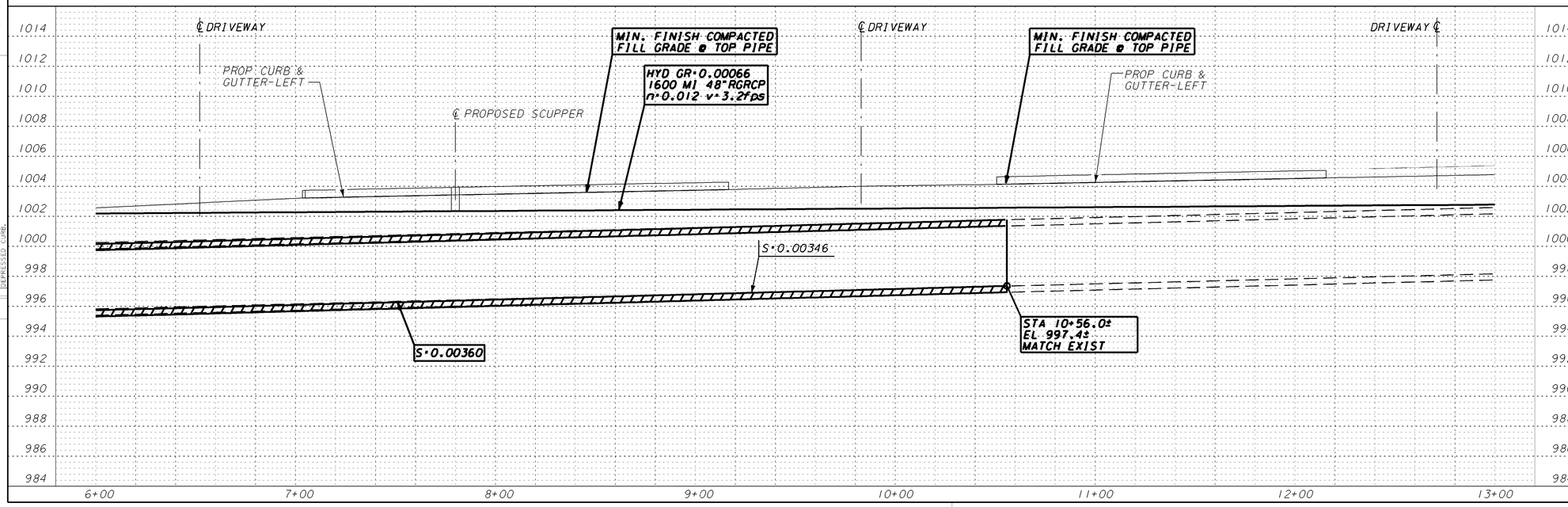
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.
ADDED PP NOTES & CIRCLE NOTES FOR BRIDGE RECOVERY
ADDED PP NOTES & CIRCLE NOTES

FORM NO
WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





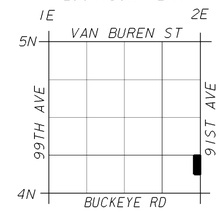
CONSTRUCTION NOTES

1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 50117711), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 6+00.0 AND STATION 10+56.0 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
1. IRRIGATION CONTRACTOR TO IMPORT, COMPACT BACKFILL MATERIAL FOR PREPARATION PIPE INSTALLATION AND NEW EASEMENT. RESTORATION OF EXISTING RETENTION SHALL BE THE RESPONSIBILTY OF MCDOT.
2. SEE SHEET PH0084 FOR UTILITY POTHOLE INFORMATION.

**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD AUTH
7	-	04.03.08	JWS	CWT	-	REL
8	-	04.10.07	JWS	CWT	-	REL

FORM NO

7 ADDED NOTE & CIRCLE FOR INDUSTRIAL DRIVEWAY WITH ADDED DEPRESSED CURB.
8 ADDED NOTES FOR BRIDGE RECOVERY

PPSNG.WDF

WDF-PPSNG

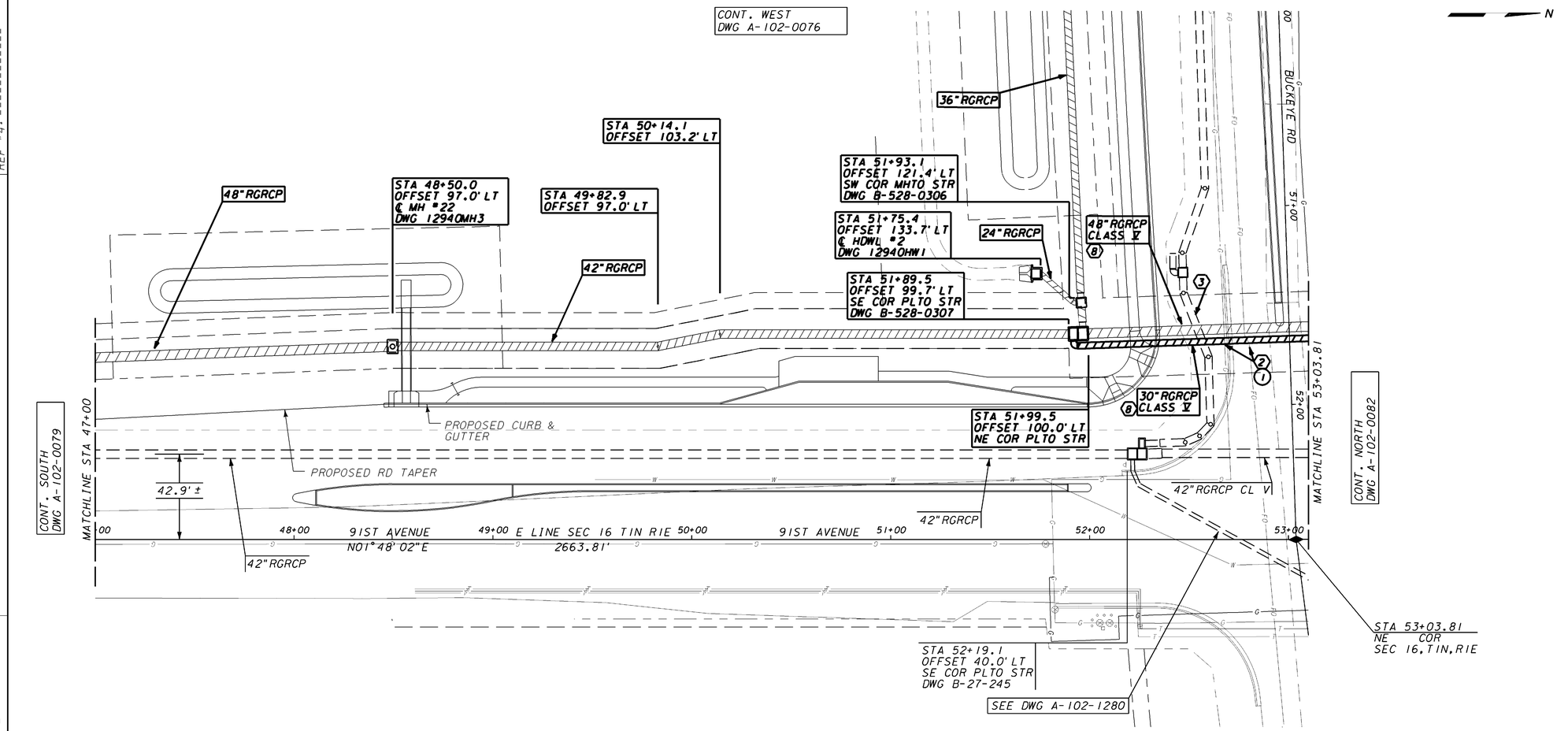
							/ /
REDRAWN FROM A-102-0845, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 6+00.0 TO STA 10+56.0±							
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17	
		BAJ	REJ	RMP	RMP		
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE	

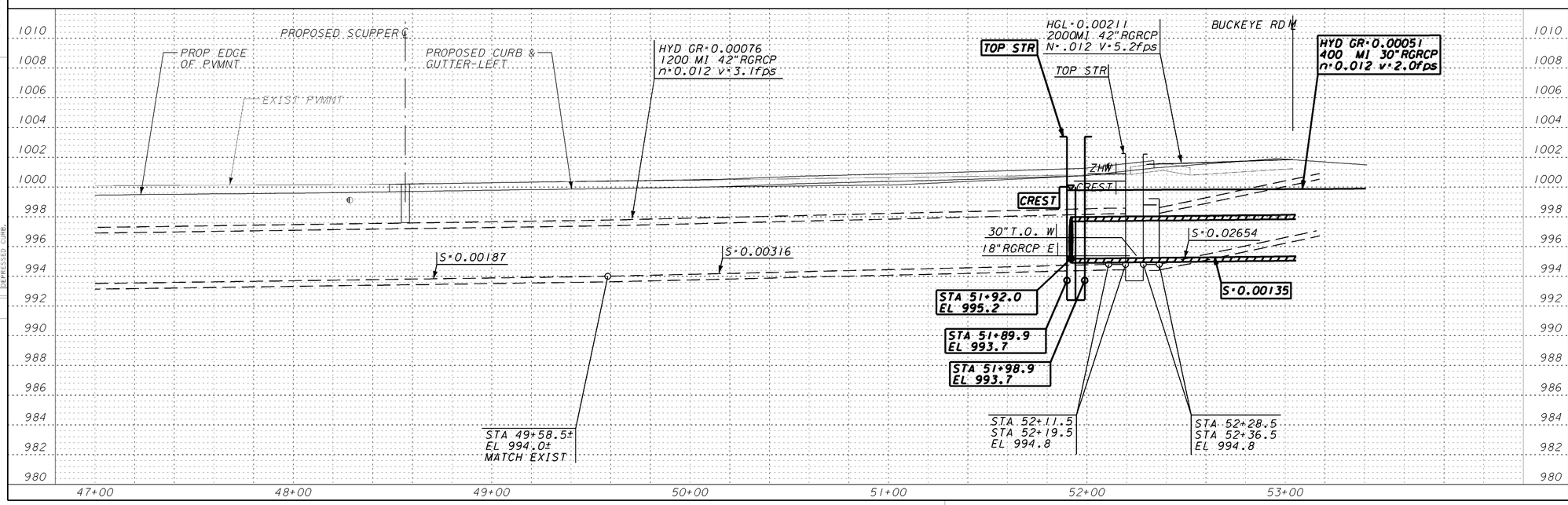
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E 600' N/O SE COR TO 16/7 COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020084.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0084	13
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------





CONSTRUCTION NOTES

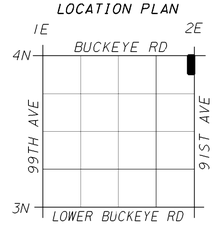
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 51+93.5 AND STATION 53+03.8 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

1. SEE SHEET PH0081 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHKR	SUPV ISSUE APPD	ISSUE AUTH	REL
7	-	04.03.08	JWS	CWT	-	-	-	DEL
ADDED TIE NOTES & CIRCLE NOTES FOR BRIDGE RECOVERY								
8	-	04.10.07	JWS	CWT	-	-	-	DEL
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.								

FORM NO
WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-1281, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
DESIGN FROM STA 51+92.0 TO STA 53+03.8

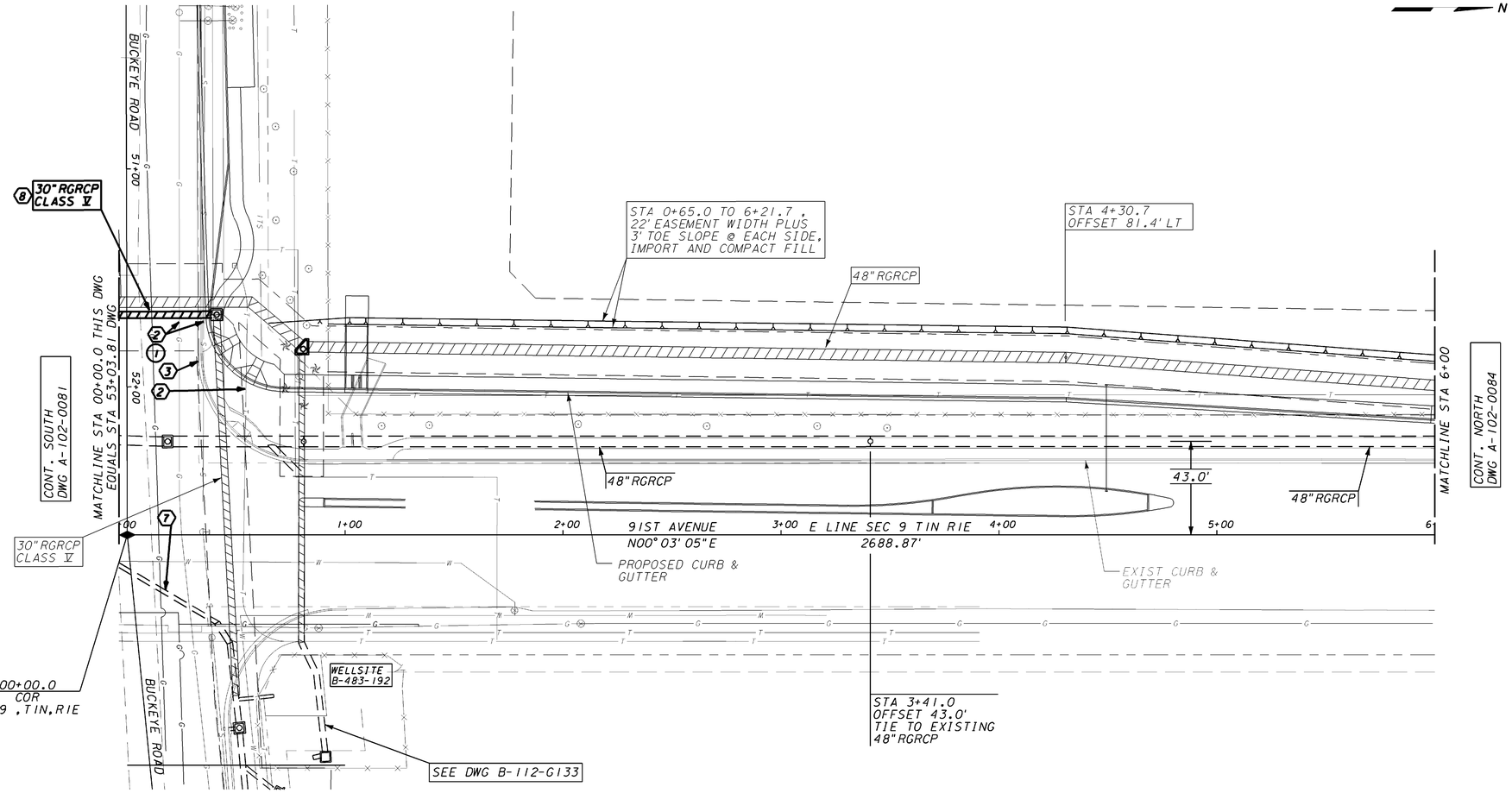
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

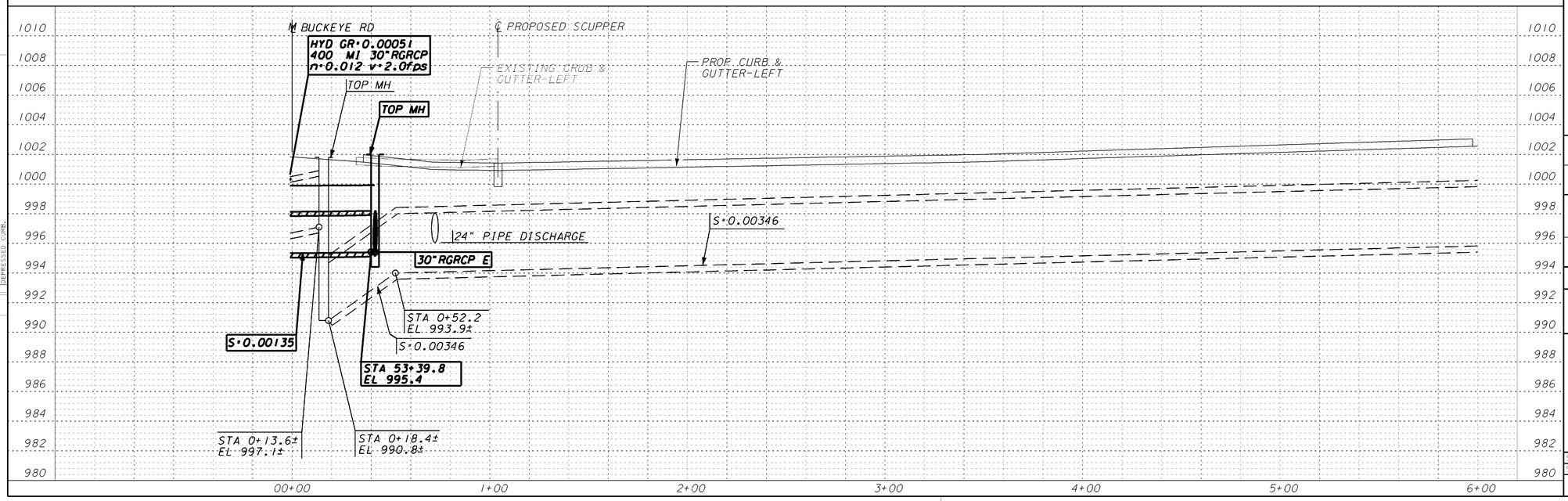
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 100' S/O NE COR TO NE COR

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020081.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0081	14
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------





CONSTRUCTION NOTES

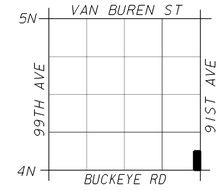
1. THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.
2. UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.
3. REMOVE AS REQUIRED FOR CONSTRUCTION.
7. CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.
8. STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE No. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 0+00.0 AND STATION 53+39.8 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.
1. SEE SHEET PH0083 FOR UTILITY POTHOLE INFORMATION.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:

ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:

NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.06	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-0845, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 0+00 TO STA 53+41.8

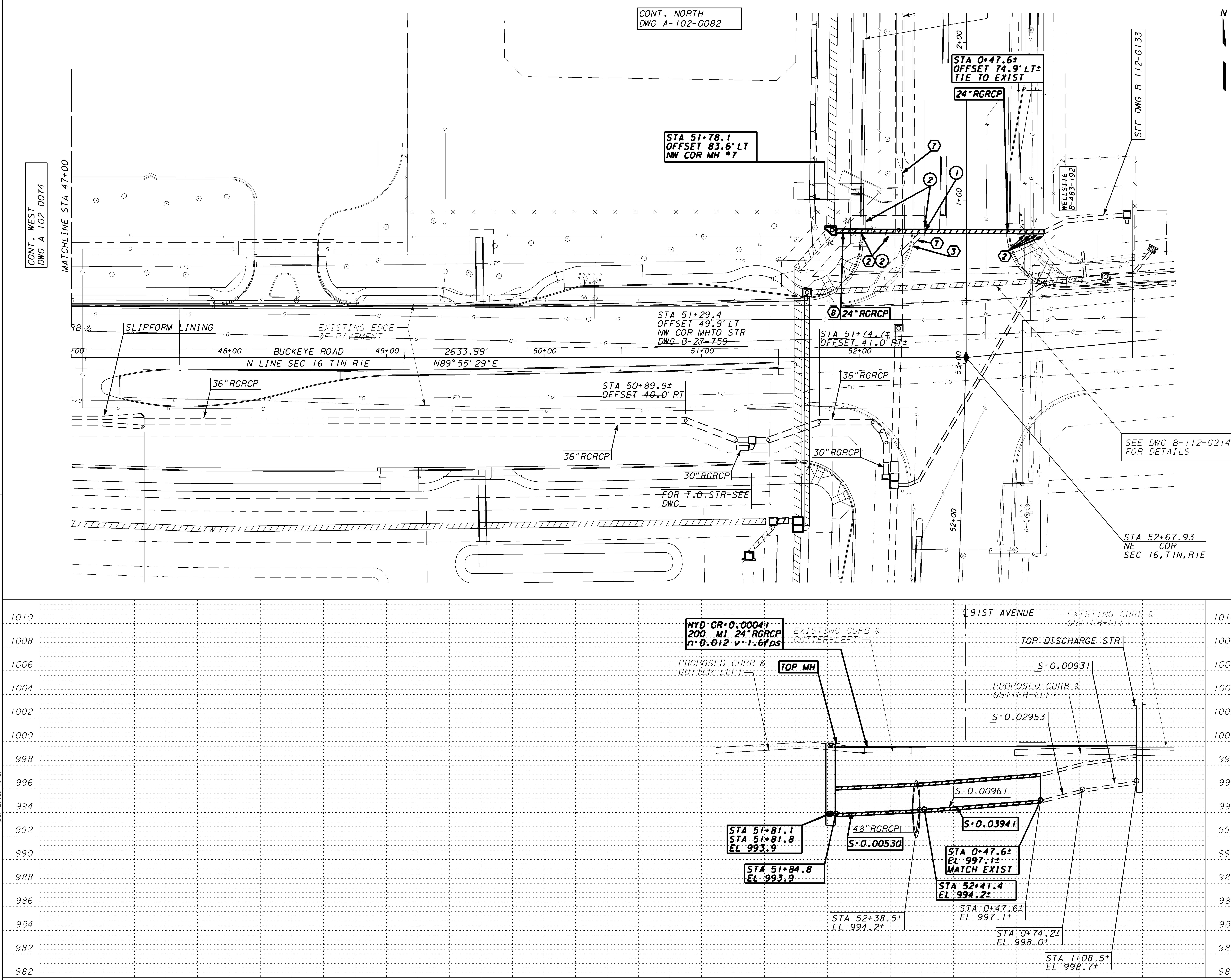
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR TO 50'N

SCALE: PLAN 1"=30', PROFILE 1"=4'			A1020083.DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0083	15
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------



CONSTRUCTION NOTES

(1) THE GENERAL NOTES ON THE COVER SHEET INCLUDE ADDITIONAL REQUIREMENTS RELATING TO THIS WORK.

(2) UTILITY CROSSING/PARALLEL - SEE THE GENERAL NOTES CONCERNING BLUE STAKING EXISTING UTILITIES, MINIMUM CLEARANCES FROM SRP IRRIGATION FACILITIES, AND RELOCATING CONFLICTING UTILITIES.

(3) REMOVE AS REQUIRED FOR CONSTRUCTION.

(7) CUSTOMER SHALL REMOVE AND PROPERLY DISPOSE OF THOSE PARTS OF SRP IRRIGATION SYSTEM MADE OBSOLETE WHEN NEW SRP IRRIGATION SYSTEM IS COMPLETE AND OPERATIONAL. BACKFILL HOLES AND DEPRESSIONS TO BRING TO DESIGN GRADE.

(8) STANDARD SRP IRRIGATION MARKER BALLS, (STOCK CODE NO. 5011771), SHALL BE INSTALLED BY THE CUSTOMER'S CONTRACTOR, AS DIRECTED BY SRP, BETWEEN STATION 51+84.4 AND STATION 52+41.4 AND AT OTHER PIPE LOCATIONS AS INDICATED. PLACE BALLS AT EVERY ANGLE POINT, AT 100' INTERVALS ALONG STRAIGHT RUNS, 50' INTERVALS ON CURVED RUNS, AT BURIED END POINTS, AND 3' BELOW THE SURFACE OR ON TOP OF THE PIPE/COLLAR (EMBED IN WET CONCRETE), WHICHEVER IS SHALLOWER. CONTACT SRP WATER INSPECTOR TO RECEIVE THE SRP IRRIGATION MARKER BALLS.

(1) STRUCTURAL CONCRETE PIPE COLLARS SHALL CONFORM TO SRP STANDARD DRAWING WES-SPIPECLR.

(2) SEE SHEET PH0076 FOR UTILITY POTHOLE INFORMATION.

**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN
1E 2E 4N 3N BUCKEYE RD 99TH AVE 91ST AVE LOWER BUCKEYE RD

BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,T1N,R1E. ELEVATION 996.48'

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. DESIGN FROM STA 51+81.8 TO STA 52+41.4

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL
LATERAL 22.0
SEC 9 & 10 T1N R1E
SE COR SEC 9 TO
SW COR SEC 10

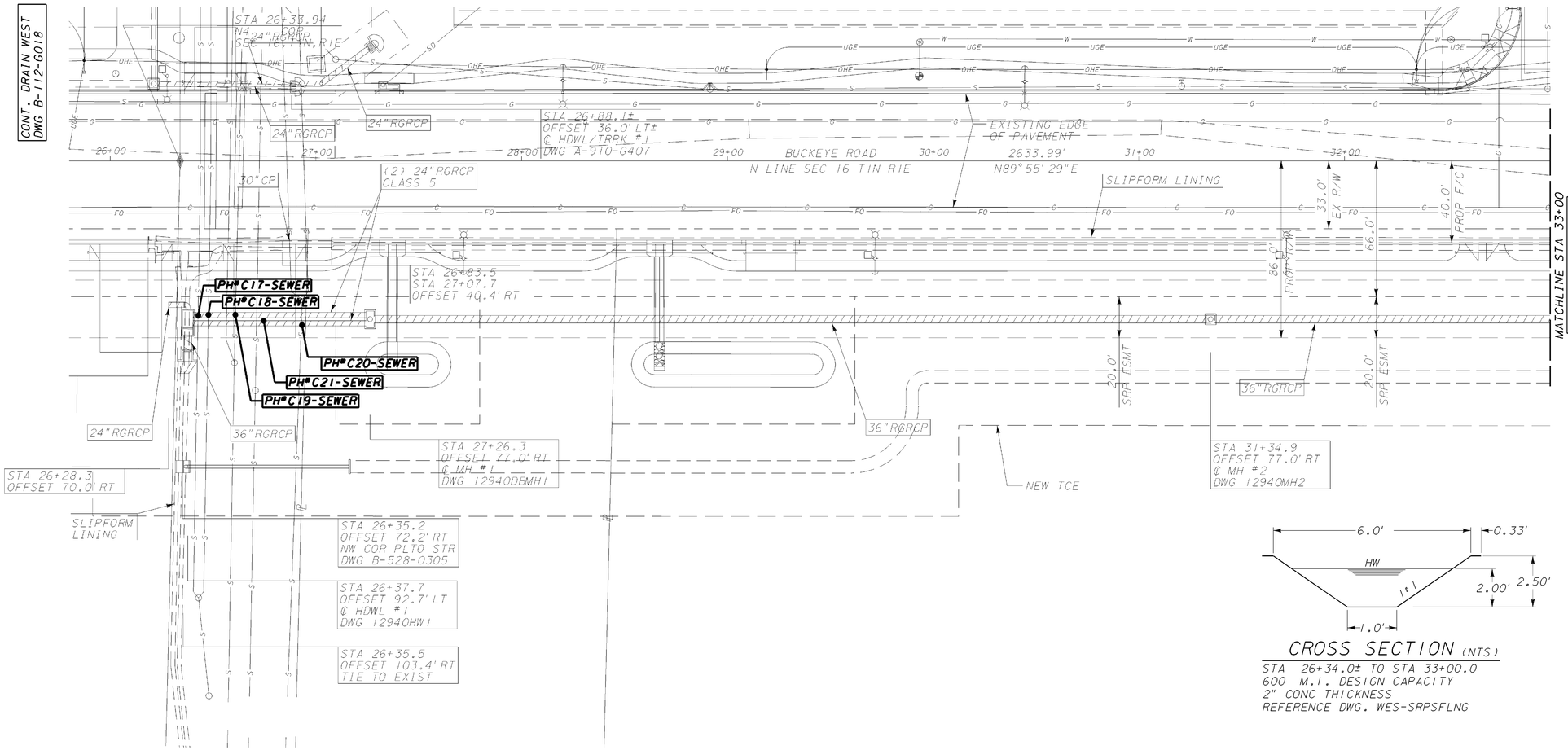
SCALE			DGN	SHEET NO.
PLAN 1"=30', PROFILE 1"=4'			A1020076.DGN	
SUBJ CODE	DIST CODE	DWG SIZE	A-102-0076	16
PP	Y2	22X34		

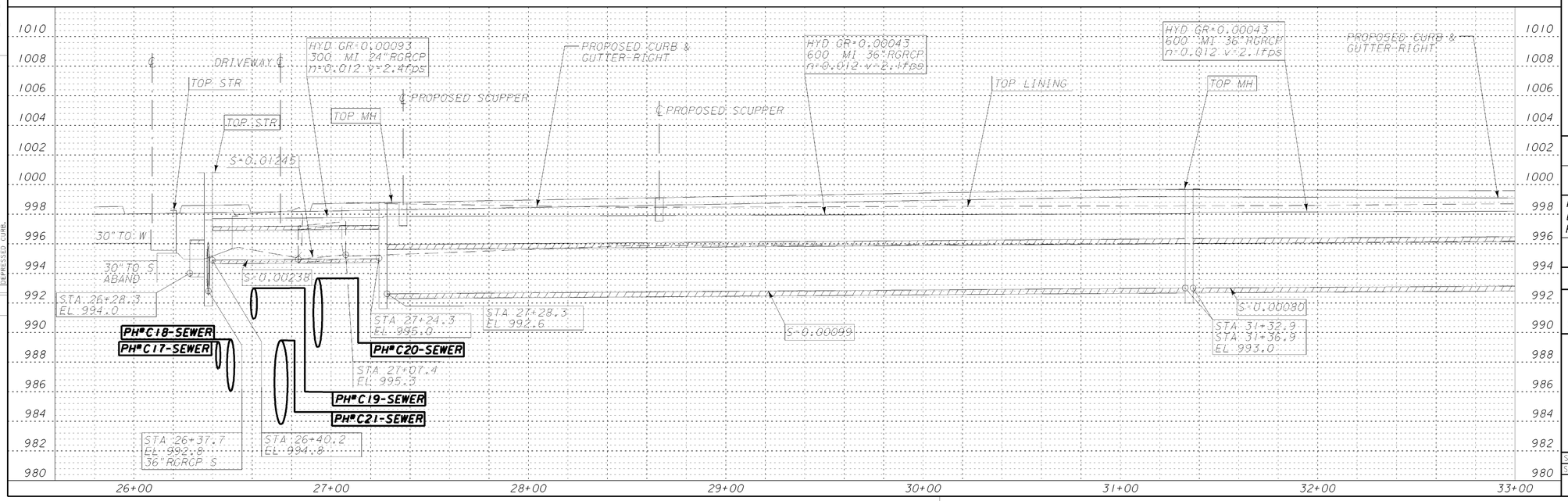
REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH	REL
ADDED HEX NOTE 9, STEEL NOTES FOR BRIDGE RECOVERY AND STEP PAD INSTALLATION.		04.03.06	WS	CWT	-	-	-	-
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.	8	04.10.07	JWS	CWT	-	-	-	-

FORM NO WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

   THIS INFORMATION IS REQUIRED TO BE ADDED TO THE CONSTRUCTION PLAN DRAWINGS.

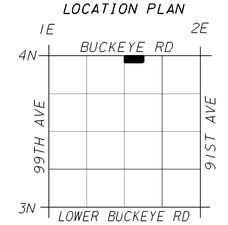
2. BY CORPORATE POLICY AND DUE TO INTERRUPTIONS TO SRP SERVICE, ALL CONFLICTING UTILITIES ISSUES ARE REQUIRED TO BE RESOLVED AND UTILITIES RELOCATED PRIOR TO ANY PROJECT RELEASE FOR CONSTRUCTION.

   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E.
ELEVATION 996.48'

							/ /

REDRAWN FROM A-102-1277, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E N4 COR TO 660' E POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0072 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0072	62
PP	Y2	22X34		

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.06	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

ADDED NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.
ADDED CIRCLE NOTE & DETAIL FOR BRIDGE RECOVERY AREA.
ADDED NOTES FOR BRIDGE RECOVERY AREA.
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.
FORM NO

PPSNG.WDF
WDF-PPSNG

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3:
REF #4:

CONT. NORTH
DWG A-102-0080

CONT. WEST
DWG A-102-0074

MATCHLINE STA 47+00

SLIPFORM LINING

EXISTING EDGE OF PAVEMENT

48+00 BUCKEYE ROAD 49+00 2633.99' 50+00 51+00 52+00

N LINE SEC 16 TIN RIE N89°55'29"E

36"RGRCP

36"RGRCP

STA 47+89.5
OFFSET 109.1'RT

STA 47+46.0
OFFSET 40.4'RT
℄ HDWL

PH#C31-SRP ELEC
PH#C34-SRP ELEC
PH#C35-SRP ELEC
PH#C42-CENT LINK COMM
PH#C40-SWG
PH#C43-SRP ELEC
PH#C38-SRP ELEC
PH#C37-SRP ELEC
PH#C36-WATER

MATCHLINE STA 52+67.39 THIS DWG
EQUALS STA 00+00.0 DWG

CONT. EAST
DWG B-112-G196

STA 52+67.39
NE COR
SEC 16,TIN,RIE

91ST AVENUE

CONT. SOUTH
DWG A-102-0079

N

POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

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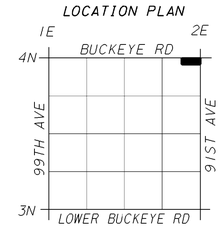
   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18,TIN,RIE. ELEVATION 996.48'

						/ /
						/ /

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	/ /

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

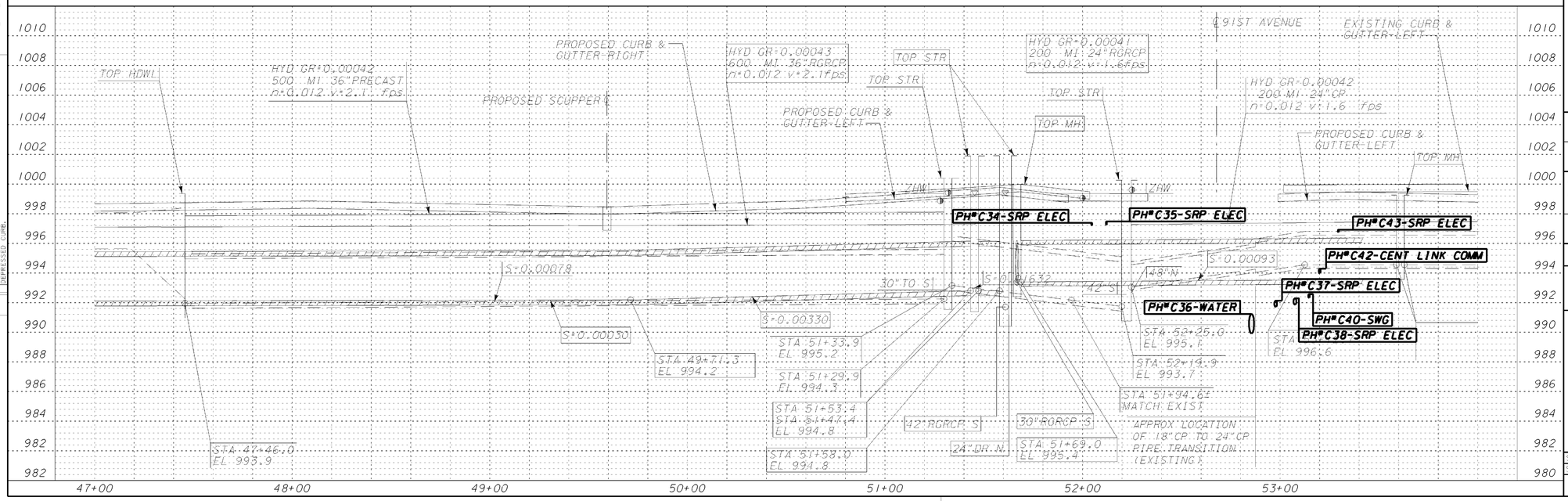
GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 450' W/O NE COR TO NE COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0075 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0075	63
PP	Y2	22X34		

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR APPD	SUPV ISSUE AUTH	REL
7	-	04.03.06	JWS	CWT	-	-	REL
ADDED KEY NOTES 1 & 2, CIRCLE NOTES FOR BRIDGE RECOVERY							
8	-	04.06.07	JWS	CWT	-	-	REL
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.							

FORM NO
WDF-PPSNG

PPSNG.WDF



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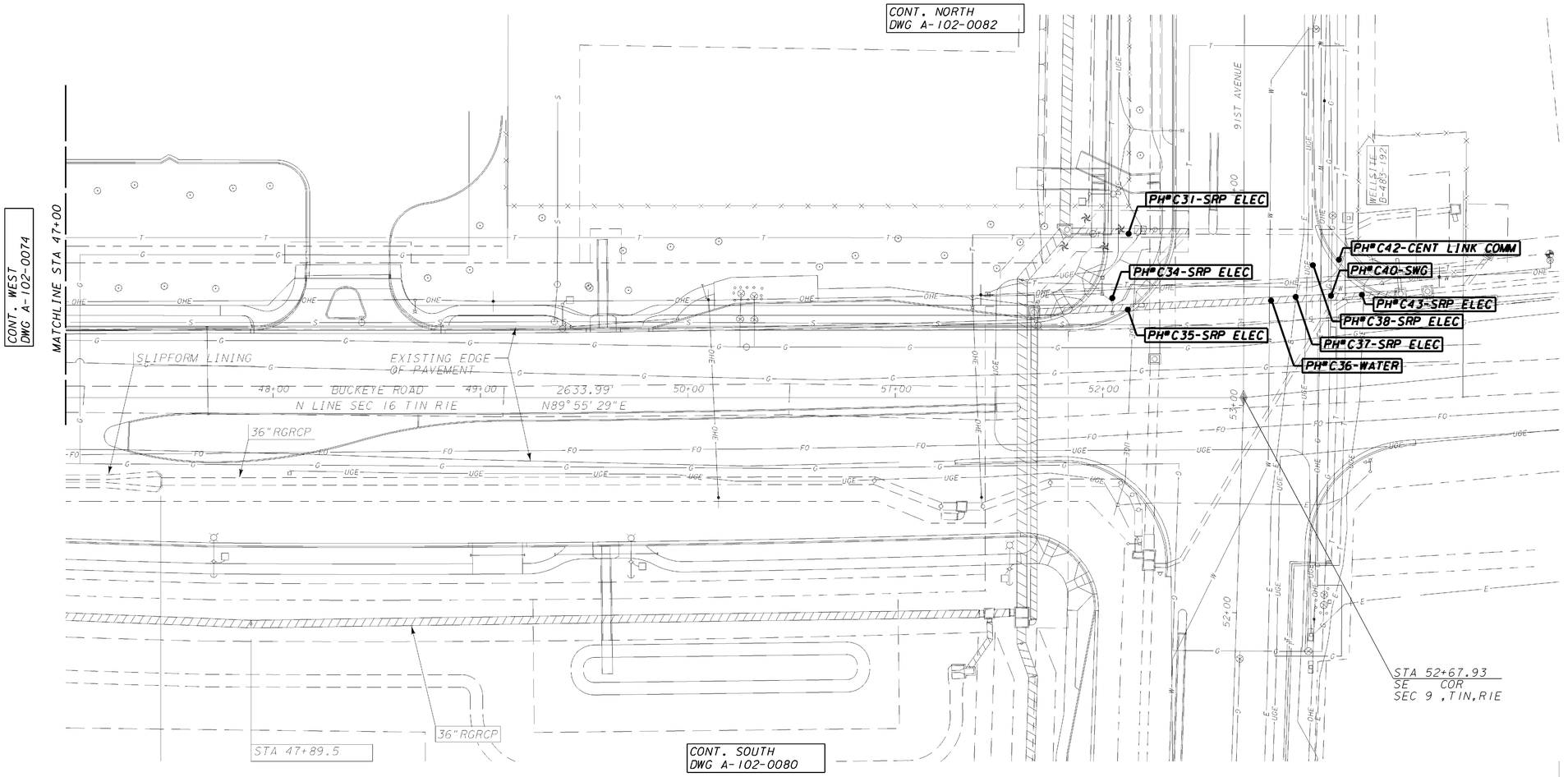
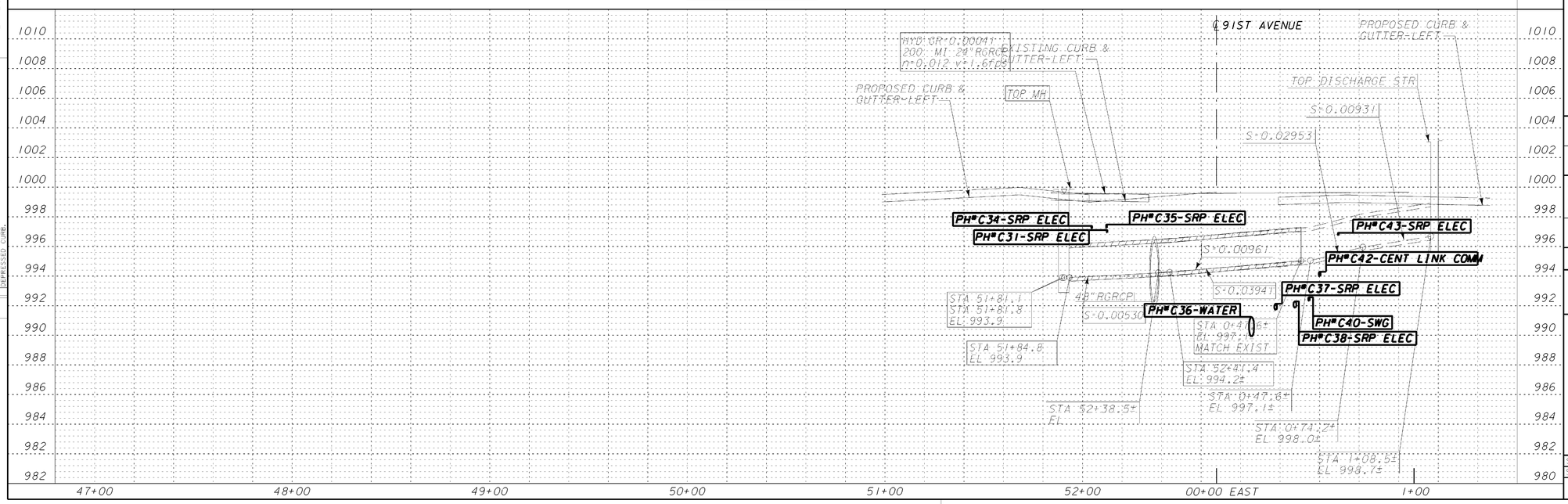
REF #4: ----------





POTHOLING NOTES

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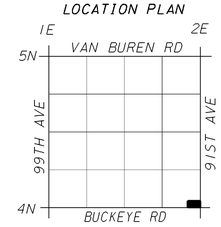
DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
0	RD-12940	12/19/17	BAJ	REJ	RMP	RMP	REL

REDRAWN FROM A-102-1280, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR SEC 9 POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0076 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0076	64
PP	Y2	22X34		

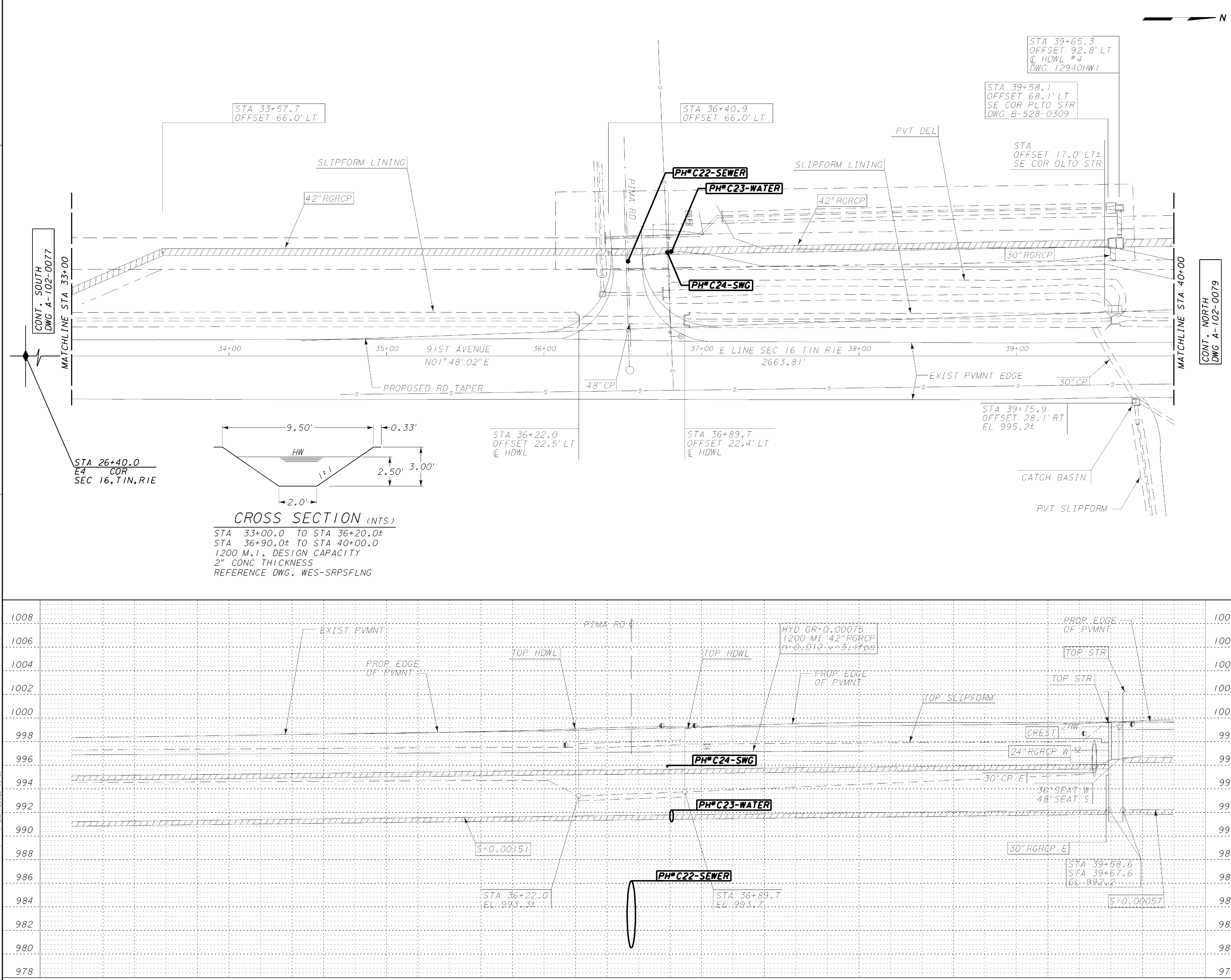
REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.08	JWS	CWT	-	-	REL
8	-	04.10.07	JWS	CWT	-	-	REL

ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO

WDF-PPSNG

PPSNG.WDF



REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------

POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

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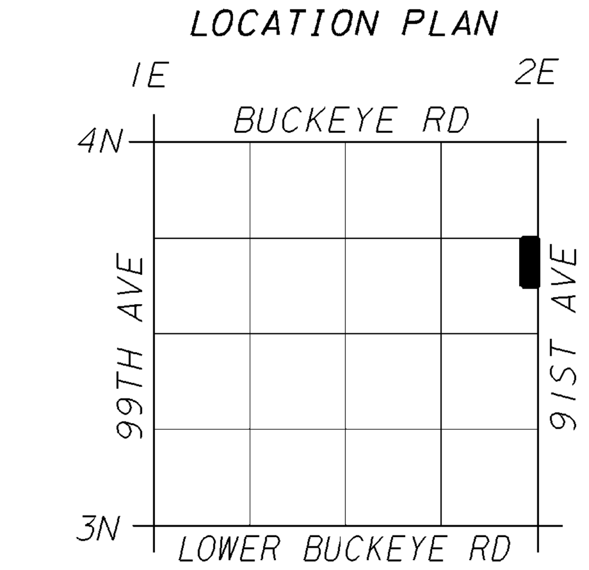
   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

DWG. NOT APPROVED. DO NOT CONSTRUCT W/ THIS DOCUMENT.

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3 LOCATED AT 50' SOUTH AND 665' WEST OF THE NORTHEAST CORNER OF SECTION 18, T1N, R1E. ELEVATION 996.48'

REV NO.	JOB/LOG NO.	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	ADDED MEX NOTE & LARGE NOTES FOR BRIDGE RECOVERY AND STEP PAD INSTALLATION.	04.03.06	WS	CWT	-	-	REL
8	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.	04.10.07	JWS	CWT	-	-	REL

FORM NO
WDF-PPSNG
PPSNG.WDF

REDRAWN FROM A-102-1300, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

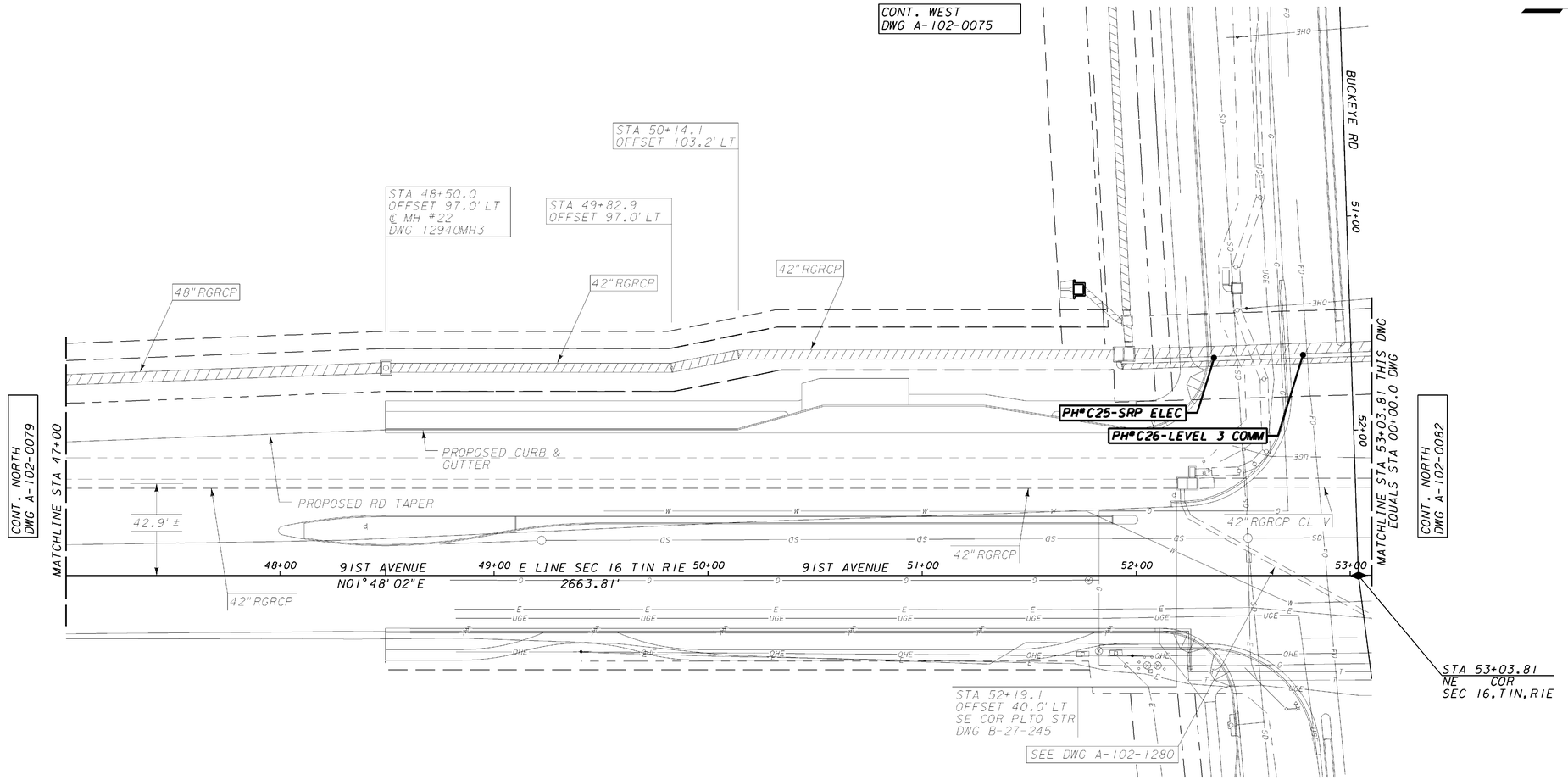
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
						/ /
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

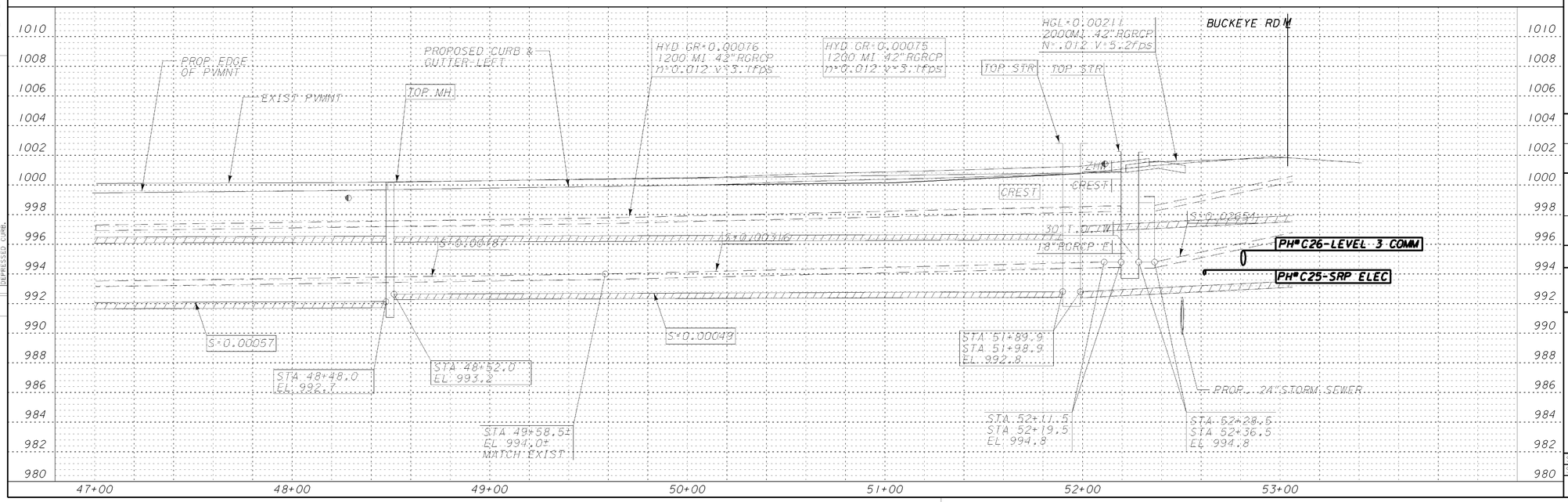
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 T1N R1E 650' N/O E4 COR TO 16/8 COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0078 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE		
PP	Y2	22X34	PH0078	65

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





POTHOLING NOTES

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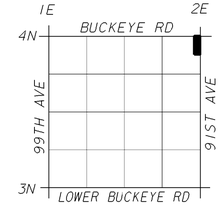
**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:

ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:

NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH	
7	-	04.03.06	JWS	CWT	-	-	REL	ADDED PP NOTES & CIRCLE NOTE FOR BRIDGE RECOVERY
8	-	04.10.07	JWS	CWT	-	-	REL	ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO
WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-1281, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

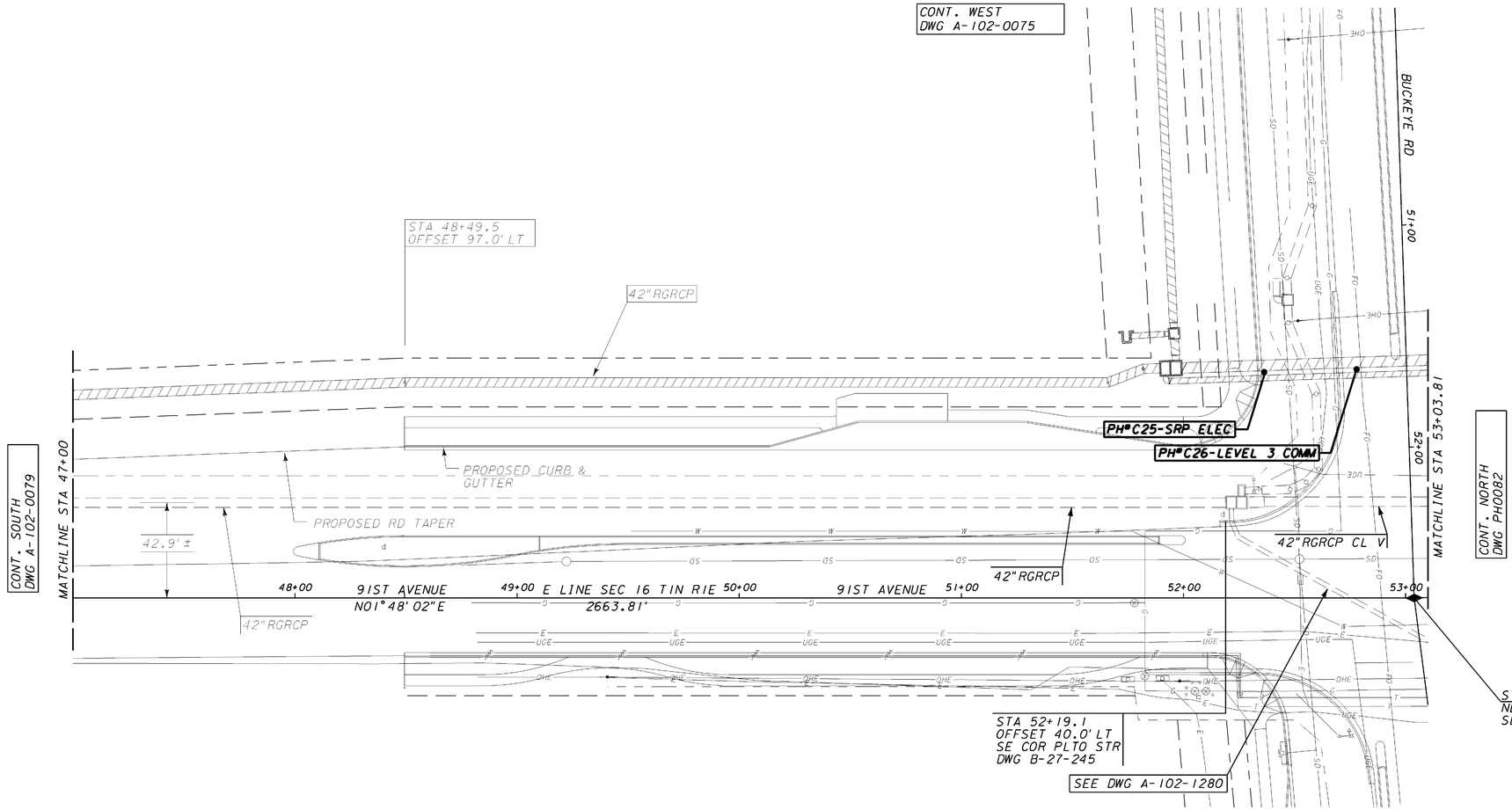
REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

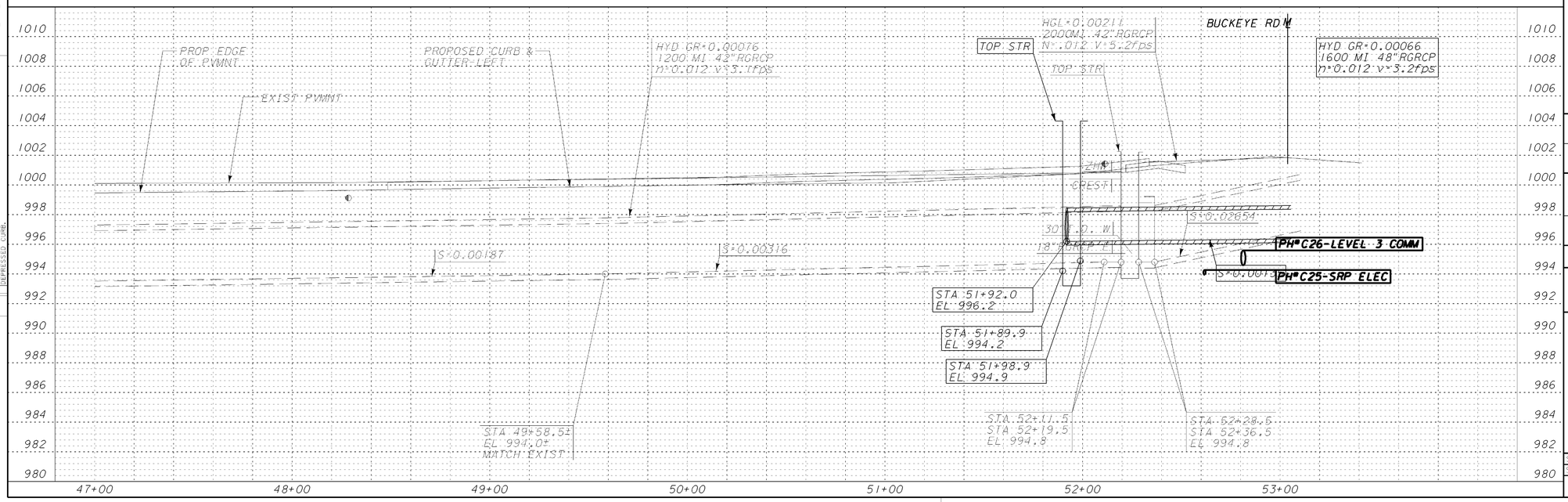
SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 600' S/O NE COR TO NE COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0080 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0080	66
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------





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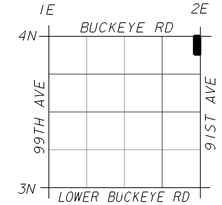
**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'

/ /

REDRAWN FROM A-102-1281, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION.
POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB/LOG NO	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 16 TIN RIE 100' S/O NE COR TO NE COR POTHOLE LOCATIONS

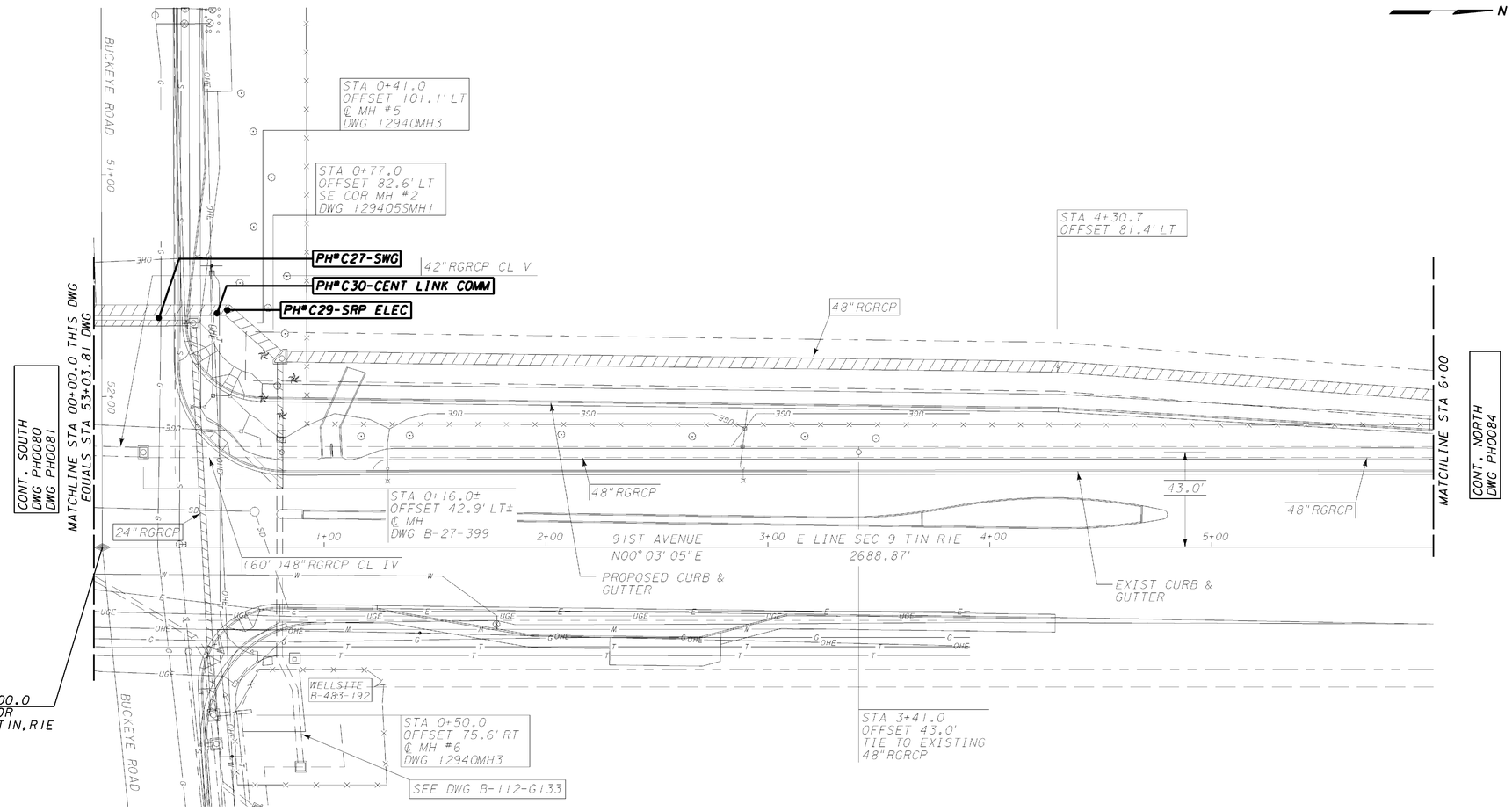
SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0081 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0081	67
PP	Y2	22X34		

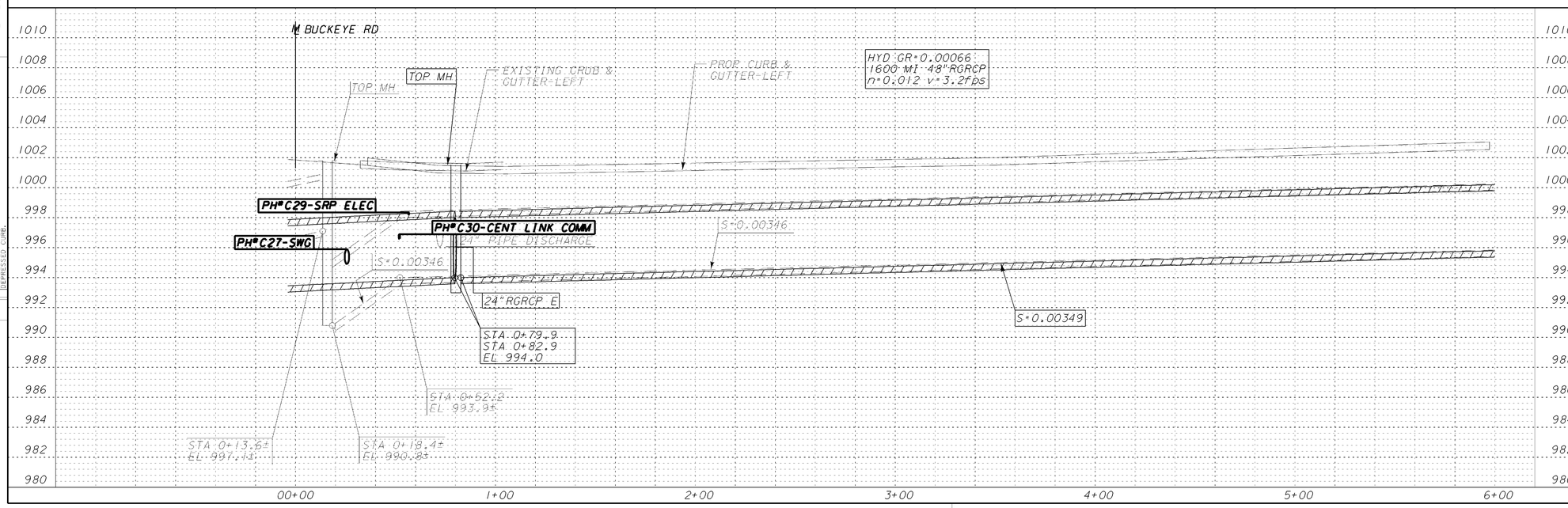
REV NO	JOB/LOG NO	DFTR	DSGN	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	JWS	CWT	CWT	-	-	REL
ADDED PP NOTES & CIRCLE NOTES FOR BRIDGE RECOVERY							
8	-	04.10.07	JWS	CWT	-	-	REL
ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.							

FORM NO
WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M3BM.DGN
REF #2: M3BM.DGN
REF #3: ----------
REF #4: ----------





POTHOLING NOTES

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**DWG. NOT APPROVED.
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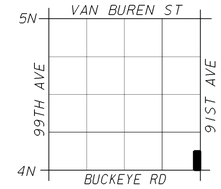
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

/ /

REDRAWN FROM A-102-0845. SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E SE COR TO 600'N POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0082 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0082	68
PP	Y2	22X34		

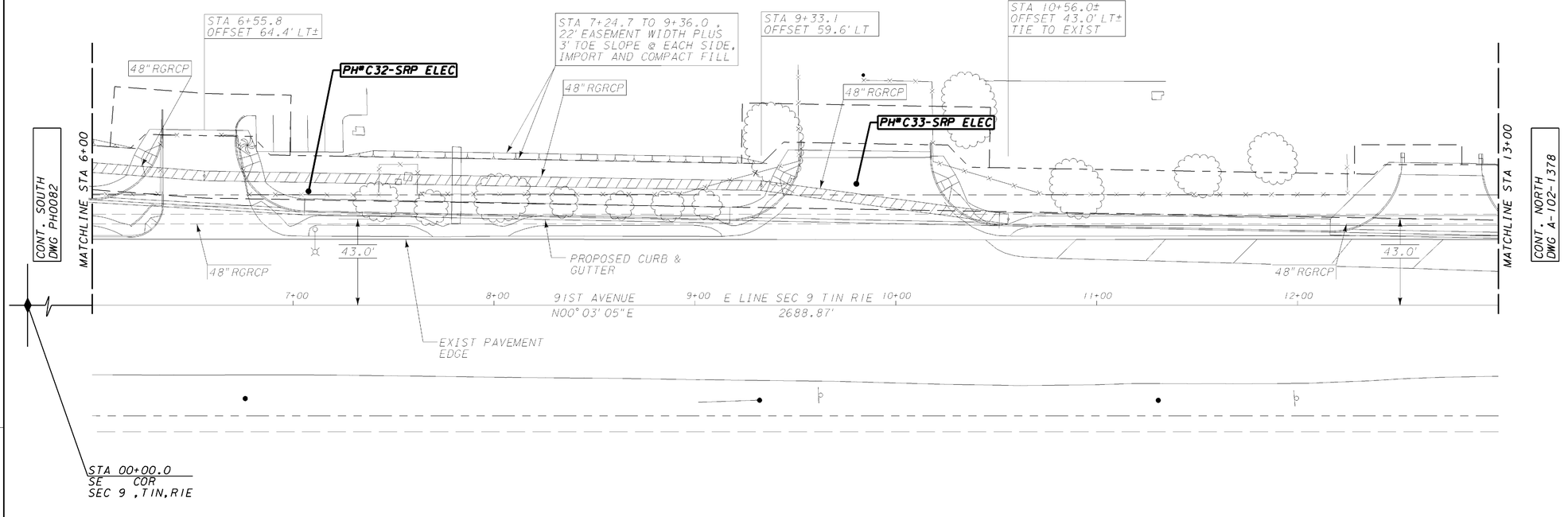
REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV ISSUE APPD	AUTH
8	-	04.10.07	JWS	CWT	-	-	REL
7	-	04.03.06	JWS	CWT	-	-	REL

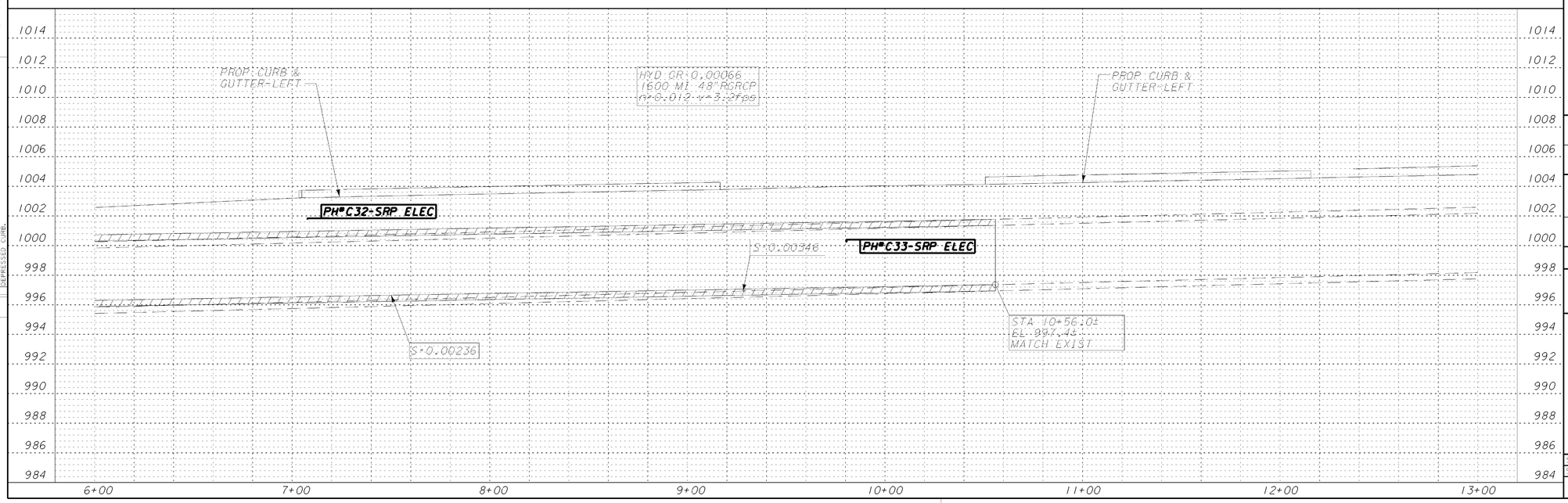
ADDED CIRCLE NOTE FOR INDUSTRIAL DR/DRIVEWAY WITH DEPRESSED CURB.
ADDED 2 NOTES FOR BRIDGE RECOVERY
ADDED CIRCLE NOTES FOR INDUSTRIAL DR/DRIVEWAY WITH

FORM NO
WDF-PPSNG

PPSNG.WDF

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------





POTHOLING NOTES

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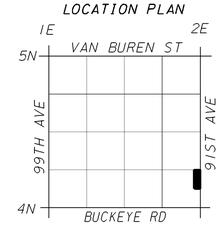
**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG.
MINUS 0.09' EQUALS
ELEAVTION OF MCDOT
PROJECT NO. TT345
MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,T1N,R1E.
ELEVATION 996.48'

REV NO	JOB/LOG NO	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	04.03.06	JWS	CMT	-	-	REL
8	-	04.10.07	JWS	CMT	-	-	REL

7 ADDED NOTES FOR BRIDGE RECOVERY
8 ADDED CIRCLE NOTE FOR INDUSTRIAL DRIVEWAY WITH DEPRESSED CURB.

FORM NO
WDF-PPSNG

PPSNG.WDF

REDRAWN FROM A-102-0845, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	12/19/17
		BAJ	REJ	RMP	RMP	

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL LATERAL 22.0 SEC 9 T1N R1E 600' N/O SE COR TO 16/7 COR POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PH0084 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PH0084	69
PP	Y2	22X34		

REFERENCE FILES USED:
REF #1: M38M.DGN
REF #2: M38M.DGN
REF #3: ----------
REF #4: ----------

CONT. NORTH
DWG B-112-G037

CONT. WEST
DWG B-112-G018

MATCHLINE STA 26+00

STA 26+21.0
OFFSET 37.5' LT
℄ MH # 1
DWG A-910-G408

STA 26+33.94
S4 COR
SEC 9 ,TIN,RIE

STA 26+23.0±
OFFSET 37.5' LT±
TIE TO EXIST

STA 27+02.5
OFFSET 38.0' LT

STA 27+26.9
OFFSET 52.2' LT
℄ HDWL/TRRK #3
DWG 12940HT1

PH*C09-SEWER
PH*C10-SEWER
PH*C11-SEWER
PH*C12-SEWER
PH*C13-SEWER
PH*C14-SEWER
PH*C15-SEWER

24"RGRCP
24"RGRCP

STA 26+88.1±
OFFSET 36.0' LT±
℄ HDWL/TRRK #1
DWG A-910-G407

EXISTING EDGE OF PAVEMENT

27+00 28+00 29+00 30+00 31+00 32+00

S LINE SEC 9 TIN RIE
BUCKEYE ROAD
2633.99'
N89° 55' 29"E

30"CP

(2) 24"RGRCP
CLASS 5

SLIPFORM LINING

33.0' EX R/W
66.0'
40.0' PROP F/C
86.0' PROP R/W

STA 26+83.5
STA 27+07.7
OFFSET 40.4' RT

20.0' SRP ESMT
20.0' SRP ESMT

36"RGRCP
36"RGRCP
36"RGRCP

STA 27+26.3
OFFSET 77.0' RT
℄ MH # 1
DWG 12940DBMH1

STA 31+34.9
OFFSET 77.0' RT
℄ MH # 2
DWG 12940MH2

NEW TCE

N

POTHOLING NOTES

1. IT IS THE PROJECT OWNER'S RESPONSIBILTY TO PROVIDE SRP ENGINEERING WITH UTILITY POTHOLE DATA ON ANY NEW UTILITY WITHIN THE PROPOSED IRRIGATION PIPELINE CORRIDOR PRIOR TO CONSTRUCTION.

   THIS INFORMATION IS REQUIRED TO BE ADDED TO THE CONSTRUCTION PLAN DRAWINGS.

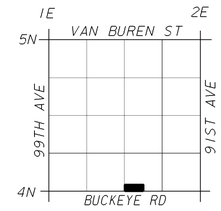
2. BY CORPORATE POLICY AND DUE TO INTERRUPTIONS TO SRP SERVICE, ALL CONFLICTING UTILITIES ISSUES ARE REQUIRED TO BE RESOLVED AND UTILITIES RELOCATED PRIOR TO ANY PROJECT RELEASE FOR CONSTRUCTION.

   SRP INSPECTION WILL REQUIRE VERIFICATION OF THIS WORK AT THE PROJECT PRE-CONSTRUCTION MEETING.

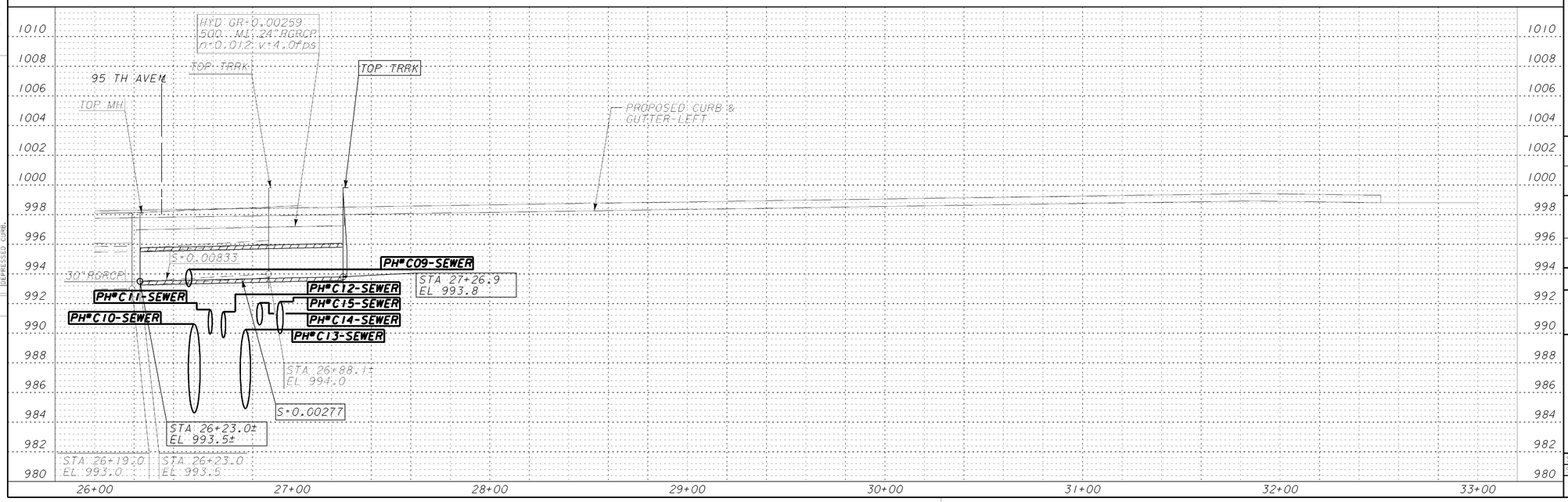
**DWG. NOT APPROVED.
DO NOT CONSTRUCT
W/ THIS DOCUMENT.**

ELEVATION EQUATION:
ELEVATION THIS DWG. MINUS 0.09' EQUALS ELEAVTION OF MCDOT PROJECT NO. TT345 MC 85 BUCKEYE ROAD

LOCATION PLAN



BENCHMARK:
NE COR PLTO STR 2-23-84.3
LOCATED AT 50' SOUTH AND
665' WEST OF THE NORTHEAST
CORNER OF SECTION 18,TIN,RIE.
ELEVATION 996.48'



REV NO	JOB/LOG NO	DESCRIPTION	DATE	DFTR	CHKR	ENGR CHK	SUPV APPD	ISSUE AUTH
7	-	ADDED DEPRESSED CURB NOTE & CIRCLE	04.03.06	JWS	CWT	-	-	REL
8	-	ADDED CIRCLE NOTE FOR DEPRESSED CURB.	04.10.07	JWS	CWT	-	-	REL

FORM NO
WDF-PPSNG

PPSNG.WDF

/ /

REDRAWN FROM B-112-G018, SRP SURVEY W13-53393-01 & DESIGN PLANS FROM MCDOT FOR MC 85 EXPANSION. POTHOLE INFORMATION PROVIDED BY MCDOT.

REV NO.	JOB NO.	DFTR	DSGN	ENGR CHK	ISSUE AUTH	DATE
0	RD-12940	BAJ	REJ	RMP	RMP	/ /

SALT RIVER PROJECT
WATER ENGINEERING ◇ PHOENIX, ARIZONA

GRAND CANAL DRAIN
SEC 9 TIN RIE
S4 COR TO 660' E
POTHOLE LOCATIONS

SCALE: PLAN 1"=30', PROFILE 1"=4'			PHG195 .DGN	SHEET NO.
SUBJ CODE	DIST CODE	DWG SIZE	PHG195	76
PP	Y2	22X34		

Appendix G –

City of Phoenix Pavement Cut Policy

The Phoenix City Code

Section 31-49.1

Sec. 31-49.1. Duty of person to repair street; cuts in new street pavement.

A. *Definitions.* The following definitions apply to this section. The plural of the word or phrase includes the singular, and the singular includes the plural.

1. *Arterial street* means all major streets and arterial streets as designated on the existing street classification map.

2. *Asphalt mill and overlay/inlay pavement treatment* means removal of the top layer of street pavement with a milling machine and replacing the removed street pavement with a new layer of street pavement.

3. *Collector street* means all streets designated as collector streets and minor collector streets on the existing street classification map.

4. *Crack fill and seal* means application of fill and seal to cracks in the pavement surface.

5. *Local street* means all streets that provide direct access to residential, commercial, industrial, or other abutting land and for local traffic movements, and that connect to collector or arterial streets.

6. *New street* means a street that was constructed, reconstructed, or resurfaced, and that received final acceptance from the Street Transportation Director or designee less than two years before the proposed street pavement cut.

7. *Permittee* means a person that possesses a permit issued by the City of Phoenix to cut street pavement.

8. *Reconstructed street* means the removal of existing pavement to its sub-base and installation of new pavement.

9. *Resurfaced street* means any surface treatment applied to the roadway including asphalt mill and overlay/ inlay pavement treatment.

10. *Slurry seal pavement treatment* means to apply a mixture of water, asphalt emulsion, aggregate, and additives to an existing asphalt pavement surface.

B. *Duty to repair damaged street.* A person that causes damage to a public street while working in the public right-of-way must repair the street at the person's sole cost and expense in accordance with City standards and specifications. The damaged street must be returned as close to its original condition as practicable and the repair maintained for a minimum of one year.

C. *Pavement cut to new street.* Except for a total of three or less pavement cuts of two square feet or less made as part of a single permit, if a pavement cut is made to a new street, all of the following requirements apply:

1. The permittee must apply an asphalt mill and overlay/inlay pavement treatment to the full width of all lanes of an arterial, collector, or local street impacted by the cut(s). The treatment must extend a minimum of 25 feet in both directions from the pavement cut(s); and

2. The permittee must apply a slurry seal pavement treatment to the half width of an arterial or collector street, or the full width of a local street. The treatment must extend a minimum of 25 feet in both directions from the pavement cut(s).

D. *Pavement cut to street other than new street.* If a pavement cut of any size is made to a street other than a new street, the permittee must apply a slurry seal pavement treatment to the half width of an arterial or collector street, or the full width of a local street. The treatment must extend a minimum of 25 feet in both directions from the pavement cut(s).

1. For purposes of this section only, the permittee must apply Type IV slurry seal to an arterial or collector street, or Type II slurry seal to a local street.

E. *Crack fill and seal.* For all pavement cut repair areas, permittee must apply crack fill and seal between existing and new pavement areas prior to any pavement treatment.

F. *Pavement treatment for exceptions.* A slurry seal pavement treatment is not required for a new street or street other than a new street if there are no more than a total of three pavement cuts less than two square feet for each permit. (Ord. No. G-2470, § 1; Ord. No. G-3313, § 1; Ord. No. G-6308, 2017; Ord. No. G-6395, 2017)

Appendix H –
2015 City of Phoenix Supplement
to the 2015 MAG Specifications

2015
CITY OF PHOENIX SUPPLEMENT TO THE

2015 EDITION MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

City of Phoenix

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2015 CITY OF PHOENIX SUPPLEMENT
TO THE
2015 EDITION MARICOPA ASSOCIATION OF GOVERNMENTS
UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

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2015 Changes to the Supplements

New Specification Sections Supplemented:

Section 310 PLACEMENT AND CONSTRUCTION OF AGGREGATE BASE COURSE – Added Supplements for COMPACTION; and THICKNESS AND/OR PLASTICITY DEFICIENCY.

Section 324 PORTLAND CEMENT CONCRETE PAVEMENT (PCCP) – Added Supplements for CONSTRUCTION METHODS.

Section 325 PLACEMENT AND CONSTRUCTION OF ASPHALT-RUBBER ASPHALT CONCRETE – Added Supplements for QUALITY CONTROL; ACCEPTANCE; and REFEREE.

Section 345 ADJUSTING FRAMES, VALVE BOXES, METER BOXES AND PULL BOXES – Added Supplement for complete Section.

Section 701 AGGREGATE – Added Supplements for RECLAIMED CONCRETE MATERIAL; and RECLAIMED ASPHALT MATERIAL.

Section 717 ASPHALT-RUBBER ASPHALT CONCRETE – Added Supplements for MATERIALS; and MIX DESIGN REQUIREMENT.

Section 736 NON-REINFORCED CONCRETE PIPE – Added Supplement to delete complete Section.

Section 740 POLYETHYLENE PIPE AND FITTINGS FOR STORM DRAIN, IRRIGATION AND SANITARY SEWER – Added Supplement to delete complete Section.

Section 742 PRECAST MANHOLES – Added Supplements for GENERAL; MATERIALS; MANHOLE PENETRATIONS; GASKETS; and LIFTING POINTS.

Section 744 ABS TRUSS PIPE AND FITTINGS – Added Supplement to delete complete Section.

Section 745 PVC SEWER PIPE AND FITTINGS – Added Supplement to delete complete Section.

Section 753 GALVANIZED PIPE AND FITTINGS – Added Supplement to delete complete Section.

Section 755 POLYETHYLENE PIPE FOR WATER DISTRIBUTION – Added Supplement to delete complete Section.

Section 775 BRICK AND CONCRETE MASONRY UNITS (BLOCK) – Added Supplement for BRICK.

Existing Supplemented Sections with major updates:

Section 321 PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT – Added Supplements for MIX DESIGN; PLACEMENT; ACCEPTANCE; and REFEREE.

Section 401 TRAFFIC CONTROL – Updated Supplement for complete Section.

Section 404 TRAFFIC SIGNALS – Updated Supplement for complete Section.

Section 610 WATERLINE CONSTRUCTION – Updated Supplements for CONSTRUCTION METHODS; CONNECTION TO EXISTING MAINS; and METER SERVICE CONNECTIONS.

Added Supplement for POLYETHYLENE CORROSION PROTECTION.

2015 Changes to the Supplements

Deleted Supplement for TESTING.

Section 611 WATER, SEWER AND STORM DRAIN TESTING – Added Supplements for HYDROSTATIC TESTING; DISINFECTING WATER MAINS; SEWER LINE TESTING; POST INSTALLATION INSPECTION OF NEW MAINLINE STORM DRAINS; and PAYMENT.

Section 615 SEWER LINE CONSTRUCTION – Added Supplements for MATERIALS; and MEASUREMENT AND PAYMENT.

Updated Supplements for TRENCHING; SEPARATION; JOINTING; SANITARY SEWER TAPS; and BACKFILLING.

Deleted Supplements for LAYING PIPE; TESTING; and MEASUREMENT AND PAYMENT.

Section 618 STORM DRAIN CONSTRUCTION WITH CONCRETE PIPE – Updated Supplements for DESCRIPTION; MATERIALS; CONSTRUCTION METHODS; MEASUREMENT; and PAYMENT.

Deleted Supplement for VIDEO INSPECTION OF NEW MAINLINE STORM DRAINS.

Section 620 CAST-IN-PLACE CONCRETE PIPE – Deleted Supplement for complete Section.

Added Supplements for GENERAL; MATERIALS; CONSTRUCTION METHODS; METHODS AND TESTS; and PAYMENTS.

Section 710 ASPHALT CONCRETE – Updated Supplement for complete Section.

Existing Supplemented Sections with minor changes:

Section 301 SUBGRADE PREPARATION – Updated the Supplement for RELATIVE COMPACTION.

Section 336 PAVEMENT MATCHING AND SURFACE REPLACEMENT – Updated the Supplement for MEASUREMENT.

Added Supplement for PAYMENT.

Section 340 CONCRETE CURB, GUTTER, SIDEWALK, DRIVEWAY AND ALLEY ENTRANCE – Added Supplements for CONSTRUCTION METHODS.

Section 343 EXPOSED AGGREGATE PAVING – Added Supplements for CONSTRUCTION PROCEDURE.

Updated Supplement for MEASUREMENT AND PAYMENT.

Section 350 REMOVALS OF EXISTING IMPROVEMENTS – Updated Supplements for CONSTRUCTION METHODS; and MISCELLANEOUS REMOVAL AND OTHER WORK.

Section 601 TRENCH EXCAVATING, BACKFILLING AND COMPACTION – Updated Supplement for complete Section.

Section 621 CORRUGATED METAL PIPE AND ARCHES – Updated Supplement for INSTALLATION.

Section 625 MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS – Updated Supplements for CONSTRUCTION METHODS.

Added Supplements for CONSTRUCTION METHODS.

2015 Changes to the Supplements

Section 626 CORROSION COATING OF SANITARY SEWER MANHOLES – Updated Supplement for complete Section.

Section 702 BASE MATERIALS – Updated Supplement for complete Section.

Section 735 REINFORCED CONCRETE PIPE – Updated Supplements for GENERAL; and MATERIALS.

Section 750 IRON WATER PIPE AND FITTINGS – Updated Supplement for JOINT REQUIREMENTS.

Section 757 SPRINKLER IRRIGATION SYSTEM – Updated Supplement for GENERAL; and PIPE AND FITTINGS.

Section 760 COATING CORRUGATED METAL PIPE AND ARCHES – Updated Supplements for MATERIALS; and BASE METAL, SPELTER AND FABRICATION.

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2015
CITY OF PHOENIX SUPPLEMENT TO THE

2015 EDITION
MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

City of Phoenix

2015 CITY OF PHOENIX SUPPLEMENT TO THE 2015 MAG
UNIFORM STANDARD, SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION

The **2015 edition** of the City of Phoenix Supplement to the 2015 Maricopa Association of Governments Uniform Standard Specifications and Details for Public Works Construction is effective **July 1, 2015**. The **2015 edition** supersede all previous editions.

All public works construction contracts advertised and all permits issued on or after **July 1, 2015** shall be governed by the **2015 edition**.

A copy of the **2015 edition** is available for review and download on the City of Phoenix Website at the following address:

https://www.phoenix.gov/streets/reference-material/2015maguniformstd

For more information, or a copy of this publication in an alternate format, contact Street Transportation Department at 602-262-6284 (Voice) and 602-256-4286 (TTY).

FOREWARD

Forward: Delete the FORWARD in its entirety and replace with the following:

The City of Phoenix Standard Specifications and Details for Public Works Construction (Specifications) provides an integrated document that utilizes a specific City adopted edition of the Maricopa Association of Governments Uniform Standard Specifications and Details for Public Works Construction, and the corresponding adopted edition of the City of Phoenix Supplement, to provide a clear compilation of the information within a single document. In the interest of maintaining consistency of established procedures, standards, specifications, and other documents used, the City has elected to adopt a complete, specific, edition of the Specifications periodically. In the interest of promoting county-wide standardization to the greatest extent possible, the City has established a standing Specifications Committee to periodically develop each edition of the Specifications utilizing that year's Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction and Standard Details as its basis. The Delegates to the Committee represent interested City departments, the consulting engineering community, the engineering contracting community, the home building community and the Design Advisory Board.

A complete, integrated Specifications, in continual review, with periodically issued editions, will enhance this document's usability by engineers, architects, contractors, inspectors and others. The integrated format will reduce misinterpretations, conflicting language, and provide improved clarity of the construction documents.

These Specifications are developed for public works construction within the City of Phoenix and include construction of improvements that will be owned and/or maintained by the City of Phoenix. These improvements may be located on City owned property, public right-of-way, public right-of-way easements, or any other type of easement dedicated to the City of Phoenix. These Specifications are not intended to supersede the City of Phoenix Construction Code, or any other applicable law, or ordinance.

The Specifications should be thoroughly reviewed by the professional engineers and architects in responsible charge prior to incorporating them into project plans and specifications. The Specifications are not a substitute for good engineering judgment. Unique conditions will arise that are outside of the scope of this document. Professional engineers and architects are required to use their judgment to develop special provisions to properly adjust the Specifications to best meet site-specific needs. Professional engineers and architects are required to provide professional services in accordance with the statutes of the State of Arizona and the rules of the Arizona State Board of Technical Registration. Not all specifications contained herein will apply to all projects.

The City of Phoenix Standard Specifications and Details for Public Works Construction (Specifications) are revised periodically to allow for current trends in the construction industry and to promote county-wide standardization to the greatest extent possible. For more information on the standing Specifications Committee, or the process for submitting a *Request for Change of the Specifications*, please contact:

City of Phoenix, Street Transportation Department
City Engineer
200 West Washington Street, 5th Floor
Phoenix, Arizona, 85003
(602) 262-6136

A copy of the currently adopted City of Phoenix Standard Specifications and Details for Public Works Construction is available for review and download on the City of Phoenix Website at the following address:

https://www.phoenix.gov/streets/reference-material/2015maguniformstd

Kini L.E. Knudson, P.E.
City Engineer

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TABLE OF CONTENTS

PART 600 - UNDERGROUND WORK FOR UTILITIES AND UNDERGROUND FACILITIES

PART 700 - MATERIALS

PART 100
GENERAL CONDITIONS

SECTION 101

ABBREVIATIONS AND DEFINITIONS

Subsection 101.1 ABBREVIATIONS: Add the following to this subsection:

COP City of Phoenix

Subsection 101.2 DEFINITIONS AND TERMS: Delete the definition for "Haunching" in its entirety and replace with the following:

The material placed in a trench from the bottom of the pipe or conduit to the springline of the pipe or conduit.

Subsection 101.2 DEFINITIONS AND TERMS: Delete the definition for "Initial Backfill" in its entirety and replace with the following:

The material placed in a trench above the springline of the pipe or conduit and the bottom of the Final Backfill. The height above the crown of the pipe or conduit is dependent on the pipe material and the type of facility.

Subsection 101.2 DEFINITIONS AND TERMS: Delete the definition for "Superpave" in its entirety:

SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

Subsection 102.10 WITHDRAWAL OR REVISION OF PROPOSAL: Add the following paragraph to the end of this Subsection:

Pursuant to the provisions of Section 2-188 of the City Code, the low bidder may file a request to withdraw his or her bid with the City Clerk.

SECTION 106

CONTROL OF MATERIALS

Subsection 106.2 SAMPLES AND TESTS OF MATERIALS: Delete the third paragraph in its entirety and replace with the following:

The procedures and methods used to sample and test materials will be determined by the Engineer. Unless otherwise specified, samples and tests will be made in accordance with the following: The City of Phoenix Minimum Sampling Frequency Guide, The City of Phoenix Materials Testing Manual, and the standard methods of AASHTO or ASTM, which were in effect and published at the time of advertising for bids.

Subsection 106.5 STORAGE OF MATERIALS: Add the following paragraph to the end of this Subsection:

No placement or storage of construction materials or storage bins, trash bins or trash receptacles on final surface pavement of Arterial and Collector streets.

Subsection 106.7 UNACCEPTABLE MATERIALS: Add the following paragraphs to the end of this Subsection:

Materials containing asbestos and/or lead in any form are unacceptable to incorporate into the project unless formally accepted in writing by the City of Phoenix. This written approval shall take place prior to the material being incorporated into the project and/or brought to the site.

Repair kits or touch-up materials, materials that include asbestos and/or lead introduced into the product at the factory or applied at the assembly plant are all unacceptable. Any and all field-applied products that are comprised of asbestos and/or lead containing materials are also unacceptable.

If asbestos and/or lead are installed without written approval by the City of Phoenix, the Contractor will remove these materials at his expense and dispose of these materials in accordance with all state and federal laws and pay for the supervision and reporting costs in addition to the cost to properly remove them.

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Subsection 107.5 SAFETY, HEALTH AND SANITATION PROVISIONS: Add the following Subsection:

107.5.3 Hoist Certification: Prior to the final acceptance (MAG Section 105), the Contractor shall schedule a hoist, crane acceptance inspection through the Engineer. This inspection and load test will be performed by an agency approved by the Engineer. This inspection and acceptance will not relieve the Contractor from his contractual responsibility nor from his warranty for this installation.

Subsection 107.6 PUBLIC CONVENIENCE AND SAFETY: Delete Subsection 107.6.1 Contractor's Marshalling Yard in its entirety:

Subsection 107.6 PUBLIC CONVENIENCE AND SAFETY: Delete Subsection 107.6.1.1 Contractor's Marshaling Yard when the Agency is the Contracting Party in its entirety:

Subsection 107.6 PUBLIC CONVENIENCE AND SAFETY: Add the following Subsection to this Subsection:

107.6.1 Contractor's Marshaling Yard: Contractors shall obtain approval of the City Engineer when using vacant property to park and service equipment and store material for use on City construction contracts.

(A) The Contractor shall notify adjacent property owners/residents of this proposed use.

(B) Any use of vacant property adjacent to or near the project for parking or servicing equipment and/or storing of material will require the Contractor to obtain written approval from the property owner. This approval shall contain any requirements which are a condition of this approval.

(C) A copy of the property owner's approval shall be submitted along with the Contractor's request to the City Engineer for approval for the use of the marshaling yard in connection with the project. An appropriate distance from adjacent property will be set by the City Engineer on a case by case basis on the size and type of equipment to be used on the project.

(D) The yard shall be fenced and adequately dust-proofed in a manner such as to preclude tracking of mud onto paved City streets.

(E) Work in the yard shall be scheduled so as to comply with the City Noise Ordinance.

(F) Equipment, materials, etc., shall be located so as to minimize impact on adjacent properties. A sound barrier may be required if deemed necessary by the City Engineer.

(G) The Contractor shall clean up property promptly upon completion of use.

Subsection 107.6.1.2 Contractor's Marshaling Yard when the Agency is not the Contracting Party (Private Development, Utility Work, Subdivision Construction, Etc.): Delete the Subsection number and replace with the following:

107.6.2

Subsection 107.6 PUBLIC CONVENIENCE AND SAFETY: Delete Subsection 107.6.2 in its entirety:

Subsection 107.6 PUBLIC CONVENIENCE AND SAFETY: Add the following Subsection to this Subsection:

107.6.3 City Code Section 23-14 (h): The Contractor shall comply with the City Code concerning work hours and noise level during construction.

SECTION 110

NOTIFICATION OF CHANGED CONDITIONS AND DISPUTE RESOLUTION

Subsection 110.3.3 Process: Delete Subsection (B) Dispute Review Board/Arbitration in its entirety and replace with the following:

(B) Dispute Review Board: The decision of the Level III Representative in relation to the claim shall be final. The Contractor reserves the right to initiate litigation pursuant to Section 12-821 et. seg. of the Arizona Revised Statues, or if mutually agreed upon, the parties may choose to resolve the controversy utilizing the Dispute Review Board as prescribed in subsection 110.4.

Subsection 110.3 ADMINISTRATIVE PROCESS FOR DISPUTE RESOLUTION: Delete Subsection 110.3.4 Amount of Dispute in its entirety.

SECTION 110 NOTIFICATION OF CHANGED CONDITIONSAND DISPUTE RESOLUTION: Subsection 110.4 ARBITRATION: Delete Subsection 110.4 ARBITRATION in its entirety.

SECTION 110 NOTIFICATION OF CHANGED CONDITIONSAND DISPUTE RESOLUTION: Add the following Subsection to this SECTION:

110.4 DISPUTE REVIEW BOARD:

If the Dispute Review Board is utilized as prescribed in Subsection 110.3.3(B), the Engineer shall be notified within thirty days after the Level III Representative decision. The Dispute Review Board is a three member board independent of the parties involved in the issue. The Agency and Contractor shall each select a member for this board. The third member shall be mutually agreed upon independent member. This Review Board must be selected within fourteen calendar days after notice to the Level III Representative. Each member shall agree to impartially serve the Agency and the Contractor. The Dispute Review Board shall meet within thirty days of the selection of the board, unless, by mutual agreement, another date is selected. The scope of the Dispute Review Board shall be restricted and limited to the matters originally presented to the Level III Representative for decision or determination and shall include no other matters. The Board shall consider and evaluate the dispute and render a written decision that assigns responsibilities and allocates adjustments in the contract time, if applicable, within seven calendar days after the meeting.

SECTION 110 NOTIFICATION OF CHANGED CONDITIONSAND DISPUTE RESOLUTION: Delete Subsection 110.5 DISPUTE REVIEW BOARD in its entirety.

Subsection 110.6 FINAL DOCUMENTATION AND PAYMENT: Delete the Subsection number and replace with the following:

110.5

PART 200
EARTHWORK

SECTION 206

STRUCTURE EXCAVATION AND BACKFILL

Subsection 206.1 DESCRIPTION: Delete the word "manholes" in the first sentence of the first paragraph.

Subsection 206.4.2 Structure Backfill for Earth Retaining Structures: Delete the word "concrete" from the first paragraph.

Subsection 206.4.2 Structure Backfill for Earth Retaining Structures: Delete subparagraph (A) in its entirety and replace with the following:

(A) Shall conform to the material and the gradation requirements for Select Material, Type A, Type B, or Aggregate Base Course in Table 702-1 unless otherwise approved by the Engineer.

Subsection 206.4.2 Structure Backfill for Earth Retaining Structures: Delete last paragraph in its entirety.

Subsection 206.4.4 Structure Backfill for Structures within Paved Areas: **Delete this Subsection in its entirety and replace with the following:**

Where a structure is located within an existing street, proposed street or paved area:

(A) Backfill within 2 feet of the surface shall be compacted to the minimum density specified in Section 601, for Type I compaction or shall be filled with controlled low strength material as specified in Sections 604 and 728.

(B) All other structure backfill shall be compacted to the minimum density specified in Section 601, for Type III compaction or shall be filled with controlled low strength material as specified in Sections 604 and 728.

PART 300
STREETS AND RELATED WORK

SECTION 301

SUBGRADE PREPARATION

Subsection 301.2 PREPARATION OF SUBGRADE: Add the following paragraphs after the second paragraph of this Subsection:

The Contractor's grading operations will proceed in an orderly sequence and shall be followed directly with the placement of base course. At no time shall the Contractor's total grading operations precede the placement of base course by more than 1200 feet without specific written approval of the Engineer. At the end of each day's operation, the first lift of base course shall have been placed to within a maximum distance of 300 feet behind the finished subgrade area. Drop-offs on opposite sides of the pavement at the same time will not be allowed.

Existing pavement under proposed median islands shall be removed. Payment for this work shall be considered incidental to the project.

When excavating for concrete work, such as curb and gutter and sidewalk, the Contractor shall place the excavated material in uniform windrows. The windrows shall not interfere with property access or traffic flow on the streets.

Subsection 301.3 RELATIVE COMPACTION: Delete the fourth sentence in the first paragraph and replace with the following:

The subgrade cut and fill areas shall be constructed to achieve a uniform soil structure having the following minimum compaction, measured as a percentage of maximum dry density when tested in accordance with AASHTO T-99, and T191 or ASTM D6938 with the percent of density adjusted in accordance with the rock correction procedures for maximum density determination, ARIZ-227c to compensate for the rock content larger than that which will pass a ¾ inch sieve or a No. 4 sieve.

Subsection 301.3 RELATIVE COMPACTION: Delete subparagraphs (A), (B), and (C) in their entirety and add the following subparagraphs to the end of this Subsection:

(A) Street Pavement Section	
(1) Top 6" Subgrade (under ABC)	100% for Arterial Streets/Major Streets
(2) Top 6" Subgrade (under ABC)	95% for Collector/Local Streets
(3) Top 6” Subgrade (under Asphalt / Concrete)	100%
(B) Sidewalks not subject to vehicular traffic	95%
(1) Refer to Subsection 340.3.1 for marginally expansive or expansive soils.	90%
(C) Curbs, Gutters, Curb Ramps, Driveways, Driveway Entrances, Sidewalks subject to vehicular traffic	95%

SECTION 310

PLACEMENT AND CONSTRUCTION OF AGGREGATE BASE COURSE

Subsection 310.3 COMPACTION: Delete the second paragraph in its entirety and replace with the following:

The laboratory maximum dry density and optimum moisture content for the aggregate base course material shall be determined in accordance with Arizona Test Method 225, method "A". Field 'one-point' maximum dry density and optimum moisture procedures shall only be allowed as a measure of quality control until a laboratory maximum dry density and optimum moisture content is provided.

Subsection 310.3 COMPACTION: Delete the first sentence of the fourth paragraph in its entirety and replace with the following:

A rock correction, to compensate for rock content larger than the #4 sieve, shall be performed in accordance with Arizona Test Method 227.

Subsection 310.3 COMPACTION: Delete the sixth paragraph in its entirety and replace with the following:

Unless otherwise noted in the project plans or project specifications, the moisture content of the aggregate base course at the time of compaction shall be the optimum moisture content +/- 2%.

Subsection 310.3 COMPACTION: Delete subparagraph (C) in its entirety and replace with the following:

(C) All other areas not subject to vehicular traffic 95%

Subsection 310.4 THICKNESS AND/OR PLASTICITY DEFICIENCY: Delete Type IV in Table 310-1 in its entirety and replace with the following:

IV	A plasticity index of 6 to 7 inclusive or gradation deficiency	(1) The Contractor may choose to reprocess or treat the existing material to bring it within specification limits or remove deficient material from affected area and replace with material complying with the specifications. (2) If grades allow, the Contractor may increase the thickness of asphalt concrete by ½-inch minimum at no additional cost to the Owner. The thickness must be approved by the Engineer prior to the placement of asphalt concrete.

SECTION 312

CEMENT TREATED BASE

Subsection 312.5 INVERTED SECTION: Delete this Subsection in its entirety and replace with the following:

Where the cement treated base is to be covered with an aggregate base material, the minimum thickness of the aggregate base shall be 5 inches, unless otherwise specified in the special provision. In order to provide for free internal drainage of the aggregate base course overlaying the cement treated material, it shall be ABC, reference Section 725. The cement treatment shall be held back approximately 1 foot from each curb line.

Subsection 312.6 CURING: Delete the first two paragraphs in their entirely:

Subsection 312.6 CURING: Delete the first sentence in the third paragraph entirely and replace with the following:

Keep the surface of the compacted cement treated base course continuously moist until overlaid with the aggregate base course.

SECTION 321

PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

Subsection 321.3 WEATHER AND MOISTURE CONDITIONS: Delete this Subsection in its entirety and replace with the following:

Asphalt concrete shall be placed only when the surface is dry. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base or sub base on which the material is to be placed is unstable. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

For any pavement courses two inches thick or greater the atmospheric temperature shall be a minimum of 40 degrees Fahrenheit and rising.

For all pavement surface courses less than two inches thick, the surface temperature on which the course is to be placed shall be a minimum of 50 degrees Fahrenheit and rising.

Subsection 321.5 MIX DESIGN: Delete the first three sentences of the first paragraph in their entirety and replace with the following:

Should a Contractor wish to utilize a City of Phoenix mix design from a non-approved source, the mix design(s) shall be submitted to the City of Phoenix Materials Lab 15 working days prior to the start of the project. Included with the mix design, the Contractor shall also submit the appropriate asphalt concrete for mix verification and laboratory calibrations as specified by the City of Phoenix Materials Lab. These samples will not include standard City of Phoenix mix designs approved through annual asphalt concrete supplier calibrations. Mix designs provided by the agency may be utilized on projects at the Engineer's discretion. The Engineer will review and approve the mix design to assure it contains all of the required information as outlined in Section 710.

Subsection 321.6 MIX PRODUCTION: Delete the last paragraph in its entirety and replace with the following:

The temperature of the asphalt concrete, upon discharge from the mixer shall be per Table 321-1.1. The discharge temperature may be increased on the recommendation of the binder supplier, when approved by the Engineer. If the asphalt concrete is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the asphalt concrete will be minimized.

Subsection 321.6 MIX PRODUCTION: Add the following Table 321-2 to the end of this Subsection:

TABLE 321-1.1 Asphalt Concrete Mix Temperatures at Production Plant

Type of Asphalt Mix	Minimum Temperature ºF	Maximum Temperature ºF
Conventional Asphalt Mix (1/2", 3/4" & 1½")	**285**	**325**
Rubberized Asphalt Mix	**290**	**350**

Subsection 321.8.1 Placing: Add the following paragraphs after the third paragraph:

"Ski-type device or string line as described in (a) or (b) above shall be used as directed by the Engineer."

In conditions where the curb and/or gutter is not even and true to grade, the Engineer may require the Contractor to use a ski-type device or string line as described in C above to establish the grade of the asphalt concrete surface adjacent to the curb or gutter.

Subsection 321.8.6 Asphalt Concrete Overlay: Add the following sentence to the first paragraph:

Asphalt concrete mix aggregate gradation and percentage of asphalt binder shall be in accordance with Table 321-3 using a D1/2" Marshall High or Low Volume mix designation for overlays.

Subsection 321.10.1 Acceptance Criteria: **Delete this Subsection in its entirety and replace with the following:**

A City of Phoenix representative will be present at the asphalt supplier plant during production and will facilitate the inspections and sampling of the asphalt concrete. The sampling frequency for hot asphalt concrete at the asphalt plant shall be 1 sample per 350 tons, with a minimum of 1 sample per day, sampled randomly. In lieu of a City of Phoenix representative at the plant, asphalt concrete may be sampled at the same frequency taken from the project by a City of Phoenix designated representative or from the list of approved materials testing labs. The approved list is available through the City of Phoenix Materials Lab. The samples will be transported to the City of Phoenix Materials Lab or other designated laboratory for acceptance testing. All samples will be obtained according to the procedures of Arizona Test Method 104 or AASHTO T-168.

Each obtained sample will be taken to the City of Phoenix Materials Lab or other designated laboratories for acceptance testing. Each sample obtained for that day's production shall be tested for oil content utilizing a calibrated Nuclear Oil Content Gauge, according to AASHTO T287. If all the samples are within oil content tolerances, a random sample will be taken and further testing will be performed, this includes oil content with a calibrated ignition oven, gradation, marshall, maximum theoretical density, and air voids. However, if there is a sample outside of the tolerances for oil content, each specific failing Nuclear Oil Content sample will be tested. The selected sample(s) will be tested for oil content, utilizing an ignition oven, and gradation. Testing for marshall, maximum theoretical density, and air voids will be performed on each sample tested utilizing an ignition oven.

The required density shall be obtained using a rolling pattern established by the Contractor and approved by the Engineer. Compaction efforts should continue until the specific gravity of the compacted mixture is not less than 95.0% of the Marshall density, from the specimens composed of the same mixture, and compacted in the laboratory by the 75-blow method of AASHTO T-245.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Subsection 321.10.2 Gradation, Binder Content and Air Voids: Delete this Subsection in its entirety, including Tables 321-3A, 321-3B, 321-4, and 321-5, and replace with the following:

The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T-168. The minimum weight of the sample shall be of sufficient amount to provide enough material to meet all the testing requirements as determined by the Engineer. Asphalt binder content and gradation shall be determined in accordance with AASHTO T-308 using the ignition furnace. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T-308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report. The bulk density for Marshall Mix designs shall be tested in accordance with AASHTO T-245. The bulk density for Gyratory mix designs shall be determined in accordance with AASHTO T312. The maximum theoretical density shall be determined in accordance with the requirements of AASHTO T-209. Effective voids of the laboratory compacted specimens will be determined at a minimum of once per day in accordance with the requirements of AASHTO T-269. Acceptance testing results will

be furnished to those who request test results within five working days of receipt of samples by the acceptance laboratory.

During production, deviation from the specified mix design will not be allowed without prior approval from the City of Phoenix Materials Lab or their representatives.

TABLE 321-3
ACCEPTANCE LIMITS FOR STANDARD COP MARSHALL MIX DESIGNS
LOW AND HIGH VOLUME

	A 1-1/2"		C3/4"		D 1/2"	
Sieve Size	**Target**	**Tolerance**	**Target**	**Tolerance**	**Target**	**Tolerance**
1 1/2"	100	---	100	---	100	---
1"	93	+/-7%	100	---	100	---
3/4"	90	+/-7%	95	88-100	97-100	---
1/2"	---	---	85	+/-7%	88	+/-7%
3/8"	63	+/-7%	75	+/-7%	78	+/-7%
No. 4	45	+/-7%	58	+/-7%	58	+/-7%
No. 8	35	+/-5%	44	+/-5%	45	+/-5%
No. 30	20	+/-5%	24	+/-5%	25	+/-5%
No. 200	5	+/-2%	4	+/-2%	5	+/-2%
	High Volume	**Low Volume**	**High Volume**	**Low Volume**	**High Volume**	**Low Volume**
Oil Content %	4.3 +/-.4	---	5.0+/-.4	5.5+/-.4	5.1+/-.4	5.6+/-.4
Air Voids % (Recommended)	5.0+/-1.0	---	4.5+/-1.0	4.0+/-1.0	4.5+/-1.0	4.0+/-1.0
Density (On Grade)	95% Minimum of 75-Blow Marshall Density (For All COP Mix Designs)					

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3(Excluding Air Voids), a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits the Contractor shall cease production of asphalt concrete. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in Table 321.3.

If the asphalt binder content is within ± 0.40% of the mix design target value, the asphalt concrete will be paid for at the contract unit price. If the asphalt binder content deviates by more than ± 0.40% from the mix design target value, the deficient area will be evaluated by coring at maximum intervals of 50 feet of either side from the deficient sample. The asphalt content of the original deficient sample will be averaged with the asphalt binder content of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the asphalt binder content deviates by more than ± 0.40% from the mix design target value, then Table 321-4 shall apply to the deficiency, if any. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 321-4		
ASPHALT BINDER CONTENT PAYMENT REDUCTION (AC)		
Deviation from that permitted (Acceptance to the tenth of a percent)	**When Contracting Agency is Owner: Payment Reduction (Percent dollar per ton asphalt concrete)**	**When Contracting Agency is Not Owner (Permit Work): Payment Reduction (Percent dollar per ton asphalt concrete) *See note Below**
Over/Under 0.0 to 0.1%	10%	Extended Warranty for two years with posted bond for the value of the taper mill and overlay
Over/Under 0.1 to 0.2%	25%	Extended Warranty for five years with posted bond for the value of the taper mill and overlay
Over/Under 0.2%	Removal of Non-Compliant Lift	Removal of Non-Compliant Lift

*Additional permit and fee required for extended warranty.

If an agency or Engineer is purchasing asphalt concrete directly from a commercial material supplier, the agency or Engineer will use Section 321.10, and specifically Table 321-3 as applicable, and Table 321-4 from Section 321.10, when determining the acceptance of the asphalt concrete with the material supplier.

Subsection 321.10.4 Asphalt Pavement Thickness: Delete the first paragraph in its entirety and replace with the following:

The method of acceptance for pavement thickness will be determined by the Engineer at any time. Coring may be required at the request of the Engineer by accepted methods based on inspection practices. If the thickness is determined to deviate from the specified thickness by more than ¼ inch, four inch cores will be obtained, at random as determined by the Engineer, for verification of the deficiency. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found at in Section 321.14. Each core location will be patched by the party responsible for the coring.

Subsection 321.10.4 Asphalt Pavement Thickness: Delete the last three sentences of subparagraph (2) in their entirety and replace with the following:

This corrective action will consist of application of a Type II Slurry Seal or Micro Seal coat, as determined by the Engineer. The Contractor may present proposed remedial measures in writing for the consideration of the Engineer. The Engineer will review and decide within 30 working days whether to accept the proposed remedial measures.

Subsection 321.10.4 Asphalt Pavement Thickness: Delete the last three sentences of subparagraph (3) in their entirety and replace with the following:

The Contractor may present other proposed remedial measures for the Engineer's consideration. The Engineer will review and decide within 30 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the proposed remedial measures, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

Subsection 321.10.4 Asphalt Pavement Thickness: Delete the fourth paragraph in its entirety and replace with the following:

If the pavement thickness deficiency is greater than 0.25 inches, but less the 0.50 inches, Table 321-6 will apply.

Subsection 321.10.4 Asphalt Pavement Thickness: Delete Table 321-6 in its entirety and replace with the following Table 321-6:

TABLE 321-6 ASPHALT PAVEMENT THICKNESS PAYMENT REDUCTION For Thickness Deficiency of More Than 0.25 inches and less than 0.50 inches		
Specified Pavement Thickness	**When Contracting Agency is Owner: Reduction in Payment**	**When Contracting Agency is Not Owner (Permitted Work): Reduction in Payment** ***See note below**
2.00 inches to 2.49 inches	25%	Extended Warranty for two years with posted bond for the value of the taper mill and overlay
2.50 inches to 2.99 inches	33%	Extended Warranty for three years with posted bond for the value of the taper mill and overlay
3.00 inches and over	50%	Extended Warranty for five years with posted bond for the value of the taper mill and overlay

*Additional permit and fee required for extended warranty.

Subsection 321.10.5.1 Pavement 1-1/2 Inches or Less in Nominal Thickness: Delete this Subsection in its entirety, including Table 321-7, and replace with the following:

Achieving the required compaction is the responsibility of the Contractor. The number and types of rollers is the Contractor's responsibility and shall be sufficient to meet these requirements.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Subsection 321.10.5.2 Pavement Greater than 1-1/2 Inches in Nominal Thickness: Delete this Subsection in its entirety, including Table 321-8, and replace with the following:

Achieving the required compaction is the responsibility of the Contractor. The number and types of rollers is the Contractor's responsibility and shall be sufficient to meet these requirements.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the

deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

The Contractor shall repair all of the core holes using high strength, no shrink grout. Sample cores shall follow the procedures outlined in Section 321.14. The frequency of testing will be determined by the City of Phoenix Materials Lab current minimum testing schedule, maintained by the City of Phoenix Materials Lab and available upon request.

Table 321-8

PAVEMENT DENSITY PAYMENT REDUCTION

Deviation Below Specification	**When Contracting Agency Owner: Reduction in Payment (Percent dollar per ton of asphalt concrete)**	**When Contracting Agency Not Owner (Permitted Work): *See note below**
94.0% to 94.9%	15%	Extended Warranty for three years with posted bond for the value of the taper mill and overlay
93.0% to 93.9%	20%	Extended Warranty for five years with posted bond for the value of the taper mill and overlay
Below 93.0%	Removal of Non-Compliant Lift	Removal of Non-Compliant Lift

*Additional permit and fee required for extended warranty.

Subsection 321.10.6 Engineering Analysis (EA): Delete this Subsection in its entirety, including Table 321-9:

Subsection 321.11 REFEREE: Delete the first paragraph in its entirety and replace with the following:

In the event the Contractor elects to question the acceptance test results for either asphalt binder content, thickness and density or a combination thereof for a deficient sample, the Contractor may make a written request for additional testing of that deficiency. The Engineer will select an independent and accredited materials lab from the City of Phoenix Contract Lab and Approved Laboratory List (referee lab) to perform the additional testing. The Contractor will pay for the cost of all referee testing as a lump sum. Included with the set of samples, the appropriate calibration samples will also be submitted to the referee lab. Only one set of samples for referee testing will be considered for the deficient sample. The results of these determinations will be binding on both the Contractor and the agency.

Subsection 321.11 REFEREE: Delete "in place air voids" in the first sentence of the second paragraph and replace with the following:

density

SECTION 324

PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

Subsection 324.3.3 Subgrade and Base Preparation: Delete "of Section 601" in the first sentence of the first paragraph.

Subsection 324.3.3 Subgrade and Base Preparation: Delete "extraneous" in the first sentence of the first paragraph and replace with the following:

deleterious

SECTION 325

PLACEMENT AND CONSTRUCTION OF ASPHALT-RUBBER ASPHALT CONCRETE

Subsection 325.8 QUALITY CONTROL: Add the following paragraphs after the first paragraph:

During production of the ARAC, the Contractor shall sample and test the mineral aggregate every 500 tons, with a minimum of one sample per day and shall test a calibration cold feed sample prior to the start-up on the first day of production. A calibrated nuclear oil content gauge will be furnished by the Contractor and 1 sample will be tested for each 350 tons produced, with a minimum of once per day. If at any time the oil content falls outside of the specified range, further testing will be performed until satisfactory results are obtained. An asphalt content test using an ignition furnace will be required once per each 500 tons of ARAC produced. A Marshall, maximum theoretical density and air voids of the laboratory compacted specimens will be determined once per shift.

Viscosities will be performed on the asphalt rubber blend, either at the asphalt production plant or rubber-blend plant, by plant quality control personnel for each blend prior to delivery or introduction to the final product. All viscosities shall be performed with a City Of Phoenix Materials Lab representative present.

Subsection 325.9.1 Acceptance Criteria: Delete this Subsection in its entirety and replace with the following:

During production, deviation from the specified mix design will not be allowed without prior approval from the City of Phoenix Materials Lab or their representatives.

TABLE 325-1		
ACCEPTANCE LIMITS FOR CITY OF PHOENIX ARAC MARSHALL MIX DESIGNS		
LOW AND HIGH VOLUME		
Modified D 1/2" ARAC		
Sieve Size	**Target**	**Tolerance**
3/4"	100	+/-0%
1/2"	97-100	+/-0%
3/8"	85	+/-7%
No. 4	35	+/-7%
No. 8	18	+/-5%
No. 30	8	+/-5%
No. 200	4	+/-2%
	High Volume	**Low Volume**
Oil Content %	8.0+/-.4	8.5+/-.4
Air Voids % (Recommended)	5.0+/-1.0	3.5+/-1.0
Density (On Grade)	95% Minimum (For All COP Mix Designs)	

Subsection 325.9.2 Gradation and Binder Content: Delete the title of this Subsection in its entirety and replace with the following:

Sampling and Testing

Subsection 325.9.2 Gradation and Binder Content: Delete the first and second paragraphs in their entirety, including Table 325-1, and replace with the following:

A City of Phoenix Materials Lab representative will be present at the asphalt supplier plant during production and will facilitate the inspections and sampling of the ARAC. Sampling for hot ARAC at the asphalt plant shall be 1 sample per 350 tons, with a minimum of 1 sample per day, sampled randomly. In lieu of a City of Phoenix Materials Lab representative at the plant, ARAC shall be sampled on grade at a frequency of 1 sample per 350 tons, with a minimum of 1 sample per day, sampled randomly. Tests used to determine acceptance will be performed by the City

of Phoenix Materials Lab or other lab designated by the Engineer. In either case the laboratory shall be accredited by the AASHTO Accreditation Program (AAP), for the tests being performed. Acceptance testing results will be furnished, by the City of Phoenix Materials Lab, to those who request test results within five working days of receipt of samples by the acceptance laboratory.

Each obtained sample will be taken to the City of Phoenix Materials Lab or other designated laboratories for acceptance testing. Each sample obtained for that day's production shall be tested for oil content utilizing a calibrated Nuclear Oil Content Gauge, according to AASHTO T287. If all the samples are within oil content tolerances, a random sample will be taken and further testing will be performed, this includes oil content with a calibrated ignition oven, gradation, Marshall, maximum theoretical density, and air voids. However, if there is a sample outside of the tolerances for oil content, each specific failing Nuclear Oil Content sample will be tested. The selected sample(s) will be tested for oil content, utilizing an ignition oven, and gradation. Testing for Marshall, maximum theoretical density, and air voids will be performed on each sample tested utilizing an ignition oven.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Subsection 325.9.2.1 Plant Based Sampling and Testing: Delete the Subsection number and Subsection title of this Subsection:

Subsection 325.9.2.1.1 Mineral Aggregate Gradation: Delete the Subsection number and replace it with the following:

325.9.2.1

Subsection 325.9.2.1.1 Mineral Aggregate Gradation: Delete the first sentence of the first paragraph in its entirety and replace with the following:

For each shift of ARAC production, at least one sample of mineral aggregate will be taken.

Subsection 325.9.2.1.1 Mineral Aggregate Gradation: Delete the last sentence of the first paragraph in its entirety:

Subsection 325.9.2.1.2 Binder Content: Delete the Subsection number and replace it with the following:

325.9.2.2

Subsection 325.9.2.1.2 Binder Content: Delete this Subsection in its entirety and replace with the following:

During production of ARAC, the Contractor shall maintain at the plant site a nuclear asphalt content gauge calibrated and operated in accordance with Arizona Test Method 421. The Contractor will utilize the same calibration samples that are provided to the City of Phoenix Materials Lab prior to the start of production. The City of Phoenix Materials Lab will store the nuclear oil content gauge calibration samples until the completion of the project. These samples may be utilized for recalibration if needed. Under the observation of the City of Phoenix Materials Lab or designated representatives, the Contractor shall determine the ARB content by means of the nuclear asphalt content gauge for each 350 tons, sampled randomly. The City of Phoenix Materials Lab or designated representative shall determine the time that the samples are taken. The Contractor's technicians performing the testing, including the calibration of

the nuclear gauge, shall meet the technician requirements given in the Arizona Department of Transportation (ADOT) System for the Evaluation of Testing Laboratories. The requirements may be obtained from ADOT Materials Group, 1221 North 21st Avenue, Phoenix, AZ 85009.

Production of ARAC shall cease immediately and the plant and/or the nuclear asphalt content gauges re-calibrated if any single test result varies by an amount greater than ± 0.40%, or the average of three consecutive test results varies by an amount greater than ± 0.40%, from the mix design target. Material that has already been produced may be used on the project if the single test value representative of that material varies by an amount from ± 0.40% to ± 0.60%, inclusive, from the mix design target. Material that has already been produced may not be used on the project if the single test value representative of that material varies by an amount greater than ± 0.61% from the mix design target unless, by retesting, the material is found to be acceptable.

Subsection 325.9.2.1.2 Binder Content: Add Table 325-2 to the end of this Subsection:

TABLE 325-2

ASPHALT RUBBER BINDER CONTENT PAYMENT REDUCTION (ARAC)

Deviation from that permitted (Acceptance to the tenth of a percent)	**When Contracting Agency is Owner: Payment Reduction (Percent dollar per ton asphalt concrete)**	**When Contracting Agency is Not Owner (Permit Work): Payment Reduction (Percent dollar per ton asphalt concrete) *See note below**
Over/Under 0.0 to 0.1%	10%	Extended Warranty for two years with posted bond for the value of the taper mill and overlay
Over/Under 0.1 to 0.2%	25%	Extended Warranty for five years with posted bond for the value of the taper mill and overlay
Over/Under 0.2%	Removal of Non-Compliant Lift	Removal of Non-Compliant Lift

*Additional permit and fee required for extended warranty

Subsection 325.9.2 Gradation and Binder Content: Delete Subsection 325.9.2.2 End Product Sampling and Testing in its entirety, including Table 325-2.

Subsection 325.9 ACCEPTANCE: Delete Subsection 325.9.3 Marshall Air Voids in its entirety, including Table 325-3.

Subsection 325.9 ACCEPTANCE: Delete Subsection 325.9.4 Requests for Referee Testing in its entirety.

Subsection 325.9.5 Density: Delete the Subsection number and replace with the following:

325.9.3

Subsection 325.9.5 Density: Add the following paragraphs after the first paragraph:

The required density shall be obtained using a rolling pattern established by the Contractor and approved by the Engineer. Compaction efforts should continue until the specific gravity of the compacted mixture is not less than 95.0% of the Marshall density, from the specimens composed of the same mixture, and compacted in the laboratory by the 75-blow method of AASHTO T-245.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Subsection 325.9.5.1 Equipment: Delete the Subsection number and replace with the following:

325.9.3.1

Subsection 325.9.5.2 Compaction Procedures: Delete the Subsection number and replace with the following:

325.9.3.2

Subsection 325.9.5.2.1 Pavement Lift Thickness 1 1/2 Inches or Less: Delete the Subsection number and replace with the following:

325.9.3.2.1

Subsection 325.9.5.2.1 Pavement Lift Thickness 1 1/2 Inches or Less: Delete this Subsection in its entirety and replace with the following:

Achieving the required compaction is the responsibility of the Contractor. The number and types of rollers is the Contractor's responsibility and shall be sufficient to meet these requirements.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Subsection 325.9.5.2.2 Pavement Lift Thickness Greater than 1 1/2 Inches: Delete the Subsection number and replace with the following:

325.9.3.2.2

Subsection 325.9.5.2.2 Pavement Lift Thickness Greater than 1 1/2 Inches: Delete this Subsection in its entirety and replace with the following:

Achieving the required compaction is the responsibility of the Contractor. The number and types of rollers is the Contractor's responsibility and shall be sufficient to meet these requirements. Initial breakdown rollers shall follow as closely behind the paving machine as practical. The roller(s) for final compaction shall follow as closely behind the initial breakdown as practical, such that a uniformly smooth surface is achieved.

Density on the grade shall be determined by the nuclear gauge. This gauge must be recently correlated with actual densities of asphalt cores. This correlation will be accomplished on the first days of paving. A four inch core will be

obtained at a minimum of 4 locations tested by nuclear method. The obtained cores will be tested for density by the laboratory performing the density testing. Adjustments will subsequently be made to the nuclear gauge according to the manufactures procedures. Correlation of the nuclear gauge will be performed for each mix or gauge utilized during compaction testing. If the required density is not achieved, then cores shall be taken to determine the density and the limits of the deficiency. One core in the deficient area and two additional cores 50 feet on either side of the deficient core location shall be taken. An average of the three values shall be obtained and used to determine the amount of the deficiency, if any.

Table 325-3

PAVEMENT DENSITY PAYMENT REDUCTION

Deviation Below Specification	**When Contracting Agency Owner: Reduction in Payment (Percent dollar per ton of asphalt concrete)**	**When Contracting Agency Not Owner (Permitted Work):** ***See note below**
94.0% to 94.9%	15%	Extended Warranty for three years with posted bond for the value of the taper mill and overlay
93.0% to 93.9%	20%	Extended Warranty for five years with posted bond for the value of the taper mill and overlay
Below 93.0%	Removal of Non-Compliant Lift	Removal of Non-Compliant Lift

*Additional permit and fee required for extended warranty.

Subsection 325.9.5.3 Compacting Miscellaneous Items and Surfaces: Delete the Subsection number and replace with the following:

325.9.3.3

Subsection 325.9 ACCEPTANCE: Delete Subsection 325.9.6 Engineering Analysis (EA) in its entirety, including Table 325-4:

Subsection 325.10 REFEREE: Delete the first paragraph in its entirety and replace with the following:

In the event the Contractor elects to question the acceptance test results for either asphalt binder content, thickness and density or a combination thereof for a deficient sample, the Contractor may make a written request for additional testing of that deficiency. The Engineer will select an independent and accredited materials lab from the City of Phoenix Contract Lab and Approved Laboratory List (referee lab) to perform the additional testing. The Contractor will pay for the cost of all referee testing as a lump sum. Included with the set of samples, the appropriate calibration samples will also be submitted to the referee lab. Only one set of samples for referee testing will be considered for the deficient sample. The results of these determinations will be binding on both the Contractor and the agency.

SECTION 329

TACK COAT

Subsection 329.1 DESCRIPTION: Add the following sentence to the end of this Subsection:

Tack coat shall be Type SS-1h per Section 713.

SECTION 336

PAVEMENT MATCHING AND SURFACING REPLACEMENT

Subsection 336.2.3 Temporary Pavement Replacement: Delete this Subsection in its entirety and replace with the following:

Temporary pavement replacement as required in Section 601 may be made using cold mix asphalt concrete. The cold mix shall be MC-70 or MC-250 liquid asphalt (6.0 +/- 0.4 percent) combined with the aggregate gradation shown below. Paving asphalt AC 2.5 (5.5 percent) may be substituted for the liquid asphalt. AC 2.5 must be heated for mixing.

TABLE 336-1

SIEVE SIZE	% PASSING	TOLERANCE
3/4"	97-100	+/- 7%
1/2"	88	+/- 7%
3/8"	78	+/- 7%
#4	60	+/- 7%
#8	47	+/- 5%
#30	25	+/- 5%
#200	.5	+/- 2%

Temporary pavement shall be used in lieu of immediate placement of single course permanent replacement or the first course of two course pavement replacement only on transverse lines such as spur connections to inlets, driveways, road crossings, etc., when required by the Engineer, by utilities or others who subcontract their permanent pavement replacement, under special prior arrangement; or for emergency conditions where it may be required by the Engineer. Temporary pavement replacement shall be placed during the same shift in which the backfill to be covered is completed.

The cold mix shall be placed in two inch increments and compacted with a roller that has not less than 60 psi. contact pressure. Each layer shall be compacted to 96 percent of the laboratory compacted density for like materials. On small areas where the use of the equipment specified above is impractical, the Engineer will approve the use of small vibrating rollers or vibrating plate type compactors provided comparable compaction is obtained. The surface of the temporary pavement shall be flush with the adjacent pavement.

Subsection 336.2.4.2 Adjustments: Delete the first and second paragraphs in their entirety and replace with the following:

The Contractor shall be responsible for adjusting to grade all new and existing manholes, valves, survey monuments, clean outs, etc., as directed by the Engineer. The Contractor shall remove all asphalt material and aggregate from this or prior work from all metal lids and covers encountered using a method approved by the Engineer. Debris will not be allowed to enter sanitary or storm drains. All loose material shall be removed from the excavation site and the interiors of structures prior to resetting the frames.

The Contractor shall coordinate with the various utility companies regarding the adjustment and inspection of their facilities. Each utility company's specifications shall be adhered to during the adjustment. The Contractor shall be responsible for meeting any additional requirements of the utility companies.

Manhole frames shall be adjusted according to the MAG Standard Detail 422, except that the concrete collar shall extend up to the finished grade. Water valve, survey monument, and sewer clean out frames shall be adjusted in accordance with the COP Standard Details P1270 and P1391.

Subsection 336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT: Delete the title of this Subsection in its entirety and replace with the following:

TYPES AND LOCATION OF BACKFILL AND SURFACING REPLACEMENT

SECTION 336

Subsection 336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT: Delete this Subsection in its entirety and replace with the following:

Normally, the type of pavement replacement and backfill required for the trench excavation will be noted on the plans or specified in the special provisions and construction will be in accordance with COP Standard Detail P-1200.

(A) Unless otherwise specified, the "T" top as shown in COP Standard Detail P-1200 will not be required within the City of Phoenix. If the project extends into another municipality/county the "T" top may be required for that portion of the project.

(B) When the trench excavation is not being accomplished in conjunction with a paving project, the following final backfill and pavement replacement requirements apply:

(1) When the trench is transverse (45 to 90 degrees to street centerline) the final backfill material required by COP Standard Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is required.

(2) When the trench is parallel or less than 45 degrees to the street centerline, the final backfill material required by COP Standard Detail P-1200 for Type A shall be used. Permanent trench pavement replacement is required.

(3) When the trench crosses a major street, collector street, or any other signalized intersection, the final backfill materials required by COP Standard Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is required.

(C) When the trench excavation is being accomplished in conjunction with a paving project the following final backfill and pavement replacement requirements apply:

(1) When the trench is transverse (45 to 90 degrees to street centerline) the final backfill material required by COP Standard Detail P-1200 for Type B will be used. Permanent pavement replacement is not required.

(2) When the trench is parallel or less than 45 degrees to the street centerline, the final backfill material required by COP Standard Detail P-1200 for Type A shall be used. Permanent trench pavement replacement is not required.

(3) When the trench crosses a major street, collector street, or any other signalized intersection, the final backfill material required by COP Standard Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is not required.

(4) Temporary pavement replacement (Subsection 336.2.3) will be required at intersections for traffic control and at existing partial paved areas when the total pavement is not scheduled for immediate removal and replacement. In addition to the above, the Engineer may require temporary pavement at any area where public safety and welfare warrants. This will be a non-pay item considered incidental to the project.

(5) If the excavation extends beyond the limits of the paving project, the Contractor shall provide permanent trench pavement replacement in accordance with paragraph (B) for this extension.

(D) When the trench excavation is made in Portland cement concrete pavement, COP Standard Detail P-1200 Type C final backfill and pavement replacement applies.

(E) When the condition of the existing pavement does not justify the use of COP Standard Detail P-1200, Type A or Type B final backfill, Type D final backfill and pavement replacement shall apply. Written approval from the Engineer shall be required.

(F) When the trench excavation is made in ABC or decomposed granite pavement, COP Standard Detail P-1200 Type E final backfill and pavement replacement shall apply.

(G) When the trench excavation is made in asphalt concrete pavement which has a soil cement base course, concrete treated base course or bituminous treated base course, the Contractor has the option of matching the existing pavement structure, including all courses, or replacing the pavement structure with equivalent full depth asphalt concrete pavement. For computing the equivalent asphalt concrete pavement required, 1 inch of asphalt concrete is equivalent to 3.25 inches of ABC or 1.4 inches of soil cement, cement treated base or bituminous treated base. After computations are completed, the equivalent depth will be rounded off to the next higher 1/2 inch, i.e., 6.15 inches computed would be rounded to 6.5 inches.

Subsection 336.4 MEASUREMENT: Delete the first paragraph in its entirety and replace with the following:

Measurement and payment for permanent pavement replacement will be by the square yard, for the thickness specified. In computing the pay quantity, the field measurement along the centerline of the trench and the trench pay width as listed in COP Supplement 601 shall be used. When the longitudinal trench is only partially in the pavement, adjustments in the pay width will be made by the Engineer.

There will be no separate measurement for pipe bedding, haunching, initial backfill, final backfill and compaction. The cost of the pipe bedding, haunching, initial backfill, final backfill and compaction shall be considered incidental to the cost of the pipe.

Unless otherwise included in a separate pay item in the proposal, removal of obstructions shown on the plans shall be considered incidental to the cost of the pipe.

There will be no separate measurement for subgrade preparation or asphalt pavement removal. Subgrade preparation and asphalt pavement removal shall be considered incidental to the cost of the permanent pavement and surface replacement.

Subsection 336.4 MEASUREMENT: Delete subparagraphs (A) and (B) in their entirety and replace with the following:

(A) In computing pay quantities for replacement Types A, B, C and E, pay widths will be based on the actual field measured width; however the boundaries of the measurement will not extend further than ½ the distance, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top of Pipe Greater Than O.D. of Barrel.

(B) In computing pay quantities for replacement Types B-"T" Top, and D, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than ½ the distance plus 12 inches, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top of Pipe Greater Than O.D. of Barrel. In all cases, the minimum pay width for replacement Types B-"T" Top and D shall be 48 inches.

Subsection 336.5 PAYMENT: Add the following paragraphs after the first paragraph:

Payment for bedding, haunching, initial backfill, final backfill and compaction shall be included in the cost of the pipe.

Payment for removal of obstructions shown on the plans, and not otherwise included in a separate pay item in the proposal, shall be included in the cost of the pipe.

Payment for subgrade preparation and asphalt pavement removal shall be included in the cost of the permanent pavement and surface replacement

SECTION 340

CONCRETE CURB, GUTTER, SIDEWALK, CURB RAMPS, DRIVEWAY AND ALLEY ENTRANCE

Subsection 340.2 MATERIALS: Delete the first paragraph in its entirety and replace with the following:

Concrete class shall be as specified on the plans, special provisions, and standard details. Concrete shall conform to the requirements of Section 725.

Subsection 340.2.1 Detectable Warnings: Delete this Subsection in its entirety and replace with the following:

Truncated dome dimensions and spacing for detectable warnings are defined by the Americans with Disabilities Act Accessibilities Guidelines (ADAAG) and, upon its adoption, the Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) for optimal detect-ability and public safety.

Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the ADAAG and, upon its adoption, the PROWAG. Detectable warning edges shall be sized and installed so that dome spacing is maintained across adjoining edges. Each dome shall have a minimum static friction of coefficient of 0.8 as tested per ASTM C1028.

Subsection 340.2.1.3 Attachment System: Delete this Subsection in its entirety and replace with the following:

Detectable warning tiles shall be back buttered with an approved, commercial-source, 5000 psi non-metallic non-shrink grout, and wet-set in freshly placed concrete to assure complete and continuous contact of the detectable warning tile bottom surface with the concrete as it cures, thus rendering the ramp a single monolithic structure.

Repair and replacement of existing detectable warning tiles shall conform to a method recommended by the manufacturer and approved by the Engineer.

Subsection 340.3.4 Joints: Delete the last sentence in the fourth paragraph.

Subsection 340.3.4.1 Expansion Joints: Add the following to the end of the first sentence in the third paragraph:

, between intersecting sidewalks and at adjacent portland cement concrete slabs and driveways

Subsection 340.3.4.2 Contraction Joints: Delete this Subsection in its entirety and replace with the following:

Unless otherwise specified, the large aggregate in contraction joints shall be separated to either side of the joint for a minimum depth equal to 25% of the concrete thickness; the minimum finished depth of contraction joints shall be 3/4 inch.

Unless an expansion joint is required, a contraction joint shall coincide with each form joint.

Sidewalk score marks shall not exceed 1/2 inch width, be at least 1/2 inch deep and shall be placed midway between contraction joints.

Subsection 340.5 MEASUREMENT: Delete the fourth paragraph in its entirety and replace with the following:

Detectable warnings shall be measured by the square foot.

Subsection 340.5 MEASUREMENT: Delete the last sentence in the fifth paragraph and replace with the following:

The surface area of the curb ramps shall be included in the measured quantity for sidewalk.

Subsection 340.6 PAYMENT: Delete this Subsection in its entirety and replace with the following:

Payment for the above named items will be made at the unit price bid in the proposal. Such payment shall include full compensation for the necessary removal of asphalt pavement, subgrade preparation and for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

Payment for detectable warnings will be made at the unit price bid in the proposal for detectable warning strip. Such payment shall include full compensation for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

SECTION 342

DECORATIVE PAVEMENT
CONCRETE PAVING STONE

Subsection 342.3.2 Aggregate Base Course: Delete this Subsection in its entirety and replace with the following:

The base course for decorative pavement shall consist of CLSM of a thickness specified in the plans or special provisions. 1-Sack CLSM shall be installed over subgrade soil compacted to a minimum of 95% density. The surface elevation of the CLSM shall be set to bring the 1-inch sand laying course, plus the thickness of the paving stones or bricks to the desired finished elevation of decorative pavement. The surface of the 1-Sack CLSM shall not vary more than +1/8 inch in 10 feet.

Subsection 342.4 MEASUREMENT AND PAYMENT: Delete this Subsection in its entirety and replace with the following:

Measurement for deco pavement shall be by the square foot. Payment for deco pavement shall be made at the unit bid price per square foot including subgrade preparation, 1-Sack CLSM, and sand base. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work.

SECTION 343

EXPOSED AGGREGATE PAVING

Subsection 343.3 CONSTRUCTION PROCEDURE: Add the following paragraph after the first paragraph:

Unless specified otherwise, the exposed aggregate may be seeded onto the surface of the finished slab and worked into the slab, or the exposed aggregate may be integral with the concrete mix.

Subsection 343.3 CONSTRUCTION PROCEDURE: Delete the second paragraph and replace with the following:

If the exposed aggregate is to be seeded, the slab surface shall be screeded and darbied; the aggregate placed onto the surface to the desired pattern; and the surface reworked to embed the aggregate into the slab and bring the cement paste over the aggregate. Cement paste shall completely surround the aggregate, leaving no holes or voids.

Subsection 343.3 CONSTRUCTION PROCEDURE: Delete the first sentence of the third paragraph and replace with the following:

A non-staining surface retarder shall be applied per the manufacturer's recommendations to provide an aggregate exposure of approximately 1/8".

Subsection 343.3 CONSTRUCTION PROCEDURE: Add the following paragraph to the end of this Subsection:

The Contractor shall utilize a method that will collect and contain the waste water, and shall properly dispose the waste water and concrete bi products generated by exposing the aggregate. The Contractor shall submit the proposed method in writing to the Engineer for review prior to start of the exposed aggregate paving.

Subsection 343.4 MEASUREMENT AND PAYMENT: Delete this Subsection in its entirety and replace with the following:

Measurement will be by the square foot. Payment will be made at the unit bid price in the proposal. This price shall include subgrade preparation, construction and disposal of the sample panel, waste water collection and disposal, concrete bi-product collection and disposal and be full compensation for all labor, material, tools, and equipment required to complete the work.

SECTION 345

ADJUSTING FRAMES, COVERS, VALVE BOXES, METER BOXES AND PULL BOXES

Delete the title of this SECTION in its entirety and replace with the following:

ADJUSTING MANHOLE FRAMES AND UTILITY BOXES

Delete SECTION 345 in its entirety and replace with the following:

345.1 GENERAL:

This specification covers the work required to adjust manhole frames and utility boxes to established grades including new and existing sewer manholes, storm drain manholes, other utility manholes, valve boxes, survey monument boxes, cleanout boxes, meter boxes and other utility boxes.

The Contractor shall furnish all labor, materials, and equipment necessary to adjust all frames and boxes as indicated on the plans or as designated by the Engineer.

The Contractor may elect to remove old frames, covers, and boxes and then install new frames and/or boxes in accordance with standard detail drawings at no additional cost to the Contracting Agency.

The Contractor shall be responsible for maintaining an accurate description and location of all items to be adjusted. The locations shall be referenced with map documentation by the use of swing ties or GPS locations. This information shall be supplied to the Engineer and utility owner(s) prior to taking any action that would hide or restrict access to the items to be adjusted.

Missing or defective frames, covers and boxes shall be reported to the Engineer in writing during the initial locating process to allow for timely replacement. The Engineer shall furnish replacements for missing or defective items, reported by the Contractor, at no cost. Replacements for missing or defective items not reported to the Engineer during the initial locating process shall be furnished by the Contractor at no additional cost to the Contracting Agency.

The Contractor shall submit a written adjustment plan and schedule to the Engineer for approval prior to commencing the work. The adjustment plan will specify the locations of the adjustments to be completed each day and specify the expected timeframes for the work.

The Contractor shall submit a written method for cleaning manhole covers and box lids to the Engineer for approval prior to commencing the work. Cleaning shall be completed prior to starting the adjustment work.

Adjustment of existing manhole frames and existing utility boxes within asphalt concrete paved areas shall commence AFTER the placement of the asphalt concrete pavement surface course.

Adjustment of new manhole frames and new utility boxes within asphalt concrete paved areas shall commence AFTER the placement of the asphalt concrete pavement surface course, slurry seal materials and/or microsurfacing materials.

The Contractor shall attempt to locate all unexposed water valve boxes within the project's limits shown on the quarter section maps and shall excavate to a maximum depth of 18 inches in the attempt. Unexposed water valve boxes found, shall be adjusted to grade. Excavations for water valve boxes not found shall be backfilled and compacted with base material conforming to Section 702.

345.1.1 Quarter Section Maps for Water and Sewer Lines: For City projects, the Contractor may obtain up to three sets of water line and sewer line quarter section maps for the project area, at no cost, after the contract is awarded and issued. The Contractor shall bring proof of contact award and a signed Service Request Form (SERF). For permit projects, the Contractor may purchase sets of water line and sewer line quarter section maps for the project area. Maps can be obtained from the Water Services Department Infrastructure Record Services counter on the 8th floor of City Hall, 200 West Washington Street.

345.1.2 Water Valve As-Built Drawings: Upon completion of the water valve box adjustments, the Contractor shall provide one complete, accurate and clearly legible set of marked-up as-built waterline quarter section maps to the Engineer. The Contractor shall mark the set with symbols consistent to those that appear on the quarter section maps. The Contractor shall color code all water valves on the maps as follows:

Blue - All valves shown on the Q.S. map found and adjusted.
Yellow - All valves shown on the Q.S. map but not found in the field.
Red - All valves not shown on the Q.S. maps but discovered in the field and adjusted. (Draw the valve symbol at the appropriate location on the map and provide the offset and location dimensions for these valves.)

345.2 LOWERING PROCEDURE:

If required, manholes and boxes located within the paved areas to be milled or reconstructed shall be lowered to an elevation that will allow required work to be accomplished without damaging these facilities. Care shall be taken to prevent entrance of any debris into these facilities.

All manhole frames, boxes and related items removed by the Contractor during the lowering process shall be maintained in a secure area, and the Contractor shall bear full responsibility for the material. Sewer manhole frames and covers shall be matched, kept together, and replaced onto their original manholes. Any hardware items lost or damaged by the Contractor shall be replaced in kind, at no additional cost to the Contracting Agency.

Preparation for Milling: Compacted asphalt concrete shall be temporarily placed over the steel plate, filling the excavated area. Excavated areas that will be subjected to traffic prior to placement of the Portland cement concrete collar ring shall be temporarily filled with Type D-1/2 asphalt concrete pavement and roller-compacted flush with the adjacent pavement. No separate measurement or payment shall be made for furnishing, placing and removing the temporary Type D-1/2 asphalt concrete pavement and the cost shall be incidental to the adjustment.

345.3 ADJUSTING MANHOLE FRAMES:

Manhole frames shall be adjusted to the elevations indicated on the plans, or established by the Engineer.

The Contractor shall loosen manhole frames in such a manner that existing facilities will not be disturbed or damaged. Debris shields shall be used to prevent debris from entering sanitary sewers or storm drains. All loose material and debris shall be removed from the excavation and the interiors of structures prior to resetting frames. If dirt or debris enters the sewer system the Contractor shall be responsible for cleaning the sewer system for a minimum of one reach (the next downstream structure from the contamination point.)

Frames shall be set to match finished grade or the elevations and slopes established by the Engineer. Manhole frames shall be firmly blocked and grouted (or mortared) in place with masonry or metal supports per MAG Standard Detail 422. Spaces between the frame and the facility shall be sealed to prevent any concrete from entering the manhole. A Portland cement concrete collar shall be placed around the frame at the required elevation and slope.

Adjustments of 24 inches or more shall require a top-of-manhole rebuild. For existing precast concrete manholes, the cone shall be removed, the manhole shaft extended with the necessary precast concrete manhole sections and the existing precast concrete cone re-installed. The Engineer shall review the condition of each exposed precast concrete cone and approve its reuse. Existing brick manholes shall be reconstructed with brick as necessary.

Existing sanitary sewer manholes adjusted to grade shall have corrosion coating or liner applied to the new portion to match the existing corrosion system in the manhole. No separate measurement or payment shall be made for the corrosion coating or liner and the cost shall be incidental to the adjustment.

Existing sanitary sewer manholes adjusted to grade shall be painted with insecticide, on the new portion, when applicable per Section 627. No separate measurement or payment shall be made for painting with insecticide and the cost shall be incidental to the adjustment.

All areas of pavement removed for adjustments that will be subjected to traffic prior to placement of the Portland cement concrete collar ring shall be temporarily filled with Type D-1/2 asphalt concrete pavement and roller-compacted flush with the adjacent pavement. No separate measurement or payment shall be made for furnishing, placing and removing the temporary Type D-1/2 asphalt concrete pavement and the cost shall be incidental to the adjustment.

345.4 ADJUSTING BOXES:

Boxes shall be adjusted to the elevations indicated on the plans, or established by the Engineer.

Boxes shall be adjusted per COP Standard Detail P1270. The top of the valve riser pipe shall be extended or shortened to conform to the dimension in COP Standard Detail P1270.

All areas of pavement removed for adjustments that will be subjected to traffic prior to placement of the Portland cement concrete collar ring shall be temporarily filled with Type D-1/2 asphalt concrete pavement and roller-compacted flush with the adjacent pavement. No separate measurement or payment shall be made for furnishing, placing and removing the temporary Type D-1/2 asphalt concrete pavement and the cost shall be incidental to the adjustment.

A debris cap with locating coil shall be installed in water valve boxes adjusted to grade in conformance with COP Standard Detail P1165. Prior to installation of the debris cap, valve risers shall be thoroughly cleaned to fully expose the operating nut. Undamaged existing debris caps with locating coils may be reinstalled. For permit projects, the Contractor shall furnish and install debris caps with locating coils. For City projects, the Contractor shall install City furnished debris caps with locating coils.

345.5 PORTLAND CEMENT CONCRETE COLLARS:

The Portland cement concrete collar around the frame or box shall be circular, and shall be a minimum of eight (8) inches thick, placed flush with the adjacent new pavement surface per COP Standard Detail P1270 and MAG Standard Detail 422. Concrete shall be a minimum of Class AA. All concrete shall be obtained from plants approved by the Engineer.

A single No. 4 rebar hoop shall be placed in each concrete collar. The hoop diameter shall be such that its placement is centered between the edge of the manhole frame or valve box, and the outer edge of the concrete collar, the depth of the hoop shall be centered in the thickness of the collar. Each concrete ring shall be scored radially at quarter-circle points. Score lines shall be ¼ -inch wide by ½ - inch deep. The concrete collar surface shall be medium broom finished.

Traffic shall not be allowed on the concrete collars until the concrete had reached a minimum compressive strength of 2500 psi on residential and 3000 psi on collector and major streets. On major streets the Contractor shall use “high-early” in the concrete mix, approved by the Engineer, to minimize delay in reopening the street(s) to traffic.

345.6 MEASUREMENT:

The quantities measured will be the actual number of existing frames adjusted and accepted.

The quantities measured will be the actual number of existing boxes of each type adjusted and accepted.

The quantities measured will be the actual number of attempts made to locate water valve boxes that are ultimately not found.

The quantities measured for rebuilding manhole tops will be the actual number of existing manhole tops rebuilt regardless of the utility served or the type of manhole construction.

No separate measurement will be made for adjusting frames of new manholes, adjusting new boxes or for adjusting frames of manholes requiring the rebuilding of the manhole top.

345.7 PAYMENT:

Payment for adjusting existing frames will be made at the contract unit price for each. Payment shall be compensation in full for all material, labor, equipment and incidentals necessary to complete the work.

Payment for adjusting existing boxes will be made at the contract unit price for each type. Payment shall be compensation in full for all material, labor, equipment and incidentals necessary to complete the work.

Payment for attempts to locate water valve boxes that are ultimately not found shall be made at the contingent contract unit price. Payment shall be compensation in full for all material, labor, equipment and incidentals necessary to complete the work, including excavation, backfill, compaction and permanent surface replacement.

Payment for top-of-manhole rebuilds will be made at the contract unit price for each. Payment shall be compensation in full for all material, labor, equipment and incidentals necessary to complete the work, including adjusting the frame to grade.

No separate payment will be made for adjusting frames of new manholes, or adjusting new boxes. The cost shall be considered incidental to the respective new manhole or box and shall be included in the contract unit price for the new manhole or box.

SECTION 350

REMOVAL OF EXISTING IMPROVEMENTS

Subsection 350.2 CONSTRUCTION METHODS: Delete the title of this Subsection in its entirety and replace with the following:

REMOVALS

Subsection 350.2.1 Utilities: Delete the title of this Subsection in its entirety and replace with the following:

General

Subsection 350.2.1 Utilities: Delete this Subsection in its entirety and replace with the following:

The removal of existing improvements shall be conducted in such a manner as not to injure active utilities or any portion of the improvement that is to remain in place.

Unless otherwise designated on the plans, sidewalks shall be removed to a distance required to maintain a 5% (1:20) maximum running slope for the replaced portion of sidewalk. All driveways shall be removed to a distance designated on the plans or as required by standard details.

Plans shall specify existing sidewalk removals for a distance that would provide a 5% (1:20) maximum running slope for the replaced portion of sidewalk unless the site's grade at that location makes it impractical to provide. All driveways shall be removed to a distance designated on the plans or as required by standard details.

Portland cement concrete pavements, driveways, driveway entrances, curbs and gutters and sidewalks designated on the plans for removal, or as necessary for other work, shall be saw-cut at specified match lines or the nearest existing construction joint, and removed.

Removal of trees, stumps, roots, rubbish, and other objectionable materials in the right-of-way shall be done in accordance with Section 201 or as a miscellaneous removal item when not included otherwise in the proposal.

The Engineer shall be notified when utilities are encountered that are not shown on the plans.

Subsection 350.2.2 Others: Delete the title of this Subsection in its entirety and replace with the following:

Disposal of Surplus Materials

Subsection 350.2.2 Others: Delete this Subsection in its entirety and replace with the following:

350.2.2.1 Inert Materials: Surplus and/or waste material not containing asbestos or lead may be incorporated into the project when permitted by the construction documents and the Engineer.

The location for off-site disposal shall be at the Contractor's option, subject to the following conditions:

1. When the City landfills are used, the Contractor shall pay the normal fee.

2. When private property within the City of Phoenix City Limits is used, the Contractor shall obtain written agreement from the property owner and submit a copy of the agreement to the Engineer prior to hauling and dumping. If the property is not a licensed disposal facility, the agreement shall specifically state that the property owner accepting the material shall be responsible for the cost and maintenance of all air quality and storm water requirements as may be necessary by laws and ordinances. All disposal and grading shall be in strict conformance with the City of Phoenix Grading and Drainage Ordinance and all other applicable regulations, laws and ordinances. The Contractor shall obtain and pay for the necessary permits. The Contracting Agency is hereby held harmless by the Contractor of all liability when private property is used for disposal.

3. When private property outside the City of Phoenix City Limits is used, the Contractor shall obtain written agreement from the property owner and submit a copy of the agreement to the Engineer prior to hauling and dumping. If the property is not a licensed disposal facility, the agreement shall specifically state that the property owner accepting the material shall be responsible for the cost and maintenance of all air quality and storm water requirements as may be necessary by laws and ordinances. All disposal and grading shall be in strict conformance with the jurisdiction's laws and ordinances and all other applicable regulations, laws and ordinances. The Contractor shall obtain and pay for the necessary permits. The Contracting Agency is hereby held harmless by the Contractor of all liability when private property is used for disposal.

No separate measurement or payment will be made for hauling and disposal. The cost shall be incidental to the work in the proposal.

350.2.2.2 Non-Inert Materials: Surplus and/or waste material containing asbestos and/or lead in any form shall not be incorporated into the project unless formally accepted in writing by the Engineer prior to its incorporation.

Disposal of materials containing asbestos and/or lead shall be in conformance with all regulations, laws and ordinances.

No separate measurement or payment will be made for hauling and disposal of material containing asbestos and/or lead. The cost shall be incidental to the work in the proposal.

Subsection 350.2.3 Backfill and Disposal: Delete the title of this Subsection in its entirety and replace with the following:

Removal of Pipe

Subsection 350.2.3 Backfill and Disposal: Delete this Subsection in its entirety and replace with the following:

Pipe designated on the plans for removal shall include excavation; removal and disposal of paving, obstructions and encasement; removal, preparation and proper disposal of pipe and debris; and backfill and compaction per Section 336 and Section 601. Measurement and payment shall be by the linear foot.

Subsection 350.2 CONSTRUCTION METHODS: Add the following Subsections:

350.2.4 Removal of Structures:

Structures designated on the plans for removal shall include the removal of irrigation structures and any other structures noted on the plans and not included otherwise in the proposal. Removal of structures shall include excavation; removal and disposal of paving, obstructions and controlled low strength material fill; removal, preparation and proper disposal of the structure and debris; and backfill and compaction per Section 336 and Section 601. Measurement and payment shall be by the lump sum.

350.2.5 Removal of Structural Concrete:

Structural concrete designated on the plans for removal shall include the removal of sidewalk scuppers and any other reinforced concrete and masonry noted on the plans and not included otherwise in the proposal. Removal of structural concrete shall include excavation; removal and disposal of paving, obstructions and controlled low strength material fill; removal, preparation and proper disposal of the structural concrete and debris; and backfill and compaction per Section 336 and Section 601.

Measurement and payment shall be by the cubic yard of structural concrete removed.

350.2.6 Removal of Asphalt Outside of the Roadway Prism:

Roadway prism is defined as the area within a roadway between the lip-of-gutter and the opposing lip-of-gutter or edge of pavement where gutters are not present.

Asphalt removal, in areas to be covered by new sidewalk, driveway, driveway entrance, curb and gutter and other improvements that include subgrade preparation, shall be incidental to those improvements. Other asphalt areas shall be included as miscellaneous removal, except where otherwise specified as incidental to an item by its specifications.

350.2.7 Removal, Salvage and Disposal of Street Lights:

Street lights designated on the plans for removal shall include the removal of the light pole, arm and luminaire; removal and disposal of the junction box and conduit; removal and proper disposal of landscaping, paving, obstructions, concrete or other foundation fill material; necessary excavation; removal and proper disposal of concrete, or other foundation material, attached to the street light; proper disposal of other debris; backfill and compaction: and any restoration necessary and not included otherwise in the proposal with other work.

Payment shall be made for each light pole removed.

350.2.8 Abandonment and Removal of Utilities:

The removal of existing improvements shall be conducted in such a manner as not to injure active utilities or any portion of the improvement that is to remain in place.

A utility may be abandoned in place below a new major structure that is part of the work only if approved by the City and solidly filled with approved grout using methods approved by the City. All abandoned utilities to remain and the approved abandonment method shall be noted on the record drawings.

Utilities to be removed by the Contractor shall be disconnected and taken out in accordance with the requirements of the utility owner to the limits shown on the plans. Utility removal shall not be performed until a release has been obtained from the utility stating that their respective service connection and appurtenant equipment have been disconnected, removed or sealed and plugged in a safe manner.

The Engineer shall be notified when utilities are encountered that are not shown on the plans.

Subsection 350.3 MISCELLANEOUS REMOVAL AND OTHER WORK: Delete the first paragraph in its entirety and replace with the following:

Miscellaneous removal and other work shall include, but not limited to, the following and as designated on the plans and not otherwise included in the proposal with other work. Existing improvements shown on the plans that may need removal, but are not specifically designated on the plans for removal, and are not included otherwise in the proposal with other work, shall be removed and restored as miscellaneous removal. Payment shall be by the lump sum.

Subsection 350.3 MISCELLANEOUS REMOVAL AND OTHER WORK: Add the following paragraphs to this Subsection:

(I) Landscape Irrigation System Removal and Restoration: The Contractor shall remove the conflicting portion of all underground landscape irrigation systems that are within the right of way and/or easements that conflict with new work or any portion which may remain under proposed curb, gutter or sidewalk regardless of whether shown or not shown on the plans.

The Contractor shall restore all affected landscape irrigation systems to an operational condition at least as good as existed prior to removal. Bubbler and/or sprinkler heads shall be installed behind the new sidewalk in areas where watering was accomplished by landscape irrigation heads which were removed. Specifically, all areas

behind the new sidewalk which were watered by the existing irrigation system before relocation shall be watered after relocation without any accumulation of water on the sidewalk or pavement.

The Contractor shall have the option of either providing all new materials or salvaging and reusing existing materials. Either new or salvaged irrigation heads shall be installed in a new location, as close as practical to the existing location. Either new or salvaged pipe shall be installed and all the necessary connections made to put the system back into operation.

In the event it is not feasible to reinstall removed irrigation heads, the Contractor shall then make all the necessary connections to make the remaining portion of the system operational. Irrigation heads and pipe not reinstalled shall be given to the owner.

The Contractor shall furnish all new irrigation heads, new pipe and fittings, and pipe compound necessary to supplement salvaged materials.

The Contractor shall notify the affected property owners, at least fourteen days prior to removing and replacing underground landscape irrigation systems because some of the owners may desire to do this work themselves.

(J) Lawn Restoration: When any construction by the Contractor encroaches into an improved yard, in or outside the right-of-way, the Contractor shall level any disturbed ground, resod all grass covered areas, and restore rock-covered areas with material to match existing in type and quality.

(K) Precast Safety Curbs Inside Right-of-Way: Existing precast concrete safety curbs inside the right-of-way and approximately parallel to the new curb line shall be reset by the Contractor directly opposite their existing location, with the back edge on the right-of-way line.

All other precast concrete safety cubs inside the right-of-way shall be salvaged and stockpiled by the Contractor at a location on the adjacent property agreeable to the property owner.

(L) Encroachments Inside the Right-of-Way: The Contractor shall notify property owners, who have encroaching walls, fences, planters, plants, bushes, small diameter trees, and other improvements in the right-of-way that interfere with construction, at least fourteen days before clearing is necessary.

Any encroaching items, not timely removed by the owner, shall be removed and disposed of by the Contractor in accordance with the Contract Documents.

(M) Restoration of Temporary Construction Easements: The Contractor shall leave the easements in as good a condition or better after work is completed. Special care must be taken to replace any asphalt, trees, sprinklers, lights, walls, fences, etc., which were disturbed as a result of construction. Where grass is located within the easement such as a lawn, the Contractor shall remove the sod which would be in the path of any construction, store it, keep it moist, an replace it immediately after construction is complete.

(N) Any removals called for on the Traffic Signal Plans and not otherwise included in a separate pay item.

(O) Any and all items not specifically set forth as a separate pay item.

Subsection 350.4 PAYMENT: Add the following to the end of the sentence in this Subsection:

to the satisfaction of the Engineer.

PART 400
RIGHT-OF-WAY AND TRAFFIC CONTROL

SECTION 401

TRAFFIC CONTROL

Delete the title of this SECTION in its entirety and replace with the following:

TEMPORARY TRAFFIC CONTROL

Delete SECTION 401 in its entirety and replace with the following:

401.1 DESCRIPTION:

Temporary traffic control shall consist of traffic control devices and flagger or pilot cars deployed to protect and guide all modes of traffic (motor vehicle, bicycle, and pedestrian) within the construction work zone areas.

The Manual on Uniform Traffic Control Devices 2009 (MUTCD) with Arizona Supplements, and the City of Phoenix 2007 Traffic Barricade Manual (TBM), or the most recent adopted editions, take precedence over Section 401.

401.2 TRAFFIC CONTROL DEVICES:

The Contractor may be required to submit a temporary traffic control plan to the Engineer to obtain a Temporary Restriction and Closure System permit (TRACS) as specified in Chapter 2 of the TBM.

The Contractor shall furnish, erect and maintain all temporary traffic control in conformance with the TRACS permit and as approved by the Engineer.

Traffic control devices shall consist of providing, erecting, and maintaining the necessary and adequate devices for the protection of the work, the workers and the public.

(A) Temporary traffic control devices shall be used to guide all traffic modes through the construction area. They include, but are not limited to, traffic cones to channelize traffic, portable barricades for warning, water-filled barriers for pedestrian separation, vertical panel channelizing devices to divert traffic, concrete barriers to protect traffic from hazards, and lighting devices between the hours of sunset and sunrise.

(B) Advance warning devices shall be used to alert all modes of traffic to the construction area. They include diamond-shaped signs, flags, and flasher-type high level warning devices mounted 8 feet above the roadway.

401.3 FLAGGERS AND PILOT CARS:

Flagging of traffic or pilot cars shall consist of providing a sufficient number of properly trained flaggers (with proper signing), uniformed off-duty law enforcement officers or pilot cars to expedite the safe passage of traffic. Off-duty law enforcement officers shall be used at signalized intersections when one through lane is maintained in any direction.

401.4 TRAFFIC CONTROL MEASURES:

The application of all traffic control measures shall be based primarily upon the conditions existing at the time that such measures are deemed necessary. Prior to the start of any work that would interrupt the normal flow of traffic; sufficient and adequate devices and measures shall be provided and erected in compliance with the TRACS permit. The Engineer reserves the right to require additional traffic control measures in any specific instance. These devices shall be immediately removed when no longer needed.

401.5 GENERAL TRAFFIC REGULATION:

Requests for a TRACS permit shall be submitted to the Right of Way Management Agent (RMP Agent) through the Engineer or the Permit Inspector on permit work. Unless directed otherwise by the Engineer or RMP office, an advance

notice of 72 hours for complete closures on major and collector streets; 48 hours for partial closures on major and collector streets; and 24 hours for complete or partial closures on local streets and alleys is required.

A minimum 11 foot clear traffic lane shall be required for a safe motor vehicle operating speed of 35 miles per hour.

For the purpose of temporary traffic control, an intersection is defined as all of the area within the right-of-way of the intersecting streets plus 300 feet beyond the prolongation of the intersecting right-of-way line on each street.

Except during emergency conditions, or otherwise provided for in the special provisions or permit, or approved by the RMP Agent, the following are minimum traffic control requirements for all traffic restrictions:

(A) During WEEKDAY PEAK TRAFFIC HOURS between 6:00 a.m. and 8:30 a.m., and between 4:00 p.m. and 7:00 p.m., TRAFFIC RESTRICTIONS ARE NOT PERMITTED on Major or Collector streets.

(B) During WEEKDAY PEAK TRAFFIC HOURS between 6:00 a.m. and 9:00 a.m., and between 4:00 p.m. and 7:00 p.m., TRAFFIC RESTRICTIONS ARE NOT PERMITTED on streets with reversible lanes.

(C) During WEEKDAY OFF PEAK TRAFFIC HOURS, when one traffic lane is restricted at a multiple lane signalized intersection with left-turn lanes, the left-turn lanes may be used to provide a minimum of four through traffic lanes (two lanes for each direction).

(D) Except as provided for in items A and C above, a minimum of two traffic lanes (one for each direction) shall be maintained on all Major and Collector streets through the week nights and through the weekends.

(E) A minimum of two traffic lanes in the same direction shall be maintained on "one way" streets at all times.

(F) A traffic lane shall not be considered as satisfactorily open to traffic unless it is paved with hot mix or cold mix asphalt.

(G) The Contractor, utility or other agency shall provide a City of Phoenix approved uniformed off-duty police officer during OFF PEAK traffic hours to assist with traffic control at multiple lane signalized intersections whenever traffic is reduced to one through lane in any one direction. This requirement may be waived by the Engineer when conditions, in his opinion, do not require it.

(H) Local streets may be closed except for local access, when construction or maintenance requires.

(I) Local access shall be maintained to all properties on all streets (Major, Collector and Local) at all possible times. When local access cannot be maintained, the Contractor, utility or other agency shall notify the affected property owner, resident, or tenant, a minimum of 72 hours in advance and restore access as soon as possible. Unless specifically authorized by the Engineer, access to businesses will not be closed during business hours.

(J) All Contractors doing work in the right-of-way shall promptly remove all traffic control devices when the closure or lane restrictions are no longer in effect. When no construction work is being done, all advance warning signs shall be turned so that they are not readable by drivers. All traffic control devices may be temporarily stored in cluster method behind the sidewalk for short periods of time. All temporary traffic control devices shall be collected and removed from the right of way within 24 hours of the expiration of the TRACS permit.

(K) Special Events: If there are special events scheduled to take place during the construction of any project, the Contractor shall coordinate the construction schedule with these events.

401.6 EXISTING TRAFFIC CONTROL DEVICES:

During construction and maintenance operations it is important that all existing traffic control devices be kept compatible with the traffic restrictions imposed. This includes existing signs, parking meters, traffic signals and pavement markings. Some devices will remain applicable to traffic and must be maintained. Other devices must be covered, relocated or removed. Requirements for each group of devices are detailed in this section.

(A) Traffic Signs:

The Contractor, utility or other agency shall maintain all existing STOP, YIELD and street name signs, verifying they are erect, clean and in full view of the intended traffic at all times. If these signs interfere with construction, the Contractor, utility or other agency shall temporarily relocate the signs to permit construction, but the devices must be kept in full view of the intended traffic. Portable signs shall be used to supplement the relocated permanent signs.

Other signs still applicable shall also be maintained erect, clean and in full view of the intended traffic by the Contractor, utility or other agency at all times. Existing signs, not applicable, shall be removed by the Contractor, utility or other agency without damage, and salvaged on the adjacent property lines. The Streets Transportation Department shall be notified of all removals.

(B) Traffic Signals:

The Contractor, utility or other agency shall maintain all existing traffic signal equipment except in-pavement vehicle detector sensing devices, fully operational in the existing locations and in full view of the intended traffic at all times unless otherwise specified in the City of Phoenix Traffic Barricade Manual or in the Project or Permit Plans or specifications. All traffic signal work performed by a Contractor shall be in accordance with Section 404.

The Contractor, utility or other agency shall notify the Traffic Signal Shop (602-262- 6021) 48 hours prior to the start of construction in the vicinity of signalized intersections. The Traffic Signal Shop will, in accordance with the Arizona Blue Stake regulations, provide the approximate locations of all underground traffic signal equipment (conduits, junction boxes, vehicle detector sensing devices, etc.). The exact location of this underground equipment shall be determined by the Contractor, utility or other agency prior to any excavating operations.

The Contractor, utility or other agency shall exercise care to prevent damage to all existing traffic signal equipment. Should damage occur, The Traffic Signal Shop will make the necessary temporary repairs to immediately restore traffic signal operation.

Responsibility for permanent repair or replacement of damaged equipment shall be as follows:

The cost for the permanent repair or replacement shall be at the Contractor's, utilities', or other agency's expense, when the approximate location of the damaged equipment has been made known to them. They will also be charged by the Traffic Signal Shop for any temporary or permanent repairs made by City of Phoenix forces. Permanent repairs or replacements made by a Contractor shall be approved in advance by the Traffic Signal Shop Supervisor or his or her designee and constructed in accordance with Section 404.

All permanent repairs or replacement shall be at the City's expense, when the approximate location of the damaged equipment has not been made known to the Contractor, utility or other agency; provided they have complied with the notification requirements of this section and requested underground locations.

When the existing traffic signal equipment cannot be maintained as provided for in the Arizona Supplemented MUTCD or in the Project or Permit Plans or specifications, the Contractor, utility or other agency shall, at their expense, have the Traffic Signal Shop or a qualified Contractor (as specified in Section 404) relocate said equipment to a temporary location and/or provide additional temporary equipment, such that all functions and indications of the existing signal equipment, except in-pavement

vehicle detector sensing devices, are operational and in full view of the intended traffic at all times. The location and type of all temporary signal equipment shall be approved by the Streets Transportation Dept. All signal equipment relocations and/or installations of temporary signal equipment shall be coordinated by the Contractor, utility or other agency with the approval of the Traffic Signal Engineer. 72 hours advance notice is required.

When temporary equipment or new equipment is installed to replace existing equipment, the temporary or new equipment shall be fully operational before the existing equipment is removed.

The Contractor, utility or other agency shall restore all traffic signal control equipment to the original locations or new locations, if so specified, as soon as possible after all work in the immediate area is completed.

(C) Signalized Intersection Requirements:

The Contractor shall notify the Engineer and the Traffic Signal Shop (262-6021) at least 72 hours prior to the start of any construction in the vicinity of a signalized intersection where traffic signals may be affected.

The Contractor shall provide the Engineer and the Traffic Signal Shop a written schedule indicating days, times and specific locations where traffic signals will be interrupted or modified. **When work has been completed, the Contractor shall immediately notify the Traffic Signal Shop.**

The Contractor shall maintain the "cone of vision" for traffic signal heads in accordance with the Arizona Supplemented 2009 MUTCD Part 4 Section 4D.13 (see figure 4D-4 on page 463) or most current version at all signalized intersections for full view of intended traffic and signal indication. Motorists driving through signalized intersections in a construction zone must always be able to see at least two (2) traffic signal heads within the "cone of vision". If the traffic control setup cannot provide the required "cone of vision", the Contractor shall contact the Engineer and the Traffic Signal Shop at (602) 262- 6021 for instructions.

(D) Pavement Markings:

Existing pavement markings that conflict with the vehicle path indicated by barricades and channelization and cause driver confusion shall be removed or obliterated by the Contractor, utility or other agency as directed by the Streets Transportation Dept.

Generally, pavement marking removal or obliteration is only required on long term construction projects such as detours for bridge construction or similar fixed location projects. However, removal or obliteration of existing pavement markings may be required at any location when visual inspection and/or accident history shows driver confusion caused by existing pavement markings.

Proper pavement marking removal or obliteration leaves a minimum of pavement scars and completely removes existing markings. Painting over existing markings with black paint or asphalt material is not satisfactory except in emergency conditions awaiting more permanent removal to follow immediately.

Final Signing and Striping of Roadway: The Contractor, through the City project inspector, shall notify the Street Transportation Department, Traffic Operations Division (602) 262-6456, at least thirty (30) days prior to desired completion of final roadway signing and lane striping.

(E) Parking Meters:

The Contractor, utility or other agency shall maintain all metered parking spaces open for parking at all possible times. When parking meters must be hooded or removed, the Contractor, utility or other agency shall notify the Streets Transportation Dept. two business days in advance.

All parking meter post removals, relocations or installations shall be done by the Contractor, utility or other agency as provided for in the plans, or as directed by the Parking Meter Supervisor. The Street Transportation Department will provide the parking meter posts.

(F) Coordination with Other Agency Projects:

The Contractor shall coordinate and schedule work to minimize disruption or conflicts with any other Agency projects.

Any work that may affect the project shall be coordinated with the appropriate Agency contact at least fourteen (14) days in advance.

(G) Pedestrian Access Requirements:

The Contractor shall ensure that all sidewalks on this project remain in compliance with the Americans with Disabilities Accessibilities Guidelines (ADAAG) and, upon its adoption, the Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). All open pedestrian walkway areas, paved or unpaved, shall be maintained and safely usable at all times. Such measures as backfilling or ramping to existing sidewalks or providing alternate sidewalk areas adjacent to existing sidewalks may be used. In high pedestrian use areas, the Engineer may request temporary hard-surface walkways, such as compacted stabilized decomposed granite, compacted cold-mix asphalt, CSLM or hot-mix asphalt.

In addition, diversions shall conform to Figure 401-1.

City of Phoenix
STREET TRANSPORTATION DEPARTMENT

June 25, 2013

Dear City of Phoenix **Traffic Barricade Manual (TBM)** User:

RE: POLICY PERTAINING TO SIDEWALK BYPASS DESIGN AND IMPLEMENTATION OF 2009 MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) RULES

Effective July 1, 2013, updated regulations specific to pedestrian diversions in Part 6 of the 2009 MUTCD will be phased into general use by the City of Phoenix, Street Transportation Department. These regulations change the required devices utilized for pedestrian diversions as well as how diversions are installed and maintained.

This addendum specifically addresses two portions of the existing TBM in Chapter 3 pertaining to pedestrian safety and Chapter 6 pertaining to traffic control devices.

In Chapter 3, "Pedestrian Safety and Service Considerations" on page 22 (Figure 1) of the existing TBM, both "In-Street" and "Out of Street" diagrams, shall be modified as follows:

IN-STREET DIVERSIONS

1) A continuous barrier shall be installed on the outside portion of the temporary pathway nearest traffic. Vertical panels with caution tape, pedestrian fencing, cones, and any other devices will no longer be accepted, except in cases where a designated spotter is utilized (SEE EXCEPTION BELOW). "Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision. The bottom of the bottom surface shall be no higher than 2" above the ground, and the top of the top surface shall be no lower than 32" above the ground. (Refer to Section 6F.63.04 and .05, 2009 MUTCD)
2) The inner barrier of the constructed pathway may consist of any channelizing device accepted by the City of Phoenix.
3) Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier shall be placed across the full width of the closed sidewalk; this barrier shall have the same dimensions and detectability as stated above. (Refer to 6D.02.03,2009 MUTCD)
4) EXCEPTION: If maintaining an alternate pedestrian route is NOT feasible during the project, a spotter may be assigned the responsibility to assist pedestrians with disabilities through the project limits. (6D.01.05, 2009 MUTCD)
5) When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility. (Refer to 6H.28.01, 2009 MUTCD)

OUT-OF-STREET DIVERSIONS

1) A continuous detectable barrier shall be provided throughout the length of the affected facility. "Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision. The bottom of the bottom surface shall be no higher than 2" above the ground, and the top of the top surface shall be no lower than 32" above the ground. (Refer to Section 6F.63.04 and .05, 2009 MUTCD)
2) Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier shall be placed across the full width of the closed sidewalk; this barrier shall have the same dimensions and detectability as stated above. (Refer to 6D.02.03,2009 MUTCD)

FIGURE 401-1 ADDENDUM TO 2009 TRAFFIC BARRICADE MANUAL

3) EXCEPTION: If maintaining an alternate pedestrian route is NOT feasible during the project, a spotter may be assigned the responsibility to assist pedestrians with disabilities through the project limits. (6D.01.05, 2009 MUTCD)
4) The detectable barrier should be placed nearest to the work zone.

WHAT THIS MEANS TO CONTRACTORS, CITY CREWS, BARRICADE COMPANIES AND OTHER RIGHT-OF-WAY USERS

Contractors will have the option of selecting from a number of new products that will fulfill the specifications for the creation of detectable pathways. When a spotter is not utilized, the outer barrier closest to traffic must have detectable edging. The inner barrier of an on-street pathway does not have to comply with this rule at this time. There are no current changes to ramps, ramp elevation ratios, or signage.

When selecting an out-of-street pathway, the barrier nearest the work area should have the detectable edge, while the other side of the pathway can be constructed of acceptable devices.

Thank you again for your partnership with the City in maintaining mobility safety for all work activities in Phoenix right-of-way. If you have any questions, please contact John Morgan at 602-262-4483 or Luiz Moreno at 602-262-6565.

Sincerely,

Thomas L. Godbee, P.E.
Deputy Street Transportation Director

P: RMP Working Documents\TBM Addendums\Sidewalk Bypass Addendum 6-25-2013

C: Luiz Moreno
John Morgan
Lorena Hall
Rick Florian

FIGURE 401-1 ADDENDUM TO 2009 TRAFFIC BARRICADE MANUAL, CONT

401.7 HOLIDAY SEASON TRAFFIC:

During the holiday season from Thanksgiving Day through the 1st of January, it is imperative that traffic restrictions be minimized or eliminated to the greatest extent possible.

On all major streets, adjacent to, or serving as primary access to large regional shopping centers, work that restricts traffic should be minimized. In addition, work within the entire Central Phoenix area should be curtailed.

Careful planning of work schedules to avoid operations that restrict traffic flow can do much to benefit the traveling public and decrease traffic accidents.

401.8 FAILURE TO PROVIDE ADEQUATE MAINTENANCE OF TRAFFIC:

If the Contractor fails to provide adequate temporary traffic control, the Engineer will have the work performed by other sources. The cost of having this work performed by other sources will be computed in accordance with Subsection 401.11. The total cost will be deducted from monies due to the Contractor.

401.9 TRAFFIC BARRICADE MANUAL - VIOLATIONS; CIVIL SANCTIONS:

401.9.1 Authority and administration: The City Manager and the Director of the Police Department are authorized to issue notices for violating the Traffic Barricade Manual and may take those measures necessary to promote, preserve and protect public health, safety and welfare within the public right-of-way.

401.9.2 Violations of Traffic Barricade Manual, Civil Sanctions: The following violations of the Traffic Barricade Manual may result in a Civil Sanction. The amount of the Civil Sanction listed is the minimum amount per day for a violation prior to the commencement of a Civil Action."

SUMMARY OF VIOLATIONS AND PENALTIES:

VIOLATION	DESCRIPTION	CIVIL SANCTION
#1	Creates imminent risk of injury to the public within ROW.	$1,500
#2	Restricting ROW without proper certification or TRACS Permit.	$1,000
#3	Restricting traffic during peak hours as described in the TBM without authorization.	$1,000
#4	Failing to correct a violation, as listed, within the time period stated on the warning notice.	$1,000
#5	Restricting traffic at signal with no work occurring.	$1,000
#6	Closing sidewalk improperly, or without proper certification, or TRACS permit.	$500
#7	Violating the restrictions, limits, times, and locations of the TRACS permit.	$500
#8	Missing or improper use of advance warning signs.	$500

#9	Missing or improper use barricades/channelizing devices.	$500
#10	Leaving advance warning signs facing traffic after restriction has been removed – per one traffic direction.	$250
#11	Leaving TTC devices in the ROW 24-hours after TRACS permit expires, unless a request for a permit extension is received prior to the expiration of permit.	$250
#12	Use of "unacceptable" quality traffic control devices as described in the TBM.	$250
#13	Rendering a bus stop inaccessible without relocating it or making other accommodations.	$250

401.10 MEASUREMENT:

Off-duty law enforcement officers will be measured by the hour for each individual, including vehicle and equipment, required to perform traffic control. Minimum payment shall be three hours on any separate call out.

401.11 PAYMENT:

Payment for complete temporary traffic control will be made at the unit bid price in the proposal item TRAFFIC CONTROL DEVICES.

Payment for uniformed off-duty law enforcement officer will be made at the unit bid price in the proposal item ALLOWANCE FOR UNIFORMED, OFF-DUTY LAW ENFORCEMENT OFFICER. If the officer is utilized in excess of 8 hours in any calendar day or in excess of 40 hours in any calendar work week, payment shall be at the rate of 1-1/2 times the proposal price for all hours worked in excess in either of the above time periods.

SECTION 404

TRAFFIC SIGNALS

Add SECTION 404 in its entirety:

SECTION 404

TRAFFIC SIGNALS

404.1 GENERAL:

The following specifications will outline the obligations of the private developer and /or private contractor constructing or relocating City of Phoenix traffic signal equipment. This includes private contractors working for ADOT, other agencies, or other departments within the City of Phoenix. **Any deviations to these work responsibilities will need to be discussed with the City of Phoenix Traffic Engineering Supervisor (602) 262-4690 or authorized designee.** The term Engineer for this section shall mean Traffic Engineering Supervisor or any of his or her authorized designees.

These specifications and approved, signed traffic signal plans are in addition to other applicable specifications and policies of the City of Phoenix, Maricopa Association of Governments and the Arizona Department of Transportation.

The Contractor shall notify the City of Phoenix, Traffic Signal Shop (602) 262-6021 a minimum of fourteen (14) calendar days prior to beginning any traffic signal work.

404.2 PREPARATION:

Before starting any traffic signal work under the project, **read and review** all project documents and general notes to make certain understanding and agreement is clear with all conditions stated.

Be sure that the traffic signal plans are the final approved plans. Final approved plans shall have the signatures of City of Phoenix, Street Transportation Department officials. An approved set of plan documents shall be present on the job site during construction.

Work to be done shall mean all labor, materials, equipment and other incidentals necessary to complete the work in accordance with the project plans. In the event an error or omission is discovered, it should be brought to the attention of the Engineer immediately. The Engineer shall make such corrections and interpretations as may be deemed necessary.

The Engineer also has the authority to suspend traffic signal work to correct conditions unsafe for the workers or the general public, for failure to carry out provisions of the contract and/or to carry out orders.

The Contractor shall note that approval from the Engineer is required before ordering or installing any material that is to be used on the project. A list of materials and equipment shall be submitted that contains all items to be supplied on the project by the Contractor. The City of Phoenix reserves the right to reject an incomplete or unclear submittal. Contractor supplied materials will be listed on the signal plans. The Engineer reserves the right to accept a partial list prior to full submission. This approval also includes the paint color for traffic signal equipment. The Engineer shall answer all questions that may arise as to quality and acceptability of materials furnished and work performed, interpretation of plans and specifications, and all questions related to acceptable completion of work. It is recommended that the Contractor invite the Engineer to a pre-construction meeting to discuss any traffic signal related questions and/or concerns. This meeting can be held in conjunction with other disciplines.

404.3 MAINTENANCE OF TRAFFIC:

Traffic shall be protected in accordance with The City of Phoenix, Traffic Barricade Manual, the Manual on Uniform Traffic Control Devices and Section 401.

404.4 MATERIALS AND WORKMANSHIP:

Materials and construction details shall conform to the latest City of Phoenix Standard Traffic Signal Drawings, the Arizona Department of Transportation, Highways Division, Supplemental Specifications to Standard Specifications for Road and Bridge Construction, latest edition, the latest edition of the Arizona Highway Department Traffic Signal and Highway Lighting Systems Standard Drawings and the current National Electrical Code Standards unless otherwise specified herein or on the plans.

All electrical materials and workmanship shall conform to the requirements of the current National Electric Code (NEC).

Contractor shall be responsible for all work and materials as shown on the signal plans, the project specific specifications and/or general provisions.

The Contractor shall call the Blue Stake Center at least 48 hours prior to excavation for information relative to the location of buried utilities. The Contractor shall also contact the City of Phoenix Traffic Signals Department at (602) 262-6204 for traffic signal locates.

All underground conduits shall be schedule 40 rigid polyvinyl chloride (PVC) installed 24 inches to 30 inches below finished grade with the exception of loop lead-in conduits which shall be schedule 40 rigid PVC installed in accordance with the latest City of Phoenix Standards. All conduits shall be installed in straight lines (unless otherwise shown on the plans) junction box to junction box or junction box to signal equipment foundation with one 90 degree sweep on each end as specified in the plans. All conduits entering junction boxes shall be vertical, with the top of the conduit six inches below the bottom of the cover.

Foundations shall conform in size, type, and location as shown on the plans. The foundation anchor bolts shall be supplied by the Contractor unless otherwise noted on the plans and installed square with the intersection. The top of the pole foundation shall be set at the finished grade and at the back of sidewalk for each location unless otherwise shown of the plans. Concrete for foundations shall be Class A, 3000 psi concrete with a 6"slump per Section 725. Minimum pole foundation curing times are: A-Poles five (5) days, M-poles seven (7) days, Special M-poles (SM) and Special R-poles (SR) ten (10) days, NO EXCEPTIONS. With approval of the Engineer, high-early strength concrete may be used at no additional cost to the City. Testing is required to verify high-early strength concrete has attained a 3000 psi compressive strength per ASTM C39 and shall be performed at the Contractor's sole expense.

The Contractor shall have a Level II IMSA certified Technician/ Electrician on site at all times during construction/maintenance of traffic signal equipment. Conductor splices and terminations shall be made by a qualified Journeyman Electrician, who has successfully completed a recognized four (4) year apprenticeship program or equivalent training, or by a person enrolled in a recognized four (4) year apprenticeship program under the direct supervision of a Journeyman Electrician.

A separate loop lead-in circuit shall be supplied for each inductive loop. Inductive loop lead-in cable shall be continuous without splices from the loop stub-out junction box to the controller cabinet. A minimum of five (5) feet of slack shall be provided in the controller cabinet and a minimum of three (3) feet of slack shall be provided in each junction box.

Detector loops shall be installed and tested ONLY in the presence of an authorized representative of the City of Phoenix Traffic Signal Shop. Detectors installed without said representative in attendance, for any reason, shall be removed from the pavement and new conductors installed, all at the Contractors expense. Each detector shall be installed according to the latest Traffic Signal Standard Drawing. Installations shall be made permanent with approved sealant after successful testing. The loop conductor shall be temporarily spliced to the lead-in cables, as directed by the Inspector, and tested at the controller cabinet. Loop sealant shall be injected into all cuts and, before setting, surplus sealant shall be struck off flush with and removed from the roadway surface.

All traffic signal heads shall be covered until activation except for 12" mast arm heads, which will not be installed until the day of the activation. These coverings must be maintained in good repair.

The Contractor shall maintain work and work site in an acceptable manner during the course of the project. Upon completion of the work all surplus earth, construction debris including abandoned foundations, and/or remnant equipment shall be removed and properly discarded by the Contractor and the work area shall be restored to a neat, orderly condition.

404.5 INSPECTION:

The City of Phoenix Traffic Signal Foreman or his designee shall inspect all work performed including these critical components: all trenches and conduit runs including splices before being covered, wiring, junction box installations, loop layout, saw cuts, loop installation, and traffic signal pole foundations before being poured. The Contractor shall contact the appropriate Traffic Signal Foreman forty-eight (48) hours in advance to request inspection or call (602) 262-6733.

Inspections are typically at no cost to the Contractor. However, if the Contractor's performance results in the need for additional inspections or excessive inspection time for the Traffic Signal Foreman or his designee the Contractor will be put on notice and subsequent inspection costs shall become the Contractor's responsibility.

The Traffic Signal Foreman, or his designee, are authorized to inspect and reject work and materials; and shall refer rejected work not resolved in the field to the Traffic Signal Engineer for resolution.

In the event the Traffic Signal Engineer determines that the materials furnished, work performed, or the finished product not in conformance with the plans and specifications, the non-conforming improvements shall be removed and replaced or otherwise brought into conformity at the sole expense of the Contractor.

The Traffic Signal Engineer has the authority to reject defective material and to suspend any work that is improperly performed.

404.6 ACTIVATION OF TRAFFIC SIGNAL WORK:

Notify the traffic signal shop prior to pulling conductors and activating the traffic signal system. Activation of new traffic signal intersections shall be scheduled through the Traffic Signal Engineer. An off duty Police Officer supplied by the Contractor is required to be present for the activation to provide traffic control.

404.7 SALVAGED MATERIALS:

Any existing equipment identified by the Traffic Signal Shop Foreman or his designee as salvageable shall be removed without damage, and delivered to 2141 E. Jefferson Street and unloaded where designated. Contact the Traffic Signal Shop at (602) 495-2083, 24 hours in advance for an appointment to return salvaged equipment.

Remnants of obsolete traffic signal equipment shall be delivered to the Traffic Signal scrap yard by the Contractor. Contact the Traffic Signal project inspector 24 hours in advance for an appointment to deliver obsolete equipment to the scrap yard.

404.8 WARRANTY:

The warranty period will begin the day the work is accepted by the City.

There will be a two (2) year warranty on all Contractor supplied equipment and detector loops following final acceptance of the work except as noted herein. The Contractor will warranty workmanship supplied in association with the installation of City supplied equipment for a two (2) year period following acceptance of the work. All LED indication modules furnished by the Contractor will be warranted for five (5) years following acceptance of the project.

404.9 MEASUREMENT:

Measurement for foundations, junction boxes, and loops shall be of the number of units of each satisfactorily constructed.

Measurement for conduit shall be the linear feet of conduit satisfactorily installed as measured along the centerline of the conduit through fittings from end of conduit to end of conduit. Measurement shall be made to the nearest 0.5 feet.

Measurement for the temporary signal cable and the lead-in cable shall be the linear feet of cable satisfactorily installed as measured along the centerline of the cable from end to end. Measurement shall be to the nearest 0.5 feet. The temporary signal cable is a contingency item and may be eliminated without compensation by the Engineer.

404.10 PAYMENT:

Payment for traffic signal work will be made at the unit prices in the applicable proposal items, the combination of which shall be full compensation for all material and labor required to complete the work, including incidentals not specified, but required, to complete the work including temporary traffic signals as described and specified herein, on the plans and permits.

SECTION 424

PARKWAY GRADING

Subsection 424.2 ROUGH GRADING: Add the following paragraph to this Subsection:

(C) The parkway area shall be graded at a variable slope from 1 inch below the back of sidewalk to meet the existing surface at the right-of-way line in accordance with the typical section shown on the plans. Material displaced in the grading of parkways shall not be allowed to be placed on base and surfacing material already in place on the roadway. No measurement or direct payment will be made for this work.

Subsection 424.3 FINE GRADING: Delete paragraph (B) in its entirety and replace with the following:

(B) Where existing parkways are planted in grass, flowers or shrubs, and the level is somewhat above the top of the curb or sidewalk, the parkway shall be graded as per City of Phoenix Landscape Standards and Guideline Detail "Water Retention on Turf Installation" with the least possible damage to the planted area.

SECTION 429

TRAILS

Add SECTION 429 in its entirety:

SECTION 429

TRAILS

429.1 DEFINITION OF TERMS

(A) Multi-Use Trail (MUT): The MUT shall be a 10’ wide compacted decomposed granite (DG) surface stabilized to its full 3” depth and shall also have 2’ DG shoulders, allowing pedestrian, bicycle, equestrian and maintenance vehicle use. Switchbacks and clearances for obstacles, vegetation, and plants will be measured from the edge of the MUT excluding the 2' shoulders where installed. All MUTs shall meet or exceed the Americans with Disabilities Act (ADA) requirements and shall be Barrier Free Trails.

(B) Multi-Use Trail Easement (MUTE): The MUT shall be constructed within a dedicated 30’ public MUTE.

(C) Shared-Use Path: The Shared-Use Path (SUP) is a non-equestrian 10’ wide concrete pathway providing recreation and educational experiences. All SUPs shall meet or exceed the ADA requirements.

(D) Private Trails: The Trails Master Plan does not regulate the locations of Private Trails (PT). Construction and maintenance of PT is the responsibility of the private development. Construction of PT should follow the MUT or SUP guidelines set forth in these specifications.

429.2 SPECIFICATIONS

(A) MULTI-USE TRAIL

(1) Users:

(a) Hikers, joggers, bicyclist, equestrians and the disabled.

(2) Multi-Use Trail Easements (MUTE):

(a) Multi-Use Trails shall be located within an exclusive 30 foot minimum public trail easement.
(b) This easement is exclusive for the trail, landscaping, and PUE unless modified by Development Services.
(c) Trail easements along an open space or wash corridor will be a minimum 25’ wide.

(3) Sub Grade:

(a) The sub-grade shall be 90% compacted prior to the installation of the MUT.

(4) Grade:

(a) Maximum sustained longitudinal grade 5% (20:1).
(b) The cross slope shall not exceed 2%.

(5) Tread Surface:

(a) The tread surface shall be a minimum of 10' wide with a 2' shoulder on each side. No shoulder will be required for the MUT in turf area.
(b) Trail shall allow for side-by-side travel and ease of passing by horses and bicycles. Tread conditions must provide an adequate walking or riding surface free of obstacles or hazards.
(c) The MUT surface shall be ¼" minus decomposed granite (DG) of a color contrasting with the surrounding DG and shall be stabilized to its full 3" depth.
(d) When located in turf, the MUT shall have a 6"x8" concrete header that meets or exceeds MAG Standards on each side. Shoulders shall not be required in turf.

(6) Path Locations:

(a) Public Multi-use Trails shall not be placed in retention basins, drainage ways, channels or naturally occurring or manmade washes, unless otherwise approved by the Parks & Recreation Department.
(b) There shall be a minimum 5-foot horizontal clearance between trails and other obstacles i.e., fences, walls, utility boxes and other fixed objects. Safety rails or ADA railing are the exception to this requirement.
(c) Where the trail surface ties into another hardscape surface material i.e., sidewalk or curb, the trail shall meet and match the grade of the hardscape surface.
(d) Trails shall feed directly into ADA ramps at all roads and driveway crossings.

(7) Switchbacks:

(a) The inside radius of a trail switchback shall be a minimum of 5'.

(8) Vegetation Clearance and Removal:

(a) Plant material shall not be planted or allowed to grow in the 2' shoulders.
(b) Plant material shall be cleared to a height of 10' measured from the trail surface.
(c) Dead vegetation will remain in place unless considered a hazard or obstruction. Tree and brush cuttings, broken limbs and other vegetative debris including fallen saguaros shall be removed from within 5' of the trail.

(9) Plants with Thorns and Poisonous Plants:

(a) Plants with thorns such as cacti, *Acacia greggi, Dasylirion* species etc., shall not be planted or allowed to grow within 10' of the MUT.
(b) Poisonous plants such as *Nerium oleander, Sophora secundiflora, Euphorbia rigida* etc., shall not be planted or allowed to grow within 10' of the MUT.

(B) SHARED-USE PATHWAY

(1) Users:

(a) Hikers, joggers, bicyclist and the disabled.

(2) Easements:

(a) Trails shall be located within 20’ public trail/sidewalk pedestrian easements.

(3) Sub Grade:

(a) The sub grade shall be 90% compacted.

(4) Grade:

(a) Maximum sustained longitudinal grade 5% (20:1).
(b) The cross slope shall be 2% maximum.

(5) Surface:

(a) The tread surface shall be 10’ wide, standard. No SUP shall be less than 8’ wide unless approved by the Parks & Recreation Department.
(b) The tread conditions shall provide an adequate walking surface free of obstacles or hazards and shall allow for side-by-side travel and ease of passing by pedestrians and bicycles.
(c) Concrete shall meet or exceed Section 725.
(d) Where the pathway surface ties into another hardscape surface material i.e., sidewalk or curb, the trail shall meet and match the grade of the hardscape surface

(6) Path Locations:

(a) SUP shall not be placed in retention basins, drainage ways, and channels or in naturally occurring or manmade washes, unless otherwise approved.
(b) There shall be a minimum 5-foot horizontal clearance between sidewalks and trails and other obstacles i.e., fences, walls, utility boxes and other fixed objects.

(7) Switchbacks:

(a) The inside radius of a pathway switchback shall be a minimum of 5 feet.

(8) Vegetation Clearance and Removal:

(a) Plant material shall not be planted or allowed to grow in the 2’ shoulders.
(b) Plant material shall be cleared to a height of 10’ measured from the trail surface.
(c) Dead vegetation will remain in place unless considered a hazard or obstruction. Tree and brush cuttings, broken limbs and other vegetative debris including fallen saguaros shall be removed from within 5’ of the trail surface.

(9) Plants with Thorns and Poisonous Plants:

(a) Plants with thorns such as cacti, *Acacia greggi, Dasylirion* species etc., shall not be planted or allowed to grow within 10’ of SUP.
(b) Poisonous plants such as *Nerium oleander*, *Sophora secundiflora, Euphorbia rigida* etc., shall not be planted or allowed to grow within 10’ of the SUP.

(C) GRADE SEPARATED CROSSING (UNDERPASS FOR PEDESTRIAN/EQUESTRIAN USAGE)

(1) When major trails intersect streets or roads, a pedestrian and/or equestrian cell (a barrel within a culvert) or bridge shall be provided for user safety.

(2) The underpass/bridge shall have a minimum 12-foot vertical and 10-foot horizontal clearance and unobstructed sight lines shall be maintained.

(3) Underpasses and bridges more than 50-foot in length shall be artificially lit to an average of 2 foot-candles minimum on the trail surface

(4) The underpass shall be connected to the MUT/SUP with a concrete tread surface, rough broom finished. The MUT shall receive a heavy broom finish to improve equestrian footing.

SECTION 430

LANDSCAPING AND PLANTING

Delete SECTION 430 in its entirety and replace with the following:

430.1 DESCRIPTION:

This Section shall govern the preparation and planting of landscape areas required in the Plans or Specifications. Materials shall be in accordance with the Section 795.

Existing utilities and improvements not designated for removal shall be protected in place. The Contractor, at no additional cost to the Contracting Agency, will repair any damages.

Unless otherwise provided, walls, curbs, planter boxes, irrigation systems, and other improvements shall be constructed after rough grading has been completed and prior to finish grading.

430.2 GENERAL:

Furnish all labor, materials, equipment, and incidental needs to install the landscape to the drawings, details and specifications shown in the plans.

Applicable publications listed below form a part of this specification to the extent referenced:

Arizona Nursery Association Growers Committee Recommended Tree Specification (latest edition)

American Society for Testing and Materials
(ASTM) C136, Standard method for sieve analysis of fine and coarse grained aggregates;

(ASTM) F1632, Test methods for particle size analysis and sand grading of golf course greens and sports field root zone mixes;

(ASTM) D2974 Method B, Test moisture, ash, and organic matter of peat and other organic soils;

(ASTM) F1647, Test methods for organic matter content of golf course greens and sports turf root zone mixes.

All landscaping and irrigation work shall be installed by a contractor licensed to perform this specialty work.

Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and local authorities in furnishing, transporting and installing materials as shown or for completing the work identified herein.

430.2.1 Source Quality Control: Ship materials with Certificate of Inspection required by governing authorities.

Do not make substitutions: If specified material is not obtainable, submit proof of non-availability, together with proposal for use of equivalent material, similar in appearance, ultimate height, shape, habit of growth and general soil requirements. The Contractor may make substitution of a larger size of the same species with approval by the Engineer. However, any additional cost for these substitutions will be borne by the Contractor.

Before delivery of the following materials, a letter of compliance shall be submitted, certifying that materials meet the requirements for legal transportation of State and Local government agricultural laws, and are true to analysis as specified. Certify the following:

Nursery propagated plants
Cacti, succulents, and native plants

Soil Amendments, and conditioners
Lawn seeds, stolons, and sod
Native seed mixes

430.2.2 Samples and Tests: The Engineer reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request. Rejected materials shall be immediately removed from the site at the Contractor's expense. The Contractor shall pay cost of testing materials not meeting specifications.

430.2.3 Herbicide / Pesticide Applicators: All herbicide / pesticide applicators shall be properly licensed for application of non-restricted use chemicals with an A-20 license or an A-21 license with Pesticide Endorsement from the State Registrar of Contractors and Structural Pest Control Commission. All landscape contractors are required to furnish a copy of their application from the Registrar of Contractors, which shall list the names of those employees approved as applicators by the Registrar of Contractors. Application of non-restricted use pesticides shall not take place until the Engineer receives a copy of the application.

430.3 PLANT ESTABLISHMENT GUARANTEE AND MAINTENANCE:

Unless otherwise authorized, the Contractor shall maintain all landscape areas on a continuous basis as they are completed during the course of work and until final Plant Establishment Guarantee and Maintenance Acceptance. The Contractor shall provide adequate personnel to accomplish maintenance. Maintenance shall include keeping the landscape areas free of debris on a weekly basis, chemical control of weeds and fertilization as needed, cultivating the planting areas, and mowing of turf where lawns are part of the project.

Plants shall be kept in a healthy, growing condition by watering, pruning, spraying, weeding and any other necessary operation of maintenance. Plant saucers and beds shall be kept free of weeds, grass and other undesirable vegetation. Plants shall be inspected at least once per week and appropriate maintenance performed. Pruning and re-staking is to include removal of any growth conflicting with vehicular or pedestrian movement.

Turf from seed or stolons shall be considered established when it is ready for use, and turf exceeds 95 percent coverage of an 18 inch diameter ring when placed on the ground by the Engineer. The turf shall be vigorously growing, uniform in color, and cut to a uniform height designated by the Engineer. Roots shall have penetrated the soil to a depth of not less than 4 inches.

The Contractor shall maintain the irrigation system and make any necessary repairs regardless of cause to assure a complete and operational system as originally designed and constructed. Repairs shall be made within 48 hours of detection.

Chemical mixing for weed control shall be done in the presence of the Engineers representative. The method of application shall be approved by the Engineer.

The Contractor shall request an initial inspection by the Engineer when all planting and related landscape work is accomplished. After this initial inspection, and subject to approval of work by the Engineer, written field notification to the Contractor, setting the effective date for beginning of the Plant Establishment Guarantee and Maintenance Period will be issued. This Period shall last for 90 days or as specified, unless extended by the Engineer. If the landscape areas are improperly maintained; if appreciable plant replacement is required (for whatever reason); if corrective work is required for the operation of the irrigation system; or if other corrective work is necessary; the Plant Establishment Guarantee and Maintenance Period shall be extended and the Contractor shall continue to maintain the entire site until accepted at no increased cost to the Owner.

At the end of the Plant Establishment, Guarantee and Maintenance Period a final inspection will be performed. If, after inspection, the Engineer is of the opinion that all planting areas are weed free, plant materials are in satisfactory growing condition, the Engineer will give the Contractor written Notice of Acceptance of the landscape installation. Any plants which need to be replaced, regardless of the cause, shall be replaced prior to final acceptance.

430.4 JOB CONDITIONS:

Site Examination: The prospective Contractors are encouraged to visit the job site prior to bidding on this project, and to satisfy their concerns as to the magnitude of the work involved.

Water costs are the Contractors responsibility, until Final Acceptance or end of Plant Establishment, Guarantee, and Maintenance Period whichever is longer and the water meters are transferred to the City.

Before the beginning of landscape work, all planting areas shall be left free of construction debris and/or toxic material and subgraded to a level to permit landscape and irrigation construction. Trenches, foundation backfill or other filled excavations shall be compacted prior to the beginning of any landscape work. No soil preparation or planting shall begin before the site has been cleared and cleaned of debris. Commencement of work indicates acceptance of job site conditions.

Cooperate and coordinate with other Contractors and trades working in and adjacent to landscape areas.

430.4.1 Utilities: Determine location of underground utilities and perform work in a manner, which will avoid possible damages. The Contractor, at no additional costs to the Contracting Agency, will repair any damages. Hand excavate, as required. Maintain stakes by others until removal is mutually agreed upon by parties concerned.

430.4.2 Obstructions: If rock or other obstructions are encountered in excavation for planting, notify the owner's representative. Proceed with work only as directed.

430.4.3 Existing Surface Soils (Borrow Excavation): Shall be used for plating non-pave (non-turf) areas, and as part of the backfill mix for planting Nursery Stock.

430.4.4 Imported clean fill: Shall be used for turf areas and amended per Subsection 430.11 Preparation for Lawn. Unless otherwise specified the minimum clean fill depth in lawn areas shall be 6 inches.

430.5 DELIVERY, STORAGE, AND HANDLING:

Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored on site.

Sod: Time delivery so that sod will be placed within 24 hours after stripping at the sod farm. Protect against drying, cracking, and breaking of soil on the rolled strips.

Trees and Shrubs: Do not prune prior to delivery unless otherwise approved by owners representative. Do not bend or bind trees or shrubs in such a manner as to damage bark, break branches or destroy natural shape. Provide adequate protection for root systems. Protect root balls from drying wind and sun.

Deliver trees/shrubs just prior to planting. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage. Keep roots moist. Water as often as necessary.

Plant Inspection Prior to Delivery to the Project Site: Before delivery of any species to the project site, the Contractor shall make the necessary arrangements with the Engineer for an inspection of the plant material and tagging of representative plant stock. The Contractor will pay for travel to non-local Nurseries, out of the metropolitan Phoenix area, when plants are not available locally.

The Contractor shall notify the Engineer, at least 7 days in advance for inspection of the plant material. Prior to notification of the Engineer for inspection, the Contractor shall physically verify that the plant material meet the size specified.

After delivery, any plants found to be unsuitable in growth or condition, or plants, which are not true to the specification, or equal to the tagged plant stock, shall be removed, and replaced with acceptable plants at the Contractor expense.

430.6 MATERIALS AND PRODUCTS:

Materials and products shall conform to the requirements of the Section 795.

430.7 SEQUENCING AND SCHEDULING:

Proceed with and complete landscape work as rapidly as portions of the site become available, working with reasonable limitations for each kind of work required.

Plant or install lawns during normal planting seasons or as directed by the Engineer.

For Bermuda, seed from April 15 to the end of September, provided nighttime temperatures are averaging above 60 degrees Fahrenheit.

For Perennial Rye Grass, when directed by the Engineer.

Coordination: Plant trees and shrubs after final grades are established and prior to planting lawns, unless otherwise accepted in the construction schedule by the Engineer. If tree and shrub planting occurs after lawn work, protect lawn areas and properly repair damage to lawns resulting from tree or shrub planting operations.

430.8 PREPARING THE SITE FOR LANDSCAPING:

All non-paved areas, as directed by the Engineer, shall be treated with a chemical control, such as Round-up or equal, to control and kill weeds. All applications of the chemical control agent shall contain a blue or green dye so that treated areas can be identified. These areas shall be cleared and grubbed, no sooner than two weeks after the last application of chemical weed control, or when week kill has been established to the satisfaction of the Engineer. Any area to receive seed mix or which is to remain undisturbed shall be excluded from treatment.

Clear and grub landscape areas in accordance with Section 201.

Remove or relocate trees, shrubs, grass, improvements or obstructions that interfere with the installation of new work. Removal includes digging out stumps and roots to a depth of 12 inches below existing or proposed grade whichever is lower.

Fill depressions caused by clearing and grubbing operations with satisfactory soil material. Place fill in 6" loose depths and compact to adjacent ground densities.

Soil Preparation in non-turf areas including planters: After clearing and grubbing is complete, rough grade and remove all deleterious materials. Fine grade the areas. Rocks and debris, including miscellaneous concrete spillage clumps, over 1 inch in any dimension, shall be removed and disposed of offsite.

The finish grade for landscape areas shall not vary more than 1 inch from specified grade and cross section and shall be a smooth, uniform surface, free of abrupt grade changes or depressions. Surface drainage shall flow as designated on the plans.

Finished soil grades, adjacent to paving, curbs or headers will consider the depth of applied toppings materials such as granite or river run. Unless otherwise specified the soil grade for granite areas shall be 3 inches below adjacent pavements, for application of 2 inches of granite. Apply a pre-emergent weed suppressant to the finish soil surface; include dye as specified with the application.

430.9 HEADER INSTALLATION:

Headers shall be installed at the locations and elevations shown on the plans.

Concrete forms, shall be approved by the Engineer prior to pouring concrete. Concrete shall be Class B.

430.10 EXECUTION OF PLANTING:

Clearing and grading areas shall be free of construction debris and/or toxic materials and graded to permit landscape construction.

Landscape or planting areas shall not be cultivated when they are so wet as to cause excessive compaction or so dry as to cause excessive dust or the formation of large clods. Prior to excavating plant pits, layout individual trees and shrubs for owner's representative to approve the locations. Make minor adjustments as might be requested.

Protect existing vegetation from damage during planting operations. The Contractor is responsible to replace any damaged vegetation in kind as directed by the Engineer.

430.10.1 Deciduous and Evergreen Plantings:

Excavation: Plant pits shall be dug to produce vertical sides and flat, non-compacted but firm bottoms. If pits are dug with an auger and sides of pits are glazed, scarify the glazed surface. The size of the pits shall be twice the diameter of plant root ball or container size, and only as deep as the root ball.

Drainage: Test drainage of plant pits by filling with water twice in succession. Plant pits retaining water for more than 24 hours shall be brought to the attention of the owner's representative. Submit in writing a proposal for correction, for approval by Engineer, before proceeding.

Plant Backfill Mix: Shall consist of 1 part organic mulch, two parts excavated soil and 4 pounds gypsum and 1 pound of sulfur per cubic yard. The backfill shall be produced by thoroughly blending these components into a homogeneous mixture. The Contractor shall notify the Engineer prior to mixing prepared soil so that he may observe the mixing process. When requested submit a letter and test analysis results from a certified horticultural testing laboratory.

Setting and Backfill for Plants: Set plant material on non-compacted firm soil, plumb and in center of pit or trench. The crown (juncture of the root and shoot) shall be at grade when planting is complete. Remove pallets or containers before placing backfill. Do not handle container plants by foliage, branches or trunks. After removing plant from container, scarify side of root ball. Do not plant stock if root ball is cracked, broken, or root bound. When set at the proper elevation and orientation, place additional backfill mix, brace plant, and place fertilizer tablets. Work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water the plant thoroughly; before placing remainder of backfill. Repeat watering again after placing final layer of backfill mix until soil is completely saturated.

Place fertilizer tablets approximately 6" below grade and evenly spaced around the plant.

For one-gallon container ....1 tablet
For five-gallon container..... .....2 tablets
For fifteen-gallon container.. .....4 tablets
For twenty-four inch box..... .....6 tablets

Plant Saucers: Prepare an example plant saucer for the Engineer's review and approval. Schedule this review with the Engineer before starting planting operations.

Stake All Trees Per Plans: Set stakes vertically and spaced to avoid penetrating balls or root masses. Place tree ties for maximum support with top tie above scaffold branches and second tie midway to the ground level. Avoid "rigid"

restraint of tree and allow for some trunk movement. Stakes are to be set into native soil.

430.10.2 Agave, Aloe, Cactus, Ocotillo and Yucca Plantings:

Excavation and Drainage: Shall be completed per Section 430.10.1, except plant pit shall be 6" deeper than root ball.

Backfill Mix: Shall be a mixture of 3 shovel's full of sand, or very coarse dirt (not clay or silt), one shovel of gypsum, one shovel of organic matter (avoid cow manure), 1/2 cup of sulfur, and ½ cup of phosphate (0-45-0). As you need more backfill mix, increase in these proportions.

Setting and Backfill: Do not set plant deeper than the plant grew naturally. Prior to placement, lay the plant down just over the hole. Trim off old dead roots to no longer than 2 inches and clean out any rocks stuck in the plant. All new plant root growth will come from the center of the root ball, not from the old roots or from the side of the stem or trunk. Sprinkle a tablespoon full of phosphate (0-45-0) in the hole. Place plant in the hole and orient to match the previous heliotropic growing condition. Set plant elevation to the visible dirt line mark of the plant and backfill the plant using the specified backfill mix. Plant shall be planted to maintain positive drainage away from the root collar of the plant. Tamp the soil to stabilize the plant. Now drench and wash off the plant.

Monitor watering closely. Normal watering for Agave, Aloe, Cactus, Ocotillo and Yuccas are once per week. During the heat of the summer, briefly spray or mist these plants from a hose, to cool the plants surface temperature. During cooler temperatures, adjust the watering schedule for the time of day and frequency.

430.11 PREPARATION FOR LAWN:

430.11.1 Soil preparation and Fine Grading New Turf areas: Excavate as necessary to accommodate depth of clean fill, topsoil and soil amendments. Prior to placing fills and amendments till to a depth of not less than 4 inches, making alternate passes at right angles. Remove rocks and debris greater than 1 inch, in any dimension. Remove high areas and fill depressions. Apply soil amendments (refer to the Section 795) as follows:

Organic matter 2 inches deep
Sulfur 10 lbs/1,000 SF
Iron Chelate 1 oz/1,000 SF

Roto-till soil and amendments to homogenous fine mixture, free of lumps clots, stones, roots and other extraneous matter. Till the mixture until it is uniform in color and appearance to the satisfaction of the Engineer.

Forty-eight (48) hours prior to seeding operations fine grade lawn areas to a smooth, even surface with a loose uniformly fine texture. Finish drag or rake lawn areas removing all deleterious material ½" or larger from the surface and to a depth of 2 inches below the surface. Roll the lawn surface to obtain the desired compaction and remove ridges. Finish grade shall be as shown on the plans. Finish grade shall be set 1-1/2" inches below adjacent paving, curb and headers. The Engineer shall be able to push a hand probe to a depth of 4 inches at any location where turf is to be established.

Apply fertilizer (refer to Section 795) fertilizer percentages (N-P-K) and the rate of application per soil fertility test results. For bidding purposes, the fertilizer shall be (15-15-15), applied at 5 LBS/ 1000 SF. Apply additional fertilizer at the end of the turf establishment or date agreed upon with the Contracting Agency. Establishing turf is the contractor's responsibility.

430.11.2 Recondition Existing Lawn Areas: Areas damaged by Contractor's operations, including damage caused by movement of vehicles, or from the storage of materials or equipment shall be reconditioned prior to seeding or sodding.

Remove ridges, ruts, and aerate compacted soils. Fill depressions with topsoil soil. Rake surfaces to remove clumps and debris and other deleterious material ½" or larger from the surface. Apply fertilizer (refer to Section 795) at the rate recommended by the manufacturer (stated on bag) before initial seeding operations.

430.12 LAWNS

The Contractor shall not begin planting until the irrigation system is completely installed and is adjusted for full coverage and is completely operational.

430.12.1 Sod: Allow for sod thickness in areas to be sodded. Apply commercial fertilizer at rates specified by the manufacturer and thoroughly mix into upper 2 inches of soil. Delay applications of fertilizer if planting will not follow within a few days.

Lay sod within 24 hours of initial cutting. Form a solid mass of sod with tightly fitted joints. Butt ends and sides of sod. Do not overlap joints. Stagger sod strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Sod edges and joints shall be leveled with approved soil mix.

430.12.2 Seeding Lawns: Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

Sow seed using a spreader or seeding machine at a rate of 3 1/2 pounds Bermuda per 1,000 square feet. Do not seed when wind velocity exceeds 5 MPH. Distribute seed evenly over the entire area by sowing equal quantities in two (2) directions at right angles to each other.

Bermuda seed shall be planted only at times when daytime atmospheric temperatures are consistently above 90 degrees F. and the nighttime atmospheric temperatures are consistently above 60 degrees F. If turf establishment from seed cannot be completed during the contract period, then Perennial Rye grass seed will be planted when required by the Engineer, at no additional cost to the Contracting Agency. Apply Rye grass at the rate of 15 pounds per 1,000 square feet. Distribute Rye seed evenly over the entire area by sowing equal quantities in two (2) directions at right angles to each other.

Rake lightly into top 1/8 inch of soil, roll and water with a fine spray.

430.12.3 Hydroseeding Lawn Areas: Contractor shall follow a two-step process of hydroseeding followed immediately by hydromulching. Equipment used shall be manufactured for the purpose of hydroseeding. It shall be equipped with a tank capable of continuous agitation, suspension, and blending of the slurry components. It shall be equipped with a pumping system capable of maintaining a continuous spray. It shall be equipped with nozzles and hoses to obtain a uniform application on designated areas. The tank and accessories shall be cleaned and be free of contaminants. The storage tanks shall have a means of estimating the volume used or remaining in the tank.

For hydroseeding and mulching materials refer to Section 795. All materials shall be labeled or supplied with test information concerning analysis of the various components. All work shall be performed in a professional manner to the best industry standards. Care shall be taken to avoid drift and displacement of material or any damage to structures and landscape. Protective covering shall be used where material would be objectionable. Clean up shall be done daily. Seeded areas shall be protected from traffic and construction activities.

Water, fertilizer, mulch and seed shall be combined in proportion in the first application to cover the areas at the specified rates. The ingredients shall be allowed to mix thoroughly. Allow the ingredients to mix for a minimum of 5 minutes before application of the slurry, but do not allow seed to be in the tank longer than 60 minutes, inclusive of the time to agitate.

Hydroseed an even first application of the following components:

Bermuda Seed	200 LBS / Acre
Fertilizer	200 LBS / Acre
Mulch (100% Wood Cellulose Fiber)	400 LBS / Acre

Hydromulch an even second application immediately after hydroseeding with the following components:

Mulch (100% Wood Cellulous Fiber).....1400 LBS / Acre
Tackifier .... 100 LBS / Acre

Hydroseeding or mulching deposited on adjacent trees and shrubs, on roadways, structures or other area surfaces where they are not specified shall be removed.

Water the hydroseed to germinate the seed and continue watering until established. Monitor watering every day. DO NOT over water or under water. It may be necessary to water several times a day. Newly germinated areas must be kept moist.

430.13 DECOMPOSED GRANITE AND RIVER RUN AREAS:

The areas on which the granite mulch or river run rock is to be placed shall be graded according to the drawings, prior to the placement of any granite or river run rock. The ground shall be reasonably smooth and rocks larger than 1" in diameter, within the top 1" of soil shall be removed and disposed of off-site.

The Contractor shall stake out all areas to receive granite mulch or river run rock. These areas shall be treated with a pre-emergent control, such as Surflan or equal, prior to and after placement of the cover material.

Decomposed granite shall be evenly distributed on the designated areas to a depth as indicated on the plans and details. If a depth is not indicated the minimum depth shall be two inches.

After placing and grading the granite mulch, the Contractor shall water granite with a light spray to settle the to granite and remove fine materials from the surface. Immediately after watering, the Contractor shall roll the granite mulch with an appropriate device to an extent satisfactory to the owner's representative.

River run rock used shall be as specified on the plans. The rock shall be evenly distributed on the designated areas to depth 1-1/2 to 2 times the maximum gradation size.

430.14 CLEANUP AND PROTECTION:

During Landscape Work, keep pavements clean and work areas in an orderly conditions. Sweep, scrub or hose affected areas as directed by the owner's representative to maintain a clean and neat work area.

Protect Landscape Work and Materials from damage due to landscape installation, operations by other contractors and trades, trespassers and animals. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged work as directed by the owner's representative. Remove all debris, trash and excess materials generated by the landscape installation.

430.15 MEASUREMENT AND PAYMENT:

The lump sum or unit prices established on the schedule of values shall be full compensation for furnishing all labor, material, tools and equipment and for performing all work necessary to complete the landscaping operation to include planting of trees, shrubs and ground cover.

The quantities of lawn seeding will not be measured but shall be the quantities designated in the contract documents, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. The quantity of lawn shall include soil preparation, fertilizer, seed, and water, established and accepted.

The quantity of sod to be measured will be the actual number of square feet, including soil preparation, water, fertilizer and sod, established and accepted.

When line item bids or schedule of values do not initially include a cost for the Plant Establishment and Maintenance

Period the cost shall be assumed in the schedule of values for landscape items (i.e., plant materials, irrigation, and inert materials, such as decomposed granite, river run and boulders). Ten percent of the sum total of landscape items in addition to retention will be held for distribution during the maintenance period. Equal monthly payments for maintenance will be authorized, based on inspection and subject to extensions, where the Contractor fails to comply with previously stated requirements in Subsection 430.3. Payment may or may not be supplemental to final project payment.

SECTION 431

PALM TREE TRANSPLANTING

Add SECTION 431 in its entirety:

SECTION 431

PALM TREE TRANSPLANTING

431.1 DESCRIPTION:

This Section shall govern the relocation (transplanting) and planting of palm trees required by the plans or specifications. The Contractor shall furnish all labor, materials and equipment required to complete the excavation, lifting, transporting and transplanting of palm trees.

431.2 GENERAL:

Unless otherwise provided by this Section the work shall conform to the Section 430 and the following.

431.3 PALM ESTABLISHMENT GUARANTEE AND MAINTENANCE:

Palm establishment, guarantee and maintenance shall be per Section 430 with the following modifications or additions:

The palm establishment, guarantee and maintenance period shall be for 90 days, unless otherwise extended.

Guarantee palms against the vascular disease Penicillium (Gliocladium) vermoeseni, the fungus Fusarium oxysporum, and the root disease Phytophora and similar vascular infections for a period of five (5) years.

Replace without additional cost to the Contracting Agency all dead palms and all palms not in a vigorous condition as determined by the Engineer. Replacement shall be when directed by the Engineer.

431.4 JOB CONDITIONS:

Prospective contractors are encouraged to visit the job site prior to bidding on this project, and to satisfy their concerns as to the magnitude of the work involved.

It may be necessary to supplement the irrigation system and provide additional water to establish newly planted palm trees. Water from the existing irrigation system will be paid for by the Contracting Agency. The Contractor is responsible for delivery and payment of water from other sources.

Remove all debris, trash and excess materials found on site or generated by the Contractor's operations.

Prior to digging and transplanting of palm trees the Contractor shall notify the Engineer at least two (2) working days before starting any work.

431.5 DELIVERY, STORAGE AND HANDLING:

Palms shall be free of dead or dying fronds with all fronds of a normal size and color.

The Landscape Architect will be available to review and tag palms at place of growth and will again review palms upon delivery for conformity to the specifications. Travel to non-local Nurseries, out of the metropolitan Phoenix area, when requested by the Contractor, will be paid for by the Contractor. In lieu of non-local nursery review, the Contractor may elect to provide photographs with a person adjacent to each palm for preliminary review. Such review shall not impair the right of review and rejection during progress of the work should the palms not meet the specifications. The selected palms shall not exceed the specified height by more than 1 foot. It is unacceptable to plant the root ball deeper than 1 foot above the soil line of the palm.

The Contractor must certify that the palms are free of disease prior to shipment.

After tagging of the palms, remove all thatch from older leaves and cut back all resulting stems to within 2 inches of the base of the trunk. The crown of the palm shall be reduced per standard nursery practice prior to shipping. Use soft rope (organic twine) to tie remaining fronds to protect crown bud. Do not permit fronds to become damaged by means of restraint.

Exercise extreme caution while pruning palms, to prevent spread of vascular diseases. Dip pruning tools in a sterilizing agent before beginning pruning and before moving from one palm to another. Do not use any chain type saws for pruning operations.

Lifting, Off-loading, and Transporting: A lattice type crane, a telescoping type crane or a specially designed tree crane is acceptable for lifting and off-loading palm trees. For transporting, the trailer used shall be long enough to avoid damage to the heart of the palm. Loading and unloading of palms must be accomplished with the aid of nylon or fabric sling/straps with a minimum width of 4 inches. Excessive scarring or trunk damage will not be permitted and will be cause for rejection of the palms at the project site.

If the palms are not planted the day they arrive at the project site, the crowns and root ball should be protected from the sun and from reflected heat from the ground. Avoid storing on an asphalt surface.

Covering material must allow air movement so that heat does not build up under the covering. Do not use plastic or rubberized tarpaulins. Trees may not be stored for more than 48 hours. Do not stack palms, but lay them in a single layer on a flat surface. Covered root balls must be watered lightly every couple of hours.

431.6 MATERIALS AND PRODUCTS:

All palms shall have been grown in accordance with good horticultural practices under climatic conditions similar to those for the project for at least two (2) years prior to shipment to the site.

All palms shall be well-grown, symmetrical, without curvature or leaning trunk from the perpendicular and so trained or favored in development and appearance as to be superior in form, compactness and symmetry of crown. All palms shall be within one foot above or below the height specified, measured from the bottom of the crown bud to finish grade after installation.

All palms shall be sound, healthy and vigorous, well foliated prior to pruning and showing no signs of disease. They shall be free of disease, insect pests, eggs or larvae. They shall also have well developed root systems. All palms shall be free from physical damage or adverse conditions which would prevent thriving growth.

Verify that all field dug palms contain an adequate root ball to guarantee transplantation. Do not wrap root ball in plastic. Do not install palms that have damaged root balls.

Accessories:

Clean washed river sand.

Frond Tie: Minimum 1/2 inch diameter soft sisal rope capable of maintaining frond in tied condition for 1 year.

Fungicides: Soil Drench: "Subdue" by CIBA-GIEGY

431.7 SEQUENCING AND SCHEDULING:

Coordinate delivery of palms with planting operations to avoid on site storage longer than 48 hours. Planting delays may result in rejection of the palm.

431.8 PREPARING THE SITE FOR LANDSCAPING:

Remove palms designated for replacement. Removal includes digging out stumps and roots to make room for replacement material. Remove all debris, trash and excess materials generated, and dispose of this material off-site.

Protect existing plant material, walls, pavements and other site amenities from damage.

431.9 PALM TREE SALVAGING:

Prior to excavation, the palm tree shall be thoroughly watered.

Excavation: A trenching machine, a backhoe with a narrow bucket or a properly sized tree spade is acceptable as the excavation equipment. The exact equipment used must be approved by the Engineer.

Reduce the crown of palm trees per standard nursery practice. Use soft sisal rope to tie remaining fronds to protect crown bud.

The size of the root ball taken shall be a minimum of 18" to 24" deep and have a 2" to 3" wider radius than the base of the palm, unless otherwise directed by the Engineer. Certify that all field dug palms contain adequate root ball to guarantee successful transplanting.

Carefully lift and transport palm tree to the new location so as not to cause damage to the tree or site.

431.10 EXECUTION OF PLANTING:

Layout palms at locations shown on the plans. Use 3 foot lath, color coded for each palm. The Engineer will check location of palms in the field to exact position before planting begins.

Where palms are to be preplanted to permit site improvements to be installed around them, be responsible for the accurate layout of those palms, measured to their centerlines. Be responsible for the protection of those palms while work is taking place. Provide regular irrigation as necessary until final acceptance.

The palm tree excavation shall be a minimum of 1.5 times (x) larger than the root ball depth and 1 foot larger on all sides. It is acceptable for the final site grade around the palm to be 6 to 12 inches higher than the original soil line of the root ball. The depth of the pit shall be approved by the Engineer prior to planting the tree.

Water test each tree pit for drainage by filling the holes twice in succession with water. If when filled with water the second time the pit fails to drain within 24 hours, then additional excavation is necessary to break through the impermeable layer or provide a thick under layer of sand below the root ball. The cost for over excavation and for the installation of a drainage chimney will be considered should the tree pit not drain.

Clean moist washed river sand should be added to the bottom of the hole and tamped or water jetted, prior to insertion of the tree.

Install drainage and viewing pipe(s) in each tree pit to assure wetting of the whole root ball and to enable monitoring and viewing of the tree pit chamber. The vents shall be 4" diameter perforated PVC, with sufficient length to extend to the bottom of the tree pit. Do not backfill drainage or viewing pipes.

Backfill should be clean washed river or concrete sand amended with 25% native soil. In areas where soils are heavy in caliche, 100% sand shall be used. After placement of the palm, moistened sand shall be thoroughly tamped as backfill is being added to assure stability of the tree.

A 6" deep swale shall be made around each palm tree to provide water holding capability.
Mulch: Apply a 2" layer of decomposed granite in all palm tree watering basins.

After planting, the crown buds of all the palms shall be within 1 foot of the designated palm height above finish grade.

After planting, drench the soil with the fungicide, "Subdue" per manufacturer's recommendations by flooding the planting basin. Reapply as often as label permits throughout the maintenance period.

Irrigation: It is essential that irrigation be deep enough to assure wetting of the whole root ball. The Contractor shall maintain the irrigation system to the existing trees and supplement additional water to newly planted trees as necessary for establishment. Use a tensiometer weekly during the maintenance period to verify correct watering at the surface and at the bottom of the root ball, report moisture levels to the Engineer.

431.11 MEASURE AND PAYMENT:

Measurement will be made on the number of trees that survive the planting operations. Unless otherwise specified by the Engineer, the Contractor shall be responsible for the cost of replacement and planting of any palm tree, in kind, that does not survive. Palms that do not survive become the property of the Contractor for disposal. Payment will be made at the unit bid price for each surviving tree which will be full compensation for all labor, materials, tools and equipment required for excavating, transporting, transplanting, and watering of the tree(s).

SECTION 440

SPRINKLER IRRIGATION SYSTEM INSTALLATION

Delete the title of this SECTION in its entirety and replace with the following:

LANDSCAPE IRRIGATION SYSTEM INSTALLATION

Delete SECTION 440 in its entirety and replace with the following:

440.1 GENERAL:

The Contractor shall furnish all labor; materials, tools, equipment, and services necessary for the execution and completion of the irrigation system work as indicated on the drawings and as described in these specifications and the General Conditions.

Due to the scale of the drawings, it is not possible to indicate all offsets, fittings and sleeves, which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such offsets, fittings and sleeves as may be required to meet such conditions. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

The work of this Section generally includes provisions of an automatic underground irrigation system including the following:

Trenching, stockpiling excavation material, and refilling trenches.

Complete system including but not limited to piping, backflow preventer assemblies, valves, fittings, emitters, controllers and wiring, and final adjustments to insure complete coverage.

Replacement of unsatisfactory materials.

Clean-up, inspection, and approval.

Tests: The system shall efficiently and uniformly irrigate all areas and perform, as required, by the plans and specifications.

No irrigation work is to be performed until all areas are finished to proper grade and until soil preparation is completed, and has been approved by the Engineer.

440.1.1 Work By The Water Services Department: The Contractor will coordinate with the Engineer at the Preconstruction Meeting to schedule water service dates well in advance of need. The Engineer will contact the Water Services Department to authorize work required to be performed by Water Services Department crews. At least six weeks prior to need the Contractor will make application with the Water Services Department. At the time of application, the Contractor will contact the Water Services Department to schedule installation of a water tap and meter, and to provide them with his billing address.

The Contractor shall pay for all water used until the project is accepted, or until completion of the Landscape Maintenance period, whichever is later, and the water meter accounts are transferred back to the City. At the close of the project, the Contractor shall submit water meter account numbers to the Engineer and request transfer of the meter to the City. The Contractor will remain responsible for water used and payment thereof, until transfer.

440.1.2 Work By The Power Company: The Contractor will be responsible for coordinating with the power company to locate power drops for the irrigation controller(s), when power is not serviced by a Service Entrance Section.

Unless otherwise specified or directed by the Engineer, the Contractor will obtain an account with the utility company

and will pay for all electrical power used until the project is accepted, or until completion of the Landscape Maintenance period, whichever is later, and the utility accounts are transferred. At Final Acceptance, Contractor will submit electrical meter account numbers to the Engineer and request transfer of the meter to the City, or the Contractor will remain responsible for electrical use and payment thereof, until transfer.

440.2 REFERENCES:

Conform to the requirements of reference information listed below except where more stringent requirements are shown or specified in the Contract Documents.

American Society of Testing Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.

Underwriters Laboratories (UL) - UL Wires and Cables.

440.3 QUALITY ASSURANCES:

Work involving plumbing for installation of copper piping, backflow preventer(s), and related work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.

440.3.1 Tolerances: Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, re-compaction, and repair of finish grade treatment.

440.3.2 Coordinate Work with Other Trades: For a period of one year from Final Acceptance, guarantee/warranty irrigation materials, equipment, and workmanship against defects. The Contractor shall replace any pavement damage resulting from the installation of the irrigation system and repair damage to grading, soil preparation, seeding, sodding, or planting at no additional cost to the owner. Make repairs within 3 days following notification by the Engineer.

440.3.3 Delivery Storage and Handling: During storage protect pipe from heat and sunlight. Provide shade protective cover and allow air to circulate between pipe. Transport pipe so as not to subject pipe to bending or concentrated external loads. Pipe, which is sun tanned, dented, or damaged will be rejected.

440.4 SUBMITTALS:

440.4.1 Shop drawings and product information: Prepare and make submittals in accordance with conditions of the Contract, and as follows: A minimum of ten days prior to beginning work on the irrigation system the Contractor shall submit six (6) copies of manufacturers literature. Highlight product specifics including name, and model numbers of materials listed below and any other items requested by the Engineer. Do not order materials until the Engineer approves products.

Items to be submitted:

Sprinklers (turf heads, shrub bubblers, emitters)	Backflow Preventers	Flowmeters
Pipe & Fittings	Automatic Valves	Flushcaps
Swing Joint Assemblies	Controllers	Micro-tubing & Stakes
Quick Coupling Valves	Solvents	Wire & Connectors
Gate Valves	Wye Strainers	Valve Boxes, Pull Boxes, etc.
Pressure Regulating Valves		

All items shall be those specified and approved by the Engineer. Substitutions will not be allowed without approval.

440.4.2 Record Drawings: The Contractor shall maintain an accurate set of as-built plans on site. At the end of each day work accomplished shall be updated on the as-built plans. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following:

Connection to existing water lines
Connection to existing electrical power
Gate valves
Routing of Sprinkler pressure lines (dimension at a minimum of 100 feet along routing)
Emitter control valves
Routing of control wiring
Quick-coupling valves
Other related equipment as directed by the Engineer

The Contractor shall indicate any non-pressure pipe routing changes on the as-built drawings.

Before the final inspection, the Contractor shall deliver to the Engineer one copy of the as-built plans to review. Delivery of this set of plans does not relieve the Contractor of the responsibility of furnishing required information that may be requested by the Engineer. The Contractor shall make corrections noted and submit final as-built plans to the Engineer for approval and acceptance. The Engineer will not certify payment requests or make final payment if as-built plans are not current or complete.

440.4.3 Controller Charts: As-Built drawings shall be approved by the Engineer before controller charts are prepared. The chart shall show the area controlled by the automatic controller and shall be 24" x 36" sheet size, unless a reduced size is approved by the Engineer. Identify the area of coverage of each remote control valve, using a distinctively different color, drawing over the entire area of coverage. Following review of the charts by the Engineer, they shall be hermetically sealed between two layers of 20 mm thick plastic sheets. These charts shall be completed and approved prior to final inspection of the irrigation system. When approved by the Engineer a separate card listing stations and areas covered may be substituted for the 24" x 36" hermetically sealed plan sheet(s).

440.4.4 Operation and Maintenance Manuals: Submit four (4) operation and maintenance manuals to the Engineer for review prior to final acceptance. The manuals should include the complete technical description of materials and products used; guarantee statement, complete operating and maintenance instructions on all major equipment. Contractor to provide a demonstration to maintenance personnel, with the Owner's Representative present, of how to adjust and maintain all sprinkler head types, controller functions, and recommended controller programs, as established by the Contractor. Contractor is also to review recommended watering rates for new plant materials.

440.4.5 Equipment to be Furnished: All materials to be new and bear the appropriate National Association seal of approval for example, NSF, UL. etc. Similar units shall be procured from the same manufacturer and internal parts shall be common and interchangeable. Parts listing and source replacement will be furnished to the Engineer.

Equipment to be furnished:

a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied to the project.
b. Two quick-coupler keys and matching hose swivels for each type of quick-coupling valve installed.
c. One five foot valve key for operation of gate valves

Extra Stock to be furnished:

a. 2 sprinklers of each type and 5 nozzles of each precipitation rate.
b. 2 bubblers of each flow rate used.
c. 5 Single Port Emitters of each flow rate used.
d. 2 Multi-port Emitters of each flow rate used.

The above mentioned equipment and stock shall be turned over to the Owner at the conclusion of the project. Before final inspection, evidence that the Owner has received this material must be provided to the Engineer.

440.5 PERMITS:

All permits for installation or construction of the work included under this Section, which are required by legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examinations required by these authorities.

440.6 EXECUTION:

Examine areas and conditions under which work of this Section is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

440.6.1 Staking: Mark the routing of the pressure supply line with powdered lime, and stake the locations of various components. Coordinate locations with other trades. Coordinate sleeves with other trades. Preliminary adjustments to conform to actual site conditions shall be accomplished during staking. Should changes be required, the Contractor shall obtain approval of the Engineer prior to actual work being performed. Utility connections, both water and electrical, shall be as shown on the plans or as designated by the utility concerned.

440.6.2 Trench Excavation: Trenches and other excavations shall be sized to accommodate the irrigation system components, conduit, and other required facilities. Additional space shall be provided to assure proper installation and access for inspection. Unless otherwise specified, the minimum depth of cover over pipelines and conduits shall be as follows:

a. Electrical conduit - 18 inches cover
b. Waterlines continuously pressurized - 18 inches cover
c. Lateral sprinkler lines - 12 inches cover
d. Plastic lines under pavement - 24 inches cover

The bottom of the trenches shall be true to grade and free of protruding stones, roots or other matter, which would prevent proper bedding of pipe or other facilities. Where ledge rock, hard pan, or boulders are encountered, the trench bottom shall be undercut and filled with sand or fine grained material approved by the Engineer.

Clearances:

a. Piping 3" and larger - minimum trench width of 12 inches.
b. Piping smaller than 3” - minimum trench width of 7 inches.
c. Provide not less than 4 inches of clearance between each line, and not less than 12 inches of clearance between lines of other trades, to permit service or replacement without disturbing the other line.

Grading and Stockpiling of trenched materials shall comply with Section 601.

440.6.3 Sleeving: Piping located under asphalt, concrete, or other pavements shall be sleeved, size and schedule as noted on the plan. If not noted, sleeves shall be Schedule 40, sized to easily accommodate piping. Use separate sleeve for wiring.

Boring will be permitted only where pipe must pass under obstructions, which cannot be removed, or when approved by the Engineer. When any cutting or removal of asphalt and or concrete work is necessary, it shall be saw cut in accordance with Section 601. Permission to cut asphalt or concrete shall be obtained from the Engineer. When piping on the drawings is shown in paved areas, but running parallel and adjacent to planted areas, the intent of the drawings is to install the piping in the planted area.

440.6.4 Piping: Provide pipe, schedule and size as shown on the drawings and per these specifications.

PVC Pipe: Snake pipe in trench as much as possible to allow for expansion and contraction. Provide a firm, uniform bearing for the entire length of each pipeline to prevent uneven settlement. Installation of pipe shall be installed in

accordance with ASAE Standard: ASAE 376. Pipe shall be clean prior to installation and shall be maintained in that condition during installation. When pipe lying is not in progress, the open ends of the pipe shall be closed by approved means.

If reclaimed water is used, all piping and associated appurtenances shall meet the applicable requirements of the Arizona Administrative Code R18-9-602(G). Signage will be placed to indicate the use of non-potable water.

Sand bedding or fine-grained material shall be provided where ledge rock, hard pan, or boulders are encountered. Compact bedding material is to provide a minimum depth of bed between pipe and rock of 4 inches.

Solvent welded joints shall be made in accordance with ASTM D-2855, and the type of solvent and primer recommended by the pipe manufacturer shall be used. Primer and solvent shall be applied to the pipe ends in such a manner that no material is deposited on the interior surface or forced into the interior of the pipe during insertion. Excess solvent on the exterior of the joint shall be wiped clean immediately after assembly. The pipeline will not be exposed to water for at least 12 hours after the last solvent welded joint has been made.

Schedule 80 pipe shall be used for threaded joints. Field threading shall be accomplished in the same manner as specified for steel pipe, except that a plug will be installed in the bore of the pipe prior to threading to prevent distortion. Solvent will not be used on threaded pipe. Threaded joints shall be hand tightened with final tightening as necessary to prevent leaks with a strap wrench.

The pipe shall be protected from damage during assembly. All vises shall have padded jaws and only strap wrenches will be used. Any plastic pipe, which has been nicked, scarred, or otherwise damaged, shall be removed and replaced. Care shall be exercised so that stress on a previously made joint is avoided.

When PVC to metal pipe connectors are required, these connections shall be accomplished first. A plastic adapter with external pipe threads should be used, screwing it into the metal internal pipe threads. Use a non-hardening pipe dope, such as Permatex #2, or equal, on all plastic to metal threaded joints. The joint shall be hand-tightened. Utilize a light wrench, as necessary, to prevent leaks.

When wrapped pipe is specified, joints and connectors shall not be wrapped until completion of the pressure test.

Use 45 degree fittings at all changes in depth of pipe. Couplings to be schedule 80 unless otherwise noted. Minimum length of PVC nipple shall be 3 inches.

440.6.5 Wiring: Service wiring shall be installed in rigid conduit from the service point to the controller at the minimum depth specified. A separate disconnect switch or combination meter socket, as required, shall be installed between the source of power and the controller. The minimum Service wire shall be No. 12 AWG copper 600 volt type, TWH or larger, as required by the contract documents or controller manufacturer. Wire splices for Service wiring shall be located in pull boxes where required to facilitate installation of wiring. Pull Boxes shall be shall be plastic, except where subject to vehicular traffic, concrete rated boxes shall be required. Service wiring shall be per current Local, State, National NEC requirements.

Low Voltage Control Wiring issuing from the controller shall be direct burial, type UF, No.12 AWG copper, unless otherwise required and installed in main or lateral waterline trenches wherever practical. Install common ground wire (type UF No. 12 AWG Copper) and one pilot or hot wire (type UF No. 14 AWG Copper) for each remote control valve (These are minimum wire sizes allowed when not noted otherwise on plans.). Multiple valves on a single control wire are not permitted.

Install two (2) control wires along the entire length of the mainline. Locate wire adjacent to main line piping. Never place wire on top of pipe. Bundle wires at 10 foot intervals with plastic electrical tape. Sufficient slack shall be left in the wiring to provide for expansion and contraction. Provide 12" loop (2 feet) at all changes in direction or at a minimum of 250 feet. When control wiring cannot be installed in the pipe trench it shall be installed a minimum of 18 inches below finish grade. Attach wire markers to the ends of the control wires and label valve stations at controller

locations.

All pilot or "hot" wires are to be of a different color and all common wires are to be of another (common) color. If multiple controllers are being utilized, and wire paths of different controllers cross both common and control wires, from each controller, shall be of different colors.

Splices in control wire shall be made only in Junction Boxes with approval from the Engineer. Splices shall be made with waterproof connector, approved for underground use. Sufficient slack shall be left to allow splices brought to the surface without disconnecting the wire. No splices shall be permitted under pavements.

All wiring shall be tested for continuity, open circuits, and unintentional grounds prior to connecting the equipment. All controllers shall be grounded independent of any other controller as recommended by the controller manufacturer, and all valves shall be connected to the common ground wire of their respective controller. A single separate pilot or hot wire (different color) shall be extended from the valve to the specified controller. Low voltage wire splices outside of the valve box are not permitted, unless approved by the Engineer, at which case they must be made in a PVC Pull Box.

One spare #12 AGW wire “Pilot” (orange) and one #12 “Common” wire, (total 2 - #12 wires) shall be installed from the controller along the entire length of pressure lines to last (farthest) electric control valve on each and every leg of the mainline. The color of the spare control wire is to be of an alternate color. Provide 3 foot length of all spare wires in each remote control valve box along wire routing.

440.6.6 Valves, Valve Boxes, and Special Equipment: Backflow Preventer Assembly: The Backflow Prevention assembly shall be installed per the details shown on the drawings and associated governing code requirements. Provide pipe supports and the accessories to properly secure the assembly. The irrigation system shall not be operated until the assembly has been tested and certified to meet the requirements of the Water Services Department.

After the backflow assemblies have been properly installed by the Contractor and approved by Planning and Development Department, the Contractor shall pay for testing and be responsible for having the assembly(ies) tested by a certified backflow prevention assembly tester, approved by the City. The tester shall prepare test report(s), showing the condition of the assemblies and confirming that the assemblies are properly functioning. It is the Contractors responsibility to submit the forms to the Engineer. Final acceptance will not be given until the reports are approved by the Engineer.

Valves, Pressure Regulators, and Related Accessories shall be installed as shown on the plans, or as specified. They shall be installed in a normal upright position unless otherwise recommended by the manufacturer, and shall be readily accessible for operation, maintenance and replacement. The equipment shall be set at a sufficient depth to provide clearance between the valve box cover and the valve handle, cap, or key for operation of the system.

Gate Valves and Isolation Valves shall be installed below ground and shall be housed in a concrete or plastic pipe, with bolt down locking cover that will permit access for servicing. The pipe shall be centered on the valve stem. Isolation valves shall not be located within range of the sprinklers they control without approval of the Engineer.

Drain Valves shall be installed at all low points in pressure supply line as detailed. Provide drainage sump for each drain valve based on the table below:

TABLE 440-1
CUBIC FEET OF GRAVEL PER DRAIN VALVE
DISTANCE OF PIPING TO BE DRAINED

Pipe Size	0-250 LF	251-500 LF	501-750 LF	751-1000 LF
1"	0.75	1.50	2.25	3.00
1-1/4"	0.75	1.50	2.25	3.00
1-1/2"	1.50	3.00	4.50	6.00
2"	2.50	5.00	7.50	10.00
2-1/2"	4.00	8.00	12.00	16.00
3"	6.00	12.00	18.00	24.00
4"	11.00	22.00	33.00	44.00
6"	25.00	50.00	50.00	50.00

Quick Couplers and Hose Bibcocks shall be installed as shown on the plans, or as specified. Their location shall be a minimum of 3 feet from curbs, pavements and walks, unless approved otherwise by the Engineer. Hose bibcocks shall be set 12 inches above finish grade and installed on a galvanized riser or as detailed.

Quick Coupler Assemblies: shall have double swing joint mobility to allow for full and optimal positioning. A pre-manufactured swing joint assembly as manufactured by Lasco Inc., or approved equal is specified. All quick couplers shall be set perpendicular to finish grade unless otherwise designated on the plans or instructed by the Engineer.

Valve Boxes: Install one valve box for each valve installed as shown on the plans, or specified unless directed otherwise by the Engineer. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted. Set valve boxes 1/2 inch above finish grade.

The valve boxes shall be branded with the controller letter and station number of the contained valve. The letter and number size shall be no smaller than 1 inch and no greater in size than 1-1/2 inches. Depth of branding shall not be more than 1/8 inch into the valve box lid. All labeling shall be neat and legible.

440.6.7 Sprinklers, Bubblers, and Emitters: Sprinklers, Bubblers, and Emitters: Install where indicated on the drawings, staked and approved. Set to finish grade as detailed; spacing of Sprinklers shall not exceed maximum recommended by the manufacturer without approval of the Engineer. Assemblies shall be installed as detailed, provide at least 4 inches clearance from vertical elements projecting above grade such as walls, planter boxes, curbs, and fences.

Turf Heads Assemblies shall have double swing joint mobility to allow for full and optimal positioning. A pre-manufactured swing joint assembly such as that manufactured by Lasco Inc., or approved equal is specified. All sprinkler heads shall be perpendicular to finish grade unless otherwise designated on the plans or instructed by the Engineer. Install for head to head coverage and uniform distribution throughout the turf area.

Plant Bubbler Assemblies shall consist of a horizontal connection to the lateral line with 1/2" S.D.R. 13.5 PVC lateral extension, schedule 40 fittings, and 1/2" flex hose riser (sch 40) with male adaptor (slip x thread) to receive the bubbler. Install bubbler assemblies as detailed on the plans. Locate the top of bubbler:

a. 1" above finish grade in shrub beds.
b. In turf areas - provide 4" diameter (times 12" long) PVC class 200 vertical sleeve filled with pea gravel. Install bubbler 3" below top of sleeve. Set top of pipe flush with finish grade of turf.

Emitter Assemblies provide a horizontal connection to the lateral line using schedule 40 PVC fittings and PVC to flex adapters (slip x slip), 1/2" schedule 40 flex tubing (max. length, 20') and slip x threaded male adaptor to receive the emitter. Emitter outlets shall be installed to the high side of the plant. Provide a minimum of 1 outlet per shrub, and 3 outlets per tree, equally space around the plant, unless otherwise noted in the plans. Single port emitters shall be located 1 inch above grade as detailed. Multi-port emitters shall be located below finish grade, as detailed, and the distribution tubing staked in place then covered with 2 inches of mulch. The distribution tube outlet end shall be exposed above the

soil/mulch surface to water the root ball of the plant.

440.6.8 Controller System: The controller and accessories shall be installed at the locations designated and per the details shown on the contract documents. Submit shop drawings of components.

Controllers located outdoors shall be installed in cabinets specifically design to house the controller, or as detailed on the plans. The concrete pad for controller enclosures shall be Class B, size shall be as shown, or if not shown, as recommended by the manufacturer. All copper pipes in contact with concrete shall be type k copper and sleeved or wrapped with "Scotchwrap #50" or equal minimum thickness 40 mils.

Controllers located in building: Prepare an elevation plan detailing placement of equipment, conduit, sleeves and wire gutter runs to the Engineer, for approval. Stub out all conduit 2 feet beyond concrete foundations or walls and provide bushings for all conduit. All RGS conduit in contact with earth shall be wrapped with "Scotchwrap #50, or equal, minimum thickness 40 mils.

440.6.9 Pipe Bedding, Backfill, and Compaction: Bedding: Pipe shall be bedded in at least 4 inches of finely graded native soil or sand to provide a firm uniform bearing. After laying the pipe shall be surrounded with additional finely grained native soil, or sand, then covered with not less than 4 inches of the same material. Bedding sand shall be required when site conditions dictate and clean finely grained native soil is not available. Contractor shall verify site conditions and satisfy his concern prior to bidding; no separate payment shall be made for bedding sand.

Backfill trenches and excavations with clean material. Remove organic material, as well as rocks larger than 1 inch in diameter. Place acceptable backfill material in lifts, the height of which shall not exceed that which can be effectively compacted, pending on the type of equipment and methods used. Trenches and excavations shall be backfilled to match engineered earthwork sections.

Partially backfill the irrigation trenches and pressure test the system, prior to completing backfill operations. Center load the pipe with sufficient backfill to hold the line in place, keeping the joints exposed for observation until completion of testing.

Compaction shall be in accordance with Section 601. Water settling of the trenches is not permitted unless approved by the Engineer.

440.6.10 Cleaning: Maintain continuous cleaning operations throughout the duration of the work. Dispose of, off-site at no additional cost to the Owner, all trash or debris generated by installation of the irrigation system.

440.7 FLUSHING AND TESTING:

After completion and prior to the installation of any terminal fittings, the entire pipeline system shall be thoroughly flushed to remove all foreign material. After flushing, the following tests shall be conducted in the sequence listed below. All equipment, materials, and labor necessary to perform the tests shall be furnished by the Contractor, and all tests shall be conducted in the presence of the Engineer.

Pipeline Pressure Test: A water test shall be performed on all pressure mains. Pressure mains shall be tested with all control valves installed and in the closed position. The constant test pressure and duration of the test shall be for 6 hours at 125 psi. Any leaks, which occur during the test period, will be repaired immediately following the test. The pressure mains will then be re-tested until accepted by the Engineer.

Sprinkler Coverage Test: The coverage test shall be performed after the sprinkler heads have been installed and shall demonstrate that each section or zone in the irrigation system is balanced to provide uniform and adequate coverage of the areas served. The Contractor shall correct any deficiencies in the system.

Operational Test: The Contractor shall perform an operational test of the system to ensure proper and even distribution of water to all plants. Adjust or replace any type of irrigation equipment not operating correctly prior to the walk-through inspection.

440.8 PRELIMINARY, SUBSTANTIAL AND FINAL WALK-THROUGH INSPECTIONS:

Arrange for a preliminary walk-through with the general contractor's superintendent, when the entire system is operational. Operate each zone in its entirety, additionally, open all valve boxes and expose items covered, if directed. Generate a list of items to be corrected and make adjustments, "fine tuning" the entire system by regulating valves, adjusting patterns and break-up devices, and setting pressure regulators at proper and similar pressure to provide optimum and efficient coverage. Flush and adjust all outlet devices for optimum performance and to prevent run-off or spray on to walks, roadways, and buildings.

Arrange for a Substantial Completion walk-through with the Engineer when all items generated from the preliminary walk-through have been corrected. Items deemed not acceptable by the Engineer shall be reworked to complete satisfaction. The Landscape Maintenance Period will not begin unless the irrigation system is operating correctly and until authorization by the Engineer. All accessories, charts, record drawings and equipment, as required, will be provided before scheduling the Final walk-through.

Following the Landscape Maintenance Period a Final walk-through inspection will be scheduled to review the system and make adjustments to the watering schedules.

440.9 MEASUREMENT AND PAYMENTS:

Measurement and payment shall be in accordance with the General Conditions. The lump sum established in the schedule of values shall be full compensation for furnishing all labor, materials, tools and equipment, and performing all work necessary for completion of the irrigation system described or specified in the contract documents.

When unit bid items are included in the proposal sheets, the unit prices quoted shall include the following items of work and material.

(A) Water Service Tap and Meter: The work under this item will be performed by the City of Phoenix Water Services Department and consists of furnishing and installing a curb stop, concrete meter box with cover, tap to main and pipeline to the curb stop at the locations and in accordance with the details shown on the plans. The curb stop and water meter box will be paid for under this item. Payment will be made at the current price for this service as charged by the City of Phoenix. With some projects an allowance may be shown in the bid proposal for this item (refer to Subsection 440.1.1).

(B) Backflow Prevention Unit: The unit price for this item shall include the backflow prevention unit, locking cage assembly, risers and concrete thrust blocks, complete and in place.

(C) Electrical Remote Control Valve and Assembly: The unit price for this item shall include the valve, the valve box with stainless steel hex bolt secured cover, pea gravel and specified pipe to the meter or backflow prevention unit.

(D) Sprinkler Controller: The unit price for this item shall include:

Cost of sprinkler controller (automatic);

All wiring for a complete underground control system, including trenching, wire, conduit, boring or jacking;

Steel security cabinet with concrete base, grounding system, metal hasp and padlocks, and all wiring within the cabinet unless controller is placed on a building or within a walled enclosure.

The junction box and any work and materials required from the stub out provided by the power company in order to complete the installation of the controller.

(E) Irrigation Pipe: The contract price for this item shall include the pipe and fittings, trenching, backfilling and any necessary boring or jacking to install the pipe. Sleeves shall be Schedule 40.

(F) Pull Box: The contract price for this item shall include the pull box (plastic irrigation valve box with stainless steel hex bolt secured cover).

(G) Sprinkler Head: The contract price for this item shall include the head and all fittings, nipples and risers from lateral to the head.

PART 500
STRUCTURES

SECTION 505

CONCRETE STRUCTURES

Subsection 505.1 DESCRIPTION: Delete the last paragraph and replace it with the following:

Permanent ladders, embedded ladder rungs, and permanently embedded tie-off points are not permitted and shall not be installed.

SECTION 515

STEEL STRUCTURES

Subsection 515.1 DESCRIPTION: Add the following paragraph to the end of this Subsection:

This Section shall govern the construction of steel structures within the public right of way and public right of way easements.

Subsection 515.1.3 As Built Plans: Delete this Subsection in its entirety and replace with:

Before formal acceptance of the work, the Contractor shall submit detailed As-Built plans of the structure to the Engineer. Scans of the As-Built plans will be retained by the City as permanent records. As-Built plans shall be submitted on bond paper and shall be of a quality satisfactory to the Engineer. Mylar or Vellum plans may be submitted at the Contractor's option at no additional cost to the City.

Subsection 515.1.4 Methods and Equipment: Add the following paragraph to the beginning of this Subsection:

Special provisions shall specify special inspection requirements for the fabrication, erection and assembly of structural members and connections.

Subsection 515.2 STEEL BUILDING AND MISCELLANEOUS STEEL STRUCTURES: Delete the first paragraph in its entirety and replace with the following:

Details of design, fabrication and erection of such buildings and structures shall conform to the City of Phoenix Construction Code.

SECTION 520

STEEL AND ALUMINUM HANDRAILS

Subsection 520.2 FABRICATION: Add the following after the fourth paragraph:

Aluminum railings or members shall be Aluminum Alloy 6063-T6 as per the Aluminum Alloy Association Standards for Handrails.

Aluminum railings shall be approved for use by the City Engineer or City Materials Lab Supervisor prior to being installed in concrete. Aluminum items shall have an approved, continuous, protective coating on all surfaces that will be in contact with a Portland cement concrete product.

PART 600
WATER, SEWER, STORM DRAIN AND IRRIGATION

SECTION 601

TRENCH EXCAVATING, BACKFILLING AND COMPACTION

Delete SECTION 601 in its entirety and replace with the following:

601.1 DESCRIPTION:

The work covered by this specification consists of furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the excavation and backfilling of trenches in accordance with the plans and special provisions.

Excavation for appurtenant structures, such as manholes, inlets, transition structures, junctions, structures, vaults, valve boxes, catch basins, etc., shall be deemed to be in the category of trench excavation.

601.2 EXCAVATION:

601.2.1 General: No extra monetary compensation or additional time will be authorized for claims that soil conditions differ from those anticipated or those indicated by soil logs and/or reports. It is the Contractor's responsibility to make his own determination as to actual existing conditions.

601.2.2 Trench Widths: Trenches for other than cast-in-place concrete pipe shall conform to the following dimensions, unless otherwise specified in the special provisions, indicated on the plans, and/or approved by the Engineer.

Table 601-1

Size of Pipe (I.D.)	Max. Width at Top of Pipe Greater Than O.D. of Barrel	Min. Width at Springline Each Side of Pipe
Less than 18"	16"	6"
18" to 24" inclusive	19"	7-1/2"
27" to 39" inclusive	28"	12"
42" to 60" inclusive	1/2 O.D.	12"
Over 60"	36"	12"

The width of the trench shall not be greater than the maximum indicated above, at and below the level of the top of the pipe. If the maximum trench width as specified above is exceeded at the top of the pipe, the Contractor shall provide, at no additional cost to the Contracting Agency, the necessary additional load bearing capacity by means of bedding, having a higher bedding factor than that specified, higher strength pipe, a concrete cradle, cap or encasement, or by other means approved in writing by the Engineer.

The width of the trench above the top of the pipe may be made as wide as necessary for shoring, sheeting or other wall support measures necessary for a safe and proper installation. The Contractor may elect to slope the trench walls in lieu of shoring, sheeting or other wall support measures. In all cases the Contractor shall be responsible for any and all problems encountered and costs incurred as a result of increased trench width.

No increases in contract time will be allowed as a result of sloping trench walls. Table 601-1 shall be used for computing trench pay width.

601.2.3 Trench Grade: Alignment and elevation stakes shall be furnished as requested by the Contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

For all pipe 8 inches or greater in diameter, the Contractor shall excavate for and provide a granular bedding at least four inches thick or 1/12 the O.D. of the pipe whichever is greater. This bedding material shall be placed at a

uniform density with minimum compaction and accurately fine graded to provide uniform bearing and support along the bottom of the pipe except where necessary to excavate for bells and pipe joint couplings.

601.2.4 Overexcavation: Except at locations where excavation of rock from the bottom of the trench is required, care shall be taken not to excavate below the depth indicated.

Whenever rock is encountered in the trench bottom, rock shall be overexcavated no less than 6 inches below the exterior bottom of the pipe. The overexcavation shall be backfilled with ABC material compacted to a uniform density of not less than 95 percent.

If the Engineer determines that overexcavation and backfilling, below the bedding material is required as a result of unsuitable material, it will be considered extra work. Payment and construction time extension will be negotiated with the Contractor. As a condition of the Contractor receiving payment for the extra work, agreement on method of payment and construction time extensions shall be reached prior to start of work.

Unauthorized excavation below the specified grade line shall be backfilled at the Contractor's expense with ABC material compacted to a uniform density of not less than 95 percent.

601.2.5 Excavation for Manholes, Valves Inlets, Catch Basins and Other Accessories: When placing concrete for a poured-in-place structure, the Contractor may place the poured concrete directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if precast structures are used, the Contractor shall overexcavate to place the structure.

When the structure is within the maximum trench limit, backfilling shall be in accordance with the requirements specified for the adjoining pipe. If the item is being constructed outside of the maximum trench limits, the overexcavation shall be backfilled with ABC compacted to 100%.

Any excavation below the elevation indicated for the foundation of any structure shall be filled with ABC per Section 702 and compacted to at least 95% at the expense of the Contractor.

601.2.6 Grading and Stockpiling: All grading in the vicinity of trench excavation shall be controlled to prevent surface water from flowing into the trenches. Any water, either surface or ground, accumulated in the trench shall be removed by pumping or by other approved methods. There shall be no additional payment for this work.

Excavated material, with excessive or inadequate moisture content, shall be considered unsuitable for proper compaction. The Contractor shall, at his own expense, remove or add moisture to the excavated material to bring it within the range of +2 to -2 percent of the optimum moisture content in order that proper compaction, as per Table 601.3, can be obtained.

In lieu of the above, the Contractor may, at no cost to the Contracting Agency, haul-off and dispose of excessively wet or dry material and replace it with material conforming to the backfill specifications. Disposal shall be in accordance with the project specifications.

In either event, the proper compaction and stability shall be obtained.

There will be no additional payment or time extension for this work.

601.2.7 Shoring and Sheeting: All shoring and sheeting necessary to protect the excavation, and provide a stable trench condition to safeguard vehicular and pedestrian traffic, the Engineer's representatives during inspection and testing procedures, and any other permitted public uses shall be installed and maintained. See Section 107.

601.2.8 Open Trench: Where a trenching operation crosses under existing 12 inch or smaller ACP waterlines (excluding service lines) and four feet or more of the existing ACP pipe is exposed, the Water Services Department - Water Distribution Division will isolate the exposed waterline by either cutting in any necessary valves or by the use of existing

valves. After the exposed waterline has been isolated, the Contractor shall remove that part of the exposed waterline to the limits shown in MAG Standard Detail 403-3. The waterline shall then be replaced by the Contractor (during the trench backfilling operation) with the same size, Class 350, ductile iron pipe as shown in MAG Standard Detail 403-3. The removal and replacement section shall extend at least five feet beyond the trenching operation's trench wall and into undisturbed ground. The Contractor shall request a shut-down, at least one week in advance, from Water Distribution (262-4711 or 4712). City forces will perform the shutdown and/or valve cut-in. There will be no charges to the Contractor for this work. On permit work, the Contractor shall pay for any and all work required.

The Contractor will be paid for the ductile iron pipe at the unit price bid per each crossing under the bid schedule item WATERLINE REPLACEMENT. If there is an unanticipated conflict at the crossing which can be resolved with "offset pipe joints", the Water Services Department will supply the offset joints to the Contractor at no cost. Offset pipe joints will be picked up by the Contractor at the City's Water Stores Warehouse at 2640 South 22nd Avenue. Requests to pick up such material must be conveyed to the Water Services Department at least 24 hours in advance by the City Inspector. The Contractor shall install the offset joints at no additional cost. The WATERLINE REPLACEMENT item shall include costs for trench excavation, backfill, compaction, and surface restoration.

601.3 FOUNDATION, BEDDING, BACKFILLING AND COMPACTION:

601.3.1 Bedding: Bedding is ABC material (unless otherwise specified in Subsection 601.3.10) placed below the bottom of the pipe at a uniform density with minimum compaction to provide uniform bearing and support along the bottom of the pipe except where necessary to excavate for bells and other pipe joint couplings. Lime-treated bedding material shall be prohibited.

Bell and joint coupling holes shall be dug after the trench grade has been fine graded. Such holes shall be of sufficient width to provide room for caulking, banding or bolting. Holes shall be excavated only as necessary to permit accurate work in making of the joints and to ensure that the pipe will rest upon the prepared foundation material, and not be supported by any portion of the joint.

Depression of joints, other than bell and spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

601.3.2 Haunching and Initial Backfill: Haunching is the material placed from the bottom of the pipe to the pipe springline. Initial backfill is the material placed from the pipe springline to one foot above the top of the pipe or conduit (1-inch above the top of pipe for SRPE pipe). Haunching and initial backfill material type is dependent upon the type of pipe and on the type of utility. Haunching and initial backfill shall be Aggregate Base (ABC) or Controlled Low Strength Material (CLSM), unless otherwise specified in Subsection 601.3.10. Lime-treated haunching and initial backfill material shall be prohibited. Open graded rock will not be used without the written approval of the Engineer.

Where water consolidation is used, haunching and initial backfill for pipes, 24 inches or less in I.D., may be placed in one lift. For larger pipes, the first lift shall not exceed the springline of the pipe. Where mechanical compaction is used, the moisture content shall be within a range of +2 to -2 percent of the optimum moisture content prior to placing the material in the trench. The first lift shall be eight inches or 2/3 of the distance to the springline whichever is greater. Succeeding lifts shall not exceed one foot loose and extreme care will be taken to prevent damage to or movement of the conduit by the compaction equipment.

The Contractor shall employ the necessary means and methods to maintain roundness of CMP, HDPE and SRPE type pipe during haunching, initial backfilling and final backfilling. The Contractor shall adequately anchor the pipe against buoyant forces to maintain grade and alignment during the placement of the CLSM haunching and initial backfill.

601.3.3 Haunching and Initial Backfill for Storm Drains Maintained by the City of Phoenix: Haunching and initial backfill for public storm drain pipe lines maintained by the City of Phoenix shall conform to this Subsection.

The Contractor shall employ the necessary means and methods to maintain roundness of CMP, HDPE and SRPE type pipe during haunching, initial backfilling and final backfilling. The Contractor shall adequately anchor the pipe against buoyant forces to maintain grade and alignment during the placement of the CLSM haunching and initial backfill.

601.3.3.1 Haunching and Initial Backfill for Storm Drain Mainline Pipe: Controlled Low Strength Material (CLSM) haunching shall be placed from the outside bottom of the pipe to the springline of the pipe for all approved storm drain pipe types, except cast-in-place pipe that is cast against the trench walls.

ABC initial backfill shall be utilized from the springline to 1 foot above reinforced concrete pipe (RGRCP), and cast-in-place concrete pipe storm drains.

The Contractor, at his option, may substitute CLSM for other initial backfill materials specified at no additional cost.

High density polyethylene (HDPE) pipe shall have CLSM initial backfill from the springline to one 1 foot over the outside top of pipe.

Steel reinforced polyethylene pipe (SRPE) shall have CLSM initial backfill from the springline to one 1 inch over the outside top of pipe. No additional initial backfill will be required over the CLSM initial backfill.

601.3.3.2 Haunching and Initial Backfill for Storm Drain Catch Basin Connector Pipe: Aggregate Base Coarse (ABC) haunching or Controlled Low Strength Material (CLSM) haunching shall be placed from the outside bottom of the pipe to the springline of the pipe for all approved storm drain pipe types. ABC initial backfill shall be utilized from the springline to 1 foot above the pipe for all approved storm drain pipe types.

The Contractor, at his option, may substitute CLSM for other haunching and initial backfill materials specified at no additional cost.

601.3.3.3 Haunching and Initial Backfill for Storm Drain Culverts: Controlled Low Strength Material (CLSM) haunching shall be placed from the outside bottom of the pipe to the springline of the pipe for all approved storm drain culvert types, except cast-in-place pipe that is cast against the trench walls. ABC initial backfill shall be utilized from the springline to one (1) foot above the top of culvert.

The Contractor, at his option, may substitute CLSM for other initial backfill materials specified at no additional cost.

Corrugated Metal Pipe (CMP) culvert shall have CLSM haunching and initial backfill from the outside bottom of pipe to one (1) foot over the outside top of pipe.

601.3.4 Final Backfill: Final backfill is the material placed above the initial backfill. The type of final backfill required shall conform to Subsection 336.3**.** Final backfill shall be sound material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, this may be native material or borrow material with no piece larger than eight inches, select material or aggregate base course. Under pavement, parking lots, sidewalks, etc., pieces larger than three inches will not be used in the final 12 inches below the pavement subgrade.

Where water consolidation is used, final backfill will be placed in lifts as required in the following table prior to settlement.

TABLE 601-2

TRENCH WIDTH	FINAL BACKFILL LIFTS (FOR WATER CONSOLIDATION)
18" TO 24"	NOT TO EXCEED 4'
25" TO 36"	NOT TO EXCEED 6'
OVER 36"	NOT TO EXCEED 8'

The above final backfill lift limitations are not applicable when water consolidation is accomplished by the jetting method.

When mechanical compaction is to be used, the Contractor will provide a test section demonstrating his proposed method and equipment to be used. Upon agreement with the Engineer as to the acceptability of the Contractor's proposed method and equipment, they shall not be changed without the prior approval of the Engineer. Mechanical compacted lifts in excess of one foot will not be allowed without the written consent of the Engineer.

Final backfill material shall be within the range of +2% to -2% of the optimum moisture content, prior to placing the material in the trench. The moisture content shall be uniform throughout the final backfill material. If clayey material is encountered within the trench excavation, the optimum moisture deviation range shall be determined by the Engineer. Clayey material will not be utilized as trench backfill without the approval of the Engineer.

Material not meeting these requirements may be required to be removed from the trench and moisture added or removed to correct the deficiencies prior to replacement, all at no increase in cost to the Contracting Agency.

It shall be the Contractor's responsibility to blend excavated material, removing or adding moisture as may be necessary to meet the requirements of the specifications, all at no increase in cost to the Contracting Agency.

Excavated material, when used for final backfill, shall meet the requirements of Subsection 601.2.6.

The moisture content requirements contained herein are waived when granular final backfill material is used and water consolidated.

The Engineer may require all or any part of the trench to be load tested for stability with Contractor's equipment prior to placement of asphalt or Portland cement concrete pavement. Unstable pumping areas as determined by the Engineer shall be corrected by the Contractor at no increase in cost to the Contracting Agency.

TABLE 601-3

MINIMUM TRENCH COMPACTION DENSITIES

Backfill Type	Location	From Surface To 2 feet Below Surface	From 2 feet Below Surface To Top of Initial Backfill	Haunching and Initial Backfill
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2-feet of the above.	100% for granular and non-granular	95%	95%
II	On any utility easement street, road or alley right-of-way outside limits of (I).	95%	95%	95%
III	Around any structures or exposed utilities.	95% in all cases		

Note: The compaction type required will generally be shown on the plans and the plans will govern. Where no compaction type is shown on the plans the compaction type shall comply with the above.

A consideration in determining the compaction types as shown on the plans is based on the trench widths as shown in the Contract Documents. If these trench widths are increased beyond those widths referred to above and fall within the 2-foot limit of paved surfaces and other improvements due to construction means and method or site conditions, the compaction designation for that portion within the 2-foot limit of such improvements shall be Type I even though Type II may be shown on the plans.

601.3.5 Compaction Methods: Water consolidation by jetting shall be accomplished with a 1-1/2" pipe of sufficient length to reach the bottom of the lift being consolidated with adequate hose attached and a water pressure of not less than 30 psi.

All jetting shall be accomplished transversely across the trench at intervals of not more than 6 feet with the jetting locations on one side of the trench offset to the jetting locations on the other side of the trench. The entire lift shall be leveled and completely saturated working from top to the bottom.

Jetting shall be used as the consolidation method for all conduit haunching and initial bedding. The Contractor shall be entirely responsible for establishing each lift depth so as to avoid floating the conduit being placed and shall make any repair or replacement at no cost to the Contracting Agency. However, for conduit larger than 24 inches I.D. the first lift shall not exceed the springline of the conduit.

Flooding is not acceptable as a water consolidation method unless authorized in the specification or by a written change order. It will consist of the inundation of the entire lift with water and then puddled with poles and bars to ensure saturation of the entire lift.

Where jetting or flooding is utilized and the surrounding material is such that is does not permit proper drainage, the Contractor shall provide, at his expense, a sump and a pump at the downstream end to remove the accumulated water.

The use of water consolidation does not relieve the Contractor from the responsibility to make his own determination that such methods will not result in damage to existing improvements. The Contractor shall be responsible for any damage incurred.

Where water consolidation is not permitted or does not result in adequate compaction, the haunching, initial backfill and final backfill material shall be compacted with hand and/or mechanical work methods using equipment such as rollers, pneumatic tamps, hydro-hammers or other approved devices which secure uniform and required density without injury to the pipe or related structures.

Water consolidation will not be permitted for non-granular material.

601.3.6 New Residential Development Area: In a new development area, prior to paving and prior to opening the area to public traffic, the following deviation to water consolidation, haunching, initial backfill, and compaction shall only apply to new local streets:

(A) Water consolidation by jetting of non-granular material will be permitted only at the Engineer's discretion and approval. Increased quantity of compaction testing (100% increase per lift) will be required in accordance with the Streets Lab minimum testing requirements.

(B) Water consolidation by flooding shall be allowed ONLY where backfill material meets the specification for granular backfill material (Subsection 601.3.7) OR the bottom of the lift is less than 4 feet from top of subgrade. Increased quantity of compaction testing (100% increase per lift) will be required in accordance with the Streets Lab minimum testing requirements.

(C) The minimum density required for haunching and initial backfill shall be 95%. Manholes shall be compacted to 95% within 24" of the structure. Outside these limits, 95% shall be required. Native material is acceptable.

(D) The minimum density required for backfill from 2 feet below the surface to the top of initial backfill shall be 95%. The minimum density from the surface to 2 feet below the surface shall be as prescribed in Table 601-3.

(E) Sewer services shall require compaction tests on 30% of the total sewer services in new subdivision.

601.3.7 Specifications for Granular Backfill Material: Granular Backfill Material shall not be used in the pipe

embedment zone. For purposes of this specification, Granular Backfill Material shall be defined as material for which the sum of the plasticity index and the percent of the material passing No.200 sieve shall not exceed 23. The plasticity index shall be tested in accordance with AASHTO T-90.

601.3.8 Rights of Way Belonging To Others: Bedding, initial backfill, final backfill and compaction for irrigation lines of the Salt River Valley Water User's Association and Roosevelt Irrigation Districts and for trenches on State of Arizona and Maricopa County rights-of-way, outside the limits of the City of Phoenix, shall be accomplished in accordance with their permit and/or their specification.

601.3.9 Test Holes: Boring logs shown on the plans or included in the specifications do not constitute a part of the contract and are included for the Contractor's convenience only. It is not intended to imply that the character of the material is the same as that shown on the logs at any point other than that where the boring was made. The Contractor shall satisfy himself regarding the soils moisture content and the amount of rock, gravel, sand, silt, clay and water to be encountered in the work to be performed.

601.3.10 Bedding, Haunching and Initial Backfill for Electronic, Telephonic, Telegraphic, Electrical, Oil and Gas Lines: Bedding, haunching and initial backfill for these underground facilities shall be native material or sand which conform the grading requirement of ASTM C-33 for fine aggregate. Lime-treated bedding, haunching and initial backfill shall be prohibited. When final backfill material consists of aggregate base course, crushed stone or other material containing stones, only sand will be used for bedding, haunching and initial backfill. The bedding depth shall be six inches and initial backfill depth shall be one foot above the top of the facility. Compaction will be in accordance with Section 601.

601.4 PAVEMENT REPLACEMENT AND SURFACE RESTORATION:

601.4.1 Grading: The Contractor shall do such grading in the area adjacent to backfilled trenches and structures as may be necessary to leave the area in a neat and satisfactory condition approved by the Engineer.

601.4.2 Restoring Surface: All streets, alleys, driveways, sidewalks, curbs, or other surfaces in which the surface is broken into or damaged by the installation of the new work, shall be resurfaced in kind or as specified to the satisfaction of the Engineer in accordance with Section 336.

601.4.3 Clean-Up: The job site shall be left in a neat and acceptable condition. Excess soil, concrete, etc., shall be removed from the premises.

601.4.4 Temporary Pavement: The Contractor shall install temporary asphalt pavement or the first course of permanent pavement replacement in accordance with Section 336 immediately following backfilling and compaction of trenches that have been cut through existing pavement. Except as otherwise provided in Section 336, this preliminary pavement shall be maintained in a safe and reasonably smooth condition until required backfill compaction is obtained and final pavement replacement is ordered by the Engineer. Temporary paving removed shall be hauled from the job site and disposed of by the Contractor at no additional cost to the Contracting Agency.

601.5 PAYMENT:

The cost for work covered in this Section, which may include the removal of asphalt pavement, removal of obstructions, trench excavation, overexcavation, bedding, haunching and initial backfilling (including CLSM), final backfilling, compaction, testing and placement of temporary pavement shall be considered incidental to the respective structure, pipe and conduit work and shall be included in the unit price bid in the proposal for the structure, pipe and conduit work.

SECTION 603

INSTALLATION FOR HIGH DENSITY POLYETHYLENE PIPE

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 604

PLACEMENT OF CONTROLLED LOW STRENGTH MATERIAL

Subsection 604.1 DESCRIPTION: Delete this Subsection in its entirety and replace it with the following:

The work covered by this specification consists of furnishing all materials, labor and equipment for the placement of controlled low strength material (CLSM).

CLSM may be specified as fill in areas where post-construction consolidation would be detrimental and in areas not accessible for the proper compaction of other fill material types.

The type of backfill to be used shall be as specified in the special provisions, plans or by the Engineer.

The following is a brief description of the types of CLSM:

1/2 SACK: A non-compressible, self-consolidating, fill material that allows future excavation with conventional hand tools and can be used as a general backfill, structure backfill, pipe bedding and embankment fill. 1/2 SACK CLSM is the default CLSM type unless otherwise specified.

1 SACK: A non-compressible, self-consolidating, fill material used, when specified, for additional compressive strength.

1-1/2 SACK: A non-compressible, self-consolidating, fill material used, when specified, under structure foundations, as thermal fill, and as mechanical protection for duct banks and conduits.

Subsection 604.2 MATERIALS: **Delete this Subsection in its entirety and replace it with the following:**

CLSM shall conform to the requirements of Section 728. Ready-mixed concrete, including timed-out, rejected, and truck wash-out material, shall not be used in lieu of CLSM without prior approval from the Engineer and shall be subject to rejection.

Subsection 604.5 ACCEPTANCE: **Delete the first paragraph in its entirety and replace it with the following:**

CLSM shall be considered deficient and may be rejected at the discretion of the Engineer when it does not conform to Section 728.

Subsection 604.5 ACCEPTANCE: **Delete subparagraphs (A) and (B) in their entirety.**

Subsection 604.6 PAYMENT: **Delete the first sentence in the first paragraph and replace it with the following:**

No separate measurement or payment will be made for CLSM.

SECTION 610

WATERLINE CONSTRUCTION

Subsection 610.3 MATERIALS: Delete the second, third, and fourth paragraphs in their entirety and replace with the following:

4-inch to 24-inch diameter pipe shall be ductile iron per Section 750 unless a specific material is specified. Class shall be designated in the plan or special provisions.

24-inch and larger diameter pipe may be concrete pressure pipe, steel cylinder type, per Section 758.

Subsection 610.4 CONSTRUCTION METHODS: Add the following Subsections:

610.4.6 Construction Work by City Forces:

(A) City forces shall perform all valve cut-ins, waterline shutdowns, and wet taps that are necessary for construction.

The Contractor shall contact the inspector to make the necessary arrangements to have the City forces perform the required work. With the exception of permit work, there will be no charge for valve cut-ins, waterline shutdowns, and wet taps that are necessary for construction.

For any valve cut-ins, waterline shutdowns, or wet taps requested by the Contractor, which are not necessary and are for the convenience of construction, the Contractor shall make application and pay the required charges to the City.

On permit work, the Contractor shall pay all costs incurred.

(B) When an existing waterline, other than as noted on the plans, conflicts with any proposed new work in the contract and no provision has been made in the proposal for relocating such lines, the City has the option to make any necessary adjustments or relocations, alter the proposed new work or negotiate with the Contractor for relocating the obstructing line.

610.4.7 Construction work by Other Utility Owners: Except as otherwise provided in the plans or project specification, all private utilities in conflict with the new work will be relocated by the owner thereof. Utility companies will adjust their manholes. In the event of an unanticipated conflict between the new work and a utility and the owner thereof disclaims responsibility for relocation, the Contracting Agency will negotiate with the owning utility and the conflict shall be resolved without extra cost to the Contractor. It will be necessary for the Contractor to coordinate his work with the utility companies in the relocation of their facilities during construction.

610.4.8 Construction Work by the Contractor:

(A) The Contractor shall adjust valve and meter boxes to final grade as described in Section 345.

(B) Where the centerline of the new waterline parallels the existing curb and gutter and is approximately two feet from the lip of the gutter, the Contractor shall remove and replace the pavement to the lip of the gutter. The Contractor will be paid for the extra pavement replacement in addition to the normal pavement re-placement over the pipe trench in accordance with Section 336.

(C) The Contractor shall accomplish the cutting and plugging of City water mains, where required on the plans, in accordance with COP Standard Detail P1343.

The cuts and plugs will remain exposed until line pressure is restored and they can be inspected for leakage. The Contractor shall schedule the restoration of line pressure through the Engineer.

Payment shall be at the unit bid price or lump sum bid price for "CUTTING AND PLUGGING EXISTING

WATER LINES." This payment shall be full compensation for material, labor, tools and equipment necessary to complete the work.

(D) Unless other adequate provisions are made for fire protection, a fire hydrant will not be out of service for a period exceeding 24 hours. When relocating water meters which utilize either galvanized or polyethylene service pipe (or any other non-standard service pipe) the entire service piping shall be replaced using the approved service pipe material for that particular meter size. The existing corporation stop can be used provided and approved copper pipe adapter is used. Approved adapters are the Ford C04-43 and C04-54 conversion assembly or equal.

(E) The Contractor shall submit record drawings and make a record of the locations of all work completed as part of the project. The as-builts shall show the locations of the beginning(s) and end(s) of the construction; all valves, fire hydrants, blow-off hydrants, pipe fittings, service connections, meters, and where pipes change alignment. The as-builts shall also show the locations and elevations where pipe changes elevation abruptly. Locations shall be shown by stationing and dimensioning from appropriate monument lines or, in their absence, appropriate lot lines, property lines or easement line references.

610.4.9 Approved Water Service Components: Approvals shown are not necessarily exclusive. If approval of a similar device, believed to be comparable and equal, is desired, a request should be submitted supported by appropriate information and data.

If general approval is desired, request should be submitted directly to the Water Services Department.

TABLE 610-1
CORPORATION STOPS

MANUFACTURER	COPPER SERVICES	W/DIELECTRIC INSULATION
FORD	P-1600	F-1000
HAYES		
JONES	J-3401	
McDONALD	4701 T	
MUELLER	H- 15028 B- 25028	

TABLE 610-2
ADAPTERS

MANUFACTURER	IPS COPPER, ELL
FORD	L-84-33 L-84-44
HAYES	
JONES	J-2619
MUELLER	H-15531
McDONALD	4779 MT

TABLE 610-3
CURB STOPS AND METERING COUPLINGS

MANUFACTUREER	CURB STOPS *	METERING COUPLINGS
FORD	B-11-333 B-11-666 B-11-444 B-11-777	SPM-2R
JONES	J-1900	J-130 J-134
McDONALD	6101	4622 or 4624
MUELLER	B-20283	H-10890

		H-10891
HAYES	4000	5680 or 5682

*Heads of all curb stops shall be drilled 1/4" diameter for locks.

610.4.10 Concrete Pressure Pipe - Steel Cylinder Type: Where concrete, steel cylinder, pressure pipe is installed the following shall apply:

(A) The Contractor shall mortar the inside and outside of all pipe joints. The mortar shall be applied in the field on the inside joints such that the mortared surface is flush with the adjacent pipe mortar lining. The outside of the joints shall be mortar coated by the diaper method. The mortar shall be a Type "M" mortar per Section 776 using Type II, low alkali cement.

(B) All non-mortar coated steel, including flanges, shall be covered with a minimum of two (2) inches of hand-packed mortar. Wire mesh shall be used to hold the mortar in place. Mortar shall be the same as applied to the joints. Field-applied coal tar coatings will not be accepted in lieu of mortar. Except, coat tar enamel in accordance with AWWA C-203 shall be applied to the non-mortar coated steel and flanges on the 24" side outlets in access manholes.

(C) Joint restraints shall be provided by means of welded joints. The extent of welded joints shall be as shown on the pipeline and layout drawings, and shall in no case be less than that shown on the plan drawings. Where welded joints are required, the weld shall be continuous about the entire circumference of the pipe joint. Welds shall be made intermittently, in short sections of about six (6) inches, to avoid overheating the gaskets on points where a gasket is used. Welds shall conform to that shown on the approved shop drawings and calculations.

610.4.11 For Mains Eighteen (18) Inches and Larger, the following shall apply:

(A) Backfill and compaction for the full distance encompassed by welded/restrained joints shall be completed prior to testing.

(B) All mainline valves shall be covered with a minimum of two (2) inches of hand-packed mortar. Wire mesh shall be used to hold the mortar in place. Field applied coal tar coatings will not be accepted in lieu of mortar. Portions of valves within manholes shall not be mortar coated. The mortar shall be a Type "M" mortar per Section 776 using Type II, low alkali cement.

(C) Where plans call for welding joints and ductile iron pipe is furnished, the Contractor shall restrain the joints by an approved joint restraint method.

610.4.12 Restrained Joints on Mains Less Than Eighteen (18) Inches in Diameter: Where restrained joints are specified on mains less than eighteen (18) inches in diameter, ductile iron pipe shall be used with an approved joint restrain method.

610.4.13 Joints in Fire Hydrant "Run-Out" Piping: Joints in fire hydrant "run-out" piping to conform to the Subsection 750.3. All joints in the fire hydrant "run-out" from the main through the shut-off valve shall be restrained by an approved joint restraint method, which may include the use of thrust blocks as approved the City of Phoenix Engineer.

610.4.14 Payment for Water Used During Construction: The Contractor shall pay for all water used during the course of construction. This cost shall be included in the unit bid price for pipe. The final fill of the pipeline with replacement water shall not be included in the cost. Water rates shall be obtained from the Water Services Department - Accounting Division (602) (262-6687).

Measurement will be through a fire hydrant meter or, if this is not possible, calculated by one of the procedures listed below:

(A) Unmetered water used for testing, flushing and chlorination shall be calculated on a cubic foot basis, using the

volume per foot pipe multiplied by the number of times the pipe is filled and by the total length of pipe installed for each hydrostatic test, flushing and chlorination procedure. If any additional testing, flushing or chlorination is required, because of failure to meet any of the above conditions, the volume of water used for each procedure shall be calculated as on the above basis for first procedure.

TABLE 610-4
FOR ONE FOOT LENGTH OF PIPE

Diameter (Inches)	Cubic Feet	Gallons	Gallons Per Mile
3	.0491	.3673	1,939
4	.0873	.6528	3,447
6	.1963	1.469	7,756
8	.3490	2.611	13,786
10	.5455	4.081	21,547
12	.7854	5.876	31,025
14	1.069	7.977	42,224
16	1.396	10.44	55,123
18	1.767	13.22	69,802
20	2.182	16.32	86,170
24	3.142	23.50	124,080
30	4.909	36.72	193,882
36	7.069	52.88	279,203
42	9.620	71.96	379,950
45	11.044	82.62	436,233
48	12.566	94.02	496,326
54	15.90	118.97	628,162
60	19.63	146.88	775,526
66	23.76	177.72	938,362
72	28.27	211.44	1,116,403

(B) Unmetered water used for settling trench backfill for small waterlines 12" and less in diameter shall be estimated at a volume of 2.66 cubic feet of water per linear foot of trench settled.

(C) Water used for settling trench backfill on waterlines 14" and larger, shall be metered by a fire hydrant meter, or other means approved by the Engineer.

Subsection 610.6.1 GENERAL: Delete the title of this Subsection and replace with the following:

General

Subsection 610.6.1 GENERAL: Delete this Subsection in its entirety and replace with the following:

Pipe, valves and fittings shall be protected from corrosion by encasement in a polyethylene protective wrapping referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

Subsection 610.6.2 Materials: Add the following sentence to the beginning of the first paragraph:

Materials shall meet requirements of ANSI/AWWA C105/A21.5-10, most current version.

Subsection 610.6.2 Materials: Delete "Table 610-1" in the last paragraph and replace with the following:

Table 610-5

SECTION 610

Subsection 610.6.2 Materials: Delete the title for TABLE 610-1 and replace with the following:

TABLE 610-5 (from AWWA C105-05) POLYWRAP FLAT TUBE WIDTHS

Subsection 610.9 FIRE HYDRANTS: Add the following to the end of this Subsection:

Except where otherwise required on the plans, the City of Phoenix will furnish the Contractor fire hydrants without cost for City of Phoenix projects. To secure the hydrants, the Contractor shall obtain a permit at the Water Distribution Special Operations office at 3045 S. 22nd Avenue, and then pick up the hydrants at the City of Phoenix Water Stores, 2500 South 22nd Avenue.

Whereas a new fire hydrant furnished by the City of Phoenix is found to be defective, the Contractor shall remove the defective hydrant, return it to the **water stores**, pick up a new one and install as indicated on the plans. The second installation will be treated as a new fire hydrant installation and the Contractor will be paid for both installations, each at the unit bid price in the proposal for fire hydrant installations.

All connections from the main to the fire hydrant shall be cast iron or ductile iron pipe as shown on the detail drawings. Fire hydrants shall be the dry-barrel type. If plugs are present in the weep holes, they shall be removed before installation.

Extenders for hydrants or valves are not permitted on new fire hydrant installations unless approved by the Water Services Department.

Subsection 610.11 CONNECTION TO EXISTING MAINS: Add the following to the end of this Subsection:

For any tie-ins/connections or required shutdowns to existing transmission mains (16-inch and larger) and systems, the Contractor shall submit a shutdown/tie-in plan to the City Inspector and / or Engineer and shall be approved at least two weeks prior to the start of the event. The plan shall include dates, durations, procedures, staffing, and any other information pertinent to shutting down the system and connecting to a new system.

Subsection 610.13 METER SERVICE CONNECTIONS: Delete the second paragraph in its entirety and replace with the following:

All water service connections shall be made using Type K copper tubing which conforms to Subsection 754.1 and fittings which conform to Subsection 754.2. Joints in the copper tubing shall be made by the use of approved compressing fittings such as flared joints or pack joints. Soldered joints are not acceptable.

Subsection 610.13 METER SERVICE CONNECTIONS: Delete subparagraph (A) in its entirety and replace with the following:

(A) When a meter is specified to be relocated, the Contractor shall replace and/or extend water service lines in accordance with COP Standard Detail P1342. The Engineer will determine when the existing service lines are unsatisfactory and must be replaced. Existing copper services in good condition, with sufficient cover, may be extended. Where the existing service pipe material is other than copper, the entire service shall be replaced from main to meter.

Subsection 610.13 METER SERVICE CONNECTIONS: Add the following subparagraph:

(E) The use of direct taps on water mains for meter service connections will not be allowed. New service taps shall be installed using an all bronze double-strap tapping saddle or a tapped coupling.

SECTION 611

WATER, SEWER AND STORM DRAIN TESTING

Subsection 611.1 HYDROSTATIC TESTING: Delete this Subsection in its entirety and replace with the following:

The Contractor shall test waterlines for water tightness, including all fittings and connections to the waterlines. Each pipe shall be tested for leakage and pressure in accordance with applicable provisions of AWWA standards and/or Manuals, except as modified below.

The Contractor shall provide all vents, piping, plugs, bulkheads, valves, bracing, blocking, pump, including measuring device and all other equipment necessary for making the tests.

The pipe shall be tested between the closed ends of the pipe. There shall be no testing against a valve unless otherwise approved. Pipe test section shall be limited to 2,500 linear feet, or less, unless otherwise approved in writing by the Engineer. The new pipeline must be separated from any potable system in such a way to prevent any potential for cross-contamination between the existing potable water system and the new pipeline.

The test shall be made after the backfilling is completed or compacted, regardless of the compaction method.

All connections, blowoffs, hydrants and valves shall be tested with the main, where practical.

The test section shall be slowly filled with potable water and all air shall be vented from the line. The rate of filling shall be as approved by the Superintendent of Water Distribution, with at least 24-hour notice required before filling is scheduled.

(A) Pressure Tests: Waterlines, including all fitting and connections shall be tested for water tightness by subjecting each test section to pressure test. The test pressure shall be measured at the lowest end of the test section. The test pressure shall be 188 psi unless otherwise specified. The duration of each pressure test shall be at least 2 hours.

The pressure test shall begin after the pipe has been filled with water for at least 24 hours to allow for absorption.

(B) Leakage Tests: Leakage tests shall be made after pressure test has been completed, pressure test results are satisfactory, and all backfilling and compaction is completed.

The duration of each leakage test shall be at least 2 hours. Leakage test pressure shall be at least 150 psi and the test pressure shall be maintained within 5 psi of the specified leakage test pressure during the test. Water may be continually fed or added when the pressure drops 5 psi.

The maximum allowable leakage from the pipe line shall be determined by the formula:

$$\frac{L = ND\sqrt{P}}{7400}$$

in which:

L = allowable leakage in gallons per hour

N = number of joints in the pipe being tested, with no allowance for joints at branches, blowoff, fittings, and similar appurtenances. "N" is calculated using the standard length of pipe installed divided into the length being tested.

D = nominal inside diameter of pipe in inches.

P = average test pressure, in psi gage, as measured at the lowest point in the test section.

Should the test on any section of the pipeline show leakage greater than specified above, the Contractor shall locate and correct until the leakage is within the specified allowance for a 2-hour duration. All repairs and retests shall be at the Contractor's expense.

Leakage is defined as the quantity of make-up water necessary for the test section to maintain the specified leakage test pressure after the pipeline has been filled with water and all air expelled.

All water must be dechlorinated to negligible levels prior to discharge to any location. Connections to existing pipelines or existing valves shall be made after new construction has satisfactorily passed both the pressure and leakage tests and potable water piping has been flushed and disinfected in accordance with Section 611.

Subsection 611.2.11 Final Flushing, Sampling and Testing: Delete this Subsection in its entirety and replace with the following:

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon testing, be proved comparable in quality to the water served to the public from the existing water system. Prior to sample collection for laboratory testing, the residual chlorine shall be verified using a color comparator or chlorine meter at each sample point to ensure the chlorine residual is not less than 0.2 ppm or greater than 4.0 ppm. Swimming pool test kits or chlorine test strips are not sensitive enough to provide results within this range and shall not be used. Once the required residual chlorine level in the pipeline is achieved, samples shall be taken as outlined below. The quality of water in the new main shall be as determined by laboratory examination and analysis of the samples over a period of up to three full days (72 hours).

Water Services Department laboratory technicians will perform sampling for tests of new water mains upon receipt, from the inspector, of a written request by the Contractor. The written request should be made to the Water Services Department no less than 24 hours prior to the time when samples are to be taken, so that the Department can properly schedule laboratory work. Waterlines less than 150 feet in length require one sampling riser installed as near the end as possible; lines 150 feet to 300 feet in length, two sampling risers, one near each end of the line; lines 300 feet to 3,000 feet in length, a minimum of three sampling risers. In addition, dead ends on main lines should be represented with a sampling riser.

Samples shall be taken from a tap and riser located and installed in such a way as to prevent outside contamination. Samples shall never be taken from an unsterilized hose or fire hydrant, because such samples will seldom meet bacteriological standards. One sample shall be taken at each sampling riser.

Results of all tests shall be sent by the laboratory to the Water Services Department. Results of laboratory analysis will be interpreted by the Water Services Department, and reported to the Engineer. Under no circumstances shall the Contractor contact the laboratory. If there is need for test results before written reports are submitted, such information shall be obtained only from the Water Services Department.

Subsection 611.3 SEWER LINE TESTING: Delete Subsections (C) and (D) in their entirety and replace with the following

(C) Closed Circuit T.V. Inspection:

The Contracting Agency reserves the right to visually inspect the interior of the sewer line using a television camera. Sanitary sewer lines eight inches and larger in diameter shall be subject to closed circuit T.V. inspection.

The Contractor shall notify the Engineer at least 48 hours prior to completion of the backfilling so that the inspection can be scheduled. Closed circuit T.V. inspections will be conducted by the City of Phoenix Water Services Department after backfilling has been completed.

Any defects in the pipe or construction methods revealed shall be corrected by the Contractor at no additional cost to the Contracting Agency.

Subsection 611.4 POST INSPECTION OF NEW MAINLINE STORM DRAINS: Delete the first sentence in Subsection (A) and replace with the following:

The Contractor shall provide the Engineer with an annotated video inspection record (either VHS or DVD format) of the new mainline storm drain pipeline and laterals.

Subsection 611.4 POST INSPECTION OF NEW MAINLINE STORM DRAINS: Delete "PVC" from the title of Subsection (B) and replace with the following:

SRPE

Subsection 611.4 POST INSPECTION OF NEW MAINLINE STORM DRAINS: Delete the first paragraph of Subsection (B) in its entirety and replace with the following:

The Contractor shall perform a deflection test on the system by use of a mandrel or other approved method as directed by the Engineer. Any part of the installation which shows deflection in excess of 5% of the nominal inside diameter per Section 738 shall be evaluated and appropriate remedy, if any, shall be performed.

Subsection 611.4 POST INSTALLATION INSPECTION OF NEW MAINLINE STORM DRAINS: Add the following to the end on this Subsection:

(C) **Leakage Test for Mainline HDPE, or SRPE Storm Sewer Pipe**:

In addition to full CLSM haunching and initial backfill of HDPE and SRPE mainline storm sewer pipe, the Engineer may require the Contractor to also perform random leakage tests on the mainline. Field leakage tests, if required, will be conducted in accordance with the following criteria:

1. After placement of CLSM haunching and initial backfill to 1 foot above HDPE pipe and 1 inch above SRPE pipe, the Engineer will select a minimum of three (3) joints of mainline pipe to be tested in accordance with the following procedure:

    a. Testing shall be accomplished by plugging the pipe test section and all branch lines and filling the pipe with water. Equipment for the test shall be furnished by the Contractor, and shall include a standpipe, a suitable meter or other acceptable method of measuring the quantity of water used. A period of at least one (1) hour shall be allowed for absorption before making the test.

    b. The allowable water loss shall not exceed 1.0 gallon per hour per 100 linear feet of pipe per inch of pipe diameter under a minimum test head of 4 feet above the top of the pipe at the upper end of the test section. A minimum test time of one (1) hour shall be required after the initial one (1) hour for absorption.

    c. The leakage test shall be made by the Contractor in the presence of the Engineer.

2. If the first test exceeds the specified leakage limit, the Contractor shall repair or replace all sections that fail the leakage test at no additional cost to the City of Phoenix. All repaired or replaced pipe sections shall be retested for compliance. The Engineer reserves the right to require additional leakage tests as deemed necessary during the course of construction to ensure that the remainder of the pipeline is leak resistant.

Subsection 611.5 PAYMENT: Add the following as the third paragraph of this Subsection:

There will be no measurement and payment for sewer line testing. The Contractor shall include all associated costs in the

unit bid price for sewer pipe installation.

Subsection 611.5 PAYMENT: Add the following as the last paragraph of this Subsection:

There will be no separate pay item for the HDPE or SRPE Storm Drain Pipe Leakage Tests. If requested by the Engineer, initial leakage tests shall be paid by the City of Phoenix. Retests shall be paid by the Contractor at no cost to the City of Phoenix.

SECTION 615

SEWER LINE CONSTRUCTION

Subsection 615.1 DESCRIPTION: Delete the second paragraph in its entirety and replace with the following:

Concrete pipe shall conform to Section 735. Vitrified clay pipe shall conform to Section 743. Ductile iron pipe shall conform to Section 750.

Subsection 615.2 MATERIALS: Delete the fourth and sixth bulleted items listed in this Subsection.

Subsection 615.3 TRENCHING: Delete the first paragraph in its entirety and replace with the following:

Excavation of trenches shall be accomplished in accordance with Section 601.

Subsection 615.3 TRENCHING: Delete the fourth paragraph in its entirety.

Subsection 615.4 SEPARATION: Delete the first paragraph in its entirety and replace with the following:

To protect water lines from contamination by sewer lines, separation and extra protection shall be in accordance with Section 610 and MAG Standard Detail No. 404-1, 404-2, and 404-3.

Subsection 615.7.2 Water Stops: Delete the Subsection number, Subsection title and this Subsection in its entirety.

Subsection 615.8 SANITARY SEWER SERVICE TAPS: Delete this Subsection in its entirety and replace with the following:

When the construction of sanitary sewer service taps are called for in the special provisions, they shall be constructed in accordance with standard details for sewer taps.

The locations of the service tap for each property shall be in the downstream ⅓ of the lot, or as requested by the property owner. Sewer service taps shall not be covered until they have been plugged and marked in accordance with standard details and their location has been recorded by the Engineer. Electronic markers shall be placed at no greater depth than electronic locating devices can locate them (typically 2'-4').

When sewer taps are found to be in conflict with the new work and no provision has been made in the proposal for relocating such taps, they shall be relocated by the Contracting Agency or the Contracting Agency will negotiate with the Contractor for their relocation. When a sewer tap or other sewer line is in conflict with the new work and it is impractical or impossible to raise or lower the tap or sewer to clear the new work, the Contracting Agency will negotiate with the Contractor to relocate the sewer on a different alignment or grade to avoid the conflict.

Subsection 615.11 BACKFILLING: Delete the first paragraph in its entirety and replace with the following:

Backfilling and compaction shall be done in accordance with Section 601.

Subsection 615.16 MEASUREMENT AND PAYMENT: Add the following Subsection:

(D) Concrete Encasement:

Measurement and payment for concrete sewer encasement shall be by the linear foot of sewer concrete encased, which price shall include trenching, backfill, compaction, materials, and any pavement and surface replacement in excess of the applicable pay widths assigned to the adjacent water pipe.

SECTION 618

STORM DRAIN CONSTRUCTION WITH CONCRETE PIPE

Delete the title of this SECTION in its entirety and replace with the following:

STORM DRAIN CONSTRUCTION WITH PRE-CAST CONCRETE PIPE, HIGH DENSITY POLYETHYLENE PIPE, OR STEEL REINFORCED POLYETHYLENE PIPE

Subsection 618.1 DESCRIPTION: Delete this Subsection in its entirety and replace with the following:

This Section covers rubber-gasketed reinforced concrete pipe (RGRCP) line, high density polyethylene (HDPE) pipe line and steel reinforced polyethylene (SRPE) pipe line construction used for the conveyance of storm drainage in public storm drains.

This Section does not include irrigation pipe lines for private irrigation systems, the Salt River Valley Water Users' Association system or other irrigation districts' systems. Irrigation pipe lines shall conform to the specifications and permit requirements of the respective irrigation district and project special provisions.

Installation of pipe in State Highways shall conform to the specifications and permit requirements of the Arizona Department of Transportation.

Subsection 618.2 MATERIALS: Delete this Subsection in its entirety and replace with the following:

In general, the pipe class or strength specified will be based upon the maximum anticipated design loads and trench conditions to which the pipe will be subjected upon completion of the project.

The structural design of the pipe for any depth of cover shall be in conformance with Section 6 of the City of Phoenix Storm Water Policies and Standards Manual (Latest Edition), applicable ASTM's, applicable AASHTO Standards, and established manufacturer recommended design procedures. The pay width for pavement replacement shall remain in accordance with Section 336 unless otherwise noted in the plans and specifications.

Should the Contractor, as a result of his construction means and methods, or for any other reason, subject the pipe to loading or trench conditions that do not conform to the plans and specifications, it shall be the Contractor's responsibility to take whatever steps are necessary to remediate, strengthen or otherwise protect the pipe from damage at the Contractor's expense.

Pipe that is stronger than that specified may be furnished at the Contractor's option and expense.

The RGRCP, HDPE and SRPE pipe, specials, joints, gaskets, and testing shall be according to Sections 735, 738, and 739, except as specified below.

(A) Specials: Pipe specials such as closure pieces, wyes, tees, bends, and manhole shafts shall be provided as indicated on the plans, and such specials shall be made equal in strength, diameter, and other physical characteristics to the standard straight pipe lengths by the use of extra concrete, extra reinforcing, or steel items. Drawings of specials shall be submitted to the Engineer for approval before their fabrication.

(B) Gasket Joints: The joint shall be sealed with a continuous ring gasket made in such size and cross-section as to fill the annular space provided for it. The gasket shall be the sole element depended upon to make the joint watertight, and shall have smooth surfaces, free from pits, blisters, porosity, and other imperfections.

(C) Water Stops: Water Stops will be required when connecting HDPE and SRPE pipe to concrete structures, manholes, etc. The water stop shall comply with Section 738 or Section 739 and will be installed per manufacturer recommendations.

(D) Storm Drain Pipe Size Option: The Contractor may substitute the next larger multiple of 6 inch size storm drain pipe

for the intermediate 3 inch size pipes shown on project plans at his discretion. The cost of the increase in size shall be borne by the Contractor. The intermediate 3 inch size pipe will remain in the bid proposal as the required size. If the Contractor elects to use the next larger multiple of 6 inch size pipe he shall be responsible for any utility or any other conflict caused by the increase in the size of the pipe. There shall be no extension of time granted for any delay caused by these conflicts.

Subsection 618.3 CONSTRUCTION METHODS: Delete this Subsection in its entirety and replace with the following:

Excavation, bedding, haunching, backfilling, compaction or consolidation, and testing shall be accomplished in accordance with Section 601 except as specified below.

The laying of the pipe shall be in finished trenches free from water or debris, and shall be commenced at the lowest point, with the spigot ends pointing in the direction of the flow. Each pipe shall be laid firmly and true to line and grade, in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden off-sets of the flowline. Any adjustment to line and grade shall be made by scraping away or filling in under the body of the pipe, never by wedging or blocking under the pipe ends.

Variation from prescribed alignment and grade shall not exceed 0.10 foot and the rate of departure from or return to established grade or alignment shall be no more than 1 inch in 10 feet of pipe line unless otherwise approved by the Engineer. Curves, bends and closures shall be made in accordance with Section 735, 738, and 739. Pipe shall be of the type, class and size shown on the plans or in the special provisions.

The minimum and maximum cover for HDPE and SRPE pipe shall be in conformance with Subsection 6.4 of the City of Phoenix Storm Water Policies and Standards Manual (Latest Edition), applicable ASTM's, applicable AASHTO Standards, established manufacturer recommended design procedures and special provisions.

All pipes installed in railroad rights-of-way shall be reinforced concrete pipe per ASTM C76, Class V and the minimum cover over all pipes shall be as specified in the railroad permit and/or special provisions. Bedding and backfill shall be in accordance with the railroad's standards and details and/or special provisions.

HDPE and SRPE pipe is prohibited as an alternate pipe material for culverts. HDPE and SRPE pipe is also prohibited as an alternate pipe material within a minimum distance of 24ft from an open end condition requiring a headwall, trash rack or access barrier. The pipe transition shall utilize an external, gasketed coupling band with cinching straps or bolts to provide a waterproof connection. The transition shall be fully bedded with CLSM or a concrete pipe collar. No separate payment will be made for the transition and the cost shall be considered incidental to the cost of the pipe.

The Contractor shall employ the necessary means and methods to maintain roundness of the HDPE and SRPE pipe during haunching, initial backfilling and backfilling. The Contractor shall employ all necessary means and methods to adequately anchor the pipe against buoyant forces to maintain grade during the placement of the CLSM haunching and initial backfill. The Contractor shall schedule a meeting with the HDPE and/or SRPE pipe supplier, the installing contractor and the Engineer to discuss the installation procedures prior to trench excavation.

618.3.1 Pipe Joints for RGRCP: Either O-ring gasket joints, or offset spigot-profile gasket joints will be used. Hydrostatic water tests may be required at the discretion of the Engineer. Certification for Hydrostatic tests will be required for all pipe joints. Gasket joints will not require mortaring and grouting.

618.3.2 Procedure for Connecting Pipes to New Storm Drain and Temporary Pipe Closure: All inlet connecting pipes and lateral pipes shall remain temporarily plugged until all lines and facilities downstream have been completed to the satisfaction of the Engineer.

Existing storm drains shall be connected to the new storm drain where indicated on the plans. However, existing storm drain systems shall remain intact or a by-pass maintained until mainline downstream has been completed to the satisfaction of the Engineer.

All pipes shall have a temporary closure placed at the open end at the end of each work day.

618.3.3 Connecting Extensions to Mainline Storm Drains: Prior to extending any existing mainline storm drain, the Contractor shall verify the depth, size, pipe type, and horizontal location of the existing storm drain in the field. If the new pipe extension is the same type and size as the existing, or if the pipe manufacturer makes a standard watertight adapter fitting made specifically to join with the existing pipe type, a standard manufacturer-recommended connection may be used. Otherwise, a concrete field collar in accordance with COP Standard Detail P1505 shall be used. The cost of connections shall be considered incidental to the cost of the project. No separate measurement or payment will be made for field connecting extensions to existing mainline storm drain pipes except that the removal of an existing pipe plug shall be paid under a separate item.

618.3.4 Structures: Inlets, manholes and similar reinforced concrete structures generally built underground as part of the storm drain are shown on the plans and shall conform to Section 505. Castings shall conform to Section 787. Miscellaneous steel shall conform to Sections 727 and/or 770.

Through manhole, lateral manhole or transition manhole, when specified on the plans, shall denote the construction and installation of a complete manhole including the base, shaft, reinforced concrete rings, frames and covers, concrete caps, frame adjustment to grade, etc., as shown on the plans and standard details. Note: Manhole steps shall not be installed. If installed they shall be removed and the holes filled with approved epoxy or approved commercial-source non-shrink, non-metallic, patching grout with an approved bonding agent.

As an option, MAG Standard Detail 522 is hereby modified to allow precast unreinforced manhole shaft pipe and cones which shall have a thickness of 6 inches and be manufactured of an approved portland cement concrete mix per Section 725. All other features of MAG Standard Detail 522 shall remain unchanged.

618.3.5 Cleaning Pipe: All pipe shall be swabbed, flushed with water, or subjected to a combination of these or other methods in order to leave the pipeline clean and free from debris, garbage, rubbish, stones, and deposits, and like foreign materials.

618.3.6 Material and Layout Submittals: At least 6 weeks prior to the manufacture and delivery of the storm drain pipe, the Contractor shall submit material and layout drawings to the Engineer for review and approval.

Submittals shall show pipe material type, layout, stationing, laying length, pipe class or gauge thickness (as appropriate), detailed fabrication drawings for mainline, curvilinear sections, prefabricated bends, special sections, etc., and any other pertinent data including certification that pipe joints have been independently tested and conform to watertight joints per ASTM D3212.

In addition, a list of catch basin connector pipes shall be submitted. The list shall contain the following information:

1. Inside diameter and type of material to be used, (RGRCP, HDPE, SRPE).

2. If RGRCP is used for connector pipe, the pipe class shall be shown.

3. Station at which connector pipes join mainline.

4. Number of sections of pipe and laying length of sections.

Subsection 618.6 MEASUREMENT: Delete the title of Subsection (B) and replace it with the following:

Catch Basin Connector Pipe

SECTION 618

Subsection 618.6 MEASUREMENT: Add the following Subsections to the end of this Subsection:

(C) Prefabricated Tees and Wyes: When separate bid items are provided in the proposal, they shall be measured by the number of such tees and wyes constructed.

(D) Concrete Pipe Collars: There shall be no measurement for construction of pipe collars for pipe less than 24 inches in diameter. For pipe collars on pipe 24 inches or larger, measurement shall be the number of such pipe collars constructed.

Subsection 618.7 PAYMENT: Delete this Subsection in its entirety and replace with the following:

(A) Main Line Pipe: Will be paid at the unit price bid per linear foot, to the nearest foot, for each size of pipe and shall be compensation in full for furnishing and installing the pipe as specified and as shown on the plans including removal of asphalt pavement, removal of obstructions, excavation, foundation, bedding, backfilling, compacting, testing, temporary pavement, joint materials, joining, and field closures.

(B) Catch Basin Connector Pipe: Will be paid at the unit price bid per linear foot, to the nearest foot for each size of pipe and shall be compensation in full for furnishing and installing complete in place as shown on the plans and as specified, the connecting pipe and specials including spur connections, removal of asphalt pavement, removal of obstructions, excavation, foundation, bedding, backfilling, compacting, temporary pavement, joint materials, joining, collars, field closures, and testing.

(C) Prefabricated Tees and Wyes: The cost of prefabricated tees and wyes shall be included in the unit price bid for main and connector pipes unless separate bid items are included in the proposal.

(D) Concrete Pipe Collars: There shall be no payment for construction of pipe collars for pipe less than 24 inches in diameter. Payment for pipe collars, on pipe 24-inches or larger, shall be made at the unit price bid for each and will be compensation in full for all labor, material, equipment and incidentals required for construction.

SECTION 620

CAST-IN-PLACE CONCRETE PIPE

Delete the title of this SECTION in its entirety and replace it with the following:

STORM DRAIN CONSTRUCTION WITH CAST-IN-PLACE CONCRETE PIPE

Subsection 620.1 GENERAL: Delete the first sentence of the first paragraph and replace it with the following:

This specification covers cast-in-place non-reinforced concrete pipe intended for use in storm drain systems.

Subsection 620.1 GENERAL: Delete subparagraph (D) in its entirety and replace with the following:

In systems that will not exceed a 15 ft operating head at any time during the life of the system.

Subsection 620.1 GENERAL: Add the following subparagraph:

(E) When designated as an allowable alternate pipe material on the Alternate Pipe Chart Sheet of the Plans. Designation of CIPP as an allowable alternate pipe material shall not be construed to indicate that the site conditions will be suitable for its use. The Contractor shall be responsible for all costs incurred to properly evaluate, prepare and utilize CIPP as part of a complete storm drain pipeline.

Subsection 620.1 GENERAL: Add the following subparagraph:

(F) When approved by the Engineer as a result of a formal Value Engineering Process that considered all location, geologic, hydrologic, and maintenance conditions. The Contractor shall be responsible for all costs incurred for developing and presenting the engineering and documentation of the Value Engineering proposal for a thorough evaluation.

Subsection 620.1 GENERAL: Add the following to the end of this Subsection:

CIPP is prohibited from being placed:

(A) Within the curb lines of arterial and major collector streets.

(B) Within the curbs of signalized and potentially signalized intersections to the limits of the curb returns.

(C) Within railroad rights-of-way.

(D) In fill, unless it can be demonstrated to the satisfaction of the Engineer, that the fill will adequately support the pipe.

(E) Where expansive or collapsible soils are encountered below the top of pipe.

Subsection 620.2.2: Delete the first sentence and replace with the following:

Sand aggregate used for concrete and mortar shall conform to Section 701

Subsection 620.2.4: **Delete this Subsection in its entirety and replace with the following:**

Concrete shall be a minimum Class A per Section 725. Concrete shall be of a type, and have a design strength and slump necessary for the site conditions and the Contractor's construction methods. The slump shall not exceed 3 inches (75MM).

SECTION 620

Subsection 620.3.1 Excavation: Delete the last sentence in the second paragraph.

Subsection 620.3.1 Excavation: Add the following paragraph after the second paragraph of this Subsection:

Excavated trench shall be checked for compliance with requirements for grade and alignment prior to placement of concrete. The Contractor shall submit his proposed method of grade and alignment control and checking of same for conformance with specifications to the Engineer for his approval prior to start of work. The Contractor shall supply manpower, equipment and materials, as are required, to provide and confirm compliance with grade and alignment requirements. This is a non-pay item and all costs incurred shall be included in the bid item(s) for the pipe installation.

Subsection 620.3.2 Placement: Add the following paragraphs after the third paragraph of this Subsection:

Under no circumstances will the Contractor be allowed to continue the pipe installation if the vibrators of the cast-in-place machine are inoperable. Portable vibrators or "stingers" shall only be used to supplement internal vibrators on the machine and not as a sole source to consolidate and distribute the concrete mix.

The Contractor shall make provisions for removing sloughed material, debris and any foreign objects from trench before and during placement of concrete such that build-up of material does not occur ahead of the machine. In addition, small transverse trenches shall be dug across the trench bottom, at distances not to exceed 25 linear feet, to receive soil any build-up that is pushed ahead of the slipform.

Subsection 620.3.2 Placement: Delete the first paragraph of Subsection (A) in its entirety and replace it with the following:

When pipe placement stops in excess of ninety (90) minutes, a construction joint shall be formed. The ends of the pipe that are to be butt contact shall be left in rough condition with a slope between 20 and 45 degrees. Number 4 reinforcing bars shall be embedded 12 inches in the previous pour and 12 inches into the next pour and shall be placed 12 inches on center for pipe 42 inches in diameter or less and 18 inches on center for pipe diameters in larger than 42 inches. For pipe diameters 60 inches or less an excavation shall be made along the sides and bottom of the joint before resuming to permit casting of a concrete collar around the outside of the joint. This collar shall have a minimum thickness of 1-1/4 times the wall thickness of the pipe and shall lap the entire joint by at least two (2) times the wall thickness Immediately before resuming concrete placement the surface to be bonded shall be cleaned of all laitance, coatings, foreign materials, and loose or defective concrete thoroughly wetted and coated with a layer of bonding mortar (Subsection 620.2.5) approximately 1/4 inch (6MM) thick. In lieu of the bonding mortar, neat cement paste may be thoroughly scrubbed onto the wet surface of the previously placed concrete.

Subsection 620.3.2 Placement: Delete Item (2) of Subsection (B) in its entirety and replace with the following:

The minimum wall thickness shall be $1/12^{th}$ of the inside diameter plus 1 inch.

Subsection 620.3.3 Curing and Backfilling: Delete this Subsection in its entirety and replace it with the following:

The Contractor shall be responsible for proper curing of the concrete and backfilling the trench to an even grade. Final backfill and compaction shall not be started sooner than seven days after concrete placement and only after the concrete has attained a compressive strength of at least 3000 psi. The pipe shall be checked for grade, alignment and thickness prior to backfilling. Curing shall be performed in such a manner as to prevent the premature drying of the concrete.

Polyethylene film complying with ASTM C-171, nominal thickness 0.0015 inches (0.038 MM), shall be placed on the exposed top surface of the pipe immediately after the pipe is cast. The film shall be anchored in place with loose soil to assure continuous, adequate curing.

A humid atmosphere within the pipe, as evidenced by condensation on the interior surface, shall be maintained for at least seven (7) days following concrete placement. To prevent air drafts which may dry the pipe and to maintain a humid atmosphere inside the pipe, all openings, ends, manholes, connector pipes shall be kept closed or securely covered, except when actual work is in progress on the inside of the pipe. The pipeline shall be partially filled with water during the curing period when work is not being performed on the inside of the pipe. If necessary, a maximum 24 hour period will be permitted within the seven days following placement for removal of forms and repairs.

Subsection 620.3.4 Repair: Delete this Subsection in its entirety and replace with the following:

Immediately after removal of the forms, the inside of the pipe shall be inspected for required repairs and conformance with all dimensional requirements including alignment and grade.

The Engineer shall be the sole judge as to the repairability of deficiencies. He shall require removal and replacement of those sections of pipeline which he judges to be non-repairable or are not within required dimensional tolerances including alignment and grade.

When concrete placement is done by a method requiring the use of metal inner forms, the Contractor shall schedule his work force, by extended, staggered or multiple shifts, as required, to provide for removal of forms within 4 to 6 hours of placement of concrete and start of repairing, patching and finishing of pipeline to conform with specification requirements.

When concrete placement is done by methods using pneumatically inflated inner liner, the Contractor shall schedule his work force, by extended, staggered or multiple shifts, as required, to provide for removal of the pneumatic inner liner within 12 hours of placement of concrete and start of repairing, patching and finishing of pipeline to conform with specification requirements.

All rock pockets, non-longitudinal cracks or indentations shall be cleaned out, moistened and filled with 1:2 cement grout or approved epoxy material. Except where, in the opinion of the Engineer, the width and/or length of the crack may indicate a structural deficiency, repairs shall be made as required for longitudinal cracks.

At the discretion of the Engineer, longitudinal cracks exceeding 0.01 inches in width and 12 inches in length may be cause for rejection and removal and replacement of that portion of the pipe. Subject to the approval of the Engineer, cracks may be repaired using a pressure applied epoxy compound capable of providing structural correction to the area in addition to sealing the void. A longitudinal crack shall be defined as one which has the general direction of a 30 degree angle or less with the alignment of the pipe.

Irrespective of concrete placement method, all repairs, patches and finishing shall be completed within 24 hours of concrete placement.

The Contractor, prior to start of concrete placement on project shall submit a written schedule of his proposed work activities and work time schedules for the Engineer's review and approval. No time schedule requiring overtime by the Engineer's staff is authorized without specific written approval of the Engineer.

Subsection 620.3.5 Finish: Delete this Subsection in its entirety and replace with the following:

Except for the form offsets, the interior surface of the pipe shall be equivalent to or better than a wood float finish. Form offsets shall be trimmed so as to provide a reasonably tapered slope from surface to surface. The bottom of the pipe below the metal forms shall be finished in a workmanlike manner and shall conform to the general circular circumference of the pipe without sags, dips and humps. All extraneous concrete shall be removed from the interior surface.

SECTION 620

Subsection 620.4 METHOD OF TESTS: Delete the title of this Subsection in its entirety and replace with the following:

TESTS

Subsection 620.4 METHOD OF TESTS: Delete this Subsection in its entirety and replace with the following:

Random tests shall be made of the wall thickness at the top, bottom and sides, approximately every 100 feet, on a daily basis by probes through fresh concrete or small holes drilled through the concrete. Holes shall be properly and permanently closed and sealed, flush with the inside surface of the pipe, after measurements are made, in accordance with the requirements of the fourth paragraph of Subsection 620.3.4.

Test cylinders shall be prepared and tested per Section 725. If the 28-day strength test does not comply to the specified compressive strength requirements, cores shall be taken from the same section of concrete represented by the non-compliant test under the supervision of the Engineer. The diameter of the core specimens for the determination of compressive strength should be at least three (3) times the maximum nominal size of the coarse aggregate used and must be at least twice the maximum nominal size of coarse aggregate.

The length of the specimen, when capped, should be twice the core diameter. A core having a maximum height of less than 95 percent of its diameter before capping or a height less than its diameter after capping shall not be tested.

If cores are taken, the Contractor shall patch all core holes in a manner that will be permanent, will be watertight to a minimum of 15 ft of internal pressure head, and will have a smooth interior finish flush with the interior surface of the pipe.

Obtaining the core specimens, preparing the specimens, testing the specimens, restoring the pipe, and the Engineer's supervision shall be at the Contractor's expense.

The Engineer will evaluate the test results and his decision as to required corrective action will be final.

Subsection 620.6 PAYMENT: Delete this Subsection in its entirety and replace with the following:

Payment will be made at the contract unit price bid per linear foot to the nearest foot for each size of pipe and shall be compensation in full for furnishing and installing the cast-in-place concrete pipe complete as specified including removal of paving and obstructions; excavating, backfilling and compacting; testing; repair and all necessary incidental costs not specifically covered in other items in the proposal.

SECTION 621

CORRUGATED METAL PIPE AND ARCHES

Delete the title of this SECTION in its entirety and replace it with the following:

STORM DRAIN CULVERT AND CATCH BASIN CONNECTOR PIPE CONSTRUCTION WITH CORRUGATED METAL PIPE AND ARCHES

Subsection 621.1 DESCRIPTION: Delete this Subsection in its entirety and replace it with the following:

This Section covers corrugated metal pipe and arches used as culverts and catch basin connector pipes for the conveyance of storm drainage in public storm drains.

This Section does not include irrigation pipe lines for private irrigation systems, the Salt River Valley Water Users' Association system or other irrigation districts' systems. Irrigation pipe lines shall conform to the specifications and permit requirements of the respective irrigation district and project special provisions.

Installation of pipe in State Highways shall conform to the specifications and permit requirements of the Arizona Department of Transportation.

Subsection 621.2 MATERIALS: **Delete the second paragraph in its entirety and replace with the following:**

The structural design of pipe and arches shall be in conformance with Section 6 of the City of Phoenix Storm Water Policies and Standards Manual (Latest Edition), applicable ASTM's, applicable AASHTO Standards, and established manufacturer recommended design procedures. The pay width for pavement replacement shall remain in accordance with Section 336.

All helical corrugated metal pipe shall have a marking system which shall provide a quick external visual check of diameter variations during and after the manufacturing process.

All prefabricated fittings for connector and culvert pipes larger than 24 inches shall be welded fittings.

Subsection 621.3 INSTALLATION: Delete the first paragraph in its entirety and replace with the following:

Excavation, bedding, haunching, initial and final backfill and compaction shall be in accordance with Section 601.

Subsection 621.3 INSTALLATION: Delete the last sentence of the second paragraph and replace with the following:

All pipes and arches shall be equipped with lifting lugs as required and shall have connecting bands designed to provide positive connection without damaging the coating on the pipe or pipe arch.

Subsection 621.3 INSTALLATION: Delete the third paragraph in its entirety.

SECTION 621

Subsection 621.3 INSTALLATION: Delete the fourth paragraph in its entirety and replace with the following:

Corrugated metal pipe and pipe arches shall be laid with separate section joined together in such a manner that the joint space shall not exceed ½ inch, with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Elliptical pipe shall be installed so that the major or minor axis, whichever the case may be, and which should be indicated by suitable markings on the top of each end of the pipe sections, coincides with the survey alignment of the trench excavation. CMP shall be carefully handled at all times to prevent damage to the coating. Each length of pipe shall be carefully inspected immediately prior to placing in the trench to verify that no damage has been done to the coating that will be concealed when the pipe is placed. Damaged coating shall be repaired in accordance with AASHTO M-36. As determined by the Engineer, pipe and arch that is damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced at no additional cost to the Contracting Agency.

Subsection 621.3 INSTALLATION: Add the following to the end of this Subsection:

Where a curved alignment is indicated, curves shall be formed by straight pipe and fabricated specials. Pipe shall be of such length that no deflection angle of the pipeline exceeds 10 degrees. All deflection angles shall occur between the point of curvature and point of tangent of the curve as shown on the plans.

Transition manhole bases, for pipe larger than 48 inches, may be constructed with a prefabricated transition and a 48 inch stubbed manhole shaft cast as one structure. Dimensions of this structure shall be equivalent to those shown in the Standard Detail. A shop drawing of this option shall be submitted to the Engineer for review. Corrugated steel manhole shafts will not be permitted unless a detail of construction is included and reviewed with the shop drawing.

Pipe layout shall be such that for manholes not located at a joint, the outside edge of the manhole shaft shall be a minimum of 1.5 pipe diameters away from the nearest joint, on both sides of the manhole.

If the manhole cannot be so located, then the concrete encasement shall be extended to include the joint or joints, not outside to minimum distance of 1.5 pipe diameters from the outside of the manhole shaft.

Subsection 621.3.1 Joints: Delete this Subsection in its entirety and replace with the following:

Joint materials shall be in accordance with Section 760.

Pipe sections shall be joined together with annular corrugated type bands or hugger type bands locking in at least one annular corrugation and shall be designed to form a leak-resistant joint. The hugger type band shall use an O-ring gasket. The annular corrugated type band shall use a 1/4 inch thick rubber sleeve gasket the same width as the connecting band.

One-piece bands may be used on pipe with diameters up to and including 48 inches. O-ring gaskets or one-piece bands shall be a minimum of 3/4 inch diameter. Two or more piece bands shall be used on all pipe diameters exceeding 48 inches. For pipe with diameters exceeding 48 inches, O-ring gaskets shall be a minimum of 7/8 inches in diameter. The minimum connecting band width shall be 7 inches for pipe diameters of 12 inches through 30 inches, 10-1/2 inches for pipe diameters of 33 inches through 60 inches, and 13-1/2 inches for pipe diameters greater than 60 inches through 120 inches. The connecting bands may be two numerical gage thickness lighter than the gage specified for the pipe material, but not less than 0.064 inches (16 gage) nor more than 0.109 inches (12 gage).

When flanges are provided on the pipe ends, the coupling shall be made by interlocking the flanges with a preformed hugger type band and gaskets or other type band incorporating a locking channel and gaskets.

The band shall be tightened evenly, keeping equal tension on the bolts. The joint shall remain uncovered over a period designated by the Engineer, and before covering the joint, the nuts shall be testing for tightness. If the nut has a tendency to loosen its grip on the bolt, it shall be tightened again and remain uncovered until a tight, permanent joint can be obtained.

Subsection 621.3.2 Pipe Elongation: Delete the title of this Subsection in its entirety and replace with the

following:

Vertically Elongating Catch Basin Connector Pipe

Subsection 621.3.2 Pipe Elongation: Delete this Subsection in its entirety and replace with the following:

When connector pipe is not fully bedded with CLSM, pipe may be vertically elongated. Pipe may be elongated 5 ± ½ percent of the nominal diameter to take advantage of the buildup of side support as it settles back toward a full round shape under the backfill load. The method or technique for obtaining and releasing the elongation shall be optional to the Contractor. Under no circumstances shall the vertical dimension of the pipe at any point along the pipe section, after backfill and compaction is completed, be less than the nominal diameter of the pipe, or more than 5 percent greater than the nominal diameter of the pipe as shown on the plans or specified elsewhere in this specification. Any damage done as a result of strutting shall be repaired as directed by the Engineer at no additional cost to the Contracting Agency. Strutting of pipe shall be approved by the Engineer.

Subsection 621.3 INSTALLATION Delete Subsection 621.3.3 Cutting in its entirety.

Subsection 621.2 INSTALLATION: Delete Subsection 621.3.4 Repair of Damage to Coatings in its entirety.

Subsection 621.4 TEST SPECIMENS: Delete the first paragraph in its entirety.

Subsection 621.5 MEASUREMENT: Delete this Subsection in its entirety and replace with the following:

Measurement of corrugated metal pipe will be the number of linear feet of pipe, measured horizontally, from end to end of the pipe through manholes and specials. No separate measurement will be made for specials and other necessary fabrications. At changes in diameter the measurement will be to center of manhole or special.

Subsection 621.6 PAYMENT: Delete this Subsection in its entirety and replace with the following:

Payment will be made at the unit price bid per linear foot, to the nearest foot, for each size of pipe and shall be compensation in full for furnishing and installing the corrugated metal pipe, specials and necessary fabrications, including removal of asphalt paving, removal of obstructions, excavation, foundation, bedding, backfilling, compacting, temporary pavement, joints, joint materials, transitions with other pipe types, testing, and all incidental costs not specifically covered in other items in the proposal.

SECTION 625

MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS

Subsection 625.2 MATERIALS: Delete the second paragraph in its entirety and replace with the following:

Brick may be used for maintenance of existing brick manholes and for adjustment of manhole frames per Section 345. Bricks for manholes per Section 775.

Subsection 625.3.1 Manholes: Delete the first paragraph in its entirety and replace with the following:

Manholes shall be constructed of brick or precast concrete risers, cones, flat tops, or of cast in place concrete, with cast iron frames and covers**.** Brick or precast manholes shall be constructed in accordance with the standard details. All manholes shall be constructed with cast in places bases. Precast manhole bases shall not be used. Cast in place manholes shall be constructed from details sealed by a licensed structural engineer in the State of Arizona. Manhole steps are prohibited. The invert channels shall be smooth and semi-circular in shape, conforming to the inside of the adjacent sewer sections. Changes in direction of flow shall be made with a smooth curve, having a radius as large as the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.

Subsection 625.3.1 Manholes: Delete the fourth paragraph in its entirety and replace with the following:

Cast-in-place manhole bases shall be constructed with Class A concrete in accordance with the standard details and Section 505.

Subsection 625.3.1 Manholes: Delete the first sentence of the fifth paragraph and replace with the following:

Brickwork, precast concrete structures, or cast in place concrete shall not be laid upon a concrete manhole base less than 24 hours after such manhole base has been poured. No brickwork, precast concrete structures, or cast in place concrete shall be laid in water, nor, except as prescribed for curing, shall water be allowed to stand or run on any brickwork until the mortar has thoroughly set.

Subsection 625.3.1 Manholes: Delete the seventh paragraph in its entirety and replace with the following:

All machined surfaces on the frame and cover shall be such that the cover will lie flat in any position in the frame and have a uniform bearing through its entire circumference. Manhole covers in pavement shall be standard open pickslot unless otherwise designated by Engineer. When specified, provide concealed pickslot, watertight or boltdown covers and frames in lieu of open pickslot. Refer to COP Standard Detail P1424. Any frame and cover which creates any noise when passed over by automobiles shall be replaced. Frames shall be set firmly in a bed of mortar true to line and grade. The frame and cover shall be continuously and solidly supported per MAG Standard Detail 422 prior to placing the collar concrete. A concrete collar per MAG Standard Detail 422 shall be constructed around the frame and cover after the frame and cover is adjusted to grade and solidly supported.

SECTION 625.3 CONSTRUCTION METHODS: Add the following Subsection and Table 625-1 to this Subsection:

625.3.3 Sanitary Sewer Manhole Testing: All new sanitary sewer manholes installed shall be tested for exfiltration either by a watertightness test or by a negative air pressure (vacuum) test modified for the timeframes listed below. Exfiltration testing shall be performed in accordance with Subsection 611.3(B) and Arizona Department of Environmental Quality (ADEQ) Engineering Bulletin No. 11, Chapter 4, Section B.

When using the watertightness test method, exfiltration loss shall not exceed 0.1 gallons per vertical foot of manhole in a 24-hour period.

Negative air pressure (vacuum) testing shall be performed in accordance with ASTM C 1244, modified for the timeframes below. Testing shall be performed at the top of the manhole cone for manholes located in paved areas. Manholes outside paved areas shall be vacuum tested at the ring and cover. A negative air pressure of ten (10) inches of

mercury shall be drawn on the manhole. The time shall be measured for the vacuum to drop from ten (10) inches to nine (9) inches of mercury. The manhole shall pass this test if the time to drop in mercury meets or exceeds the following values:

TABLE 625-1

MANHOLE DEPTH	MINIMUM TEST DURATION (SECS) 48-INCH DIAMETER MANHOLE	MINIMUM TEST DURATION (SECS) 60-INCH DIAMETER MANHOLE
12 feet or less	60	75
Greater than 12 feet to 15 feet	Not Applicable*	90
Greater than 15 feet	Not Applicable*	105

*Manholes greater than 12 feet in depth shall be 60-inch diameter

If manhole joint compound is pulled out during the vacuum test, the manhole shall be disassembled and the joint repaired or replaced as necessary. The vacuum testing shall then be repeated until the manhole passes.

Exfiltration testing of sanitary sewer manholes is considered incidental to the cost of furnishing and installing the manhole. There will be no separate measurement or payment for this testing.

SECTION 626

CORROSION COATING OF SANITARY SEWER MANHOLES

Add SECTION 626 in its entirety:

SECTION 626

CORROSION COATING OF SANITARY SEWER MANHOLES

626.1 GENERAL

626.1.1 Description

(A) Scope: All new concrete manholes and access structures constructed over 15-inch diameter or larger sanitary sewers shall have an internal corrosion coating as specified herein. When specified, existing sanitary sewer manholes shall be similarly coated.

(B) Requirements

(1) Contractor shall furnish all labor, materials, and equipment required to clean and line the manholes.

(2) Contractor shall comply with the local authority and all occupation safety and health administration (OSHA) requirements for confined space entry.

(3) All materials specified by name brand or manufacturer shall be delivered unopened to the job in original containers.

(4) All Safety precautions recommended by the manufacturer in printed instructions or special bulletins shall be obtained and followed.

(5) For existing manholes, application of coating shall be carried out after all planned repairs to cone, walls, pipe penetrations, bench and invert are completed.

(6) Contractor's applicator shall be certified by the coating and underlayment material manufacturers as properly trained for applying the manufacturer's coating and underlayment products. Underlayment products include repair materials, fillers, primers, etc.

626.1.2 Quality Assurance

(A) Standardization: Materials and supplies provided shall be the standard products of manufacturers. The standard products of manufacturers other than those specified will be accepted when it is demonstrated to the Engineer that they are equal in composition, durability, and usefulness for the purpose intended. Requests for submission shall include directions for the application, descriptive literature, safe storage, handling, and disposal of the product.

(B) Warranty:

(1) A written warranty against coating failure shall be provided for the entire coating system, including all repair material, defect fillers, primers, intermediate, and finish coats. The minimum duration of the warranty shall be five (5) years. The product and the installation may be both covered by the manufacturer's warranty, or separate warranties may be issued by the manufacturer and installer.

(2) This warranty shall state that the coating will not fail for a minimum period of five years. Coating failure is defined as blistering, cracking, embrittlement, or softening, or failure to adhere to the substrate. The warranty shall also apply to any underlayment materials used in the application. If any repair or replacement is necessary within the warranty period, a new 5 year warranty period shall start at the date that

the manhole is placed back into service.

626.1.3 Submittals

(A) Contractor Shall Submit:

(1) Manufacturer's data:

(a) Manufacturer's technical literature on coating material.
(b) Description of installation method including:

(I) Product material safety data sheets (MSDSI).
(II) Maximum storage life and storage requirements.
(III) Mixing and proportioning requirements (as applicable).
(IV) Environmental requirements for application and worker safety, including ventilation, humidity, and temperature ranges.
(V) Application film thickness PM coat of primer and finish coat.
(VI) Curing time required.

(2) Sample of finished product showing final color: Coating shall be light in color.

(3) Contractor (or subcontractor) applying coating shall be an Arizona licensed contractor: Each of the Contractor's employees applying coatings and underlayments shall be certified by manufacturer as having sufficient training and knowledge to properly apply their products. Contractor shall submit certification documents. Such certification shall be no more than two (2) years old for any applicator.

626.2 PRODUCTS

626.2.1 Coating Material

(A) Approved Materials: Coating materials shall be one of the following pre-approved products:

(1) Sauereisen corrosion-clad polymer lining No. 210, and Sauereisen underlayment. No. F-120, as manufactured by Sauereisen Cements, Pittsburgh, PA 15238. The underlayment shall be used to repair and reprofile corroded areas of manhole surfaces. Manhole surfaces shall be cleaned and prepared in accordance with the manufacturer's recommendations and requirements herein prior to application of any underlayment and coating.

(2) Sewer shield 100 topcoat as manufactured by Environmental Coating, Mesa, AZ 85207. An underlayment recommended by the manufacturer shall be used to repair and reprofile corroded areas of manhole surfaces. Manhole surfaces shall be cleaned and prepared in accordance with the manufacturer's recommendations and requirements herein prior to application of any underlayment and coating.

(3) Raven 405, as manufactured by Raven Living Systems, 1024 North Lansing Avenue, Tulsa, OK, 74106. An underlayment recommended by the manufacturer shall be used to repair and reprofile corroded areas of manhole surfaces. Manhole surfaces shall be cleaned and prepared in accordance with the manufacturer's recommendations and requirements herein prior to application of any underlayment and coating.

(4) COR+GARD, Polymer and Permacast MS 10,000 underlayment as manufactured by AP/M Permaform P.O. Box 55, 620 NW Beaver Drive, Suite 1 Johnston, IA 50131. The underlayment shall be used to repair and reprofile corroded areas of manhole surfaces. Manhole surfaces shall be cleaned and prepared in accordance with the manufacturer's recommendations and requirements herein prior to application of any underlayment and coating.

NOTE: This product is a trial product with limited applications. A maximum of 50 total manholes in City of Phoenix until Fenruary 26, 2019, or five (5) years following first installation, whichever is later. All applications shall be reported to the Water Services Department Wastewater Engineering and Construction Management Section.

(B) Dry film thickness of epoxy/polymer coatings shall be minimum 1/8-inch (125 Mils) thick.

(C) Cured underlayment thickness shall equal or exceed minimum thickness recommended by manufacturer, but shall provide uniform finished surface for application of epoxy/polymer.

626.3 EXECUTION

626.3.1 Manhole Cleaning

(A) Cleaning shall remove all sediment, rocks, debris, roots, grease accumulations, and obstructions from the manholes. Cleaning of the manhole walls, bench, and channel shall remove all grease, scale encrustation, and loose mortar so that no foreign intrusion shall cause imperfections in the coating. Cleaning methods shall include washing with high-pressure water, mechanical removal, or other as approved by the Engineer.

(B) The Contractor shall use water blasting with a minimum water pressure of 3,000 PSI to clean the manhole prior to applying the coating. Contractor shall also be responsible for any additional surface preparation beyond water blasting as required by the coating system manufacturer. Where additional preparation is required, the Contractor shall provide all labor materials and equipment as necessary at no additional cost to the City.

(C) Before installation of the coating system, the surface must be clean. Excess water shall be blown from the surface using compressed air equipment with oil-trapping filters. Suitable heaters shall be used as needed to produce a surface-dry condition. The surface shall be vacuumed to make sure that loose particles are not present.

(D) Any sediment or debris from cleaning operations larger than U.S. #8 sieve shall not be deposited downstream in the sewer. Sedimentation deposited downstream, as determined by the Engineer, shall be removed at no cost to the City.

626.3.2 Coating Installation and Repair

(A) With Engineer's approval new manholes may have corrosion coating applied at manhole manufacturer's facility but all final acceptance testing shall be performed in field following installation of manhole.

(B) If new manhole is coated at manufacturer's facility then joints will require sealing and coating in the field after manhole assembly. After the joint is assembled in field the Contractor shall prepare the coated surface above and below the joint to receive the protective coating in accordance with the manufacturer's recommendations. Typically a light abrasion blast to 2-inches above and below the joint will clean the surface and give the coating a good surface to adhere to.

(C) If new manhole is coated at manufacturer's facility, coating of joints, chimney, bench and invert, and any necessary repairs to barrel or cone shall be performed in the field after successful leakage testing per Section 625.

(D) New manholes that do not have corrosion coating applied at manhole factory shall be fully coated in the field including barrels, cones, joints, chimney, and bench and invert after successful leakage testing per Section 625.

(E) When identified for corrosion coating existing manholes shall be prepared in accordance with these specifications and the manufacturer's recommendations. Weak and deleterious material shall be removed down to sound substrate. Repairs shall be made with coating manufacturer's recommended underlayment. Coating shall be applied to barrels, cones, joints, chimney, and bench and invert. If flows cannot be bypassed or diverted with a

flow thru plug, Engineer may waive coating of invert.

(F) If frame and cover of an existing coated manhole is adjusted in the field, the existing or added chimney adjustment rings shall be coated or have coating repaired as necessary in accordance with the manufacturer's recommendations.

626.3.3 Inspection and Testing:

(A) Contractor shall give Engineer a minimum of three days advance notice before start of any surface preparation work, underlayment application work, coating application work or testing.

(B) All work and testing shall be performed in presence of Engineer, unless Engineer has granted prior approval to perform portions of the work in his/her absence.

(C) Acceptance for holidays testing and adhesion testing shall be witnessed by an independent Testing Agency or Laboratory approved by the City of Phoenix. Cost of this inspection and testing shall be the responsibility of the Contractor. At owner's option, owner may waive requirement for Contractor provided testing agency or laboratory and have Engineer witness this testing.

(D) Additional illumination, scaffolding, and confined space entry equipment and support shall be provided by Contractor as necessary to facilitate inspection by Engineer and/or Testing Agency when requested.

(E) Contractor shall furnish appropriate equipment and supplies for holiday testing, dry and wet film thickness testing, and coating adhesion testing. Contractor shall provide trained personnel for performing required acceptance testing including operation of holiday detection devices.

(F) Holiday testing equipment and procedures shall be performed in strict accordance with latest edition of NACE "Standard Recommended Practice-Discontinuity (Holiday) Testing of Protective Coatings." Areas containing holidays shall be marked repaired or re-coated and re-tested in accordance with coating manufacturer's printed instructions. Holiday detectors shall be:

> High voltage pulse-type holiday detectors as manufactured by Tinker & Rasor or D.E. Stearns Co. Unit shall be adjusted to operate at voltage required to cause sparks jump across air gap equal to twice specified coating thickness. Minimum applied voltage for 125 Mil coating shall be 12,500 volts.

(G) Wet film thickness measurement shall be provided by report submitted by Contractor to Engineer. The report shall be presented after completion of underlayment, top coating operations, and shall state number of manufacturer's product units used and total square footage of surface area covered. Engineer shall have option of requiring Contractor to document number of units (coating materials) on hand before and after coating operations to verify actual minimum dry film thickness applied.

All film thicknesses not meeting required minimums will be re-coated per manufacturer's recommendations to required minimum 125 mil thickness.

(H) Contractor shall perform adhesion tests on 15% of the manholes coated on any given project (at least one manhole if 15% is less 1.0). Adhesion tests shall conform to ASTM D7234, minimum pull off strength shall be 200 PSI on concrete and 100 PSI on brick and some portion of substrate shall be adhered to coating and dolly. A minimum pull off strength of 150 PSI on concrete will be acceptable if substrate is adhered to coating and dolly on more than ½ the area of the dolly. 50mm dollies shall be used for adhesion testing. In the event of a failure, Engineer and Contractor shall determine limits of failure through additional investigation, sounding and pull tests. Failed areas shall be removed and repaired in accordance with these specifications and manufacturers recommendations. Repaired area shall be tested.

626.3.4 Warranty Period Inspection:

Owner may conduct inspection any time prior to five (5) years following completion of new coating work and/or repaired coating work. Contractor and representative of coating manufacturer shall be notified of any apparent coating failures. Defective work or coating failures shall be repaired in accordance with specifications and to satisfaction of Owner. If warranty inspections are not held, Contractor is not relieved of responsibilities under Contract Documents.

626.4 MEASUREMENT

Measurement shall be per square foot of manhole wall coated.

626.5 PAYMENT

Payment shall be made at unit price bid per square foot, and be full compensation for cleaning, surface preparation materials, application, testing, and any incidentals, thereto, in conformance with the plans and specifications.

-End of Section-

SECTION 627

PAINTING SANITARY SEWER MANHOLES WITH INSECTICIDE

Add SECTION 627 in its entirety:

SECTION 627

PAINTING SANITARY SEWER MANHOLES WITH INSECTICIDE

627.1 GENERAL

This specification pertains to manholes on sewer, 15-inch in diameter and under.

All new manholes shall be painted with insecticide.

After the new pipe has been tested, inspected, and accepted for service and the manhole has been adjusted to final grade, the top 8 feet or from the manhole bench to the finish grade whichever is less shall be painted. The entire interior circumference shall be covered, including adjusting rings.

The interior of the manhole shall be free from all loose material to provide a clean bonding surface. Refer to manufacturer's specifications for preparation instructions.

Existing manholes to which corrosion coatings are applied, shall be painted with insecticide.

627.2 INSECTICIDE PAINT

Product shall meet requirements of the current City of Phoenix IFB Requirements Contract for Manhole Insecticide Application.

627.3 APPLICATION

Product shall be applied in accordance with requirements of the current City of Phoenix IFB Requirements Contract for Manhole Insecticide Application. Paint must be applied to top 8-feet of manhole cone and barrel. Paint must be applied by a State of Arizona Licensed Pest Control Applicator.

Existing manholes to which a tap or main connection is made do not require insecticide paint.

627.4 MEASUREMENT

Measurement shall be per manhole.

627.5 PAYMENT

Payment shall be made at unit price bid per manhole, and be full compensation for cleaning, surface preparation, materials, application, and any incidentals, thereto, in conformance with plans and specifications.

SECTION 630

TAPPING SLEEVES, VALVES AND VALVE BOXES ON WATER LINES

Subsection 630.3 GATE VALVES: Delete the paragraph "630.3.2 Supplements Specifically Relating to Valve Size:" in its entirety and replace it with the following Subsection:

630.3.2 Supplements Specifically Relating to Valve Sizes: Iron body resilient-seated gate valves are allowed up to 30 inches in accordance with AWWA C509-01.

Subsection 630.4.2 Tapping Sleeves: Add the following as the first paragraph of this Subsection:

All tapping sleeves where the tap size is the same size as the size of the main to be tapped shall conform to Subsection 630.4.2 (A) (1).

Subsection 630.5 BUTTERFLY VALVE: Add the following subparagraphs to Subsection (A):

(14) The rubber valve seats shall be located in the valve body for valves 16-inches in diameter and larger. Valve seat configurations which rely on the mating pipe flange to hold the seat in position in the valve body will not be acceptable. The seating surfaces mating with rubber seats shall be AISI Type 304 or 316 stainless steel, monel or plasma-applied nickel-chrome overlay for all valves.

(15) Valve shafts shall be fabricated of AISI Type 304 or 316 stainless steel. The use of shafts with a hexagonal cross section is not acceptable. The connection between the shaft and the disc shall be mechanically secured by means of a solid, smooth sided, stainless steel or monel taper pin or dowel pin. Each taper pin or dowel pin shall extend through or shall wedge against the side of the shaft and shall be mechanically secured in place. The use of bolts, setscrews, knurled or fluted dowel pins, expansion pins, roll pins, tension pins, spring pins, or other devices instead of the solid, smooth sided, stainless steel or monel taper pins or dowel pins shall not be acceptable.

(16) Prior to installation of the butterfly valve, Contractor shall provide to the inspector, certification statements from the valve manufacturer indicating the leakage tests in both directions, proof of design tests were performed and successfully met per AWWA C504-06 Section 5.1.2. If certifications are not provided, Contractor can elect to perform tests per AWWA C504-06 Section 5.1.2 and witnessed by the inspector. If the tests are not successful, the contract is required to contact the manufacturer to have the seats adjusted until such a time the tests are successful in both directions.

PART 700
MATERIALS

SECTION 701

AGGREGATE

Subsection 701.4 RECLAIMED CONCRETE MATERIAL (RCM): Delete the first two sentences of the second paragraph and replace with the following:

The use of RCM in any manner shall require prior approval from the Engineer. In accordance with Section 7 of AASHTO M319, RCM shall not contain more than five percent by mass of brick or concrete block and shall be free of wood, metal, plaster, and gypsum board. RCM shall be free of all materials that fall under the category of solid waste or hazardous materials as defined by the state or local jurisdiction.

Subsection 701.5 RECLAIMED ASPHALT PAVEMENT (RAP): Delete the title of this Subsection in its entirety and replace with the following:

RECLAIMED ASPHALT PAVEMENT (RAP) AND RECLAIMED ASPHALT SHINGLES (RAS)

Subsection 701.5 RECLAIMED ASPHALT PAVEMENT (RAP): Delete the last two sentences in the first paragraph and replace with the following:

RAP shall not be used in Asphalt Concrete, Portland Cement Concrete or CLSM. RAP shall not be used in Structure Backfill. The use of RAP in other fill shall require prior approval from the Engineer.

Subsection 701.5 RECLAIMED ASPHALT PAVEMENT (RAP): Add the following paragraph to the end of this Subsection:

Reclaimed asphalt shingles (RAS) is defined as all recovered, salvaged or recycled asphalt roof shingles that have been processed to make the material reusable. RAS shall not be used in Asphalt Concrete, Portland Cement Concrete or CLSM. RAS shall not be used in Structure Backfill. The use of RAS in other fill shall require prior approval from the Engineer.

SECTION 702

BASE MATERIALS

Delete this SECTION in its entirety and replace with the following:

702.1 GENERAL:

Base material (Select Material Type A, Select Material Type B, Aggregate Base ABC), shall be crushed aggregate, with gradation per Table 702-1.

The Contractor shall submit documentation to the Engineer from a City approved testing laboratory showing compliance with Table 702-1 ten (10) days prior to placement of base material except where base materials are being obtained from an approved source that is on a list maintained by the City of Phoenix, Street Transportation Department, Design and Construction Management Division, Materials Lab Section.

RCM and RAP will not be utilized as base material without prior approval from the City of Phoenix Materials Lab.

Cement or lime treated base, meeting the requirements of Section 705, can be utilized as base material, except within the pipe embedment zone around Reinforced Concrete Pipe (RCP) and metal pipe.

702.2 PHYSICAL PROPERTIES:

Crushed aggregate shall consist of crushed rock or crushed gravel or a combination thereof as defined in Section 701.

TABLE 702-1

Sieve Analysis Test Methods AASHTO T-27, T-11			
	Accumulated Percentage Passing Sieve, by Weight		
Sieve Sizes (Square Openings)	**Select Material**		**Aggregate Base**
	Type A	**Type B**	
3"	100	--	--
1 ½"	--	100	100
1"	--	--	90-100
No. 4	30-75	30-70	38-65
No. 8	20-60	20-60	25-60
No. 30	10-40	10-40	10-40
No. 200	0-12	0-12	3-12
CBR Test Method AASHTO T-193			
Minimum at 0.2000 inch penetration at 65 blows, 100% compaction	50		50
Liquid Limit Test Method AASHTO T-89 Method A, T-90, T-146 Method A			
Maximum allowable value	25		25
Plasticity Index Test Methods AASHTO T-89 Method A, T-90, T-146 Method A			
Maximum allowable value	5		5
Fractured Face, One Face Test Method ARIZ 212, Percent by Weight of the Material Retained on a #4 Sieve			
Minimum required value	50		50
Resistance to Degradation and Abrasion by the Los Angeles Abrasion Machine Test Method AASHTO T-96, Percent Loss by Weight			

TABLE 702-1		
Maximum allowable value 100 revolutions	10	10
Maximum allowable value at 500 revolutions	40	40
Friable or Deleterious Substances Test Method ASTM C-142, Percent by Weight		
Maximum allowable in fine aggregate	3	3
Maximum allowable in coarse aggregate	3	3
Soundness Test Method ASTM C-88, Percent Loss by Weight		
Maximum allowable in fine aggregate	10	10
Maximum allowable in coarse aggregate	12	12
Apparent Specific Gravity Test Method ASTM C-127		
Minimum (considering other factors)	2.65	2.65
pH and Resistivity Test Method ARIZ 236		
pH (For Pipe Embedment Zone Only)	5.0 – 9.0	5.0 -9.0
Minimum resistivity	2,000 ohm-centimeters	2,000 ohm-centimeters

SECTION 710

ASPHALT CONCRETE

Delete this SECTION in its entirety and replace with the following:

710.1 GENERAL

Asphalt concrete shall consist of a mixture of paving asphalt and mineral aggregate which, with or without the addition of mineral filler and blending sand as may be required, shall be mixed at a central mixing plant in the proportions hereinafter specified to provide a homogeneous and workable mixture.

Asphalt concrete is designated as Type A-1½ Base Course; Type C-3/4 Base, Surface or Single Course; Type D-½ Single or Surface Course, and Gyratory (on specified projects).

Each mix shall be designed using Marshall compaction methods, unless Gyratory is specified. Marshall Mixes may be used for low or high traffic conditions, as determined by the agency. Low traffic conditions are conditions where the asphalt mix will be subject to low volume and low weight vehicle usage. Examples of this condition are residential streets, most parking lots and residential minor collector streets. High traffic conditions are conditions where the asphalt mix will be subject to high volume and/or heavy weight vehicle usage as found on major collector, arterial and commercial streets. Street classifications (i.e. minor collector and major collector) shall be determined by the specifying agency.

710.2 MATERIAL

710.2.1 Asphalt: The asphalt to be mixed with mineral aggregate shall be paving grade asphalt conforming to Section 711, and shall be PG 64-16 or PG 70-10 as directed by the Engineer, unless otherwise specified in the special provisions.

710.2.2 Aggregate: Coarse and fine aggregates shall conform to the applicable requirements of Section 701 except as modified herein.

Coarse aggregate is material retained on the No. 4 sieve and fine aggregate is material passing the No. 4 sieve.

Blending sand shall be clean, hard and sound material, either naturally occurring sand or crushed fines, which will readily accept asphalt coating. The exact grading requirements shall be such that, when it is mixed with the mineral aggregate, the combined product shall meet the requirements of the designated mix as specified elsewhere in this specification.

710.2.3 Mineral Filler and Anti-Stripping Agent:

(A) Mineral filler shall conform to the requirements of AASHTO M-17. The mineral filler shall be dry hydrated lime conforming to the requirements of ASTM C 1097, or Portland cement conforming to Section 725 or other approved mineral filler shall be added to the aggregate in accordance with the requirements contained herein. The amount of mineral filler to be used shall be determined by the Engineer. The method of adding the mineral filler shall be such that the aggregate is uniformly coated and the mineral filler is uniformly distributed without loss or waste within the material prior to adding the asphalt to the mixture.

(B) When aggregate is subject to stripping, dry hydrated lime conforming to the requirements of ASTM C 1097, Portland cement conforming to Section 725 or other approved anti-strip agent shall be added. Hydrated lime and Portland cement shall be added in accordance with Subsection 710.2.3(A).

Other approved no strip agents shall be added in accordance with the manufacturer's recommendations and approved by the Engineer.

710.2.4 Combined Aggregates: The combined aggregates sampled after all processing, except the adding of asphalt and mineral filler, shall conform to the following quality requirements.

At least 85 percent by weight of the aggregate retained on the No. 8 sieve shall consist of particles which have at least one rough, angular surface produced by crushing.

710.2.5 Mix Design Criteria: Should the Contractor wish to utilize a City of Phoenix mix design from a non-approved source, the mix design(s) shall be submitted to the City of Phoenix Materials Lab 15 working days prior to the start of the asphalt placement. Included with the mix design, the Contractor shall also submit the appropriate asphalt concrete for mix verification and laboratory calibrations as specified by the City of Phoenix Materials Lab. These samples will not include standard City of Phoenix mix designs approved through annual asphalt concrete supplier calibrations.

The mix design shall be performed by the Marshall Mix Design method and shall conform to the requirements specified herein. After the asphalt mix designs have been approved by the Engineer, the Contractor and/or the asphalt supplier shall not change the mix design or utilize additional mixing plants without prior approval of the Engineer.

TABLE 710-1
CRITERIA FOR STANDARD COP MARSHALL MIX DESIGNS
LOW AND HIGH VOLUME

	A 1-1/2”		**C 3/4”**		**D 1/2"**	
Sieve Size	**Target**	**Tolerance**	**Target**	**Tolerance**	**Target**	**Tolerance**
1 1/2"	100	---	100	---	100	---
1”	93	+/-7%	100	---	100	---
3/4"	90	+/-7%	95	88-100	97-100	---
1/2"	---	---	85	+/-7%	88	+/-7%
3/8”	63	+/-7%	75	+/-7%	78	+/-7%
No. 4	45	+/-7%	58	+/-7%	58	+/-7%
No. 8	35	+/-5%	44	+/-5%	45	+/-5%
No. 30	20	+/-5%	24	+/-5%	25	+/-5%
No. 200	5	+/-2%	4	+/-2%	5	+/-2%
	High Volume	**Low Volume**	**High Volume**	**Low Volume**	**High Volume**	**Low Volume**
Oil Content %	4.3 +/-.4	---	5.0+/-.4	5.5+/-.4	5.1+/-.4	5.6+/-.4
Air Voids % (Recommended)	5.0+/-1.0	---	4.5+/-1.0	4.0+/-1.0	4.5+/-1.0	4.0+/-1.0

TABLE 710-2 MARSHALL MIX DESIGN CRITERIA				
Criteria	**Requirements**			**Designated Test Method**
	1/2" Mix	**3/4" Mix**	**1.5" Mix**	
Voids in Mineral Aggregate: %, Min.	14.0	13.0	12.0	AI MS-2
Effective Voids: %, Range (Recommended)	4.0 ±0.2 (LV) 4.5 ±0.2 (HV)	4.0 ±0.2 (LV) 4.5 ±0.2 (HV)	5.0 ±0.2	AI MS-2
Absorbed asphalt: %, Range*	0-1.0	0-1.0	0-1.0	AI MS-2
Dust to Eff. Asphalt Ratio, Range **	0.6-1.4	0.6-1.4	0.6-1.4	AI MS-2
Tensile Strength Ratio: % Min.	60	60	60	ASTM D 4867
Dry Tensile Strength: psi, Min.	100	100	100	ASTM D 4867
Stability: pounds, Min.	2,500	2,500	3,000	AASHTO T-245
Flow: 0.01-inch, Range	8-16	8-16	8-16	AASHTO T-245

710.2.6 Gyratory Mix Designs: Gyratory Mix Designs shall be performed in accordance with the requirements of latest edition of the Asphalt Institute's SP-2 manual. Mix design laboratory compacted specimens shall be prepared using a gyratory compactor in accordance with AASHTO T-312.

The mix design shall be formulated in a manner described for volumetric mix designs in the current edition of the Asphalt Institute Manual SP-2, except the number of trial blend gradations necessary will be determined by the mix design laboratory. Duplicate gyratory samples shall be prepared at a minimum of four (4) binder contents to select the recommended binder content. The gyratory specimens shall be compacted to 160 gyrations. Volumetric data for the design number of gyrations, N_{des}, and the initial number of gyrations, N_{ini}, are then back calculated based on the bulk specific gravity, G_{mb}, of the N_{max} specimens and the height data generated during the compaction process of those same specimens. For Low traffic designs, volumetric data for 115 gyrations, N_{max} for Low Traffic designs, is also back calculated from the specimens compacted to 160 gyrations.

The corrected density of the specimens shall be less than 89.0 percent of maximum theoretical density at N_{ini}. The corrected density of the specimens shall be less than 98.0 percent of maximum theoretical density at N_{max}. The Gyratory mix shall comply with the criteria in Table 710-3.

TABLE 710-3				
GYRATORY MIX DESIGN CRITERIA				
Criteria	**Requirements**			**Designated Test Method**
	3/8" Mix	**1/2" Mix**	**3/4" Mix**	
Voids in Mineral Aggregate: %, Min.	15.0	14.0	13.0	AI SP-2
Effective Voids: %, Range	4.0 +/- 0.2	4.0 +/- 0.2	4.0 +/- 0.2	AI SP-2
Absorbed Asphalt: %, Range *	0 - 1.0	0 - 1.0	0 - 1.0	AI SP-2
Dust to Eff. Asphalt Ratio, Range **	0.6 - 1.4	0.6 - 1.4	0.6 - 1.4	AI SP-2
Tensile Strength Ratio: %, Min.	75	75	75	ASTM D 4867
Dry Tensile Strength: psi, Min.	75	75	75	ASTM D 4867
Mineral Aggregate Grading Limits				AASHTO T-27
	Percent Passing with Admix			
Sieve Size	**3/8 inch Mix**	**1/2 inch Mix**	**3/4 inch Mix**	
1 inch			100	
3/4 inch		100	90 - 100	
1/2 inch	100	90 - 100	43 - 89	
3/8 inch	90 - 100	53 - 89	-	
No. 8	32 - 47	29 - 40	24 - 36	
No. 40	2 - 24	3 - 20	3 - 18	
No. 200	2.0 - 8.0	2.0 - 7.5	2.0 - 6.5	
Number of Gyrations	**Low Traffic**		**High Traffic**	
N_{ini}	7		8	
N_{des}	75		100	
N_{max}	115		160	

* Unless otherwise approved by the Engineer.

** The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the indicated range.

710.3 COMPOSITION AND GRADING:

The grading of the combined aggregates shall be such as to conform to the requirements indicated on the approved list. Contact the City of Phoenix Materials Lab for approved list of all standard COP mixes.

710.4 GENERAL REQUIREMENTS:

Mixtures shall be delivered to the site of the work without segregation of the ingredients and within the temperature range specified in Section 321.

At the time of delivery to the job site, the Engineer shall be provided with a legible weight master's certificate (delivery ticket) containing the following information:

(1) Date
(2) Supplier's name;
(3) Plant location and/or plant number;
(4) Ticket number;

(5) Truck number;
(6) Contractor's name;
(7) Project name and/or location;
(8) Product code/description with percent asphalt;
(9) Mineral filler/additive and percent;
(10) Temperature at batching;
(11) Time of batching, arrival and unloading;
(12) Material weight or vehicle weight with and without material;
(13) Weight of accumulative loads.

SECTION 717

ASPHALT-RUBBER ASPHALT CONCRETE

Subsection 717.2.1.3 Asphalt-Rubber Portions and Properties: Delete Table 717-2 in its entirety and replace with the following Table 717-2:

TABLE 717-2	
PHYSICAL PROPERTIES OF ASPHALT RUBBER BINDER	
Grade of base asphalt cement	**PG 64-16**
Property	**Requirement**
Rotational Viscosity*; 350° F, Pascal seconds	1.5-4.0
Penetration; 39° F (4° C), 200g, 60 sec. (ASTM D5); dmm, min	10
Penetration, 77° F, 100g, 5 sec: 1/10 mm (ASTM D5), min.	20
Softening Point; (ASTM D36); °F, min.	135
Resilience; 77°F (ASTM D3407); %,min	25
Flash Point: °F (ASTM D92), min.	450
* The Viscometer used must be a hand held rotational viscometer, such as a Rion (formerly Haake) Model VT – 04, or an equivalent, using Rotor No. 1. The rotor, while in the off position, shall be completely immersed in the binder at a temperature from 350° to 355° F for a minimum heat equilibrium period of 60 seconds, and an average viscosity determined from three separate constant readings (± 0.5 pascal-seconds) taken within a 30 second time frame with the viscotester level during testing and turned off between readings. Continuous rotation of the rotor may cause thinning of the material immediately in contact with the rotor, resulting in erroneous results.	

Subsection 717.2.2 Aggregate: Delete Table 717-3 in its entirety and replace with the following Table 717-3:

TABLE 717-3		
MIX DESIGN GRADATION REQUIREMENTS		
LOW AND HIGH VOLUME		
Modified D 1/2" ARAC		
Sieve Size	**Target**	**Tolerance**
3/4"	100	+/-0%
1/2"	97-100	+/-0%
3/8"	85	+/-7%
No. 4	35	+/-7%
No. 8	18	+/-5%
No. 30	8	+/-5%
No. 200	4	+/-2%

Subsection 717.3.1 General: Delete the second paragraph in its entirety and replace with the following:

The date of the design shall not be older than one year from the date of submittal, unless supportive documentation is submitted to, and approved by, the Engineer.

Subsection 717.3.2 Mix Design Criteria: Delete Table 717-5 in its entirety and replace with the following Table 717-5:

TABLE 717-5		
MARSHALL MIX DESIGN CRITERIA		
Criteria	**Low Volume Traffic**	**High Volume Traffic**
Asphalt Rubber Binder Content	8.5% minimum	8.0% minimum
Mixture Air Voids, %	3.5 +/-1	5.0 +/- 1
Voids in Mineral Aggregate, %	19.0 min	19.0 min
Tensile Strength Ratio, AASHTO T-283	60% min	60% min
Marshall Stability, pounds minimum	800	800
Marshall Flow, 0.01 inch minimum	16	16

SECTION 725

PORTLAND CEMENT CONCRETE

Subsection 725.8.1 Field Sampling and Tests: Delete the eighth paragraph in its entirety and replace with the following:

Sampling and testing for the 7-day cylinder, the 14-day cylinder, the two 28-day concrete acceptance test cylinders and the two HOLD cylinders will be at the expense of the Contracting Agency. Sampling and testing for the Contractor's purposes of quality control or other needs shall be at the Contractor's expense.

Subsection 725.8.2 Concrete Cylinder Test: Add the following sentence after the fourth sentence:

A single 7-day and a single 14-day cylinder shall be made and tested to provide progress information only and neither shall be considered an acceptance test. Two HOLD cylinders shall also be made and shall be acceptance tested at a 56-day when the 28-day test fails to comply.

SECTION 728

CONTROLLED LOW STRENGTH MATERIAL

Subsection 728.1 GENERAL: Delete this Subsection in its entirety and replace with the following:

Unless approved by the Engineer, the Controlled Low Strength Material (CLSM) shall be from an approved commercial-source and is a mixture of cementitious materials, aggregates, admixtures\additives, and water that, as the cementitious materials hydrate, forms a soil replacement. Approved CLSM shall be identified by a product code that includes "PHCLSM". CLSM is a self-compacting, flowable, cementitious material primarily used as a backfill, structural fill, or a replacement for compacted fill or unsuitable native material. Placement and usage of each type of CLSM is described in Section 604.

Subsection 728.3 PROPORTIONING OF MIXTURES AND PRODUCTION TOLERANCES: Delete Note (2) for Table 728-1 and replace with the following:

(2) Ready-mixed concrete, including timed-out, rejected, and truck wash-out material, shall not be used in lieu of CLSM without prior approval from the Engineer and shall be subject to rejection.

SECTION 735

REINFORCED CONCRETE PIPE

Subsection 735.1 GENERAL: Add the following after the second paragraph of this Subsection:

The size, type, and class of pipe shall be as shown on the plans, or specified under the item of work for the project of which the pipe is a part.

When specified in the special provisions, four sets of pipe line layout drawings shall be furnished to the Engineer prior to the manufacture of the concrete pipe. The pipe layouts will be used by the Contracting Agency for reference only, but their use shall in no way relieve the Contractor of the responsibility for the correctness of the layout. Catch basin connector pipe need not be included in the pipe line layout; however, pipe stubs shall be included. In lieu of including catch basin connector pipe in the pipe layout, a list of catch basin connector pipes shall accompany the layout. The connector pipe list shall contain the following information.

(A) Size, and class of pipe.

(B) Station at which pipe joins main line.

(C) Number of section of pipe, length of section, type of sections (straight, horizontal bevel, vertical bevel, etc.).

All pipe installed in tunnels shall be ASTM C76, Class III. Pipe stronger than that specified may be furnished at the Contractor's option, and at no additional cost to the Contracting Agency, provided such pipe conforms in all other respects to the applicable provisions of these specifications.

Subsection 735.2 JOINTS: Delete the last paragraph in its entirety.

Subsection 735.4 MATERIALS: Add the following as the last sentence of subparagraph (C):

The area of steel used shall be the same as that shown on the shop drawing for that pipe.

SECTION 736

NON-REINFORCED CONCRETE PIPE

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 738

HIGH DENSITY POLYETHYLENE PIPE & FITTINGS FOR STORM DRAIN AND SANITARY SEWER

Delete the title of this SECTION in its entirety and replace with the following:

HIGH DENSITY POLYETHYLENE PIPE & FITTINGS FOR STORM DRAIN

Delete this SECTION in its entirety and replace with the following:

738.1 GENERAL:

This specification covers the requirements of open profile high density polyethylene (HDPE) pipe manufactured per ASTM F894 or AASHTO M-294 (corrugated Type S) for gravity flow storm drain. When noted on the plans or in the special provisions, gravity flow storm drain may be constructed using HDPE pipe. The HDPE pipe will be 15inch diameter through 48 inch diameter only.

All pipe joints shall conform to the controlled pressure test of 10.8 psi of air or 25 feet of water as stipulated in ASTM D3212.

The size and class of the HDPE pipe to be furnished shall be designed by the Engineer and shown on the plans or in the project specifications. At no time will the class designed be less than RSC-63 for ASTM F894 open profile pipe, or the Pipe Stiffness (PS) for corrugated Type S pipe per the requirements of AASHTO M-294.

738.2 MATERIALS:

738.2.1 Base Material Composition: Open profile pipe base material and fittings shall, in accordance with ASTM F894, be made from a PE plastic compound meeting the requirements of Type III, Class C, Category 5, Grade P34 as defined in ASTM D1248 and with established hydrostatic design basis (HDB) of not less than 1250 psi for water at 73.4 degrees F^{o} as determined in accordance with Method ASTM D2837. Materials meeting the requirements of cell classification PE 334433 C or higher cell classification, in accordance with ASTM D3350 are also suitable. Corrugated Type S pipe base material shall comply with the requirements of AASHTO M-294 and have a minimum cell classification PE 335420C.

738.2.2 Other Pipe Materials: Materials other than those specified under Base Materials shall comply with ASTM F894, or AASHTO M-294.

738.2.3 Gaskets: Gaskets shall be manufactured from a natural rubber, synthetic elastomer or a blend of both and shall comply in all respects with the physical requirements in ASTM F477.

738.2.4 Water Stops: Water stops shall be manufactured from a natural or synthetic rubber and shall conform to the requirements of ASTM C923. The water stop shall have expansion rings, a tension band, or a take-up device used for mechanically compressing the water stop against the pipe.

738.2.5 Thermal Welding Material: The material used for thermally welding the pipe material shall be compatible with the base material.

738.2.6 Lubricant: The lubricant used for assembly shall comply to manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

738.3 JOINING SYSTEMS:

738.3.1 Gasket Type: Joints for the piping system and fittings shall consist of an integrally formed bell and spigot gasketed joint. The joint shall be designed so that when assembled, the elastomeric gasket located on the spigot is compressed radially on the pipe or fitting bell to form a water tight seal. The joint shall be designed so to prevent

displacement of the gasket from the joint during assembly and when in service. The elastomeric gasket shall meet the provision of ASTM F477.

All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The bell and spigot configurations for the fittings shall be compatible to those used for the pipe.
Joints shall provide a seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear, shall be smooth and free of any imperfections, which would adversely affect sealability. The assembly of the gasketed joints shall be in accordance with the pipe manufacturer's recommendations.

738.3.2 Thermal Weld Type: The pipe ends shall consist of an integrally formed bell and spigot, with or without the elastomeric centering gasket, which join together to form an interface between bell and spigot, such that it is suitable to seal by thermal weld using the extrusion welding process, in accordance with the manufacturer's recommended procedure.

Thermal welded joints may be effected by welding from inside the pipe or outside, or both.

The assembly of the welded joints shall be in accordance with the manufacturer's recommendations.

Thermal welded joints shall be used only when specified on plans or in specifications.

738.4 FITTINGS:

Fittings for HDPE open profile or corrugated Type S pipe may include tees, elbows, manhole adapter rings, plugs, caps, adapters and increasers. Fittings shall be joined by gasket type or thermal weld type joints in accordance with Subsection 738.3.

A clamp gasket or approved method shall be provided at manhole entry or connection to reduce infiltration and exfiltration. Where precast manholes are used, entrance holes must be large enough to allow for proper grouting around the manhole gasket. A non-shrink grout shall be used for grouting.

Storm drain manholes in public rights-of-way, right-of-way easements, and dedicated public drainage easements shall conform to COP Standard Detail P1520, MAG Standard Detail 522 excluding steps, and Section 625.

738.5 CERTIFICATION:

A manufacturer’s certification that the material was manufactured, sampled, tested and inspected in accordance with ASTM F894 and been found to meet the requirements shall be submitted. A report of the test results shall be included in the submittal.

Pipe and resin producers that manufacture according to AASHTO M-294 shall be certified according to the Plastic Pipe Institute protocol for their Third Party Certification Program.

A manufacturer’s certification that the material was manufactured, tested and supplied in accordance with AASHTO M-294 and found to meet the requirements shall be submitted. A report of the test results shall be included in the submittal.

738.6 DIMENSIONS AND TOLERANCES:

Open profile HDPE pipe dimensions shall comply with dimensions given in Table 1 of ASTM F894. The “average or nominal inside diameter” of profile wall HDPE pipe shall not deviate from its normal pipe size by more than as specified in Table 1 of ASTM F894. Corrugated Type S HDPE pipe dimensions shall be “nominal inside diameter” dimensions and shall not deviate from its nominal pipe size by more than the minimum and maximum tolerances as described in AASHTO M-294, Section 7.2.3.

Pipe shall have a Ring Stiffness Constant (RSC) or Pipe Stiffness (PS) as shown on the plans. The minimum RSC for open profile HDPE pipe shall be RSC-63. The minimum PS for corrugated Type S pipe shall be as shown in AASHTO M-294 (Section 7.4), and tested per ASTM D2412. In no case shall the minimum PS be less than the equivalent PS value for RSC-63.

738.7 CLASSIFICATIONS:

HDPE open profile pipe products shall be made in four standard Ring Stiffness Constant (RSC) classifications, 40, 63, 100 and 160. These are referred to as RSC-40, RSC-63, RSC-100 and RSC-160. The RSC test shall be conducted in accordance with ASTM D2412 with the exceptions listed in accordance with ASTM F894. HDPE corrugated Type S pipe shall meet the minimum Pipe Stiffness (PS) requirements of AASHTO M-294. The PS test shall be conducted in accordance with ASTM D2412 with the exceptions listed in accordance with AASHTO M-294.

738.8 MARKINGS:

Markings on pipe shall be per ASTM F894 or AASHTO M-294. These markings shall be clearly shown on the pipe at intervals of approximately 12 feet and include but not limited to the following: the manufacturer's name or trademark, nominal size, the specification designation, plant designation code, date of manufacture or an appropriate code. All fittings shall be marked with the designation number of the specification and with the manufacturer's identification symbol. In addition, manufacturers of AASHTO M-294 corrugated Type S pipe shall print on or affix the appropriate Plastic Pipe Institute Program Mark on each length of pipe produced that meets the requirements of the program.

738.9 CARE OF PIPE AND MATERIALS:

All pipe and materials shall be manufactured, handled, loaded, shipped and unloaded in such manner as to be undamaged and in sound condition, in the completed work. Particular effort shall be exercised to protect the ends of pipe. Repairs on damaged pipe shall be made to the satisfaction of the Engineer otherwise they shall not be used in the work and shall be replaced with an equal pipe or special in an acceptable condition. Pipe that is gouged, marred or scratched forming a clear depression shall not be installed, and it shall be removed if damaged during the installation

Open profile pipe in shipping or storage shall not be stacked higher than three rows for pipes 21 inches in diameter or less, nor higher than two rows for pipes 24 to 36 inches in diameter inclusive. Pipe shall not be stacked, shipped, or stored with weight on the bells of the pipe.

Corrugated Type S pipe in shipping and storage shall be stacked per manufacturer's recommendation, but in no case higher than 5 rows for pipe 24 inches or less in diameter, or 3 rows for pipe greater than 24 inches in diameter.

SECTION 739

STEEL REINFORCED POLYETHYLENE PIPE & FITTINGS FOR STORM DRAIN, IRRIGATION AND SANITARY SEWER

Delete the title of this SECTION in its entirety and replace with the following:

STEEL REINFORCED HIGH DENSITY POLYETHYLENE PIPE & FITTINGS FOR STORM DRAIN

Delete this SECTION in its entirety and replace with the following:

739.1 GENERAL:

This specification covers the requirements of ribbed-pipe profile steel reinforced polyethylene pipe (SRPE) pipe manufactured per ASTM F2562 for gravity flow storm drains. When noted on the plans or in the special provisions, gravity flow storm drains may be constructed using SRPE pipe. The SRPE pipe will be 24 inch diameter through 48 inch diameter only.

All gasketed pipe joints shall conform to the controlled pressure test of 10.8 psi or 25 feet of water as stipulated in ASTM D3212.

All electro fusion pipe joints shall conform to the controlled pressure test of 30.0 psi or 69 feet of water as stipulated in ASTM D3212.

The size and class of the SRPE pipe to be furnished shall be designed by the Engineer and shown on the plans or in the project specifications. At no time will the class designed be less than Class 1 per the requirements of ASTM F2562.

739.2 MATERIALS:

739.2.1 Base Steel Materials: Continuous high strength galvanized ribs shall be cold rolled steel meeting the requirements of either ASTM A1008 or ASTM A1011 with minimum yield strength of 80,000 psi. Steel ribs shall be completely encased within the HDPE profile.

739.2.2 HDPE Material Composition: SRPE pipe high density polyethylene material and fittings shall, in accordance with ASTM 2562, be made from a high density polyethylene plastic compound meeting the minimum requirements of cell classification 335464C or higher cell classification, in accordance with ASTM D3350.

739.2.3 Gaskets: Rubber gaskets shall be manufactured from a natural rubber, synthetic elastomer or a blend of both and shall comply in all respects with the physical requirements in ASTM F477.

739.2.4 Water Stops: Water stops shall be manufactured from a natural or synthetic rubber and shall conform to the requirements of ASTM C923. The water stop shall have expansion rings, a tension band, or a take-up device used for mechanically compressing the water stop against the pipe.

739.2.5 Thermal Welding Material: The material used for thermally welding the pipe material shall be compatible with the base material.

739.2.6 Lubricant: The lubricant used for assembly shall comply with manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

739.2.6 Other Materials: Materials other than those specified above shall comply with ASTM F2562.

739.3 JOINING SYSTEM:

739.3.1 Gasketed Type: Steel reinforced bell and spigot joints for the piping system and fittings shall consist of an

integrally formed steel reinforced bell and steel reinforced spigot gasketed joint. The joint shall be designed so that when assembled, the elastomeric gasket is compressed radially on the pipe or fitting bell to form a water tight seal. The joint shall be designed so to prevent displacement of the gasket from the joint during assembly and when in service. The elastomeric gasket shall meet the provision of ASTM F477.

All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The bell and spigot configurations for the fittings shall be compatible to those used for the pipe.
Joints shall provide a seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear, shall be smooth and free of any imperfections, which would adversely affect seal ability. The assembly of the gasketed joints shall be in accordance with the pipe manufacturer's recommendations.

739.3.2 Thermal Weld Type: Electro fusion (EF) joints shall utilize plain ended pipe welded together by internal pressure testable couplers. The internal couplers shall have a minimum wall thickness equal to or greater than the pipe wall thickness as defined in pipe specification, ASTM F2562. The assembly of the welded joints shall be in accordance with the manufacturer's recommendations.

739.4 FITTINGS:

Fittings for SRPE pipe may include tees, elbows, manhole adapter rings, plugs, caps, adapters and increasers. Fittings shall be joined by gasket type or thermal weld type joints in accordance with Subsection 739.3.

A clamp gasket or approved method shall be provided at manhole entry or connection to reduce infiltration and exfiltration. Where precast manholes are used, entrance holes must be large enough to allow for proper grouting around the manhole gasket. A non-shrink grout shall be used for grouting.

Storm drain manholes in public rights-of-way, right-of way easements, and dedicated public drainage easements shall conform to COP Standard Detail P1520, MAG Standard Detail 522 excluding steps, and Section 625.

739.5 CERTIFICATION:

A manufacturer's certification that the product was manufactured and tested in accordance ASTM F2562 and found to meet the requirements shall be submitted. A report of the test results shall be included in the submittal.

739.6 DIMENSIONS AND TOLERANCES:

Profile wall SRPE pipe dimensions shall comply with dimensions given in Table 2 of ASTM F2562. The "inside diameter" of profile wall SRPE pipe shall not deviate from its published inside diameter by more than as specified in Section 6.2.3 of ASTM F2562.

739.7 MARKINGS:

Markings on pipe shall be per ASTM F2562. These markings shall be clearly shown on the pipe at intervals of approximately 12 feet and include by not limited to the following: the manufacturer's name or trademark, nominal size, the specification designation, plant designation code, date of manufacture or an appropriate code. All fittings shall be marked with the designation number of the specification and with the manufacturer's identification symbol.

739.8 CARE OF PIPE MATERIALS:

All pipe and materials shall be manufactured, handled, loaded, shipped and unloaded in such manner as to be undamaged and in sound condition, in the completed work. Particular effort shall be exercised to protect the ends of pipe. Repairs on damaged pipe shall be made to the satisfaction of the Engineer otherwise they shall not be used in the work and shall be replaced with an equal pipe or special in an acceptable condition. Pipe that is gouged, marred or scratched forming a clear depression shall not be installed, and it shall be removed if damaged during the installation. Gaskets shall remain

covered at all times by the supplied gasket cover material until the joint is ready for lubrication and assembly.

SRPE pipe in shipping and storage shall be stacked per manufacturer's recommendation, but in no case higher than 4 rows. Pipe shall not be stacked, shipped or stored with weight on the bells of the pipe.

SECTION 740

POLYETHYLENE PIPE AND FITTINGS FOR STORM DRAIN, IRRIGATION AND SANITARY SEWER

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 741

LINING FOR REINFORCED CONCRETE SANITARY SEWER PIPE

Delete this SECTION in its entirety and replace with the following:

741.1 GENERAL:

The interior area of the reinforced concrete pipe as indicated on the plans shall be protected with lining, as specified below.

The installation and application of the pipe lining shall be accomplished by the supplier of the reinforced concrete pipe.

All work for and in connection with the installation of lining in concrete pipe and the field welding of joints shall be done in strict conformance with all applicable published specifications, instructions and recommendations of the approved lining manufacturer.

741.2 MATERIALS:

741.2.1 Material Composition: The material shall be a liner plate which is a combination of inert, synthetic resins, pigments, and plasticizers, compounded to make a permanently flexible sheet.

The liner plate shall be resistant to the following: Oxidizing agents, sulfuric, phosphoric, nitric, chromic, oleic, and stearic acids; sodium and calcium hydroxides; ammonia, sodium, calcium, magnesium, and ferric chlorides; ferric sulfate, petroleum oils and greases; vegetable and animal oils, fats, greases and soaps that normally occur in sanitary sewers.

Liner plate shall be impermeable to sewage gasses and liquids and shall be nonconductive to bacterial or fungus growth. All liner plates shall be factory checked electrically to insure freedom from any porosity with a high voltage holiday detector set at a minimum of 20,000 volts.

Joint strips and welding strips shall have the same general composition and corrosion resistance as liner plate, but shall not have locking extensions.

The lining shall have good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to a ¼ inch settling crack which may take place in the pipe or in the joint after installation without damage to the lining.

Once cast into the pipe, the lining shall be permanently and physically attached to the concrete by locking extensions and shall not rely on an adhesive bond.

741.2.2 Material Details and Dimensions: The liner plate shall not be less than 0.065 inches in thickness. Locking extension shall be of the same material as the liner and shall be integrally extruded with the sheets. If steel bands are used to secure the liner plate to the forms transversely, strap channels shall be formed by removing the locking extensions as required.

Liner plate shall be supplied either as pipe size sheets or tubes and fabricated by shop welding together using the di-electric welding process. Tensile strength measured across the shop welded joint shall be in accordance with ASTM D412 using Die B and shall be at least 2000 PSI.

Joint strips shall be 4-inches ± 0.25 inches in width and shall have each edge beveled prior to application.

Welding strips shall be 1-inch ± 0.125 inch in width and shall have the edges beveled at time of manufacture.

The Contractor shall submit a shop drawing showing liner plate details for approval by the Engineer, prior to fabrication of the pipe.

741.3 INSTALLER QUALIFICATIONS:

The application of joint strips, weld strips and plastic liner to forms and other surfaces is considered to be specialized work. Personnel performing such work shall be adequately trained in the methods of liner installation and shall demonstrate their ability to the Engineer prior to commencing work.

Each welder shall pass an approved qualification welding test before doing any welding. Certification shall be renewed on a yearly basis and the list of qualified personnel shall be maintained by the pipe manufacturer. All test welds shall be made in the presence of the Agency's representative and shall consist of the following:

(A) Two pieces of liner at least 15-inches long and 9-inches wide, shall be lapped 1 ½-inches and held in a vertical position.

(B) A welding strip shall be positioned over the edge of the lap and welded to both pieces of liner. Each end of the welding strip shall extend at least 2-inches beyond the liner to provide tabs.

The weld sample shall be tested by the Engineer as follows:

(A) Each welding strip tab, tested separately, shall be subjected to a 10-pound pull normal to the face of the liner with the liner secured firmly in place. There shall be no separation between the welding strip and liner

(B) Three test specimens shall be cut from the welded sample and the weld shall be tested for tensile strength in accordance with ASTM D412 using Die B. Tensile strength measured across the welded joint shall be at least 2000 PSI.

(1) If none of these specimens fails when tested as indicated above, the weld will be considered as satisfactory.

(2) If one specimen fails to pass the tension test, a retest will be permitted. The retest shall consist of testing three additional specimens cut from the original welded sample. If all three of the retest specimens pass the test, the weld will be considered satisfactory.

(3) If two of three specimens fail, the welder will be considered to be an unqualified welder and shall be disqualified.

A disqualified welder may submit a new welding sample when he has had sufficient off-the-job training or experience to warrant re-examination.

741.4 INSTALLATION OF LINER PLATE:

The installation of liner plate, including the welding of all joints, shall be done in accordance with the manufacturer's recommendations. Liner plate shall be installed with locking extensions parallel with the longitudinal axis of the sewer, unless otherwise shown on the plans. All joints between individual sheets or sections of liner plates shall be continuously heat-welded by the use of welding strips of the same general composition and equivalent thickness of material as the liner plates (with the exception of the integral extension ribs).

Liner plate shall be held snugly in place against inner forms by means of light gage steel wire, light steel banding straps or other suitable means. If steel banding straps are used, they shall be applied in strap channels provided for this purpose or onto flaps created at pipe ends.

Locking extensions (T-shaped) shall be integrally extruded to all lower, terminal or longitudinal edges of liner plate as applied to concrete pipe. If banding straps are used, a steel rod ¼-inch in diameter may be inserted in each locking extension along the longitudinal edges of each sheet of liner plate for concrete pipe or some other approved method for holding the lower edge of the liner plate snugly against the form shall be provided. Concrete poured against liner plate shall be compacted in a careful manner so as to protect the liner plate and to produce a dense, homogeneous concrete securely anchoring the lock extensions into the concrete.

In removing forms, care shall be taken to protect liner plate from damage. Sharp instruments shall not be used to pry forms from lined surfaces. All holes, cuts, torn or seriously abraded areas in the liner plate shall be patched. Patches made entirely with welding strip shall be fused to the liner plate over the entire patch. Larger patches may consist of smooth liner plate applied over the damaged area with adhesive. All edges must be covered with welding strip fused to the patch and the sound liner plate adjoining the damaged area.

The Contractor shall take all necessary measures to prevent damage to installed liner plate from equipment and materials used in or taken through the work.

The applied lining shall be free from bubbles due to poor workmanship, and the Contractor shall cut out said bubbles and weld a similar sheet in place of the bubble, unless otherwise directed by the Engineer.

Application on Concrete Pipe-Special Requirements: Type P-1 joint, Liner plate shall be set to within ¼" of the inner edge of the bell or groove end of a pipe section and shall extend to within ¼" of the spigot or tongue end. Type P-2 joint, Liner plate shall be set to within ¼" of inner edge of the bell or groove end of a pipe section and shall extend a minimum of 3" beyond the spigot or tongue end.

Wherever concrete pipe, which are protected with liner plate, join structures not so lined, such as brick structures, concrete pipe, cast-in-place structures or clay pipe, the liner plate shall be extended over and around the end of the pipe and back into the structure for not less than 2-inches.

Where a pipe spur, not of plastic lined concrete, is installed through lined concrete pipe, the liner plate shall be returned not less than 2-inches at the surface of contact. The seal between the liner plate and the spur shall be made using an approved adhesive material and strapped in place. If the joint space is too wide or the joint space surface too rough to allow satisfactory sealing with this adhesive, the joint space shall be filled with 2-inches of densely caulked lead wool or other approved caulking material.

Lined concrete may be cured by standard curing methods. Care shall be exercised, in handling, transporting and placing lined pipe to prevent damage to the liner plate. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or with a suitable forklift lifting the pipe only from the exterior.

No pipe with damaged lining will be accepted until and unless the damage has been repaired to the satisfaction of the Engineer.

741.5 FIELD JOINTS:

The Contractor shall obtain the services of qualified and approved personnel to weld the liner plate field joints. Pipe joints must be dry before the liner plate joints are made. All mortar and other foreign material shall be removed from liner plate surfaces adjacent to the pipe joint, leaving them clean and dry.

No field joint shall be made in liner until the lined pipe or structure has been backfilled and 7 days have elapsed after the flooding, jetting, or other means of compaction has been completed. Where groundwater is encountered, the joint shall not be made until pumping of groundwater has been discontinued for at least 7 days and no visible leakage is evident at the joint. The liner at the joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made. When the pipe liner coverage is 360 degrees, 6 to 8-inches of the downstream side of the joint strip or flap at the pipe invert shall not be welded.

Heated joint compound shall not be brought in contact with liner.

No coating of any kind shall be applied over any joint, corner, or welding strip, except where nonskid coating is applied to liner surfaces.

Field joints in the liner plate at pipe joints may be either of the following described types:

Type P-1 joint shall be made with a separate 4-inch joint strip and two (2) 1-inch welding strips. The 4-inch strip shall be centered over the joint, secured to the liner plate by heat sealing with hot air and welded along each edge to adjacent liner plate with a 1-inch weld strip. The width of the space between adjacent liner plate sheets shall not exceed 2-inches. The 4-inch joint strip shall lap over each liner plate a minimum of 1-inch.

Type P-2 joint shall be made with an integral joint flap with locking extensions removed, extending a minimum of 3-inches beyond the spigot end of the pipe. The flap shall overlap the adjacent lined pipe and shall be heat sealed to this lining and then welded on the edge to the adjacent liner with 1-inch weld strip. Care shall be taken to protect the flap from damage. Excessive tension and distortion while bending the flap back to facilitate laying and joint mortaring shall be avoided. Heat shall be applied to straighten the PVC flaps as needed to prevent cracking of the PVC.

Any flap which has been bent back and held shall be allowed to return to its original shape and flatness well in advance of making the liner joint.

If joints are to be mortared, field joints on liner at pipe joints shall not be made until the mortar in the pipe joint has been allowed to cure for at least 48 hours and the pipe has successfully passed the leakage tests.

741.6 INSTALLATION OF WELDING STRIP:

Welding strips shall be fusion welded to joint strips and liner by welders approved by the Engineer, and trained by the manufacturer, using only approved methods and techniques.

Adequate ventilation shall be maintained during all welding operations.

Hot air welding tools shall provide clean effluent air at constant pressure to the surfaces to be joined within a temperature range between 260ºC and 315ºC (500ºF and 600ºF).

For lap welds, the welding strip shall be positioned so that approximately 1/3 of the width is placed on the high side of the lap and properly fused. The weld strip shall be completely fused across its' entire width, except for a small allowable gap in the center. Incomplete fusion, charred, or blistered welds will be rejected by the Engineer.

741.7 JOINT REINFORCEMENT:

A 12-inch long welding strip shall be applied as reinforcement across each transverse joint, weep channel, or return which extends to the lower terminal edge of liner. These reinforcement strips shall be centered over the joint being reinforced and located as close to the edge of liner as possible.

741.8 TESTING AND REPAIRING DAMAGED LINER SURFACES:

After the pipe is installed in the trench, all surfaces covered with liner plate shall be tested with an approved electrical holiday detector set at a minimum of 20,000 volts. All welds shall be physically tested by a non-destructive probing method. All patches over repairs to the liner plate wherever damage has occurred shall be done in conformance with the instructions and recommendations of the liner plate manufacturer.

The Contractor shall provide adequate ventilation, ladders for access, barricades or other traffic control devices, and shall be responsible for opening and closing entrances and exits. All areas of liner failing to meet the field test shall be properly repaired and retested. The electrical holiday detector shall be supplied by the Contractor and shall be a Tinker & Rasor Holiday Detector (Model AP-W).

The Contractor, at his expense, shall have an independent inspection service perform the visual inspection and the probing of all weld joints. The independent inspection service and the inspection and probing procedures shall be approved by the Engineer. In addition, the independent inspection service shall witness the spark testing and any repairs performed by the Contractor. Inspectors employed by the independent inspection service to test the welds shall have

passed the qualification welding test specified in Section 741.3. Upon completion of all liner testing and inspection, the Contractor shall submit certification by the independent inspection service that all installation and weld joints have been tested and inspected and are in compliance with the Specifications. However, this certification shall not relieve the Contractor of the responsibility to correct defective work.

741.9 PAYMENT:

Payment for plastic liner materials, their installation and testing shall be included in the price bid for the pipe or structure to which they are applied.

SECTION 742

PRECAST MANHOLES

Subsection 742.1 GENERAL: Delete this Subsection in its entirety and replace with the following:

This specification covers requirements for precast manhole sections except precast manhole bases. All precast manhole manufacturers shall be NPCA (National Precast Association) certified and shall provide all NPCA certifications upon request. Loading criteria for the precast manhole sections shall meet or exceed the AASHTO HS20-44 loading requirements. All precast manhole risers shall be monolithically cast to ensure water tightness and have a certified structural design and the manhole sections shall be cast in a fashion to achieve water tightness.

Subsection 742.2.2 Precast Sections: Delete the first sentence and replace with the following:

Precast sections shall conform to ASTM C478 (except Section 15 and 16) and AASHTO M199 (except Sections 15 and 16).

Subsection 742.3 MANHOLE PENETRATIONS: Delete the title of this Subsection in its entirety and replace with the following:

MANHOLE BASES

Subsection 742.3 MANHOLE PENETRATIONS: Delete this Subsection in its entirety and replace with the following:

Sanitary sewer manhole bases shall be cast-in-place concrete in accordance with MAG Standard Details 420-1and 420–2.

Storm drain manhole bases shall be cast-in-place concrete in accordance with COP Standard Details P1520 and P1560.

Subsection 742.5 GASKETS: Delete this Subsection in its entirety and replace with the following:

Sanitary sewer manhole joints shall have gaskets and cement mortar in accordance with MAG Standard Details 420-1 and 420-2.

Storm drain manhole joints shall have grouted joints in accordance with MAG Standard Detail 522 and COP Standard Details P1520 and P1560.

Subsection 742.6 LIFTING POINTS: Delete this Subsection in its entirety and replace with the following:

Lifting points shall be designed and evaluated by a registered professional engineer and have a minimum safety factor of four. After installation, the lifting holes shall be thoroughly packed with an approved commercial-source, non-shrink, non-metallic patching grout with an approved bonding agent. Bent reinforcing steel bars shall not be used as lifting devices. Through lifting holes will not be allowed.

SECTION 744

ABS TRUSS PIPE AND FITTINGS

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 745

PVC SEWER PIPE AND FITTINGS

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 750

IRON WATER PIPE AND FITTINGS

Delete the title of this SECTION in its entirety and replace with the following:

DUCTILE IRON PIPE AND FITTINGS

Subsection 750.1 CAST IRON WATER PIPE: Delete the title of this Subsection in its entirety and replace with the following:

SANITARY SEWER PIPE

Subsection 750.1 CAST IRON WATER PIPE: Delete this Subsection in its entirety and replace with the following:

All ductile iron pipe for conveying sewerage shall be in accordance with AWWA C-150:

- 14" inside diameter and smaller shall be pressure class 350
- 16" inside diameter through 24" inside diameter shall be pressure class 250
- 30" inside diameter and larger shall be pressure class 150

Ductile iron pipe with a minimum wall thickness of Class 50 may be substituted in lieu of the above.

The lining shall cover, at a minimum, the inner surfaces of the pipe and the fitting from the plain end or beveled spigot end to the rear of the gasket socket. If flanged fittings and pipe are included in the project, the lining must not be used on the face of the flange, however full face gaskets must be used to protect the ends of the pipe. At the ends of the pipe and fittings, the lining thickness shall taper for a distance of four inches to a minimum thickness of ten mils.

All ductile iron sewer pipe shall have a protective lining with a nominal thickness of 40 mils and a minimum thickness of 35 mils of Protecto 401 (ceramic epoxy), Polythane (polyurethane), throughout the barrel area of the pipe. However, the lining in the bell area shall transition to a minimum thickness of ten mils at the edge of the gasket socket. The ten-mil lining shall extend into the gasket socket area to a point where the gasket would overlap the lining when it is compressed due to pipe assembly during construction. The ten-mil lining shall also continue from inside the barrel area, around the spigot end of the pipe and along the outside of the pipe to a point where the center of the gasket of the next pipe section would contact the edge of the lining on the spigot end of the previous pipe section. The thickness of the linings shall be determined by using a dry film thickness magnetic gauge at four quadrants.

Each section of pipe and each fitting shall be tested and shall have an absence of holidays when tested by a suitable holiday detector. In all cases, the barrel area of the pipe shall be tested using a voltage of 2, 500 volts and a dry conductive probe.

Holiday testing shall conform to ASTM G 62-87 and NACE Standards RP0274-74 and RP0188-90 (latest revision).

The pipe manufacturer shall be solely responsible for the quality of the lining and shall supply a certification as to compliance to the specification. The certification shall state specifically the following items:

(A) All ductile sewer pipe and fittings have a protective lining of 40 mils (35 mils min) in the barrel area, ten mils in the bell area and ten mils minimum on the exterior of the spigot end.

(B) Each section of pipe and each fitting have been tested for holidays utilizing a test voltage of 2,500 volts with a dry conductive probe in the barrel area and a test voltage of 67.5 volts with a wet sponge in both the bell area and the exterior of the spigot end, and no holidays were found.

(C) The lining material used meets the current specifications and that the material was applied as required by the specification.

If the Contractor makes a field cut of the lined ductile pipe, the Contractor shall comply with the recommendations of the pipe manufacturer in applying a field coating to the end of the pipe ends. In all cases, as a minimum, a ten mil coating shall be applied to the pipe end and shall overlap the lining by four inches and extend around the pipe end and along the outside of the pipe a minimum of ten inches. The coating shall be allowed to dry before assembly. In addition, the overlapped surface of the lining shall be roughed up to produce a three to five mil profile over the entire surface. The end result of this process is to insure proper adhesion of the field coating.

750.1.1 Repair: Repair of the damaged sections of the lining shall be in accordance with the lining manufacturer's recommendation or as specified above so that the repair area is equal to the undamaged lined area in all respects. All damaged lined areas and holidays shall be repaired immediately after discovery.

Holiday testing may be required by the Engineer before pipe assembly when deemed appropriate. The testing and repair requirements shall follow the procedures called for in this specification and all cost for such repairs will be the responsibility of the Contractor.

There will be no other provision for repair of the lining of DIP.

750.1.2 Protective Collar: In order to protect the exterior spigot end against abrasion and damage during shipping and handling, the manufacturer shall install temporary collars on the exterior of each spigot end of each pipe section. The manufacture shall secure the collars to the pipe to prevent accidental removal during shipping and normal handling by the Contractor. The collars are not to be removed from the pipe until right before the pipe section is to be installed or field cut.

Subsection 750.2 DUCTILE IRON WATER PIPE: Delete the last paragraph in its entirety and replace with the following:

Manufacturer shall have a minimum of five years of experience producing ductile iron pipe and fittings, and shall be able to show evidence of at least five installations in satisfactory operation of similar diameters, lengths, and pipe class required for the Work.

All ductile iron pressure water pipe shall be furnished by a single manufacturer and fully manufactured in the USA, including casting, testing, and all applicable linings and coatings. The supplier shall be responsible for the provisions of all test requirements specified in AWWA C151 as applicable. In addition, all ductile iron pressure water pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Contracting Agency. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, will be borne by the Contracting Agency.

Ductile iron water pipe shall be of minimum pressure class as follows in accordance with AWWA C-150:

14" and smaller... 350
16" through 24" 250
30" and larger 150

The wall thickness of all flanged and grooved end pipe shall be minimum Class 53 except where the specified pressure requires heavier pipe.

All ductile iron water pipe shall be cement-mortar lined and seal coated in accordance with AWWA C-104.

For ductile iron pipe eighteen (18) inches and larger, a manufacturer's pipeline layout shall be submitted showing the line layout with each fitting specified and detailed. Numbering of each standard joint is not required.

All ductile iron pipe shall have polyethylene wrap per Section 610.

Subsection 750.3 JOINT REQUIREMENTS: Add the following to the end of this Subsection:

Joints for piping located in vaults shall be flanged unless mechanical clamp-type couplings or flange adapters are shown on the Drawings.

Bolts and nuts for joints shall conform to ANSI B18.2.1 and ANSI B18.2.2, respectively. Exposed and buried bolts and nuts shall be ASTM A 307, Grade B, with buried bolts and nuts coated with a petroleum based mastic and wrapping tape system Denso Paste primer and Densyl Tape finish as manufactured by Denso, or approved equal.

The following are approved integral restrained joint ductile iron pipes:

Pacific States Pipes.....Thrust-Lock
U.S. Pipe.....TR Flex
U.S. Pipe .....HP Lok
American Ductile Iron Pipe.....Flex Ring
American Ductile Iron Pipe.....Lok-Ring
Clow Water Systems .....Super-Lock
Griffin Pipe.....Snap-Lok
Griffin Pipe.....Bolt-Lok

The following are approved restrained joint glands for mechanical joint pipe and fittings:

Star Pipe Products .....Stargrip Series 3000
Romac Industries.....Romagrip
Romac Industries.....GripRing
EBAA Iron .....Megalug Series 1100
Ford Meter Box.....Uni-Flange Series 1400
Tyler Union .....Tuf-grip
Sigma Corporation .....Sigma One Lok Series

Split restrained joint glands for mechanical joints, or wedge action restrained joint glands for push (non-mechanical) joints, are only allowed for connection or repair to existing installed pipe. The following are approved split restrained joint or wedge glands:

Star Pipe Products .....Stargrip Series 3000S, 3100P, 3100S
EBAA Iron .....Megalug Series 1100SD, 1100HD
EBAA Iron .....Megalug Series 1700
Ford Meter Box.....Uni-Flange Series 1450
Sigma Corporation .....Sigma One Lok Series

All pipeline valves and fittings shall have thrust blocks as shown or referenced on the drawings designed for the working pressure in addition to the above restraining systems.

Flanged joints are allowable for above ground piping installations only, except for locations where valves are connected. Buried flanged joints shall be coated with a petroleum based mastic and wrapping tape system Denso Paste primer and Densyl Tape finish as manufactured by Denso, or approved equal.

Weld-on boss outlets are not acceptable.

750.3.1 Welded-On Outlets For Ductile Iron Pipe Larger Than 16 Inches:

750.3.1.1 Scope: Welded-on outlets shall be limited to branch outlets having a nominal diameter not greater than 50% of the nominal diameter of the main line pipe or 12-inch whichever is smaller (see Table 750-1). Welded-on outlets may be

provided as a radial (tee) outlet, or lateral outlet fabricated at a specific angle to the main line pipe, as indicated on the drawings. Welded outlets for ductile iron pipe are not acceptable for a tangential configuration unless shown on the plans or approved by the Engineer. No welding shall be permitted within 24-inches from the end of the pipe. Spacing of welded outlets shall not be closer than two times the diameter of the largest outlet. The pipe manufacturer or fabricator shall have a minimum of 5 years' experience in the fabrication and testing of outlets of similar size and configuration.

Table 750-1
Main Line Nominal Diameter Versus Maximum Nominal Branch Outlet Diameter

Main Line Nominal Diameter	Maximum Nominal Branch Outlet Diameter
18"	8"
20"	10"
24"	12"
30"	12"
36"	12"
42"	12"
48"	12"
54"	12"
60"	12"
64"	12"

750.3.1.2 Outlet Joint Types: The joints on welded-on branch outlets shall meet, where applicable, the requirements of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15**.**

750.3.1.3 Design: Weldment for welded-on outlets shall be based on the method described in Section VIII of the ASME Unfired Pressure Vessel Code. Reinforcing welds shall be placed using Ni-Rod FC 55o cored wire or Ni-Rod 55o electrodes manufactured by INCO Alloys (or an electrode with equivalent performance properties). Carbon Steel electrodes are not acceptable.

Parent pipe and branch outlet pipe shall be centrifugally cast ductile iron pipe designed in accordance with ANSI/AWWA C150/A21.50 and manufactured in accordance with ANSI/AWWA C151/A21.51. Minimum classes shall be: for sizes 4-inch through 54-inch, Special Thickness Class 53; for sizes 60-inch through 64-inch, Pressure Class 350.

Welded outlets require submittal and approval of design calculations, welding procedures, and actual structural testing results for both hydrostatic pressure as well as transverse and axial loading imposed on the outlet itself.

750.3.1.4 Testing: All welded-on outlets shall be rated for a working pressure of 250 psi and must have a minimum safety factor of 2.0 based on proof of design hydrostatic test results. The manufacturer shall, at the request of the owner or owner's Engineer, provide representative proof test data confirming hydrostatic test results and safety factors.

Prior to the application of any coating or lining in the outlet area all weldments for branch outlets to be supplied on this project shall be subjected to an air pressure test of at least 15 psi. Air leakage is not acceptable. Any leakage shall be detected by applying an appropriate soapy water solution to the entire exterior surface of the weldment and adjoining pipe edges or by immersing the entire area in a vessel of water and visually inspecting the weld surface for the presence of air bubbles. Any weldment that shows signs of visible leakage shall be repaired and retested in accordance with the manufacturer's written procedures.

750.3.1.5 Quality Assurance: The manufacturer shall have a fully documented welding quality assurance system and maintain resident quality assurance records based on ANSI/AWS D11.2, the Guide for Welding Iron Castings. The manufacturer shall maintain appropriate welding procedure specification (WPS), procedure qualification (PQR), and welder performance qualification test (WPQR) records as well as appropriate air test logs documenting air leakage tests. The manufacturer shall have ISO 9001 or 9002 registration.

Prior to the start of manufacturing any proposed manufacturer not meeting ISO 9001 or 9002 registration requirements

shall submit to the owner or owner's Engineer the name of an Independent Inspection Agency and the agency's qualifications. Submitted qualifications shall include but are not limited to the following:

(A) List of project references for projects of similar type and size

(B) Resumes for inspection and testing personnel

(C) Capacities for chemical and mechanical testing of material specimens

(D) Frequencies for all instrument and testing equipment certifications

The independent inspection agency shall be responsible for all of the following:

(A) Verify compliance to written welding procedures specification (WPS) and procedure qualification (PQR)

(B) Verify qualification of all welders (WPQR) per ANSI/AWS D11.2 criteria

(C) Document use of Ni-Rod FC 55o cored wire or Ni-Rod 55o electrodes manufactured by INCO Alloys (or an electrode with equivalent performance properties)

(D) Witness and document all air testing of outlet welds

750.3.1.6 Field Welding: No field welding or field repairs shall be allowed. Should a leak be detected at a welded-on outlet after installation, the piece shall be removed and returned to the pipe manufacturer's facility, where originally produced, for repair.

Subsection 750.4 FITTINGS: Delete the second paragraph in its entirety and replace with the following:

Mechanical joint fittings shall conform to AWWA C110, and flange fittings shall conform to AWWA C110 and C115. AWWA C153 compact fittings are acceptable for use unless otherwise specified. Long-radius elbows shall be provided where specified.

Fittings for water pipe shall be cement mortar lined and seal coated in accordance with AWWA C-104.

SECTION 750 IRON WATER PIPE AND FITTINGS: Add the following Subsection:

750.5 CATHODIC PROTECTION:

All ductile iron pipe 16-inches and larger shall have cathodic protection. Pipelines less than 16 inches shall have cathodic protection where called for in the plans and specifications or directed by the Engineer.

750.5.1 Bonded Joints: Bond wires shall be provided across all non-conductive ductile iron pipe joints to ensure electrical continuity. Joint bonds shall be installed as shown on the drawings. Joint bonds shall be made utilizing #4 AWG type HMWPE stranded conductors. Bond wires shall not exceed 18 inches in length. Joint bond wires shall be installed as shown on the plans. Connections shall be made utilizing the exothermic weld process per Section 750.5.2.

750.5.2 Exothermic Welds: Exothermic welds shall be provided for wire to structure connections in strict accordance with the manufacturer's recommendations. Connections shall be made at locations shown on plans. Exothermic welds shall be "Cadweld", as manufactured by Erico Products, Inc., "Thermoweld" as manufactured by Continental Industries, Inc., "Pin Brazing" by BAC, or approved equal. Duxseal packing as manufactured by Johns-Manville or approved equal shall be used where necessary to prevent leakage of molten weld metal.

The shape and charge of the exothermic weld shall be chosen based on the following parameters:

- Pipe Material
- Pipe Size
- Wire Material
- Number of Strands to be Welded
- Orientation of Weld (Vertical or Horizontal)

Type of exothermic weld to be used shall be submitted to the Construction Manager for approval. Copper sleeves specifically designed for the purpose shall be crimped on all bare wire ends of all stranded wires prior to exothermic welding to improve mechanical strength and thermal capacity.

Exothermic weld connections shall be installed in the manner and at the locations shown on the plans. Coating materials shall be removed from the surface over an area of sufficient size to make the connection. The steel surface shall be cleaned to shiny metal by grinding or filing prior to welding the conductor. The use of resin impregnated grinding wheels will not be allowed. The conductor shall be welded to the pipe by the exothermic welding process with a copper sleeve fitted over the conductor. Only enough insulation shall be removed such that the copper conductor can be placed in the welding mold. After the weld has cooled, all slag shall be removed and the metallurgical bond shall be tested for adherence to the pipe or casing. All defective welds shall be removed and replaced. All exposed surfaces of the copper and steel shall be covered with insulating materials as shown in the detail drawings. No connections to the piping shall be buried prior to inspection and approval of the Engineer. Connections made in violation of this requirement shall be rejected.

Welds shall be primed with an elastomer resin based primer, covered with a weld cap, and then over-coated with bitumastic.

750.5.3 Weld Caps: Welds to be buried or submerged shall be primed with an elastomer resin based primer then be covered with a 100% solids mastic filled plastic cap. Use the plastic cap on dielectric coated pipe following the manufacturer's instructions. Primer shall be Roybond Primer 747 as manufactured by Royston Laboratories, or equivalent. Weld caps shall be Royston Handy Cap, as manufactured by Royston Laboratories, Inc. Thermit Weld Cap, as manufactured by Phillips Petroleum Co. or an approved equal.

750.5.4 Testing: The Contractor shall be responsible for testing the corrosion monitoring and cathodic protection systems. All testing shall be performed by or under the direct supervision of a Corrosion Engineer. All field tests shall be performed at the expense of the Contractor. This testing shall include all insulators, wires, continuity testing, and cathodic protection system activation. The tests shall be conducted in the presence of the Owner or its representative. The Contractor shall correct, at his expense, all deficiencies in the installation observed by these tests and inspections.

The Contractor shall pay for all retests made necessary by the corrections.

(A) Services of Corrosion Engineer: Contractor shall obtain the services of a Corrosion Engineer to inspect, activate, adjust, locate electrical discontinuities, and evaluate the effectiveness of the cathodic protection system. The Corrosion Engineer is herein defined as a registered Professional Engineer with certification or licensing that includes education and experience in cathodic protection of buried or submerged metal structures, or a person accredited or certified by NACE International at the level of Corrosion Specialist or Cathodic Protection Specialist (i.e. NACE International CP Level 4). Such a person shall have not less than five years' experience inspecting pipeline cathodic protection systems.

(B) Services of Cathodic Protection Technician: If necessary, obtain the services of a Cathodic Protection Technician to inspect, activate, adjust, and evaluate the effectiveness of the cathodic protection system. The Cathodic Protection Technician is herein defined as a person accredited or certified by NACE International as a Cathodic Protection Level 2 Technician. Such a person shall have not less than five years' experience inspecting pipeline cathodic protection systems and shall be under the direct supervision of the Corrosion Engineer.

Upon completion of installation of all components in accordance with these specifications, testing shall be performed to demonstrate that the installation has been completed and is in working order in conformance with the plans and

specifications. In no case shall the testing be less than those outlined herein unless requested in writing by the Contractor and approved by the Construction Manager. The testing described herein shall be in addition to and not a substitution for any required testing of individual items at the manufacturers' plant. The Contractor shall provide testing of the system. The test data shall be submitted to the Engineer for acceptance to demonstrate that the system is in proper working order. The cost of the testing shall be borne by the Contractor, including any additional expenses which result from retesting due to equipment or installation which is not in conformance with these specifications and drawings.

750.5.4.1 Exothermic Weld Testing: Exothermic welds shall be tested by the Contractor for adherence to the pipe or casing and for electrical continuity between the pipe or casing and wires. Test completed weld by striking weld with a hammer and pulling on wire. A 22-ounce hammer shall be used for adherence testing by striking a blow to the weld. Care shall be taken to avoid hitting the wires.

750.5.4.2 Joint Bond Testing: After installation, all joint bonds shall be tested for effectiveness. The testing shall be performed prior to backfill of the pipe and shall be verified upon completion of backfilling operations. Prior to backfilling, current shall be circulated through the pipe and the measured resistance shall be compared to the theoretical resistance of the pipe and bond cables. The resistance measured shall not exceed 120 percent of the theoretical resistance. Once backfilling operations have been completed, the testing shall be repeated to ensure continued effective continuity. All data shall be tabulated and submitted upon completion of testing and prior to final acceptance of the contract.

SECTION 752

ASBESTOS-CEMENT WATER PIPE AND FITTINGS

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 753

GALVANIZED PIPE AND FITTINGS

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 755

POLYETHYLENE PIPE FOR WATER DISTRIBUTION

Delete the SECTION number, SECTION title and this SECTION in its entirety.

SECTION 756

DRY BARREL FIRE HYDRANTS

Subsection 756.3 HYDRANTS: Add the following after the first paragraph of this Subsection:

Approved fire hydrants allowed for installation in the City of Phoenix include:

Mueller Super Centurion 250
Clow Medallion (new model)
Kennedy K-81 Guardian
American Darling B-84-B
East Jordan Iron Works CD-250

All fire hydrants shall be supplied to meet a 42-inch bury depth.

SECTION 757

SPRINKLER IRRIGATION SYSTEM

Delete the title of this SECTION in its entirety and replace with the following:

LANDSCAPE IRRIGATION SYSTEM

Subsection 757.1 GENERAL: Add the following to this Subsection:

The Manufacturer of component equipment shown on the drawings or specified in the Special Provisions form the basis of the irrigation design as well as the physical and operational standards for which the components were selected. Component equipment from other manufacturers may be submitted, by the Contractor, to the Engineer for approval. No equipment however is to be ordered without approved shop drawings.

All buried galvanized pipe and fittings shall be protected from corrosion by the application of a tight fitting, extruded or wrapped coating. Coatings shall be not less than 0.030 inches in thickness at any point. Extruded coatings shall be of polyethylene or polyvinyl chloride, Extrucoat or equal. Wrapped coatings shall be of polyethylene, polyvinyl chloride, asphalt tape, Pretecto Wrap No. 200, Safe-t-Clad FOS No. 655, Tapecoat, Trantex VID-10 or E-12, Polyken No. 900, Scotchrap No. 50, or approved equal. Tape shall be edge lapped no less than 1/4 inch.

Subsection 757.2.1 Steel Pipe: Delete this Subsection in its entirety and replace with the following:

All steel pipe shall be newly galvanized, welded or seamless steel pipe conforming to the requirements of ASTM A53, standard weight, schedule 40.

Subsection 757.2.2 Plastic Pipe: Delete this Subsection in its entirety and replace with the following:

Rigid Plastic Pipe shall be extruded from 100% virgin normal impact unplasticized polyvinyl chloride (PVC) Type I, Grade I or II resin 2000 psi (PVC 1120 or PVC 1220), design stress ASTM D1784, Department of Commerce PS-21-70, PS-22-70, Standard Dimension Ratio (SDR) 26 or less than 160 psi. Pipe shall conform to ASTM D-2241 and D-2672.

Testing of pipe: Provide written certificate by supplier that polyvinyl chloride pipe has successfully passed the following tests:

Acetone test: Immerse a sample of pipe in 99% pure anhydrous acetone for 15 minutes; at the end of this time there should be no evidence of flaking or delamination on the inner or outer walls of pipe. Evidence of softening or swelling shall not constitute failure.

Flattening: Cut a specimen two inches long from each end of the pipe sample. Flatten each test specimen from parallel plates of a press until the distance between the plates, in inches, is equal to sixty (60) percent of the pipe O.D., and there shall be no evidence of cracking, splitting or breaking.

The pipe shall be homogeneous throughout, free from visible cracks, holes, or foreign materials. The pipe shall be free from blisters, dents, wrinkles or ripples and die and head marks.

Piping up to and including 2-1/2" size shall be SDR solvent welded.

Pressure mainline piping 3" size and larger shall be gasket pocket type, as manufactured by the Swanson Co. or approved equal, and shall conform to ASTM F-477.

Continuously and permanently mark pipe with manufacturer's name or trademark, kind and size (IPS) of pipe, material, manufacturer's lot number, schedule or type and NSF seal of approval.

Subsection 757.2.3 Pipe Fittings and Couplings: Delete this Subsection in its entirety and replace with the following:

(A) Steel Pipe Fittings and Couplings: Steel pipe fittings and couplings shall be 150 psi pressure rated, banded, galvanized, malleable iron screwed fittings and couplings.

(B) Plastic Pipe Fittings and Couplings: For pipe fittings up to and including 2-1/2" size, fittings and couplings shall be either threaded type or slip fitting tapered socket solvent weld type. Schedule 80 pipe will only be used for threaded joints. Tapered socket solvent weld fittings may be either Schedule 80 or Schedule 40, but in either case, will be equal to or greater than the schedule and Pressure Rating of the plastic pipe being joined. Tapered fittings shall be sized so that a dry, unsoftened taper cannot be inserted more than halfway into the socket. Plastic saddles and flange fittings are not permitted.

PVC fittings shall be marked with manufacturers name or trademark, type PVC, size and NSF seal of approval. Extruded couplings to be produced from NSF rated raw materials and meet ASTM standards.

For pipe 3" and greater, fittings shall be ductile iron, grade 80-55-06, in accordance with ASTM A-536. Fittings shall have mechanical joints with gaskets meeting ASTM F-477. Fittings shall have radii of curvature conforming to AWWA C110.

Subsection 757.2 PIPE AND FITTINGS: Add the following Subsection:

757.2.5 PVC Primer: The primer shall be specifically formulated for the pipe and type of connection, as recommended by the pipe manufacturer.

Subsection 757.3.1 General: Add the following to this Subsection:

Valves on galvanized pipelines shall be all bronze, double disc wedge, non-rising stem with wheel handle on top, such as Jones J373 or equal, with bodies, bonnets, yokes and wedges made of material conforming to ASTM B62.

Subsection 757.3.4 Electrical Remote Control Valves: Delete this Subsection in its entirety and replace with the following:

The electric remote control valve listed on the plans or specifications and described by the manufacturer's most recent literature (catalogue cut sheet), constitute the quality and performance standards for the specified valve.

Subsection 757.3.7 Valve Boxes: Delete this Subsection in its entirety and replace with the following:

All valve boxes shall have stainless steel bolts and washers with lock down covers. Valve boxes and covers shall be molded, non-corrosive plastic, ASTM D638, D-356, except when located in paved surfaces. These shall be concrete boxes with lock down steel or concrete cover rated for traffic conditions to which it will be exposed.

Subsection 757.4 BACKFLOW PREVENTER ASSEMBLY: Delete this Subsection in its entirety and replace with the following:

The Backflow Preventer Assembly shall consist of Pressure type or Reduced Pressure type backflow preventer unit and associated components conforming to the governing code requirements and as shown on the plans or specifications. The backflow preventer unit shall be equal in quality and performance to the unit listed in the Contract Documents.

757.4.1 Backflow Preventer Cage: Pre-manufactured units shall be approved for use by the Engineer. The Contractor shall submit catalog information. Pipe used to support the units shall be not less than 1-¼" schedule 40 and shall be ASTM A-53 Grade A electric weld Pipe, expanded metal shall be ½" spacing, #13 gauge flattened diamond pattern steel. There shall be no exposed ends of expanded metal on the outside of the enclosure. The expanded metal shall be "die formed" for uniformity. Welds shall be a minimum of ¼" long weld on a 4" spacing. All units shall withstand a

minimum of 200 lbs. per square foot for 24 hours without deflection or distortion. Cage locking mechanism shall be vandal resistant. Cage shall be powder coated by electrostatic application to 1.5 to 2 mil thickness. Color shall be approved by the Engineer.

Subsection 757.5 SPRINKLER EQUIPMENT: Delete the last two paragraphs in their entirety and replace with the following:

Spray heads, impact sprinkler heads, rotor pop-up sprinkler heads, bubblers, emitters, etc., as shown on the plans or specifications and as described in the Manufacturer's latest literature (Catalogue cut sheets) constitute the performance and quality standards for this equipment.

Subsection 757.6.1 Conduit: Delete this Subsection in its entirety and replace with the following:

Conduit shall be as designated on the plans or specifications.

Subsection 757.6.3 Electro-Mechanical Controller Unit: Delete the title of this Subsection in its entirety and replace with the following:

Controller Unit and Assembly

Subsection 757.6.3 Electro-Mechanical Controller Unit: Delete this Subsection in its entirety and replace with the following:

The Controller unit and assembly listed on the plans or specifications and as described in the Manufacturer's latest literature (Catalogue cut sheets) constitute the quality, performance and operational standards for the specified Controller.

SECTION 758

CONCRETE PRESSURE PIPE - STEEL CYLINDER TYPE

Subsection 758.1 GENERAL: Add the following before the first paragraph:

All pipe shall be designed for 150 psi working pressure plus 60 psi surge pressure unless otherwise specified. Test pressure shall be188 psi.

The pipe shall be designed to support the earth cover over the pipe as shown by the pipeline profiles on the plans. Where the earth cover over the pipe is less than eight (8) feet, the design shall be based on eight (8) feet minimum cover. When the plans show both existing and future surface profiles, the critical cover shall be used for design purposes.

Earth loads on pipe shall be calculated assuming the pipe is installed in a positive projecting embankment condition. The loading for positive projecting embankment condition shall be derived using a product of the projection ratio and the settlement ratio of 0.5. The Ku factor shall be 0.150. The soil unit weight shall be 140 pounds per cubic foot.

Pipe reinforced with ring stiffeners will not be permitted. Dimensions of fittings and specials shall conform to AWWA C-208.

Field joints for specials and fitting shall be as called for on the plans. Flanges shall be Class D steel ring flanges in accordance with AWWA C-207, unless otherwise specified.

Subsection 758.1 GENERAL: Delete the second and third paragraphs of Subsection (A) in their entirety and replace with the following:

Reinforced concrete cylinder pipe (CCP) may be furnished in pipe diameters of twenty-four (24) inches through sixty (60) inches.

Pipe and fittings shall be designed by the methods described in AWWA Manual M9 to resist the internal pressures and external loading conditions designated on the approved plans or in the project specifications.

The pipe shall be designed for the maximum stress to be encountered in place as indicated on the plans, whether it is internal pressure, external backfill load, H-20 truck load on the backfill, or any combination of loading.

The pipe shall be designed to limit the deflection of the pipe, in inches, under the external loads specified to not more than the square of the diameter of the pipe in inches divided by 4,000. Deflection shall be calculated by "Spangler's" formula using a bedding constant (K) of 0.1 and an appropriate modulus of soil reaction (E'). An E' value of 1,500 psi may be used for pipe bedding material based on 90 percent Standard Proctor or 70 percent relative density for pipe cover depths between 5 feet and 15 feet. For pipe burial depths less than 5 feet or greater than 15 feet or alternative pipe bedding materials, designer may use alternate E' values provided that the rationale for developing the alternate E' value is acceptable to the Owner. E' = 2,500 psi may be used for controlled low-strength material (CLSM).

The pipe shall be designed for external loading based on an H-20 truck loading and impact factors recommended by AASHTO for highway truck loads in "Standard Specifications for Highway Bridges."
Immediately after the cement-mortar coating has been placed, the ends of each section of pipe shall be tightly capped with waterproof covers to prevent the escape of moisture when water curing. When steam curing, waterproof covers may not be necessary until completion of cure, provided prompt application of steam is begun. The waterproof covers shall become a component part of the completed pipe section, to protect the interior of the pipes, and shall remain on the pipe until it is installed in the trench.

The minimum steel plate thickness for fittings and special pipe shall be 0.25 inches.

For fittings and special pipe, the minimum cement mortar or concrete lining thickness shall be 0.75 inches and the 0.75 inches shall be the maximum thickness allowed for resisting any external loads and shall be so used and shown in any design calculations. External or outside cement mortar coating shall be limited to a maximum of 1.25 inches for the

purpose of resisting any external loads.

For standard pipe, the maximum allowable cement mortar coating shall be 1.25 inches, measured from the bar wrap.

Subsection 758.1: GENERAL: Add the following paragraphs to the end of Subsection (B):

Pipe shall be embedded cylinder type. Stress analysis of pipe shall be made using "Olander's" coefficients for a 120 degree bedding angle.

Prestressed concrete cylinder pipe (PCCP) may be furnished in forty-two inch and larger diameters.

Except as otherwise provided in this Section, fabricated steel plate fittings and specials shall be designed for internal pressure only. The internal pressure design shall be based upon a design stress of 15,000 psi. The minimum steel plate thickness shall be 1/4 inch.

Outlets, where specified on the plans, with an internal diameter of less than one-half the diameter of the mainline pipe may be installed on prestressed concrete cylinder pipe. Outlets with an internal diameter greater than one-half the diameter of the mainline pipe or twenty-four (24) inches shall be designed and manufactured as a separate fabricated steel plate fitting.

The exterior of fabricated steel plate fittings and specials shall not be mortar coated, but shall be shop painted as provided in this Section.

All fabricated steel plate fittings and specials shall be encased in reinforced concrete as shown on the details in the plans.

At mainline valves, where a steel plate section is required to comply with plans and/or attach a companion flange for connection to the valve, the following shall apply to such plate sections:

(a) Design shall limit deflection to the square of the diameter in inches divided by 4,000 for pipe diameters less than sixty (60) inches. For pipe diameter sixty (60) inches and greater, deflection is limited to one and one-half (1-1/2) percent of the diameter.

(b) Unless otherwise specified, plate sections shall not be longer than one (1) foot.

(c) Plate sections shall comply with all other applicable provisions, MAG Specifications, Phoenix supplement to MAG and AWWA Standards and AWWA Manual of Water Supply Practices-M9, second edition, with the following exception. For design, the minimum cement mortar or concrete lining thickness shall be 0.75 inches and the 0.75 inches shall be the maximum thickness allowed for resisting any external loads and shall be so used and shown in any design calculations. External or outside cement mortar coating shall not be considered for the purposes of resisting any external loads.

Subsection 758.2 MANUFACTURE: Add the following paragraphs to the end of this Subsection:

An affidavit of compliance as specified in Section 1.11 of AWWA C-301 and Section 1.11 of C-303 shall be furnished to the Engineer.

Cement used in manufacture of pipe shall conform to ASTM C-150, Type II, low alkali.

No concrete admixture shall be used except as approved in writing by the Engineer.

Liquid membrane-forming compounds shall conform to ASTM C-309, Type I, and shall be of such composition that after drying they will not impart taste or odor to water flowing through the pipe, nor will they contain any toxic materials. The

use of such compounds shall be subject to the approval of the Engineer.

Rust inhibitors used for preventing rust on steel surfaces at holdbacks of mortar lining and/or coating shall be quick-drying material with good bonding properties to the steel, and shall be tack-free and smooth within four (4) hours after applying.

All joints shall be the Carnegie Bell and Spigot type with rubber gaskets. The joint rings for spigot ends for rubber gasket joints shall be Carnegie Shape M-3516, M-3818 or M-3836.

Openings, connections and outlets shall be cement mortar lined and concrete coated as detailed on the plans.

Prestressing wire shall be wrapped directly over steel shorting straps (Minimum of 4).Steel bars shall be welded between prestress anchor assemblies and joint rings.

Design steel cylinders and welds between cylinders and joint rings for the longitudinal thrust exerted by full test pressure. Minimum cylinder thickness for AWWA C 301 pipe shall be 10 gauge where restrained joints are required.

SECTION 758 CONCRETE PRESSURE PIPE - STEEL CYLINDER PIPE: Add the following Subsections:

758.3 MATERIAL DRAWINGS:

The Contractor shall furnish the Engineer with six (6) copies of shop drawings, pipe layout diagrams, manufacturer's catalog data, and detailed information, in sufficient detail to show complete compliance with all specified requirements, covering but not limited to the following items:

Fabricated pipe and specials; design calculations; field closures; reinforcing steel and concrete mix designs.

The manufacturer's complete design calculations shall be submitted to the Engineer for review prior to or with the Joint Detail submittal.

The procedure outlined in American Water Works Association Manual M-9 will be used in determining the length of pipe requiring welded joints. Joint restraints design shall be based on test pressures. Shop drawing submittal shall include calculations showing the length of welded joints, tensile stress to be resisted by, and design of joint welds and pipe longitudinal reinforcement. Minimum design parameters shall be as follows: Soil unit weight is 110 pounds per cubic foot; soil friction coefficient 0.3; height of backfill over pipe - maximum four (4) feet or as shown on plans (if less than four (4) feet). Throat thickness of welds shall be based on an allowable stress of 8,800 pounds per inch per inch of throat thickness using an E60 low-hydrogen electrode. The allowable stress in the steel cylinder shall not exceed 15,000 psi.

Shop Drawings and Line Layout:

(A) The manufacturer's pipeline layout shall be furnished together with standard details for review. The line layout shall show each standard pipe joint and each special joint or fitting by number. Manufacturer's standard details shall be furnished in sufficient details to assure that the detail design of the pipe and specials will comply with the design concept and structural requirements of the project as presented in the Contract Documents. Full details of reinforcement, concrete, cement, mortar, joint dimensions, etc., for the straight pipe, specials and connections shall be furnished. Layout drawings shall show stations and the invert elevations of the pipeline.

(B) Manufacturer's shop drawings shall be furnished for fabrication, inspection and record purposes in accordance with the "General Conditions". The manufactured pipe and specials shall conform to the approved standard details and shall meet all specified requirements unless otherwise approved in writing.

(C) Valves and fittings to be incorporated in the pipeline shall be considered when preparing the pipeline layout.

758.4 SHOP INSPECTION AND TESTS:

(A) Inspection:

(1) The City and its representatives shall have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection during the manufacturing process.

(2) Inspection by the City or its representatives, or failure of the City or its representatives to provide inspection, shall not relieve the Contractor of his responsibility to furnish materials and to perform work in accordance with this specification.

(3) Material, fabricated parts, and pipe which are discovered to be defective or which do not conform to the requirements of this specification, will be subject to rejection at any time prior to final acceptance. Rejected material and pipe shall promptly be removed from the site of the work.

(B) Test and Materials:

(1) In advance of manufacture of the pipe, the Contractor shall furnish to the Engineer three (3) copies of the mill test certificate for all steel products incorporated in the pipe. Three (3) copies shall be furnished of mill test reports on each heat from which the steel is rolled.

(2) Methods of Tests for Cement, Mortars and Concrete:

(a) Mortar Lining: The mortar for all mortar lined pipe shall be sampled and molded by the following procedure:

The mortar sample shall be taken directly from the transfer bucket between the mixer and the charging trough which injects the mixed mortar into the spinning pipe. A sufficient amount shall be extracted to make four (4) 4" x 8" cylinders, and shall be placed in a wheelbarrow or other suitable container. The mortar sample material shall then be transported to the location at which the cylinder cans are to remain without moving for the next 24 hours. The mortar shall be thoroughly mixed immediately prior to pouring into the cylinders in order to prevent segregation. After the mortar has been thoroughly mixed, it shall be poured in a continuous stream into the cylinder cans. The cans shall immediately be capped and allowed to remain without disturbing for twenty-four (24) hours.

(b) Mortar Coating: Mortar for all mortar coated pipe shall be sampled by molding four (4) cylinders for compressive tests of the representative material being used to seat the pipe. The mortar sample shall be molded in 4" diameter cylinders in accordance with applicable provisions of ASTM D-558.

(c) Curing of Test Cylinders: The curing of concrete, lining and coating cylinders for the first twenty-four (24) hours shall be the same as that for the pipe, except that the mortar for coating cylinders shall be covered with a piece of damp burlap to retard the drying out or the low moisture content of the mortar coating. At the end of twenty-four (24) hours, the cylinders shall be transported to a moist curing cabinet and cured in accordance with ASTM C-192.

(3) Strength of Cement Mortar Lining, Coating, Concrete and Steel:

(a) Mortar Lining: The average compressive strength, as per Section C below, of cylinders for mortar lining for the several types of pipe shall be as follows:

(i) Semi-Rigid Pipe: Steel pipe and steel cylinder pipe, single wrap, pretensioned, the average compression strength of cylinders shall not be less than 1700 psi at seven days, and 2300 psi at 28 days.

(ii) Rigid Pipe: Steel cylinder pipe prestressed, the average compressive strength of cylinders shall not be less than 3000 psi at seven days, and 4500 psi at 28 days. Steel cylinder pipe, double wrapped shall not be less than 3000 psi at seven days, and 4500 psi at 28 days.

(b) Mortar Coating and Concrete for Prestressed Pipe:

(i) Semi-Rigid Pipe: Steel pipe and steel cylinder pipe, single wrap, pretensioned, the average compression strength of cylinders shall not be less than 3000 psi at seven days, and 4500 psi at 28 days.

(ii) Rigid Pipe: Steel cylinder pipe prestressed, and steel cylinder pipe, double wrap pretensioned, the average compressive strength of cylinders shall not be less than 3000 psi at seven days, and 4500 psi at 28 days.

(c) To conform to these requirements (a and b above), the average of any five (5) consecutive strength tests of the laboratory cured specimens shall be equal to or greater than the specified strength, and no more than 20% of the strength test shall have values less than the specified strength. If any one cylinder falls below 80% of the specified strength at seven days, an extra cylinder from the same batch shall then be broken, and if the strength of this cylinder also falls below 80% of the specified strength, then the entire production represented by these cylinders will not be accepted for use until the results of the twenty-eight day test is known, and if it also falls below 80% of the specified strength, the above non-acceptance will become final. The expense of the required tests of cylinders and mortar shall be the responsibility of the Contractor.

(d) Testing of Steel Pipe Cylinders (Hydrostatic Pressure Test): Each steel pipe cylinder, prior to embedment in cement mortar, or concrete, shall by hydrostatically tested under a water pressure which stressed the steel to a unit stress of at least 22,000 psi after the bell and spigot ends have been welded in place, utilizing companion bell and spigot test heads. While under this stress, the welded seams shall be hammered vigorously at one foot intervals with a one pound sledge hammer, and shall be thoroughly inspected.

All parts of the cylinder showing leakage shall be marked for rewelding. After rewelding, such cylinders shall be subjected to another hydrostatic test as stipulated above. The costs of hydrostatic pressure test shall be at the Contractor's expense.

(e) Testing of Fittings and Specials: The seams in angle pipe, short-radius bends and special fittings shall be welded in two or more passes, and each weld tested for tightness by the air-soap method or by the dye-penetrant method. However, if the fitting is fabricated from cylinders which have been previously tested hydrostatically, no further test is required for seams so tested. Hydrostatic testing of fittings to 150% of the design operating pressure may replace the tests described above. Any defect revealed under any of the alternate test methods shall be rewelded, and the weld tested again. The cost of these tests shall be at the Contractor's expense.

758.5 MARKING, HANDLING AND DELIVERY:

(A) Marking: Identification markings, for each type of water pipe as specified herein, shall be placed on the pipes. These markings shall show the proper location of the pipe or special in the line by reference to layer drawings. All bends shall be marked on the ends with the angle of deflection and the plane through the axis of the pipe. All beveled pipe shall be marked with the amount of the bevel, and the point of maximum bevel shall be marked at the end of the spigot.

(B) Handling and Delivery: All pipe shall be manufactured, handled, loaded, shipped, unloaded and stored at the job site in such a manner as to prevent any damage to the pipe. Any pipe section that becomes damaged shall be

repaired as directed by the Engineer if, in his opinion, a satisfactory repair can be made. Otherwise, it shall be replaced with an undamaged section, at the Contractor's expense. Lifting from the inside of the pipe will not be permitted.

758.6 CATHODIC PROTECTION:

(A) Joint Bonding: Except where otherwise specified, all non-welded joints shall be bonded in accordance with the details shown on the drawings. The pipe shall be cleaned to bare bright metal at the point where the bond is installed. The steel bonding clips (1.25-inches wide) shall be welded to the joint rings during installation. The total resistance of the bonds at the joint shall not be more than 150-percent of the linear resistance of a pipe section. A minimum of two bonding clips shall be furnished at each joint and installed at the pipe springline, one on each side of the pipe.

(B) Cathodic Protection: Corrosion mitigation and testing materials, such as magnesium anodes, reference electrodes, test lead wires and test stations shall be installed where shown. See ***Water Services Department Guide Specifications*** Section 13110, Cathodic Protection Systems for additional requirements

SECTION 760

COATING CORRUGATED METAL PIPE AND ARCHES

Delete the title of this SECTION in its entirety and replace with the following:

CORRUGATED METAL PIPE AND ARCHES

Subsection 760.1 GENERAL: Add the following paragraph to the end of this Subsection:

Corrugated metal pipe and arch utilization in public storm drain facilities is limited to culverts and catch basin connectors.

Subsection 760.2 MATERIALS: Delete this Subsection in its entirety and replace with the following:

Corrugated metal products covered by this specification shall be aluminum-coated Type 2 conforming to the requirements of AASHTO M-36 Type I or Type II as modified herein. No other coating is approved for use in the City of Phoenix.

Subsection 760.3 BASE METAL, SPELTER AND FABRICATION: Delete the title of this Subsection in its entirety and replace with the following:

FABRICATION

Subsection 760.3 BASE METAL, SPELTER AND FABRICATION: Delete this Subsection in its entirety and replace with the following:

The nominal pipe diameter shall meet the tolerances of this specification. Elliptical pipe and arches, when specified, shall be shaped after fabrication and coating have been completed.

Corrugated Metal Pipe and Arches: The pipe and arches shall be manufactured per AASHTO M-36, Type 1 or II. Nominal pipe sizes and corrugations furnished shall be in accordance with Table 6 of AASHTO M-36. Arches furnished shall be in accordance with Tables 2, 3, 4 and 5 of AASHTO M-36. Other shapes shall be as shown on the plans. Pipe and arches with helical corrugations shall have a continuous lock or weld seam extending from end to end of each length of pipe. The seams shall be fabricated in such a manner that they will not affect the shape or nominal diameter of the pipe and so that they will not create an element of weakness in the pipe.

Subsection 760.4 COUPLING BANDS: Delete the first sentence of the first paragraph and replace with the following:

Watertight joints shall be fabricated for corrugated metal pipe by the use of couplers or connecting bands per AASHTO M-274, aluminum-coated Type 2, with each band overlapping by at least 2 inches.

Subsection 760.4 COUPLING BANDS: Add the following paragraph to the end of this Subsection:

The rubber O-ring gasket shall conform to the requirements of ASTM C-361. The sleeve gasket shall be a closed cell rubber in accordance with ASTM D-1056, grade SCE 43.

Subsection 760.5 PERMISSIBLE VARIATIONS IN DIMENSION: Delete the last paragraph in its entirety.

SECTION 775

BRICK AND CONCRETE MASONRY UNITS (BLOCKS)

Subsection 775.1.1 Manhole Brick: Delete the first paragraph in its entirety and replace with the following:

Manhole brick shall conform to the requirements of ASTM C216, Grade SW. Brick may be used for maintenance of existing brick manholes and for adjustment of manhole frames.

SECTION 787

GRAY IRON CASTING

Subsection 787.3 MANHOLE FRAME AND COVER SETS: Add the following to the end of this Subsection:

ASTM A-48 Class 35, gray cast iron manhole frames and covers are approved for use on improvements within dedicated public right-of-way and dedicated public easements. The weights of the 30-inch frame and cover castings shall be a minimum of 219 pounds for the frame and 207 pounds for the cover. The weights of the 24-inch frame and cover castings shall be a minimum of 170 pounds for the frame and 180 pounds for the cover. The Contractor shall provide manufacturer's certification that the product meets the required H-20 traffic loading.

The casting shall be tested in accordance with the method and procedure that is outlined in AASHTO M306 Section 7.0, proof load testing. The casting shall be tested on a suitable and calibrated load testing machine and the casting shall hold a 40,000-pound proof load for one minute without experiencing any cracks or detrimental permanent deformation. Any added costs for testing are assumed by the manufacturer.

A foundry certification shall be furnished to the Owner stating that the samples have been tested, inspected, and are in accordance with these specifications.

SECTION 795

LANDSCAPE MATERIAL

Delete this SECTION its entirety and replace with the following:

795.1 GENERAL:

Material used for landscaping purposes shall be in conformance with this Section.

795.2 TOPSOIL:

Topsoil shall be a fertile, friable soil, obtained from well-drained arable land, and shall be free from nut grass, refuse, roots, heavy clay, clods, weed seed or any other material toxic to plant growth. At least 10 days prior to delivery of topsoil to the site, the Contractor shall furnish the Engineer, at no additional cost, with a soil sample from each source for analysis and tests.

Soil tests will be accomplished by an approved independent soil testing laboratory capable of doing the appropriate horticultural soil test. The results of the test will determine the acceptability of the soil. The testing laboratory may suggest ways to amend the soil to make it suitable to grow plants. The Contractor may be directed by the Engineer to provide the amendments at no additional cost.

To be acceptable, the pH factor shall not exceed 8.0 or be lower than 5.5, soluble salts shall not exceed 1500 PPM, the plasticity index shall be in the range of 3 and 10 inclusive, and it shall contain between 1 and 2%, by dry weight, organic matter either natural or added.

Gradation shall be as follows:

TABLE 795-1

SIEVE SIZE	PERCENT PASSING
1/2"	100
No. 4	90-100
No. 10	70-100
No. 200	15-70

795.3 SOIL AMENDMENTS AND CONDITIONERS:

795.3.1 Chemical Conditioners: Fertilizing material shall comply with the applicable requirements of the State Agricultural Code. Fertilizing material shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's analysis. It shall not contain toxic ingredients or fillers in quantities harmful to human life, animals, or plants. Material which has become caked or otherwise damaged shall not be used.

Fertilizing material for plants shall be similar to the product "Super Start" or approved equal, with the following additive ingredients (% by weight): 3% Nitrogen, 10% Sulfur, 4% Iron, 1% Zinc, 0.08% Manganese, and 0.13% Viterra. All fertilizing material shall be in 40 pound packages with additive ingredient derived from:

1. Nitrogen from Urea Formaldehyde and M.A.P.
2. Sulfur from Potassium Sulfate
3. Iron from Sequestrene 138 Iron
4. Zinc from Sequestrene Zinc
5. Manganese from Sequestrene Manganese
6. Viterra from a synthetic, superabsorbent co-polymer.

Slow Release Fertilizer Plant Tablets: Shall be Agriform 21 gram tablets or equal with 20-10-5 analysis.

Fertilizing Material for lawn areas or used in revegetation shall be a commercially approved brand or a mixture of standard commercial forms to meet the requirements recommended by horticultural test results.

Slow Release Nitrogen: Shall be Methylene urea (38-0-0) or equivalent. It is use to extend nitrogen availability over time on sites where long term nitrogen availability is a limiting factor.

795.3.2 Organic Soil Amendments:

General Soil Conditioner: Compost shall be naturally organic, free of weeds and weed seeds, and contain no plant growth inhibiting factors. This material shall be tested and meet the following minimum requirements.

Germination Rate (full strength extract)	85% minimum
Maturity Index (full strength extract)	50% minimum
Conductivity EC mmhos/cm	less than 8
Exchangeable Sodium Percentage	less than 15
Carbon/Nitrogen Ratio	less than 20:1
Total Nitrogen (not added)	0.5% minimum
pH range of extract	5.5 – 8.0

When cow manure is used as a soil conditioner in turf areas, it shall be the product of yard fed cattle, free of weed seeds, straw or any other inert material and aged at least 3 months. This manure shall have been processed by grinding and screening and shall be treated with a non-toxic agent so as to be hydrophilic.

Plant Conditioner: Shall consist of a ground or processed wood product derived from redwood, ground or shredded fir, redwood or ponderosa bark. It shall have a nitrogen content of 1%, a ph not exceeding 7.5% and organic matter not less than 85%. Mulch gradation shall be treated with a non-toxic agent so as to be hydrophilic. Cow Manure shall not be used as organic mulch in plant backfill mixes.

Bone Meal: Commercial grade product uniform in composition.

Sand: Shall be brown washed natural mortar sand passing at least a #7 screen, free of weeds, organic material, stones, deleterious materials, non-toxic to plant and human life and usable for backfill mixtures.

Hydromulch shall be packaged in units containing current labels, with the manufacturer's name, the net weight, and certification that the material meets the forgoing requirements. The mulch shall be dyed green to aid in the visual metering application. The dye shall be biodegradable and not inhibit plant growth.

(A) 100% Wood Cellulose Fiber Hydromulch: Shall be shall be used as mulch when hydroseeding turf grass.

Moisture content	10.0% + 3.0%
Organic Matter (Wood Cellulose Fiber)	99.3% + 0.2%
Ash content	0.7% + 0.5%
pH	4.9 + 0.5%
Water Holding Capacity	10 : 1

(B) Cellulose Fiber Hydromulch: Shall be used as mulch when hydroseeding native seed. Cellulose fiber mulch shall consist of at least 70% specially prepared virgin wood cellulose fiber which has been thermo-mechanically processed for specific use as hydromulch. It shall contain no growth inhibiting factors. It shall have the following properties:

Wood Cellulose Fiber	70% (minimum)
Recycled Cellulose Fiber	30% (maximum)
Ash Content	0.8% + 0.3% (maximum)
pH	4.5 + 1.0
Water Holding Capacity ratio; water: fiber	10:1

Upon application, the mulch material shall form a blotter-like mat covering the ground. This mat shall have the characteristics of moisture absorption and percolation and shall cover and hold seed in contact with the soil.

Tackifier: Used in hydroseeding shall consist of a free-flowing, noncorrosive powder produced from the natural plant gum of Plantago insularis (Desert Indianwheat), applied in a slurry with water and wood fiber. The powder shall possess the following properties:

Protein content	1.6 + 0.2 %
Ash content	2.7 + 0.2%
Fiber	4.0 + 0.4%
pH 1% solution	6.5 –8.0 %

The material used for mulch tackifier shall not contain any mineral filler, recycled cellulose fiber, clays, or other substance which may inhibit germination or growth of plants.

Activated Charcoal: Agricultural grade powdered activated charcoal is used in the hydromulching slurry to boost seed germination during cold weather as a soil colorant.

Granular humus based soil conditioner used in hydromulching operations shall be tested and meet the following:

Total humus	50% minimum
Total humic acid	15% minimum

Liquid humic acid soil based conditioner used in hydromulching operations shall be tested and meet the following:

Total humic acid	6% minimum

795.4 SEEDS:

795.4.1 Native Seeds: Shall be certified to scientific name, lot number or other identification, origin of the seed, purity of the seeds as a percentage of pure live seed by weight, germination percentage and percentage of firm ungerminated seeds, name and address of person who labeled or offers seed for sale.

Pure Live Seed (PLS) percentage = (% germination + % ungerminated firm seed) x (% purity). The seed rate specified is pounds of Pure Live Seed.

795.4.2 Turf Seed: Shall be fresh clean seeds, pre-mixed to the specified proportion. They shall be delivered to the site in original, unopened containers bearing the dealer's name guaranteed analysis and germination percentage. They shall have a certification or a stamp or a release accomplished by an agricultural commission.

795.5 PLANTS:

Plants shall be nursery grown or plantation grown stock conforming to ANSI 260-1 and shall be of the varieties specified in the plant list bearing botanical name listed. Plants shall meet the standards established by the Arizona Nursery Association Grower's Committee recommended specifications.

Planting stock shall be well broached and well formed, sound, vigorous, healthy and free from disease, sun-scald, windburn, abrasion and harmful insects or insect eggs and shall have healthy, normal and unbroken root system which is neither root or pot-bound and are free of kinked or girdling roots. Plants shall have been grown under climate conditions similar to those at the project site.

795.6 SOD:

The sod shall be Midiron Bermuda if not specified on the plans and meet State standards to insure high quality and

freedom from noxious weeds.

Sod shall be machine cut at a uniform soil thickness of 1/2 inch (plus or minus 1/4 inch), at time of cutting. Measurement excludes top growth and thatch.

Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 30% of the section.

Sod shall be free from disease, nematodes, and soil born insects.

795.7 MISCELLANEOUS MATERIAL:

795.7.1 Lumber: Lumber in contact with the earth shall be redwood heartwood, sized according to the drawing. When unit bid items that include headers or lumber are included in the proposal sheets, the unit prices quoted shall be per linear foot.

795.7.2 Clean fill: Clean fill shall be soil free of weeds, boulders, clods, heavy clay, aggregate base, asphalt or concrete or other deleterious material.

795.7.3 River Run Rock: Rock shall be clean, hard, durable, uniform in quality, free from seams and coatings, rounded and water-worn. The gradation shall be as specified and approved by the Engineer.

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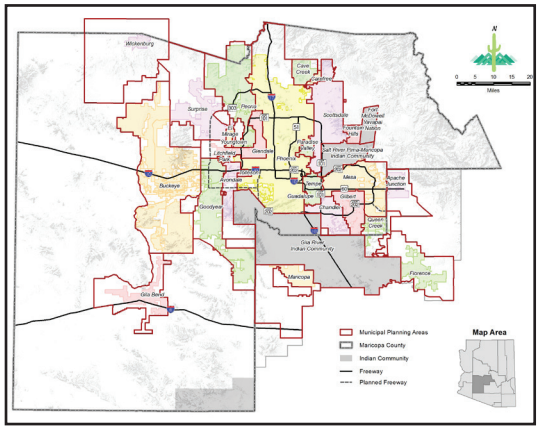
Appendix I –
2015 MAG Specifications

2015 Edition

Uniform Standard Specifications and Details for Public Works Construction



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January 2015

NEW IN THE 2015 REVISION

Uniform Standard Specifications and Details for Public Works Construction—2015 Edition
The MAG Standard Specifications and Details Committee, with assistance from five specialized working groups, considered 22 cases during the 2014 session. Of these, 18 were approved and included in this revision.

New Specifications:
- Section 607: Trenchless Installation of Smooth Wall Jacking Pipe
- Section 742: Precast Manhole

Specifications rewritten, or with major updates:
- Section 101: Abbreviations and Definitions
- Section 321: Placement and Construction of Asphalt Concrete Pavement
- Section 324: Portland Cement Concrete Pavement
- Section 325: Placement and Construction of Asphalt-Rubber Asphalt Concrete Pavement
- Section 405: Monuments
- Section 601: Trench Excavation, Backfilling and Compaction
- Section 610: Water Line Construction
- Section 611: Water, Sewer and Storm Drain Testing *(was Disinfecting Water Mains)*
- Section 615: Sewer Line Construction
- Section 618: Storm Drain Construction
- Section 625: Manhole Construction and Drop Sewer Connections
- Section 710: Asphalt Concrete
- Section 735: Reinforced Concrete Pipe
- Section 775: Brick and Concrete Masonry Units (Blocks)

Specifications with minor updates:
- Section 107: Legal Regulations and Responsibility to Public
- Section 206: Structure Excavation and Backfill
- Section 211: Fill Construction
- Section 310: Placement and Construction of Aggregate Base Course
- Section 336: Pavement Matching and Surfacing Replacement
- Section 340: Concrete Curb, Gutter, Sidewalk, Sidewalk Ramps, Driveway and Alley Entrance
- Section 342: Decorative Pavement, Concrete Paving Stone
- Section 345: Adjusting Frames, Covers, Valve Boxes, Meter Boxes and Pull Boxes
- Section 355: Utility Potholes-Keyhole Method
- Section 616: Reclaimed Water Line Construction
- Section 717: Asphalt-Rubber Asphalt Concrete
- Section 726: Concrete Curing Materials
- Section 739: Steel Reinforced Polyethylene Pipe and Fittings for Storm Drain, Irrigation and Sanitary Sewer
- Section 740: Polypropylene Pipe and Fittings for Storm Drain, Irrigation and Sanitary Sewer
- Section 750: Iron Water Pipe and Fittings

Specifications that have been deleted:
- Section 603: Installation for High Density Polyethylene Pipe *(Incorporated into Section 601.)*

New detail drawings:
- Detail 420-1: Concrete Sanitary Sewer Manhole *(Replaces existing 420-1: Precast Concrete Sewer Manhole)*
- Detail 420-2: Precast Manhole Base
- Detail 420-3: Concrete Manhole Base *(Replaces parts of existing 420-2 and adds details.)*

Details that have been updated:
- Detail 100-1: Index (Page 1 of 2)
- Detail 100-2: Index (Page 2 of 2)
- Detail 120: Survey Marker
- Detail 200-1: Backfill, Pavement and Surface Replacement
- Detail 200-2: Backfill, Pavement and Surface Replacement
- Detail 212: Utility Pothole Repair
- Detail 391-1: Valve Box Installation and Grade Adjustment
- Detail 391-2: Valve Box Installation and Grade Adjustment
- Detail 392: Debris Cap Installation
- Detail 421: Offset Manhole 8” to 30” Pipe
- Detail 422: Manhole Frame and Cover Adjustment *(Deletes Brick Sewer Manhole drawing from existing Detail 422)*
- Detail 429: Industrial Waste Control Vault with Manhole
- Detail 522: Storm Drain Manhole Shaft
- Detail 552: Ford Crossing and Cut-off Walls

Details that have been deleted:
- Detail 428: Manhole Steps

The 2015 Edition also includes all the updates made in the 2014 and 2013 Revisions to the 2012 Edition. See the next page for details.

Changes made in the 2014 Revision

Uniform Standard Specifications and Details for Public Works Construction—2014 Revision to the 2012 Edition
The MAG Standard Specifications and Details Committee, with assistance from five specialized working groups, considered 26 cases during the 2013 session. Of these, 23 were approved and included in this revision.

New Specifications:
- Section 602: Trenchless Installation of Steel Casing *(Replaces Section 602: Encasement of Water of Sewer Pipe by Jacking or Tunneling Operation)*
- Section 739: Steel Reinforced Polyethylene Pipe (SRPE)
- Section 740: Polypropylene Pipe and Fittings for Storm Drain, Irrigation, and Sanitary Sewer

Specifications rewritten, or with major updates:
- Section 309: Lime Stabilization or Modification of Subgrade
- Section 321: Placement and Construction of Asphalt Concrete Pavement
- Section 337: Crack Sealing
- Section 340: Concrete Curb, Gutter, Sidewalk, Sidewalk Ramps, Driveway and Alley Entrance
- Section 345: Adjusting Frames, Covers, Valve Boxes, and Water Meter Boxes
- Section 610: Water Line Construction
- Section 711: Paving Asphalt
- Section 729: Expansion Joint Filler

Specifications with minor updates:
- Section 107: Legal Requirements and Responsibility to Public
- Section 108: Commencement, Prosecution and Progress
- Section 301: Subgrade Preparation
- Section 311: Placement and Construction of Cement Treated Subgrade
- Section 324: Portland Cement Concrete Pavement
- Section 415: Flexible Metal Guardrail
- Section 430: Landscaping and Planting
- Section 505: Concrete Structures
- Section 605: Subdrainage
- Section 725: Portland Cement Concrete
- Section 735: Reinforced Concrete Pipe
- Section 795: Landscape Materials

Specifications that have been deleted:
- Section 737: Asbestos-Cement Pipe and Fittings for Storm Drain and Sanitary Sewer

New detail drawing:
- Detail 120: Survey Marker *(Replaces Details 120-1 and 120-2)*

Details that have been updated:
- Detail 201: Asphalt Pavement Edge Details
- Detail 221: Curb and Gutter Transition Type A to Type C Integral Roll Curb, Gutter and Sidewalk
- Detail 230: Sidewalks
- Detail 250-1: Driveway Entrances with Detached Sidewalk
- Detail 270: Frame and Cover
- Detail 391-1: Valve Box Installation and Grade Adjustment
- Detail 501-5: Headwall Drop Inlet

Details that have been deleted:
- Detail 120-2: Survey Marker (for Unincorporated Maricopa County)

Changes made in the 2013 Revision

Uniform Standard Specifications and Details for Public Works Construction—2013 Revision to the 2012 Edition
The MAG Standard Specifications and Details Committee, with assistance from five specialized working groups, considered 20 cases during the 2012 session. Of these, 17 were approved and included in this revision.

New Specifications:
- None

Specifications rewritten, or with major updates:
- Section 107: Legal Regulations and Responsibility to Public
- Section 310: Placement and Construction of Aggregate Base
- Section 350: Removal of Existing Improvements
- Section 415: Flexible Metal Guardrail
- Section 701: Aggregate
- Section 702: Base Materials
- Section 710: Asphalt Concrete
- Section 711: Paving Asphalt

Specifications with minor updates:
- Section 108: Commencement, Prosecution and Progress
- Section 317: Asphalt Milling
- Section 321: Placement and Construction of Asphalt Concrete Pavement
- Section 332: Placement and Construction of Asphalt Emulsion Slurry Seal Coat
- Section 505: Concrete Structures
- Section 610: Water Line Construction
- Section 725: Portland Cement Concrete
- Section 728: Controlled Low Strength Materials
- Section 770: Structural and Rivet Steel, Rivets, Bolts, Pins and Anchor Bolts.

Specifications that have been deleted:
- Section 709: Reclaimed Asphalt Pavement
- Section 719: Recycled Asphalt Concrete Hot Mixed

New detail drawings:
- Detail 260: Alley Entrance (With Vertical Curb and Gutter)
- Detail 360-1: Dry Barrel Fire Hydrant Installation
- Detail 360-2: Wet Barrel Fire Hydrant Installation
- Detail 360-3: Fire Hydrant Installation Details

Details that have been updated:
- Detail 160: 6’ Chain Link Fence and Gate
- Detail 201: Asphalt Pavement Edge Details
- Detail 250-2: Driveway Entrances with Sidewalk Attached to Curb

UNIFORM STANDARD SPECIFICATIONS for PUBLIC WORKS CONSTRUCTION

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2015 Edition

ARIZONA

FOREWORD

Publication of these Uniform Standard Specifications and Details for Public Works Construction fulfills the goal of a group of agencies who joined forces in 1966 to produce such a set of documents. Subsequently, in the interest of promoting county-wide acceptance and use of these standards and details, the Maricopa Association of Governments accepted their sponsorship and the responsibility of keeping them current and viable.

These specifications and details, representing the best professional thinking of representatives of several Public Works Departments, reviewed and refined by members of the construction industry, were written to fulfill the need for uniform rules governing public works construction performed for Maricopa County and the various cities and public agencies within Maricopa County who could not afford to promulgate such standards for themselves. Agencies in other regions or climes that desire to use these specifications may need to make adjustments for local conditions.

A uniform set of specifications and details, updated and embracing the most modern materials and construction techniques will reduce conflicts, provide clarity and lower construction costs for the benefit of the public.

Use of these standards for projects outside of the right-of-way should be reviewed by professional engineers and architects and applied with care to insure relevance to the planned work.

Specifications and details should be incorporated into project plans and specifications after careful review by the design engineer or architect of specific project needs. Not all specifications contained herein will apply to all projects. Prepared plans and specifications should clearly call out only those specific uniform specifications and details required for the project.

Uniform specifications and details are not a substitute for good engineering judgment. Unique conditions will arise that are outside the scope of these standards. When this happens, professional engineers and architects are required to use their judgment to amend these standards to best meet site-specific project needs in accordance with the rules set forth by the State of Arizona and policy statements made by the Arizona State Board of Technical Registration.

The Uniform Standard Specifications and Details for Public Works Construction are revised periodically and reprinted to reflect the changing technology of the construction industry. To this end a Specifications and Details Committee has been established as a permanent organization to continually study and recommend changes to the Specifications and Details. Interested parties may address suggested changes and questions to:

Standard Specifications & Details Committee
c/o Maricopa Association of Governments
302 North First Avenue, Suite 300
Phoenix, Arizona, 85003

Suggestions will be reviewed by the committee and appropriate segments of the construction industry and revisions will be published the first of each year. A copy of this publication is available for review on the internet at the website listed below. Please follow the links to the publications page and look for *Uniform Standard Specifications for Public Works Construction and/or Uniform Standard Details for Public Works Construction*:

www.azmag.gov

In the interest of regional uniformity, it is hoped that all using agencies will adopt these standards with minimal changes. It is recognized that because of charter requirements and for other reasons, some agencies will find it necessary to modify or supplement certain requirements. In the interest of regional uniformity, it is strongly recommended that using agencies bring desired modifications to the MAG Committee for consideration and inclusion into these standards.

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PART 100

GENERAL CONDITIONS

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SECTION 101

ABBREVIATIONS AND DEFINITIONS

101.1 ABBREVIATIONS:

Wherever the following abbreviations are used in these specifications, standard details or on the plans, they are to be constructed the same as the respective expressions represented.

AASHTO	American Association of State Highway and Transportation Officials
AAN	American Association of Nurserymen
AB	Aggregate base
Aban	Abandon
ABC	Aggregate base course
AC	Asphalt cement or concrete
ACB	Asphalt concrete base
ACI	American Concrete Institute
ACP	Asbestos cement pipe
ACPA	American Concrete Pipe Association
ACWS	Asphalt concrete wearing surface
AFRB	Arizona Fire Rating Bureau
AGC	Associated General Contractors of America, Inc.
Agg	Aggregate
ADOT	Arizona Department of Transportation
ADA	Americans With Disabilities Act of 1990
ADEQ	Arizona Department of Environmental Quality
Ahd	Ahead
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
Approx	Approximate
APWA	American Public Works Association
AR	Aged residue
ARAC	Asphalt-Rubber Asphalt Concrete
ARIZ	Arizona Department of Transportation Test Method
ARS	Arizona Revised Statutes
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
Ave	Avenue
AWPA	American Wood Preservers Association
AWSC	American Welding Society Code
AWWA	American Water Works Association
Bbl	Barrel
BC	Beginning of curve
BCR	Beginning of curb return
Beg	Beginning
Bk	Book or Back
Blvd	Boulevard
BM	Bench Mark or Board Measure
Brg	Bearing
BST	Bituminous Surface Treatment
BTB	Bituminous Treated Base
BTU	British Thermal Units
BVC	Beginning of vertical curve
C	Centigrade or Curb
CB	Catch Basin
CBF&C	Catch basin frame & cover
CC or C/C	Center to Center
CE	City or County Engineer
Cem	Cement
CF	Curb face
cfs	Cubic Feet per second
CIP	Cast Iron pipe
CIPP	Cast-in-place concrete pipe
CL or C	Centerline
CLR	Clear
Cm	Centimeter
CMP	Corrugated metal pipe
CO	Clean out
Col	Column
Conc	Concrete
Const	Construct
CP	Concrete pipe (non-reinforced)
CTB	Cement Treated Base
Cu	Cubic
Deg	Degree
DF	Douglas Fir
DG	Decomposed granite
Dia	Diameter
Dim	Dimension
DIP	Ductile Iron Pipe
Div	Division
Dr	Drive
Drwg	Drawing
Dwy	Driveway
Ea	Each
Ease	Easement
E	East
EC	End of curve
ECR	End of curb return
El or Elv	Elevation
Equa or Eq	Equation
EVC	End of vertical curve
Ex or Exist	Existing
F	Fahrenheit
FB	Field book
F & C	Frame & cover
FH	Fire hydrant
FL or F	Floor line or flow line
Fl El	Floor Elevation
Fnd	Found
fps	Feet per second
FS	Finished surface
FSS	Federal Specifications and Standards
Ft	Foot or feet
G	Gutter

Ga	Gage
Galv	Galvanized
GL	Ground line
Gpm	Gallons per minute
Gr	Grade
H	High or height
HC	House connection
HH	Hand Hole
Hdwl	Headwall
Horiz	Horizontal
Hwy	Highway
ICA	Industrial Commission of Arizona
ID	Improvement District or inside diameter
IE	Invert Elevation
IEEE	Institute of Electrical and Electronic Engineers
In	Inch
Inv	Invert
IP	Iron Pipe
IPS	Iron Pipe Size
Irrig	Irrigation
Jt	Joint
JC	Junction Chamber
Jct	Junction
JS	Junction Structure
L	Length
Lb	Pound
L&T	Lead and Tack
LD	Local Depression
LF	Linear Feet
LH	Lamp Hole
Lin	Linear
Long	Longitudinal
Lt	Left
M	Map or Maps
MAG	Maricopa Association of Governments
Max	Maximum
MCR	Maricopa County Records
Meas	Measured
MH	Manhole
MHF&C	Manhole Frame and Cover
Min	Minutes or Minimum
Misc	Miscellaneous
ML or M	Monument Line
mm	Millimeter
Mon	Monolithic or monument
MTD	Multiple Tile Duct
N	North
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NE	Northeast
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NP	Non-Plastic
NPI	Non pay item
NSC	National Safety Council
NSF	National Sanitation Foundation
NTS	Not to Scale
NW	Northwest
No	Number
OC	On Center
OD	Outside Diameter
Oz	Ounces
PC	Point of Curvature
PCC	Point of Compound Curve or Portland Cement Concrete
PI	Point of Intersection or Plastic Index
PL	Property Line
POC	Point of Curve
POS	Point of Spiral
PP	Power Pole
ppm	Parts per million
PRC	Point of Reverse Curve
Prod	Produced
Prop	Proposed or Property
psi	Pounds per square inch
psf	Pounds per square foot
PT or POT	Point of Tangent
P&TP	Power and Telephone Pole
Pvmt	Pavement
Q	Rate of flow
R	Radius
RC	Reinforced Concrete
RCP	Reinforced Concrete Pipe
Rd	Road
Rdwy	Roadway
Reinf	Reinforced, Reinforcing
Ret Wall	Retaining Wall
RGRCP	Rubber Gasket Reinforced Concrete Pipe
rpm	Revolutions Per Minute
Rt	Right
R/W	Right-of-way
S	South or Slope
SAE	Society of Automotive Engineers
San	Sanitary
SC	Spiral to Curve
SCCP	Steel Cylinder Concrete Pipe
SD	Storm Drain or Sewer District
Sdl	Saddle
Sec	Seconds
Sect	Section
SE	Southeast
Sht	Sheet
Spec	Specifications
SPR	Simplified Practice Recommendation
Sp MH	Special Manhole
Sq Ft Yd	Square Foot, Yard
SS	Sanitary Sewer
St	Street
Sta	Station
Std	Standard

Str gr	Structural grade
Struct	Structure or structural
SW	Southwest
SWPPP	Stormwater Pollution Prevention Plan
T	Tangent Distance
Tel	Telephone
Temp	Temporary
TH	Test Hole
TP	Telephone pole
Tr	Tract
Trans	Transition
TS	Traffic signal or Tangent to spiral
TSC	Traffic signal conduit
Typ	Typical
UL	Underwriters' Laboratories Inc.
USC & GS	United States Coast and Geodetic Survey
USGS	United States Geological Survey
V	Velocity of flow
VC	Vertical curve
VCP	Vitrified clay pipe
Vert	Vertical
W	West or width
WI	Wrought iron
WS	Wearing surface
Wt	Weight
Yd	Yard
‘	feet or minutes
“	inches or seconds
°	degrees
%	percent
#	number or pound
@	at
/	per
=	equals

101.2 DEFINITIONS AND TERMS:

Whenever in these specifications or in other contract documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

Addendum: A supplement to any of the Contract Documents issued, in writing, after advertisement of but prior to the opening of bids for a contract.

Advertisement: The public announcement, as required by law, inviting bids for work to be performed or materials to be furnished.

Agency: The governmental agency for which the construction is being done, either by permit or contract.

Architect: The individual or firm who has accomplished the architectural services for the project, including his representatives.

Arizona Test Method: Arizona Department of Transportation Materials Testing Manual test method.

Award: The formal action of the governing body is accepting a proposal.

Backfill: Material placed in an excavated space to fill such space. For trenches, see definitions for Initial Backfill and Final Backfill.

Base Course: The upper course of the granular base of a pavement or the lower course of an asphalt concrete pavement structure.

Bedding: A material layer placed on top of the trench foundation to the bottom of the pipe, typically 4-6 inches in height. The bedding establishes the line and grade for a conduit and provides support that is firm, but not hard.

Bidder: Any qualified individual, firm, partnership, corporation or combination thereof, acting directly or through a duly authorized representative who legally submits a proposal for the advertised work.

Board of Supervisors: The Maricopa County Board of Supervisors acting under the authority of the laws of the State of Arizona.

Bond Issue Project: A project financed from bonds issued by the City or County pledging credit or a revenue resource.

Bridge: A structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of roadway of more than 20 feet between undercopings of abutments or extreme ends of openings for multiple boxes.

(Length) The length of a bridge structure is the over-all length measured along the line of survey stationing back to back of backwalls of abutments, if present, otherwise end to end of the bridge floor; but in no case less than the total clear opening of the structure.

(Roadway Width) The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom or curbs or guard timbers or in the case of multiple heights of curbs, between the bottoms of the lower risers.

Budget Project: A project financed by funds from General Tax levies and shared revenue funds set aside in the annual budget adopted by the Council or Board of Supervisors.

Building: Any structure built for the support, shelter, or enclosure of persons, animals, chattel or movable property.

Building Code: A regulation adopted by the governing body establishing minimum standards of construction for the protection of the public health, safety, and welfare in terms of measured performance rather than in terms of rigid specification of materials and methods.

Calendar Day: Every day shown on the calendar.

Call for Bids: The standard forms inviting proposals or bids.

"Careful and prudent manner": means conducting excavation in such a way that when it approaches within twenty-four inches of the underground facility located and marked by the owner or operator, by stakes, paint or in some customary manner, the exact location is manually determined, and the uncovered facility is supported and protected.

Change Order: A written order issued by the Engineer to the Contractor to make changes in the work or to perform extra work, and setting forth conditions for payment and/or adjustment in time of completion.

City: A municipal corporation, organized and existing under and by virtue of the laws of the State of Arizona.

City/County Clerk: The duly authorized person who performs the duties of clerk for the Contracting Agency.

Completion Time: The number of calendar days for completion of an act, including authorized time extensions. In case a calendar date of completion is shown in the proposal in lieu of the number of calendar days, the contract shall be completed by that date. The time within which an act is to be done shall be computed by excluding the first and including the last day; and if the last day be Sunday or a legal holiday, that shall be excluded.

Conflicting Utility: An existing utility, shown or not shown on the plans is conflicting when any part of the utility falls within the dimensions of the new installation, such that it would be in physical contact with the new installation.

Construction Project: The erection, installation, remodeling, alteration, of durable facilities upon, under, or over the ground. This shall include, but is not limited to buildings, roadways and utility pipes, lines, poles or other structures.

Contingent Bid Item: This is a minor bid item which is likely, but not certain, to occur during the course of work. If the Engineer determines that this work is required, the Contractor will accomplish the work and payment will be made based on the contingent unit bid price included in the proposal. Since the quantity listed in the proposal is primarily for bid comparison, the amount of work required by the Engineer may vary materially from this.

Contract: The written instrument executed by the Contractor and the Contracting Agency by which the Contractor is bound to furnish all labor, equipment, and materials and to perform the work specified, and by which the Contracting Agency is obligated to compensate the Contractor therefore at the prices set forth therein. The Contract Documents are herewith by reference made a part of the contract as if fully set forth therein.

Contract Documents: All the integral documents of the contract, including but not limited to, Call for Bids, Plans, Standard Specifications and Details, Special Provisions, Proposal, Addenda, Performance Bond, Payment Bond, Certificates of Insurance, Ordinance, Contract, and Change Orders.

Contracting Agency: The legal entity that has contracted for the performance of the work or for whom the work is being performed.

Contractor: The individual, firm, partnership, corporation or combination thereof entering into a contract with the Contracting Agency to perform the advertised work.

Council: The City Council which by law constitutes the Legislative Department of the City.

County: Maricopa County, organized and existing under and by virtue of the laws of the State of Arizona.

Culvert: Any structure not classified as a bridge, which provides an opening under or adjacent to the roadway.

Days: Unless otherwise designated, days will be understood to mean calendar days.

Emergency: Unforeseen occurrences and combinations of circumstances involving the public welfare or the protection of work already done under the Contract Documents, or which endanger life or property and call for immediate action or remedy.

Engineer: The person, appointed as City or County Engineer by the Council or the Board of Supervisors, acting directly or through his duly authorized representative.

Equipment: (Construction) — All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of work. (Installed) — All material or articles used in equipping a facility as furnishings or apparatus to fulfill a functional design.

Extra Work: An item of work not provided for in the contract as awarded but found essential to the satisfactory completion of the contract within its intended scope.

Final Backfill: The material placed in a trench above the initial backfill to the top of the trench or to the bottom of the road base material.

Flooding: Flooding will consist of the inundation of the entire lift with water, puddle with poles or bars to insure saturation of the entire lift.

Force Account Work: Work done by personnel of the Contracting Agency as in-house work.

Foundation: For buildings or structures, this will be the substructure. For a trench, the foundation is the bottom of the required trench excavation. The foundation surface is either native material, or replacement material when unsuitable material occurs, and is removed and replaced at the bottom of the required trench excavation.

Full Depth Pavement: An asphalt concrete pavement structure in which the granular base and subbase are replaced by proportionate thicknesses of asphalt concrete.

Haunching: The area of a pipe trench between the bottom of the pipe and the springline of the pipe.

Improvement District Project: A project financed by assessments against the property included in a special assessment district authorized under, or implemented by an act of the legislature of the State and/or a procedural ordinance of the City or County.

Initial Backfill: The material placed in a trench between the springline and 12 inches above the crown of the conduit.

Inspector: The Engineer's authorized representative assigned to make detailed inspections of contract performance.

Jetting: Jetting is the densification of material, using a continuous supply of water, under pressure, transmitted to the material through a rigid pipe of sufficient length to reach the bottom of the lift being densified. In all cases, the entire lift will be completely saturated working from the top to the bottom.

Laboratory: The established materials testing laboratory of the Contracting Agency's Engineering Department, or other laboratories acceptable to and/or authorized by the Engineer to test materials and work involved in the Contract.

Major Item: A major item shall be the total of any item of work and/or materials specified in the bid schedule that exceeds the amount established in Table 109-1.

Materials: Any substance specified in the project, equipment and other material used or consumed in the performance of the work.

Median: The portion of a divided highway separating the roadways used by traffic going in opposite directions.

Non Pay Item: An item of work for which no separate payment will be made under the proposal, but which must be included as an incidental cost for payment on an associated item included in the proposal.

Notice of Award: A letter from the City or County Clerk advising the Contractor that he is the successful bidder and the Council or Board of Supervisors has accepted his proposal.

Notice to Proceed: A directive issued by the Engineer, authorizing the Contractor to start the work or improvements required in the Contract.

Obligee: One to whom another is obligated.

Open Trench: The excavated area shall be considered as open trench until all the aggregate base course for pavement replacement has been placed and compacted or, if outside of a pavement area, until the excavated area is brought to finish grade or natural grade.

Owner: The City or County, acting through its legally constituted officials, officers or employees.

Pavement: Any surfacing of streets, alleys, sidewalks, courts, driveways, etc., consisting of mineral aggregate bound into a rigid or semi-rigid mass by a suitable binder such as, but not limited to, Portland cement or asphalt cement.

Pavement Structure: The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.

Pay Item: A detail of work for which separate payments are to be made under the Contract, as specified in the proposal.

Payment Bond: The security provided by the Contractor solely for the protection of claimants, supplying labor and materials to the Contractor or his Subcontractors.

Performance Bond: The security provided by the Contractor solely for the protection of the Contracting Agency and conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions thereof.

Permit: The license to do construction in public rights-of-way and/or easements; issued by an Agency to a Contractor working for another party.

Pipe Embedment Zone: The area of a trench consisting of the bedding, haunching, and initial backfill areas.

Plans: All approved drawings or reproductions thereof pertaining to the work and details therefore, which are made a part of the Contract Documents.

Plant: The Contractor's and/or subcontractor's facilities, including but not limited to small tools and mobile equipment, located on and/or offsite, necessary for preparation of materials and prosecution of work for the project.

Principal: The individual, firm or corporation primarily liable on an obligation, as distinguished from a surety.

Professional Engineer: A person who has a current engineering registration granted by the Arizona State Board of Technical Registration in one or more branches of engineering recognized by the board.

Profile Grade: The trace of a vertical plan intersecting the top surface of the proposed wearing surface, usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of such trace according to the context.

Project: A specific coordinated construction or similar undertaking identified by a single project number and bid and awarded as one contract. On occasion two or more projects may be bid and awarded as a single contract.

Proposal: The offer of a bidder on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

Proposal Form: The approved form on which the Contracting Agency requires bids to be prepared and submitted for the work.

Proposal Guarantee: The security furnished with a bid to guarantee that the bidder will enter into the contract if his bid is accepted.

Proposal Pamphlet: The book or pamphlet pertaining to a specific project, containing proposal forms, special provisions and other information necessary for and pertinent to the preparation of the proposal or bid.

Referred Documents: On all work authorized by the Contracting Agency, any referenced documents in the specification, i.e., Bulletins, Standards, Rules, Methods of Analysis or test. Codes and Specifications of other Agencies, Engineering Societies or Industrial Associations, refer to the Latest Edition thereof, including Amendments, which are in effect and published at the time

of Advertising for Bids or the issuing of a permit for the work, unless otherwise stated.

Right-of-way: A general term denoting land, property, or interest therein, usually in a strip acquired for or devoted to a street, highway, or other public improvement.

Road: A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Roadside: A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

Roadside Development: Those items necessary to the complete roadway which provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the roadway.

Roadway: The portion of the right-of-way intended primarily for vehicular traffic, and including all appurtenant structures and other features necessary for proper drainage and protection. Where curbs exist, it is that portion of roadway between the faces of the curbs.

Sewers: Conduits and related appurtenances employed to collect and carry off water and waste matter to a suitable point of final discharge.

Shop Drawings: Drawings or reproduction of drawings, detailing; fabrication and erection of structural elements, falsework and forming for structures, fabrication of reinforcing steel, installed equipment and installation of systems, or any other supplementary plans or similar data, which the Contractor is required to submit for approval.

Shoulder: The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk: That portion of the roadway primarily constructed for the use of pedestrians.

Special Provisions: The special conditions, requirements, additions, and/or revisions to the Standard Specifications, applicable to the work, to cover conditions or requirements peculiar to the project under consideration.

Specifications: The descriptions, directions, provisions, and requirement for performing the work as contained in the Contract Documents.

Standard Details: Uniform detail drawings of structures or devices adopted as Standard Details by the Engineer.

Standard Specifications: Uniform general specifications adopted as Standard Specifications by the Engineer.

Springline: The vertical location having a maximum horizontal dimension or in box sections, the mid-height of the vertical wall.

Storm Drain: Any conduit and appurtenance intended for the reception and transfer of storm water.

Street: Streets, avenues, alleys, highways, crossings, lanes, intersections, courts, places, and grounds now open or dedicated or hereafter opened or dedicated to public use and public ways.

Structures: Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, sewers, service pipes underdrains foundation drains, fences, swimming pools, and other features which may be encountered in the work and not otherwise classed herein.

Subbase: The lower course of the base of a roadway, immediately above the subgrade.

Subcontractors: Those having direct contracts with the Contractor and those who furnish material worked into a special design according to the Plans and Specifications for the work, but not those who merely furnish material not so worked.

Subgrade: The supporting structures on which the pavement and its special undercourses rest.

Substructure: All of that part of the structure or building below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with the backwalls, wingwalls and wing protection railings.

Superintendent: The Contractor's authorized representative in responsible charge of the work.

Superintendent of Streets: The person duly appointed by the Council of the Contracting Agency, as provided by the Arizona Revised Statutes.

Superpave Mix: Asphalt mix in compliance with the Gyratory Mix design requirements of Section 710.3.2.2.

Superstructure: The entire structure or building except the substructure.

Supplemental Specifications: Additions and revisions to the Standard Specifications that are adopted subsequent to issuance of the printed book.

Supplementary General Conditions: Requirements, or revisions, to the Standard General Conditions, applicable to the work, and to cover conditions or requirements peculiar to the project under consideration.

Surety: The individual, firm or corporation, bound with and for the Contractor for the acceptable performance, execution, and completion of the work, and for the satisfaction of all obligations incurred.

Surface Course: The finished or wearing course of an asphalt concrete pavement structure.

Title or Headings: The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

Township, City, Town or District: A subdivision of the County used to designate or identify the location of the proposed work.

Traveled Way: The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

"Underground Facility": means any item which shall be buried or placed below ground for use in connection with the storage or conveyance of water, sewage, electronic, telephone or telegraphic communications, electric energy, oil, gas or other substances, and shall include, but not be limited to pipes, sewers, conduits, cables, valves, lines, wires, manholes, attachments and those portions of poles and their attachments below ground.

Utility: Pipe lines, conduits, ducts, transmission lines, overhead or underground wires, railroads, storm drains, sanitary sewers, irrigation facilities, street lighting, traffic signals, and fire alarm systems, and appurtenances of public utilities and those of private industry, businesses or individuals solely for their own use or use of their customers which are operated or maintained in, on, under, over or across public right-of-way or public or private easement.

Waterworks (Water Supply System): The reservoirs, pipe lines, wells, pumping equipment, purification works, mains, service pipes, and all related appliances and appurtenances utilized in the procurement, transportation and delivery of an adequate, safe, and palatable water supply for the Contracting Agency.

Work: Any or all of the improvements mentioned and authorized to be made, and the construction, demolition, reconstruction, and repair of all or any portion of such improvements, and all labor, services, incidental expenses, and material necessary or incidental thereto.

Working Day: A calendar day, exclusive of Saturdays, Sundays, and Contracting Agency recognized legal holidays, on which weather and other conditions not under the control of the Contractor will permit construction operations to proceed for the

major part of the day with the normal working force engaged in performing the controlling item or items of work which would be in progress at that time.

101.3 In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, if, as, or, when, or where contemplated required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, accepted, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned, it shall be understood as if the expression were followed by the words by the Engineer or to the Engineer.

- End of Section -

SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

102.1 ELIGIBILITY AND PREFERENCE:

The employment of Contractors and Subcontractors on Public Works shall be governed by the provisions of Section 34-241 of the Arizona Revised Statutes.

102.2 CONTENTS OF PROPOSAL PAMPHLET:

The prospective bidder may examine and/or purchase plans, special provisions, and proposal pamphlets at the Engineering Office of the Contracting Agency advertising for bids.

The proposal pamphlet will state the location of the contemplated construction; give the description of the various quantities of work to be performed or materials to be furnished, and have a bid schedule of pay items for which unit bid prices are invited. In addition, it will state the form and amount of the proposal guarantee, the time in which the work shall be completed and include additional instructions not included in these specifications.

The plans, the standard specifications, the standard details, the special provisions, the contracting agency's supplements and all supplementary documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In a case of a discrepancy or conflict, the order in which the various documents shall govern is as follows from highest to lowest: addenda, special provisions, plans, agency's supplements to the standard specifications, agency's supplements to the standard details, standard specifications and standard details.

Each and every provision of law and clause required by law to be inserted in the contract shall be deemed to be inserted herein, and the contract shall be read and enforced as though it were included herein.

102.3 INTERPRETATION OF QUANTITIES IN PROPOSAL:

The quantities appearing in the proposal are approximate only and are to be used for the comparison of bids. Payment to the Contractor will be made only for the actual quantities of work performed and accepted or materials furnished in accordance with the contract at the unit bid price in the proposal.

After the contract is awarded the quantities of work listed by any pay item, or all pay items, may be increased or decreased a reasonable amount at the discretion of the Contracting Agency, without in any way invalidating the unit bid price.

102.4 EXAMINATION OF PLANS, SPECIAL PROVISIONS AND SITE OF WORK:

The Contracting Agency will prepare plans and special provisions in accordance with acceptable engineering standards, giving such direction as will enable any competent Contractor to carry them out.

The bidder shall examine the site of the proposed work and all documents pertaining to the work. It is mutually agreed that the submission of a proposal shall be considered prima facie evidence that the bidder has made such examination and is familiar with the character, quality and quantity of the work to be performed and material to be furnished.

Logs of the test holes, ground water levels, and any accompanying soil reports as furnished by the Contracting Agency are furnished for general information only. The field condition so set forth shall not constitute a representation or warranty expressed or implied that such conditions are actually existent. Bidders shall make their own investigations and form their own estimates of the site conditions.

After the submission of the proposal, no complaint or claim that there was any misunderstanding as to the quantities, conditions or nature of the work will be entertained.

102.5 PREPARATION OF PROPOSAL:

The bidder shall submit his proposal on the forms obtained from the Contracting Agency. The bidder shall specify a unit bid price and extension in words, figures or both, whichever is required, for each pay item where units and approximate quantities are given.

The proposal total will be obtained by adding the extension amount or lump sum indicated for the individual pay items. If there is a conflict between words and figures, the words shall apply. If there is a conflict between the unit bid price and the extension for a particular pay item, the unit bid price shall govern. In either case, the Contracting Agency shall correct the discrepancy in accordance with the above procedure and the corrected proposal total will apply.

In addition, the following shall be completed by the bidder on the proposal:

(A) Acknowledge receipt of and agree that the proposal is based on the listed Addenda received with and/or after receipt of the proposal pamphlet.

(B) Note the bidders Arizona State Contractor's License number and classification.

(C) Signatures in ink and attested or witnessed as applicable.

102.6 SUBCONTRACTORS LIST:

When required, the List of Subcontractors form will be attached to the proposal pamphlet. The bidder shall submit this form with his proposal, in a separate sealed envelope, listing the firm name and business address of each specialty subcontractor to whom he proposes to subcontract any portion of the work. Only one name shall be listed for each category.

The bidder may list himself to perform one or more of the listed categories of work for which he has any requisite State licenses when required.

102.7 IRREGULAR PROPOSALS:

Proposals will be considered irregular and may be rejected for the following reasons:

(A) If the proposal is on a form other than that furnished by the Contracting Agency; or if the form is altered or any part thereof is detached.

(B) If there are unauthorized additions, statements, conditional or alternate bids, or irregularities of any kind.

(C) If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.

(D) If the proposal does not contain a unit price for each pay item listed except in the case of authorized alternate pay items.

(E) If, when required, the bidder fails to accomplish and submit the List of Subcontractors form.

102.8 PROPOSAL GUARANTEES

No proposal will be read unless accompanied by a proposal guarantee in the proper amount and in the form provided in the proposal pamphlet. The guarantee shall be made payable and acceptable to the Contracting Agency as a guarantee that the bidder, if awarded the contract, will execute the contract documents and furnish the required bonds and certificates of insurance to be forfeited if the Contractor fails or refuses to enter into a contract as required by the bid documents.

The proposal guarantee shall be in the form of a certified check, cashier’s check, or surety bond for ten percent of the amount of the bid. The surety bond shall be executed solely by a surety company or companies holding a certificate of authority to

Transact surety business in the State of Arizona issued by the Director of the Department of Insurance. The surety bond shall not be executed by an individual surety or sureties. In addition, said company or companies shall be rated "Best A-" or better as required by the Contracting Agency, as currently listed in the most recent Best Key Guide, published by the A.M. Best Company.

102.9 SUBMISSION OF PROPOSAL:

The proposal and proposal guarantee shall be submitted in a sealed envelope. The outside, lower right-hand corner of which shall be marked as follows:

Bid of _____, Contractor
For _____
_____ Project No. _____ Contracting Agency

Envelopes shall be mailed or delivered to the office of the Contracting Agency, and must be received before the time and date specified in the Call for Bids or any Addenda.

Proposals received after the time and date specified will be returned, unopened, to the bidder.

102.10 WITHDRAWAL OR REVISION OF PROPOSAL:

Any bidder may withdraw or revise a proposal after it has been deposited with the Contracting Agency, provided his request is received by the Contracting Agency, in writing or by telegram, before the time specified for opening proposals or as stipulated herein.

102.11 PUBLIC OPENING OF PROPOSALS:

Proposals will be opened and read publicly at the time and place specified in the Call for Bids or any Addenda. Bidders, their authorized agents and other interested parties are invited to be present.

When proposals for more than one project are to be opened at the same time, any bidder may, after the time set for the opening proposals, request to withdraw his second or succeeding proposal prior to the opening of proposals for that project. Should this occur, there will be a brief delay in the opening of proposals to permit the bidder to submit his request. Upon receipt of the bidder's written request, by the Contracting Agency, his proposal will be returned unopened.

102.12 DISQUALIFICATION OF BIDDERS:

Either of the following reasons may be considered as being sufficient for the disqualification of a bidder and the rejection of his proposal:

(A) Receipt of more than one proposal for the same work from an individual, partnership or corporation under the same or different names.

(B) Evidence of collusion among bidders or assistance from any officer of the Contracting Agency, or of any Department thereof.

102.13 SUCCESSFUL BIDDERS:

Unless otherwise specified in the proposal pamphlet, the successful bidder may obtain 7 sets of plans and special provisions, for the project from the Contracting Agency, at no cost.

- End of Section -

SECTION 103

AWARD AND EXECUTION OF CONTRACT

103.1 CONSIDERATION OF PROPOSALS:

After the proposals, for the contemplated work, have been opened and read as provided in these specifications, the respective totals will be checked and compared by the Contracting Agency. The basis of comparison will be to verify the accuracy of the total proposal by checking the extensions and additions. In the event of a discrepancy, in the amount bid for a pay item, the unit bid price will govern unless obviously in error. The results of such comparison will be considered public information.

The right is reserved to award the contract to the lowest and/or best responsible bidder, or to reject all proposals and to readvertise for any reason the Contracting Agency determines.

In case all proposals are rejected, any subsequent changes, additions, addenda, or new sets of plans and special provisions will be provided to all purchasers of the first issue of the plans and special provisions at no additional charge, except that out-of-town bidders will pay shipping charges.

103.2 RETURN OF PROPOSAL GUARANTEE:

All proposal guarantees, except those of: the two lowest responsible bidders on Bond Issue and Budget Projects; the lowest responsible bidder or the lowest responsible bidders of alternative plans and specifications on Improvement District Projects, will be returned immediately following the opening and checking of proposals. The retained proposal guarantee or guarantees will be returned immediately after the contract documents have been executed by all parties.

103.3 AWARD OF CONTRACT:

The Contracting Agency, through its duly authorized body or agent will award the contract to the lowest and/or best responsible bidder, or all proposals will be rejected, as soon as practicable after the date of opening proposals.

No proposal shall be withdrawn for a period of 50 days after opening without consent of the Contracting Agency through the body or agent duly authorized to accept or reject the proposal except that in the case of Federally-assisted projects, or other projects award of which is conditioned on the approval of an agency not under the control of the Contracting Agency, withdrawal shall be made within a period of 50 days after opening without such consent.

If written notice of the acceptance of a proposal is delivered to the successful bidder within the times noted above, or at any time thereafter before such proposal has been withdrawn, the bidder shall execute and deliver a contract in the prescribed form, within 10 days after receipt of such notice or his proposal guarantee shall be forfeited as provided elsewhere herein. Concurrently with the contract, the Contractor shall submit all documentation required to enable the agency to execute the contract.

The successful bidder will be furnished a Notice of Award on:

(A) Bond Issue or Budget Projects by letter, to the address shown on the proposal.

(B) Improvement District Projects by publication in accordance with the requirements of Arizona Revised Statutes, Section 9-681.

103.4 CANCELLATION OF AWARD:

The Contracting Agency reserves the right to cancel the award of any contract at any time before the execution of said contract by all parties, without any liability against the Contracting Agency.

103.5 REQUIREMENT OF CONTRACT BONDS:

Concurrently with the submittal of the contract, the Contractor shall furnish the Contracting Agency the following bonds, which shall become binding upon the award of the contract to the Contractor.

(A) A Performance Bond in an amount equal to the full contract amount conditioned upon the faithful performance of the contract in accordance with plans, specifications and conditions thereof. Such bond shall be solely for the protection of the Contracting Agency awarding the contract.

(B) A Payment Bond in an amount equal to the full contract amount solely for the protection of claimants supplying labor or materials to the Contractor or his Subcontractors in the prosecution of the work provided for in such contract.

Each such bond shall include a provision allowing the prevailing party in a suit on such bond to recover as a part of his judgment such reasonable attorney's fees as may be fixed by a judge of the court.

Each such bond shall be executed by a surety company or companies holding a certificate of authority to transact surety business in the State of Arizona issued by the Director of the Department of Insurance. The bonds shall not be executed by an individual surety or sureties. The bonds shall be made payable and acceptable to the Contracting Agency. The bonds shall be written or countersigned by an authorized representative of the surety who is either a resident of the State of Arizona or whose principal office is maintained in this State, as by law required, and the bonds shall have attached thereto a certified copy of Power of Attorney of the signing official. In addition, said company or companies shall be rated "Best A-" or better as required by the Contracting Agency, as currently listed in the most recent Best Key Rating Guide, published by the A.M. Best Company.

103.6 CONTRACTOR'S INSURANCE:

103.6.1 General: The Contractor shall agree to carry all insurance which may be required by Federal and State Laws, County and City Ordinances, Regulations and Codes. Neither the Contractor nor any subcontractor shall commence work under a contract until the Contracting Agency has approved the insurance. The entire project covered by the contract will be at the Contractor's risk until final acceptance by the Contracting Agency.

Concurrently with the submittal of the contract, the Contractor shall furnish the Contracting Agency the following:

(A) Public Liability and Property Damage Insurance**:** The Contractor shall provide and maintain, during the life of the contract, General Liability, Automobile Liability, and Worker's Compensation Insurance as follows:

INSURANCE	**MINIMUM LIMITS OF LIABILITY**
GENERAL LIABILITY Comprehensive Form Premises/Operations Underground Explosion and Collapse Hazard Exclusions Deleted (where applicable) Products/Completed Operations Contractual Independent Contractors (OCP) Broad Form Property Damage Personal Injury with Exclusion “C” Deleted	$1,000,000 Combined Single Limit —

AUTOMOBILE LIABILITY Owned Hired Non-Owned	$1,000,000 Combined Single Limit
EXCESS LIABILITY Umbrella Form	As required
WORKER'S COMPENSATION & EMPLOYERS' LIABILITY	Statutory Limits
BUILDER RISK/COURSE OF CONSTRUCTION	As required

The Contracting Agency shall have no responsibility or liability for such insurance coverage.

The Contractor shall furnish a Certificate of Insurance on a form approved by the Contracting Agency. The Certificate shall be issued by an insurance company authorized to transact business in the State of Arizona, or be named on the list of Unauthorized Insurers maintained by the Arizona Department of Insurance. Insurance coverage shall not expire until all the work has been completed and the project has been accepted by the Contracting Agency. If an insurance policy does expire during the life of the contract, the Contractor shall provide a renewal certificate of the required insurance coverage to the Contracting Agency not less than thirty (30) days prior to the expiration date.

(B) Worker's Compensation and Employer's Liability**:** A Letter of Certification, from the Industrial Commission of Arizona, that the Contractor is insured by the State Compensation Fund or is an authorized self-insurer or a Certificate of Insurance issued by an insurance company authorized by the Arizona Department of Insurance to provide Workmen's Compensation and Employer's Liability Insurance in the State of Arizona.

(C) Builders Risk/Course of Construction: When the project includes construction of a new building or addition to an existing building, the Contractor shall also obtain insurance coverage for at least, as a minimum, the perils of fire, extended coverage, vandalism and malicious mischief for the full amount of the contract. The Contractor shall be responsible for any deductibles, mutual waiver of subrogation and any co-insurance for the construction that is the subject of this contract.

(D) Additional Insured: The Contracting Agency, its officers, agents and employees shall be named as insurers on policies listed in (A) and (C) and this shall also be indicated on the Certificates of Insurance issued to the Contracting Agency. The Contractor's coverage shall be primary for any and all losses arising out of the performance of this contract.

(E) Owner Protective Policy: In addition to other insurance the Contractor is required herein to provide and maintain in its own name, the Contractor shall also provide and maintain a separate policy of insurance, at its sole cost and expense, naming the Contracting Agency as the insured and providing primary coverage for the Contracting Agency in an amount not less than One Million Dollars, or other minimum amount determined by the Agency, for personal injury or death, per person and per occurrence, and not less than $500,000 for property damage for any damage or injury suffered as a result of any work performed by Contractor or its employees, representatives, contractors or subcontractors in connection with the Project or Permit. Such policy shall also provide the Contracting Agency coverage, in the amounts specified above, for any and all damages or injury suffered as a result of alleged acts or omissions of the Contracting Agency in connection with, directly or indirectly, the Project or Permit. Such policy shall be primary and not contributory to any insurance maintained by the Contracting Agency. The insurance company writing such policy must have a BEST rating of not less than “A-” and be licensed by the Arizona Department of Insurance to do business in the State of Arizona. The form of the policy must be approved by the Contracting Agency before the notice to proceed will be issued.

103.6.2 Indemnification of the Contracting Agency Against Liability: To the fullest extent permitted by law, the Contractor, its successors, assigns and guarantors, shall pay, defend, indemnify and hold harmless the Agency, its agents, representatives, officers, directors, officials and employees from and against all allegations, demands, proceedings, suits, actions, claims, damages, losses, expenses, including but not limited to, attorney fees, court costs, and the cost of appellate proceedings, all claim adjusting and handling expense, related to, arising from or out of or resulting from any actions, acts, errors, mistakes or omissions caused in whole or part by the Contractor relating to work or services in the performance of the

Contract, including but not limited to, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable and any injury or damages claimed by any of the Contractor's and Subcontractor's employees.

103.7 EXECUTION AND APPROVAL OF CONTRACT:

The Contractor shall execute the contract with the Contracting Agency as follows:

(A) Bond Issue or Budget Projects within 10 calendar days after the date of Notice of Award of contract from the Contracting Agency.

(B) Improvement District Projects, not less than 15 or more than 20 calendar days after the date of the first publication of Notice of Award, if no objections have been filed.

The Contracting Agency will approve and execute the contract within 10 calendar days following receipt of signed contract and acceptable bonds and certificates of insurance.

No contract shall be considered in effect until it has been fully executed by all parties concerned.

Information relative to the execution of contract documents may be obtained from the Engineering Office of the Contracting Agency advertising for bids.

103.8 FORFEITURE OF PROPOSAL GUARANTEES:

If the Contractor fails or refuses to enter into the contract, within the time stated, then the Contracting Agency may declare a forfeiture of his proposal guarantee as liquidated damages for failure to enter into the contract.

- End of Section -

SECTION 104

SCOPE OF WORK

104.1 WORK TO BE DONE:

104.1.1 General: The Contractor shall perform all work as may be necessary to complete the contract in a satisfactory and acceptable manner in full compliance with the plans, specifications and terms of the contract.

In the event a conflict exists between Contract Documents the order of precedence listed in descending order shall be as follows:

Change Orders
Addenda
Special Provisions
Project Plans
Contracting Agency's supplements to the MAG Uniform Standard Specifications and Details
MAG Uniform Standard Specifications
MAG Standard Details

Unless otherwise specified in the special provisions, The Contractor shall furnish all labor, materials, equipment, transportation, utilities, services and facilities required to perform all work for the construction of the project within the time specified.

104.1.2 Maintenance of Traffic: The Contractor's operations shall be in accordance with the traffic manual and/or policies of the appropriate public agency having jurisdiction over the project and Section 401. These operations shall cause no unnecessary inconvenience to the public and public access rights shall be considered at all times. Unless otherwise authorized in the specifications or on a temporary basis by the Engineer, traffic shall be permitted to pass through the work area. The Contractor shall coordinate with the various agencies both commercial and public, involved in the collection and removal of trash and garbage, so that adequate services are maintained.

Safe and adequate pedestrian and vehicular access shall be provided and maintained to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, motel, hospitals, fire stations, police stations, and establishments of a similar nature. Access to residential properties shall be in accordance with Section 107.

Grading operations, roadway excavation and fill construction shall be conducted and maintained in such a manner as to provide a reasonably satisfactory and safe surface for vehicular and pedestrian traffic. When rough grading is completed, the roadbed shall be brought to and maintained in a reasonably smooth condition, satisfactory and safe for vehicular traffic at the posted speed limit. Pedestrian walkways shall be provided and maintained in a like manner. The Contractor shall accomplish any additional grading operations and/or repairs, including barricade replacement or repairs during working and nonworking periods which, in the opinion of the Engineer, are required.

In the event of abnormal weather conditions, such as windstorms, rainstorms, etc., the Contractor shall immediately inspect his work area and take all necessary actions to insure that public access and safety are maintained.

The Contractor shall provide the Engineer with the emergency address of his representatives as required by Section 105.

104.1.3 Water Supply:

Water shall consist of providing a water supply sufficient for the needs of the project and the hauling and applying of all water required.

The Contractor shall make arrangements for and provide all necessary water for his construction operation and domestic use at his own expense.

If the Contractor purchases water from a water utility at a fire hydrant on or near the project, all arrangements shall be made by him at his own expense and payment made direct to the water utility as agreed upon.

The Contractor shall use only those hydrants designated by the water utility in charge of water distribution and in strict accordance with its requirements for hydrant use.

The Contractor shall furnish all connections, wrenches, valves and small tools that may be necessary to meet the requirements of the water utility pertaining to hydrant use.

The tank truck and/or trailer shall meet all safety and licensing regulations and the water shall be applied by sprinkling with tank trucks equipped with spray bars and suitable apparatus.

No measurement will be made of water, unless otherwise provided for in the special provisions or proposal.

The cost of watering will be included in the proposal price for the construction operation to which such watering is incidental or appurtenant.

104.1.4 Cleanup and Dust Control: Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work area clean and free from rubbish, excess materials and debris generated by Construction Activities.

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At disposal sites and storage sites, other than agency landfills, the Contractor shall be responsible for all required dust control measures. This includes temporary yard or staging areas.

The Contractor shall take whatever steps, procedures or means required preventing any dust nuisance due to his construction operations. The dust control measures shall be maintained at all times to the satisfaction of the Engineer and in accordance with the requirements of the Maricopa County Bureau of Air Pollution Control Rules and Regulations.

Failure of the Contractor to comply with the Engineer's cleanup orders may result in an order to suspend work until the condition is corrected. No additional compensation or time will be allowed as a result of such suspension and the Engineer has the authority to take such other measures as may be necessary to remedy the situation. Subsection 104.2.5 applies.

104.1.5 Final Cleaning Up: Before final acceptance, all private or public property and grounds occupied by the Contractor in connection with the work shall be cleaned of all rubbish, excess materials, temporary structures and equipment, and all parts of the work area shall be left in an acceptable condition.

104.2 ALTERATION OF WORK:

***104.2.1 By the Contracting Agency:** The Contracting Agency reserves the right to make, at any time during the progress of the work, such alterations in the details of construction and such increases or decreases in quantities as may be found necessary or desirable. Such alterations and changes shall not invalidate the contract nor release the surety and the Contractor agrees to perform the work as altered, the same as if it had been a part of the original contract. The Engineer will issue Change Orders to cover unforeseen circumstances which make it impossible to carry out the work in accordance with the original contract plans and specifications.

If the alterations or changes made by the Contracting Agency increases or decreases the total cost of the contract or the total cost of any major item by more than 20 percent, either party may request an adjustment in payment in accordance with Section 109.

104.2.2 Due to Physical Conditions:

***(A) Should the Contractor encounter or discover during the process of the work, subsurface or latent physical conditions at the site differing materially from those indicated in the contract, or unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract, the Engineer shall be promptly notified in writing of such conditions before they are disturbed. The Engineer will thereupon promptly investigate the conditions and, if he finds they do so materially differ and cause an increase or decrease

*Not applicable to Improvement District Projects.

in the cost of or the time required for performance of the contract, an equitable adjustment will be made and the contract modified in writing accordingly.

*****(B) If at the time of opening up any portion of the work, material from which the subgrade, backfill or bedding is to be constructed contains an excess of moisture so that the required compaction cannot be obtained without additional manipulation, the Engineer will determine the cause of such condition. If the cause of such condition is determined to have been unforeseeable and beyond the control of and without fault or negligence of the Contractor, the Engineer will determine whether the material shall be aerated or removed and replaced. Such work shall be done as directed and will be paid for as provided in Section 109.

*****(C) Failure to notify the Engineer of the conditions described in A and B above prior to doing any work may be just cause to reject any claims for additional monies and/or time.

*****(D) Material in ditches and ditch banks that contains moisture in an amount considered excessive by the Engineer shall be removed and shall be aerated to the extent required by the Engineer before compaction is affected. No measurement or direct payment for the removal and aeration of such material will be made.

*****(E)After any portion of the work has been opened up, saturation of material caused by irrigation water, storm drainage, weather or such similar causes will be considered as within the responsibility of the Contractor.

***104.2.3 Due to Extra Work:** The Contractor shall perform unforeseen work, for which there is no unit bid price in the proposal, whenever it is deemed necessary or desirable by the Engineer in order to fully complete the work as contemplated. Such work shall be governed by all applicable provisions of the contract documents and payment will be made in accordance with the provisions set forth in Section 109.

Should the Contractor claim that any instructions received involve extra work under the contract, he shall give the Engineer written notice within two work days after receipt of such instructions, and in any event before proceeding to execute the work, except in emergencies endangering life or property. No claim shall be valid unless written notice is given.

If this extra work is performed by others, the Contractor agrees to cooperate fully with the other source accomplishing this work and agrees that this action shall not invalidate the Contract or release the surety.

104.2.4 At the Contractor's Request: Changes in the plans or specifications, which do not materially affect and are not detrimental to the work or to the interests of the Contracting Agency, may be granted to facilitate the work. Requests shall be in writing and submitted to the Engineer for approval. These changes, if approved and when resulting in a saving to the Contractor, will be made at an equitable reduction in cost or in no case at any additional cost to the Contracting Agency.

104.2.5 Due to the Failure of the Contractor to Properly Maintain the Project:

(A) If the Contractor fails to provide adequate Maintenance of Traffic or Cleanup and Dust Control or to correct deficiencies resulting from abnormal weather conditions, the Engineer has the authority to suspend the work wholly or in part until this condition has been corrected.

(B) If the Contractor fails to comply with the Engineer's written order to provide adequate maintenance of traffic, cleanup, dust control, or to correct deficiencies resulting from abnormal weather conditions, the Engineer has the authority to have this work accomplished by other sources.

(C) The Contractor agrees to cooperate fully with the other source accomplishing this work and agrees that this action shall not invalidate the Contract or release the surety.

- End of Section -

*Not applicable to Improvement District Projects.

SECTION 105

CONTROL OF WORK

105.1 AUTHORITY OF THE ENGINEER:

The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; all questions which may arise as to the interpretation of the plans and specifications; all questions as to the acceptable fulfillment of the contract on the part of the Contractor. The Engineer's estimates and decisions shall be final and conclusive. In case any question should arise, relative to the Contract Documents, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive final approval of the work being questioned under the contract.

In giving instructions, the Engineer may make minor changes in the work, not involving extra work and not inconsistent with the purpose of the work, except in emergencies endangering life or property.

The Engineer will suspend the work wholly or in part due to the failure of the Contractor; to correct conditions unsafe for the workmen or the general public; for failure to carry out provisions of the contract; for failure to carry out orders; for such periods as he may deem necessary due to unsuitable weather; for conditions considered unsuitable for the prosecution of the work or for any other condition or reason deemed to be in the public interest.

105.2 PLANS AND SHOP DRAWINGS:

The Contractor shall submit, for review, a proposed schedule of shop drawings and product data submittals. This schedule will include concrete and asphalt concrete mix designs unless they are previously approved supplier's mix design. The schedule will show the needed response date for each submittal and will indicate the relationship of the submittal to the project construction schedule.

Shop drawings for major temporary support structures such as falsework, shoring, soldier piles, and other major temporary structures that facilitate construction shall be prepared by and bear the seal and signature of a Professional Engineer. Temporary support structures for Minor Structures as defined in Section 505.1.1 are exempt from this requirement.

The Contractor shall submit five (5) copies of each shop drawing, product data or mix design to the Engineer for review. Each submittal shall be numbered sequentially and shall be submitted in accordance with the schedule established in conjunction with the Contracting Agency so as to cause no delay in the work schedule. The Contractor shall certify, by stamp or letter, that he has reviewed and approved the submittal and that it conforms to the requirements of the contract documents. If this certification is not included, the submittal will be returned without action.

At the time of each submittal, the Contractor shall define and delineate in writing, separate from the certification, any deviations from the contract documents. If the Engineer accepts this deviation, he will authorize the deviation by issuing a change order or if the deviation is minor by endorsement to the letter.

The Engineer will review and return the submittals in accordance with the previously established response date. The review will be only for conformance with the design concept of the work and for compliance with the information contained in the contract documents. The review of a specified item, as such, will not indicate review of the assembly in which the item functions. Review by the Engineer will not relieve the Contractor from responsibility for any errors or omissions in the submittals nor from his responsibility for complying with the contract documents. The only exception is deviations accepted in accordance with the preceding paragraph.

If the submittal is acceptable, one (1) copy with each page stamped “Furnish as Submitted” will be returned to the Contractor. The Contractor shall submit additional copies (as required) to the Engineer.

If the Engineer determines that the submittal requires corrections or is to be rejected, one (1) copy stamped “Furnish as Noted” or “Revise and Resubmit” will be returned to the Contractor. The Contractor will submit five (5) corrected or new copies.

The copy stamped “Furnish as Submitted,” returned to the Contractor, will become a part of the contract documents and will be kept at the job site. Any work done prior to the receipt of this review will be at the Contractor's risk and expense.

SECTION 105

105.3 CONFORMITY WITH PLANS AND SPECIFICATIONS:

All work performed and all materials furnished shall be in conformity with the lines, elevations, grades, cross-sections, dimensions and material requirements, including tolerances, shown on the plans or indicated in the specifications.

In the event the Engineer finds the materials or the finished product in which the materials are used not in conformity with the plans and specifications, but that reasonably acceptable work has been produced, he shall then make a determination if the work shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modification which will provide for an appropriate adjustment in the contract price for such work or materials as he deems necessary to conform to his determination based on engineering judgment.

In the event the Engineer finds the materials or the finished product in which the materials are used or the work performed are not in conformity with the plans and specifications and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by the Contractor at no additional cost to the Contracting Agency.

In all instances wherein the items and/or specifications require installation or construction in accordance with either manufacturers' or suppliers' recommendations and/or instructions, said recommendations and/or instructions shall be submitted with the applicable portion clearly marked for approval prior to the commencement of work on that item or portions of the contract.

105.4 COORDINATION OF PLANS AND SPECIFICATIONS:

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall immediately notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

105.5 COOPERATION OF CONTRACTOR:

The Contractor will be supplied with a minimum of seven sets of approved plans and special provisions, one set of which the Contractor shall keep available on the work site at all times.

The Contractor shall give the work the constant attention necessary to facilitate the progress thereof, and shall cooperate with the Engineer, his inspectors, and other Contractors in every way possible.

The Contractor shall at all times be present at the work in person or represented by a competent superintendent. The superintendent shall be authorized to receive and fulfill instructions from the Engineer and who shall supervise and direct the work. No less than fourteen days prior to the scheduled/planned Notice to Proceed, the Contractor shall submit to the Engineer for review and approval, the name and qualifications of the proposed superintendent. When the superintendent is approved, he shall not be changed by the Contractor without written approval of the Engineer. Instructions and information given by the Engineer to the Contractor’s superintendent shall be considered as having been given to the Contractor.

(A) All phases of the project such as concrete work, pipe work, etc., shall be under the direct supervision of a foreman or his designated representative on the site who shall have authority to accept instructions, with respect to that particular phase of the project, and take action required to properly carry out the work.

(B) In the event of noncompliance with the above, the Engineer may require the Contractor to stop work on that part of the project until the required supervision is present.

The Contractor shall file with the Engineer, the names, addresses, and telephone numbers of representatives who can be contacted, at any time, in case of emergency. These representatives must be fully authorized and equipped to correct unsafe or excessively inconvenient conditions on short notice.

Emergencies may arise during the progress of the work which may require special effort or require extra shifts of men to continue the work beyond normal working hours. The Contractor shall be prepared in case of such emergencies from whatever cause, to do all necessary work promptly.

105.6 COOPERATION WITH UTILITIES:

The Contracting Agency will notify all utility companies, all pipe line owners, or other parties affected, and endeavor to have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction, made as soon as practicable.

The Contractor shall comply with the requirements of Arizona Revised Statutes-40-360.21 through 40-360.29 (one call system, Blue Stake) in notification to the interested utility owners prior to start of construction. The Contractor shall resolve all problems with the utility owners concerned.

Where water user's association facilities obstruct construction of the work, the Contractor shall contact officials of the association relative to the shutdown of irrigation water and shall acquaint himself with and conform to the requirements of the association.

Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners at their expense except as otherwise provided for in the special provisions or as noted on the plans. In the event an existing service is found to be in a materially different location than shown on the plans and requires additional or more costly work on the part of the Contractor, the procedures in Section 104, will apply.

It is understood and agreed that the Contractor has considered in his proposal all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him due to any interference from the said utility appurtenance or the operation of moving them. If delays are encountered because utility owners have not relocated or adjusted their facilities, the contract time will be adjusted in accordance with Section 108.

It shall be the responsibility of the Contractor to ascertain the need for bracing or shoring of utility poles during the construction of the project and no additional compensation will be allowed for such bracing or shoring.

In general, the contract will indicate various utility items, certain of which are to be relocated or adjusted by the utility owner and others by the Contractor. Any work performed by the Contractor for any utility company, separate from the contract shall be paid for by the utility company and will not be a part of the agency contract.

105.6.1 Notifications Requirement in the Event of Any Damage to or Dislocation of Underground Facilities: In the event of any damage to or dislocation of any underground facility, the Contractor responsible for the excavation operation shall immediately notify the owner of such facility and shall not attempt to repair any facility, except those intended for the conveyance or storage of water and sewage. The excavation shall be left open until the arrival of representatives of the owner. The owner will dispatch its representative promptly to examine the underground facility and, if necessary, make repairs.

105.6.2 Work Within a Railroad Right of Way: When a railroad right of way is included in the work, the Contractor shall:

(A) Comply with the rules and regulations of the railroad company relative to the required manner of constructing said portion of the work; and shall perform the work so as not to endanger or interfere with the safe operation of the track(s) and property of the railroad company and of the traffic moving on such track(s).

(B) Carry the kinds and amounts of insurance and bonds required by the railroad company for the period of time in which work is performed on or adjacent to the railroad company's property, and until such work has been satisfactorily completed and all tools, equipment and materials have been removed from the railroad company's property and such property is left in a clean and presentable condition.

(C) Contact the railroad company at least 48 hours in advance of performing any construction within the right of way of any track(s).

105.7 COOPERATION BETWEEN CONTRACTORS:

The Contracting Agency reserves the right at any time to contract for and perform other or additional work on or near the work covered by the contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct his work so as not to interfere with or hinder the progress or completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his contract and shall protect and save harmless the Contracting Agency from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by him because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange his work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. He shall join his work with that of others in an acceptable manner and shall perform it in proper sequence to that of the others.

The Contracting Agency will not honor any claim for extra compensation due to delays, extra work, or extension of time caused by any other Contractors working within the limits of the same project.

105.8 CONSTRUCTION STAKES, LINES AND GRADES:

The Engineer will set construction stakes establishing lines and grades for road work, curbs, gutters, sidewalks, structures and centerlines for utilities and necessary appurtenances as he may deem necessary, he will furnish the Contractor with all necessary information relating to the lines and grades. These stakes and marks shall constitute the field control by and in accordance with which the Contractor shall establish other necessary controls and perform the work.

The Contractor shall perform the work in accordance with the Engineer's stakes and marks, and shall be charged with full responsibility for conformity and agreement of the work with such stakes and marks.

The Contractor shall be held responsible for the preservation of all stakes and marks, and if the construction stakes or marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost for replacing them will be charged against him and will be deducted from the payment for the work.

The Contractor shall give notice to the Engineer not less than two working days in advance of when he will require survey services in connection with any portion of the work.

The Contractor shall set the construction stakes for buildings establishing lines, grades, and elevations to include necessary utilities and appurtenances and shall be responsible for their conformance with plans and specifications. The Engineer will establish or designate a control line or bench mark of known location and elevation for use as a reference.

105.9 DUTIES OF INSPECTOR:

The Engineer may provide the Inspector, assistants, and other field staff to assist the Engineer in observing performance of the work of the Contractor. Through onsite observations of the work in progress and field checks of materials and equipment, the Inspector shall endeavor to provide further protection for the Contracting Agency against defects and deficiencies in the work of the Contractor; but, the furnishing of such services will not make the Inspector responsible for or give the Inspector control over construction means, methods, techniques, sequences, or procedures or for safety precautions or programs, or responsibility for the Contractor's failure to perform the work in accordance with the contract documents.

Inspectors employed by the Contracting Agency will be authorized to inspect all work done and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication or manufacture of the materials to be used. The inspector will not be authorized to alter or waive the provisions of the contract. The inspector will not be authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

The inspector will, however, have the authority to reject work or materials until any questions at issue can be referred to and decided by the Engineer.

105.10 INSPECTION OF WORK:

Inspection of the work by the Engineer or his authorized representative shall not be considered as direct control of the individual workman and his work. The direct control shall be solely the responsibility of the Contractor's foreman and superintendent.

The Engineer shall be permitted to inspect all materials, and each part or detail of the work at any time for the purpose of expediting and facilitating the progress of the work. He shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

Any work done or materials used without supervision and inspection by an authorized Contracting Agency representative may be ordered removed and replaced at no additional cost to the Contracting Agency. Failure to reject any defective work or materials shall not in any way prevent later rejection when such defect is discovered nor obligate the Engineer to final acceptance.

When any unit of government or political subdivision is to pay a portion of the cost of the work covered by the contract, its representatives shall have the right to inspect the work. Such inspection shall in no sense make any unit of government or political subdivision a party to the contract, and shall in no way interfere with the rights of either party to the contract.

105.11 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK:

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner.

No work shall be done without lines and grades having been given by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans, or as given, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at no additional cost to the Contracting Agency.

105.12 MAINTENANCE DURING CONSTRUCTION:

The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end so that the roadway or structures are kept in satisfactory conditions at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations. All cost of maintenance work during construction and before the project is accepted shall be included in the unit bid price on the various pay items.

105.13 FAILURE TO MAINTAIN ROADWAY OR STRUCTURE:

If the Contractor, at any time, fails to perform maintenance during construction, the Engineer will immediately notify the Contractor of such noncompliance. If the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the Engineer may immediately proceed to maintain the project. The entire cost of this maintenance will be deducted from monies due or to become due the Contractor on his contract.

105.14 PARTIAL USE OR OCCUPANCY:

Should an urgent or unforeseen need occur, the Contractor agrees to let the Contracting Agency use or occupy a unit or portion of the project, such as a structure, utility service, or a section of road or pavement, prior to final acceptance.

Prior to such use or occupancy the Contracting Agency will prepare a written agreement with the Contractor and accomplish a partial acceptance inspection. The written agreement will include a revised construction schedule, responsibilities for maintenance of the partial acceptance and continued construction of the original project to final acceptance, payments, insurance and bond requirements.

105.15 ACCEPTANCE:

(A) Partial Acceptance: If at any time during the prosecution of the project the Contractor substantially completes a unit or portion of the project, such as a structure, utility service, or a section of road or pavement, he may request the Engineer to make final inspection of that work. If the Engineer finds, upon inspection, that the work has been satisfactorily completed in compliance with the contract he may accept the work as being completed and the Contractor may be relieved of further responsibility for that work. Such partial acceptance shall in no way void or alter any terms of the contract.

(B) Final Acceptance: Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer will make an inspection. If all construction provided for and contemplated by the contract is found completed to his satisfaction, the inspection shall constitute the final inspection and the Engineer will make the final acceptance. The Contractor will be notified in writing of this acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection.

- End of Section -

SECTION 106

CONTROL OF MATERIALS

106.1 SOURCE OF MATERIALS AND QUALITY:

All construction materials to be used on the work or incorporated into the work, equipment, plant, tools, appliances or methods to be used on the work shall be subject to the inspection and approval or rejection of the Engineer.

The materials used on the work shall meet all quality requirements of the contract. In order to expedite the inspection and testing of materials, the Contractor shall notify the Engineer of his proposed source of materials prior to delivery. At the option of the Engineer, materials may be approved at the source of supply before delivery is started. If it is found after trial that sources of supply for previously approved materials do not produce specified products the Contractor shall furnish materials from other sources.

Unless otherwise noted, all materials used in the project shall be new and unused. Additionally, any new materials used in this project that are damaged during the construction of the project and prior to final acceptance, as determined by the Engineer, shall be replaced by the Contractor with new material at no additional cost to the Contracting Agency.

106.2 SAMPLES AND TESTS OF MATERIALS:

All materials to be incorporated in the work may be subject to sampling, testing and approval, and samples furnished shall be representative of the materials to be used. The Engineer may select samples, or may require that samples be delivered by the Contractor to a laboratory designated by the Engineer.

The Contracting Agency will pay for the initial or normal test required by the Engineer to guard against unsuitable materials or defective workmanship. Additional tests, required due to failure of the initial or normal test(s), shall be paid for by the Contractor. The Engineer will designate the laboratory which will accomplish the additional test(s).

The procedures and methods used to sample and test materials will be determined by the Engineer. Unless otherwise specified, samples and tests will be made in accordance with either: the Materials Testing Manual of the Contracting Agency; the standard methods of AASHTO or ASTM, which were in effect and published at the time of advertising for bids.

The laboratory responsible for the test shall furnish at least one copy of the test results to the Contracting Agency or his designated representative, to the Contractor, and to the appropriate material supplier.

With respect to certain manufactured materials, the Engineer may permit the use of some materials prior to sampling and testing provided they are delivered with either a certificate of compliance or analysis or both, stating that the materials comply in all respects with the requirements of the specifications. These certificates shall be furnished in triplicate and clearly identify each delivery of materials to the work area. The certificates shall be signed by a person having legal authority to bind the supplier or manufacturer.

106.3 PLANT INSPECTION:

The Engineer may undertake the inspection of materials at the source. In this event, the following conditions shall be met:

(A) The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

(B) The Engineer shall have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials being furnished.

It is understood that the Contracting Agency reserves the right to retest all materials, prior to their use in the work, upon delivery.

106.4 TRADE NAMES AND SUBSTITUTIONS:

Plans and specifications may contain references to equipment, materials or patented processes by manufacturer, trade name, make or catalog number. Unless the name is followed by words indicating that no substitution is permitted, such references shall be regarded as establishing a standard of quality, finish, appearance, performance or, as indicated, a selection based upon compatibility with existing equipment or materials.

The use of an alternate or substitute item or source may be permitted, subject to the following:

(A) No consideration will be given to a substitution prior to the award of the contract.

(B) Only substitutions submitted by the Contractor will be accepted for review. The substitution shall be submitted in writing to the Engineer.

(C) The submittal shall certify that the substitution will perform the functions and achieve the results called for by the general design, be similar and of equal substance, and be suited to the same use as that specified.

(D) The submittal shall state any required changes in the contract documents to adapt the design to the proposed substitution. This will include all changes required of other contractors/subcontractors affected by the resulting changes.

(E) The submittal shall contain an itemized estimate of all costs and credits that will result directly or indirectly from the acceptance of such substitution, including costs of design, license fees, royalties, testing, Engineer's evaluation, claims of other contractors/subcontractors, etc. Also, the submittal shall include any adjustment in the contract time created by the substitution.

(F) The Contractor, on request of the Engineer, shall submit samples or any additional information the Engineer may deem necessary to evaluate the acceptability of the substitution. The Engineer will evaluate the information provided, perform tests when necessary and make comparisons. The Engineer will then make the final decision as to the acceptability of the proposed substitution. The Contractor will be notified in writing by the Engineer as to whether his substitution has been accepted or rejected.

(G) The submittal, for purposes of review, number of copies, etc., shall follow the procedures as outlined in Section 105.2, except in the case of response time. If the Engineer does not respond in a timely manner, which in turn, impacts the substitution, the Contractor shall continue to perform the work in accordance with the contract and the substitution will be considered rejected. Also, no adjustment in the contract time will be granted for nonacceptance of the substitution.

(H) There will be no additional costs to the Contracting Agency for the substitution. If the substitution yields a net savings in the contract price, the amount of savings shall be divided between the Contracting Agency and the Contractor in a percentage established by the Contracting Agency.

(I) If the substitution is accepted and an adjustment in the contract cost and/or contract time is in order, a change order will be issued to the Contractor for the changes.

106.5 STORAGE OF MATERIALS:

The Contractor shall provide storage facilities and exercise such measures as will insure the preservation of the quality and fitness of all materials and/or equipment to be used in the work. Stored materials and/or equipment, even though approved before storage, may again be inspected prior to their use in the work. Stored items shall be located so as to facilitate their prompt inspection. That portion of the right-of-way and easements not required for public travel may be used for storage purposes, when approved by the Engineer. Any additional storage area as required must be provided by the Contractor. Private property shall not be used for storage purposes without written permission of the owner or lessee. If requested, by the Engineer, copies of such written permission shall be made available.

106.6 HANDLING MATERIALS:

All materials and/or equipment shall be handled in such a manner as to preserve their quality and fitness for the work.

106.7 UNACCEPTABLE MATERIALS:

All materials and/or equipment not conforming to the requirements of the specifications, whether in place or not, may be rejected. Rejected materials and/or equipment shall be removed immediately from the site of work unless otherwise permitted by the Engineer. No rejected material and/or equipment, the defects of which have been subsequently corrected, shall be used until approved in writing by the Engineer.

106.8 FURNISHED MATERIALS:

Materials and/or equipment, furnished by the Contracting Agency, will be delivered or made available to the Contractor as indicated in the special provisions. The cost of handling and placing shall be considered as included in the contract price for the pay item with which they are used.

The Contractor will be held responsible for all materials and/or equipment accepted by him and will make good any shortages, deficiencies and damages which may occur after such acceptance.

- End of Section -

SECTION 107

LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

107.1 COMPLIANCE WITH LAWS:

The Contractor shall keep fully informed of, observe and comply with all Federal and State laws, County and City ordinances, regulations, codes and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any way affect the conduct of the work. The Contractor warrants that all items supplied and work performed under the contract have been sold, produced, delivered and furnished in strict compliance with all such laws, ordinances, regulations, codes, orders and decrees to which the items, work and Contractor are subject. Upon request, Contractor shall execute and deliver to the Agency such documents as may be required by the Agency to evidence compliance with such laws, ordinances, regulations, codes, orders and decrees. The Contractor shall protect and indemnify the Contracting Agency and its representatives against any claim or liability arising from or based on the violation of such, whether by the Contractor or the Contractor's employees.

107.2 PERMITS:

Permits, bonding and insurance requirements shall be as required by statutes, codes, ordinances or regulations.

The Public Agency, when acting as the Contracting Agency, may obtain some of the required permits. It is the duty of the Contractor to determine that all necessary permits have been obtained. The Contractor shall, at the Contractor's own expense, obtain all the required permits which have not been furnished. The Contractor shall comply with all permit requirements until the Contract is completed or the permit is closed-out or transferred. The Contractor shall be responsible to close out all permits except those authorized by special provision to be transferred.

In all cases, the Contractor or the person supervising the authorized work shall notify the appropriate permit agency so as to insure proper inspection by the agency concerned.

107.3 PATENTED DEVICES, MATERIALS AND PROCESSES:

If the Contractor employees any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the surety shall indemnify and save harmless the Contracting Agency, any affected third party or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Contracting Agency for any costs, expenses, and damages which it may be obligated to pay by reason of any infringement, at any time during the prosecution or after the completion of the work.

107.4 ARCHAEOLOGICAL REPORTS:

Attention is directed to Sections 41-844 and 41-865 Arizona Revised Statues. In view of the above, it shall be a provision of every contract that when archaeological features are encountered or unearthed in the excavation of material pits or of the roadway prism, or other excavation, the Contractor shall report promptly to the Director of the Arizona State Museum and the Contracting Agency. The Contractor will be allowed extra time as appropriate in accordance with the provisions of Section 108.

107.5 SAFETY, HEALTH AND SANITATION PROVISIONS:

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Arizona State Department of Health or as specified by the Maricopa County Health Department, Sanitary Code.

The Contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on his own responsibility or as the Engineer may determine, reasonably necessary to protect the life and the health of employees on the job, the safety of the public and to protect property in connection with the performance of the work covered by the contract.

Precaution shall be exercised by the Contractor at all times for the protection of persons (including employees) and property. The Contractor shall comply with the provisions of all applicable laws, pertaining to such protection including all Federal and State occupational safety and health acts, and standards and regulations promulgated there under.

107.5.1 Asbestos Materials: If asbestos materials are encountered during any building remodeling/demolition work, the Contractor shall comply fully with the Arizona Administrative Code, A.A.C. R18-2-901 and notify the Engineer. An extension of contract time will be granted for any delay resulting from the asbestos material in accordance with Section 108.

107.5.2 Lead-Containing Paint: Paint and similar surface coating materials that contain lead compounds and in which the lead content exceeds 0.06 percent of the total weight of the non-volatile content of the paint or the weight of the dried paint film is declared a banned hazardous product and will not be used (Consumer Product Safety Act Part 1303 dated 9-1-77).

107.6 PUBLIC CONVENIENCE AND SAFETY:

The Contractor shall at all times so conduct his work as to assure the least possible obstruction to traffic and adjacent residents. The safety, convenience, and the protection of persons and property, of the general public and residents along the street, highway, and areas adjacent to the work area shall be provided for by the Contractor.

107.6.1 Contractor's Marshaling Yard: If the Contractor or his subcontractor utilizes property outside the limits of the project in the performance of the contract, the Contractor/subcontractor shall comply with the following:

107.6.1.1 Contractor's Marshaling Yard when the Agency is the Contracting Party:

(A) Prior to occupying the property, the Contractor shall provide written notification as to the number and location of all properties to be used. The notification shall specify in detail how the Contractor proposes to use each property and how he proposes to comply with (B) through (D) below. Also, the Contractor shall provide a statement, signed by the property owner(s), which gives the Contractor permission to use the property.

(B) The property(s) shall be adequately maintained to control dust, mud, trash and other pollutants from leaving the property.

(C) Work on the property(s) shall be scheduled so as to comply with the Agency Noise Ordinance.

(D) Use of the property(s) such as location of stored materials, service of equipment, etc., shall be conducted to minimize impact on adjacent properties.

(E) The Contractor shall leave the property in a condition, as determined by the Engineer, equivalent to that which existed prior to entry. In no case shall any use cause, or allow to remain, any negative impact to adjoining properties or right-of-way unless such impact existed prior to the Contractors' use.

(F) The Contractor shall obtain a written release signed and dated from each property owner after completion of use. Each release shall state that, at the time of signing, the owner accepts the property in its present condition from the Contractor and relieves the Contractor and the Agency from any or all claims for the use or damage to said property. A copy of each release shall be submitted to the Engineer.

(G) This Subsection also applies to all levels of subcontractors who will need to obtain marshaling yards for the project, which will be separate from that of the Contractor. It will be the responsibility of the Contractor to obtain copies of the various documents from the subcontractors, as required above, and provide them to the Engineer.

107.6.1.2 Contractor's Marshaling Yard when the Agency is not the Contracting Party (private development, utility work, subdivision construction, etc): All conditions will apply as in Subsection 107.6.1.1 except that the permit holder will be responsible for obtaining all documents. The permit holder will retain the documents and make them available to the Agency upon request.

107.6.2 The Contractor shall comply with the Agency Code concerning work hours and noise level during construction.

107.7 BARRICADES AND WARNING SIGNS:

The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs

and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public. Roads, partially or fully closed to traffic, shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness. Suitable warning signs shall be provided to properly control and direct traffic.

The Contractor shall erect warning signs in advance of any place on the project where operations may interfere with the use of the road by traffic, and at all intermediate points where the new work crosses or coincides with an existing road. Such warning signs shall be constructed and erected in accordance with the Traffic Barricade Manual prepared or adopted by the Contacting Agency's Traffic Engineering Department which is hereby made a part of these specifications.

107.8 USE OF EXPLOSIVES:

The use of explosives or blasting agents is controlled by the Uniform Fire Code, which is generally administered by the Fire Department of the Agency. The Contractor shall obtain a special permit from the Agency's Fire Department for the use of explosives. A copy of this permit shall be delivered to the Engineer prior to the use of explosives. If the Agency does not use the Uniform Fire Code or have a department for enforcement of this Code, the Contractor shall use explosives only when authorized in writing by the Engineer. The approval by the Engineer for the use of explosives shall not relieve the Contractor from his responsibilities for proper use and handling of the explosives or for any and all damages resulting from their use.

Explosives shall be transported, stored, handled and used in accordance with the provisions and requirements of all applicable laws, ordinances and regulations. Work shall be done in accordance with recommendations of the AGC Manual of Accident Prevention in Construction, the Institute of Makers of Explosives, and the Occupational Safety and Health Administration Regulations (29 CFR 1926.1(U)). In addition to the applicable regulations, the Contractor shall:

(A) Exercise the utmost care not to endanger life or damage property.

(B) Furnish and erect special signs to warn the public of his blasting operations. They shall be located and maintained so as to be clearly evident to the public during all critical periods of blasting operations.

(C) Notify each public utility company, having structures adjacent to the work, of his intention to use explosives. Such notice shall be given sufficiently in advance to enable the companies to advise the Contractor of any precautions that should be taken to protect their structures from damage.

(D) Make a survey of adjacent properties, before commencing blasting operations, locating on drawings and by photographs all existing cracks and damages to structures. A copy shall be filed with the Engineer, including a report.

(E) Blasting shall be accomplished in such a manner that nearby buildings, structures, railways, highways, etc. will be safe from rocks and other projectiles. Adequate blasting mats or other means of protection shall be employed when blasting in congested area or close proximity to any of the above improvements. Steel mats shall not be allowed within 2,000 feet of power lines.

(F) At the time of firing, the Contractor shall station men along the road at sufficient distance from the blasting operation to flag down any vehicles.

The Contracting Agency reserves the right to order the discontinuance of blasting operations at any time.

107.9 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE:

The Contractor shall be responsible for the preservation of all public and private property and shall protect carefully from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

SECTION 107

The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, he shall restore, at no cost to the Contracting Agency, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner. Such damage will include but not be limited to landscaped areas. The contractor shall regrade the disturbed area as directed and restore the surface material to match existing in type and quality.

When construction is within temporary construction easements, the Contractor shall restore all disturbed areas to a condition equal to or better than the existing improvements. Such restoration will include but not be limited to asphalt, walkways, fences, lights, sprinklers, landscaping, etc. In the case of landscaping, the Contractor may remove and store sod and plant material. If, in the determination of the Engineer, the sod and/or plant material did not survive the transplanting in good condition, the Contractor shall replace the sod and/or plant material to match in type and quality. Also, the Contractor may salvage any sprinkler system materials, lighting materials, etc. In the event that it is not feasible to reinstall the salvaged material, new material shall be installed.

The Contractor shall not dump spoil or waste material on private property without first obtaining from the owner written permission for such dumping. All such dumping shall be in strict conformance with the Grading and Drainage Ordinance of the Contracting Agency.

Access to private property shall be maintained to keep inconvenience to the property owner to a minimum. Prior to any construction in front of driveways the Contractor shall notify the property owner 24 hours in advance. Inconvenience caused by construction across driveways and sidewalks shall be kept to a minimum by restoring the serviceability as soon as possible. If it is necessary to leave open excavation for a long period of time, the Contractor shall provide structurally adequate steel plates to bridge the excavation.

107.10 CONTRACTOR'S RESPONSIBILITY FOR WORK:

The Contractor shall properly guard, protect, and take every precaution necessary against injury or damage to all finished or partially finished work, by the action of the elements or from any other cause until the entire project is completed and accepted by the Engineer. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work before final acceptance at no cost to the Contracting Agency. Partial payment for completed portions of the work shall not release the Contractor from such responsibility.

In case of suspension of the work for any cause whatever, the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project and shall erect any necessary temporary structures, signs, or other facilities at no cost to the Contracting Agency.

107.11 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES:

At points where the Contractor's operations are adjacent to properties of utility firms or other property, damage to which might result in considerable expense, loss, or inconvenience, work shall not commence until all arrangements necessary for the protection thereof have been made.

The Contractor shall cooperate with the owners of any underground or overhead utilities in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

If any utility service is interrupted as a result of accidental breakage, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

The Contractor shall expose all underground utilities and structures which might interfere with the construction of the project, in order to permit survey location prior to construction.

The Contractor shall assume full responsibility for damages to any underground facility/utility as a result of failing to obtain information as to its location, failing to excavate in a careful and prudent manner or failing to take measures for protection of the facilities/utilities. The Contractor is liable to the owner of the underground facility/utility for the total cost of the repair.

107.12 FURNISHING RIGHT-OF-WAY:

The Contracting Agency will provide right-of-way and easements for all work in advance of construction. Any exceptions will be indicated in the special provisions.

107.13 PERSONAL LIABILITY OF PUBLIC OFFICIALS:

In carrying out any provisions of these specifications, or in exercising any power or authority granted to them by or within the scope of the contact, there shall be no liability upon the Contracting Agency, Engineer, or their authorized representatives, either personally or as officials of the Contracting Agency, it being understood that in all such matters they act solely as agents and representatives of the Contracting Agency.

107.14 NO WAIVER OF LEGAL RIGHTS:

Upon completion of the work, the Contacting Agency will expeditiously make final inspection and notify the Contractor of acceptance. Such final acceptance, however, shall not preclude or stop the Contracting Agency from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Contracting Agency be precluded or stopped from recovering from the Contractor or his surety, or both, such overpayment as it may sustain, or by failure on the part of the Contractor to fulfill his obligations under the contract. A waiver on the part of the Contracting Agency of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract and in addition to any specific remedy provided the Contracting Agency in the contract documents, shall be liable to the Contracting Agency for latent defects, fraud or such gross mistakes as may amount to fraud, or as regards the Contracting Agency's rights under any warranty or guaranty or remedy required by law.

- End of Section -

SECTION 108

COMMENCEMENT, PROSECUTION AND PROGRESS

108.1 NOTICE TO PROCEED:

(A) On Bond Issue and Budget Projects, neither the Contractor nor any Subcontractor shall commence work on a project prior to receipt of the written Notice to Proceed from the Contracting Agency. The Contractor shall commence work as soon as practicable after the starting date specified in the Notice to Proceed. All work under the contract shall be completed within the number of calendar days stated in the proposal, plus extensions, beginning with the day following the starting date specified in the Notice to Proceed.

(B) On Improvement District Projects, the Contractor shall commence work within 10 days from the date of execution of the contract with the Contracting Agency. All work under the contract shall be completed within the number of calendar days stated in the proposal, plus any days extended on the contract, beginning with the day following the date of execution of the contract. The time set for completion of the project will be established by the Contracting Agency, in accordance with Arizona Revised Statutes Section 9-683.

The Contractor shall notify the Field Engineering Inspection Section 24 hours in advance of the time and place where work will begin and the Survey Section two working days in advance for staking.

108.2 SUBLETTING OF CONTRACT:

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or contracts, or of his right, title, or interest therein, without written consent of the Contracting Agency.

Subcontracts shall be in accordance with and the Contractor shall be bound by the following provisions:

(A) All subcontracts shall be subject to the approval of the Engineer.

(B) All subcontracts shall be in writing and shall provide that all work to be performed there under shall be performed in accordance with the terms of the contract.

(C) Subcontractors shall conform to the regulations governing employment of labor.

(D) The subcontracting of any portion of the work will in no way release the Contractor of his liability under the contract and bonds.

(E) On all contracts for pipeline construction, roadway construction or roadway maintenance, the Contractor shall perform, with his own organization, work amounting to not less than 50 percent of the total contract cost.

On other types of contracts the individual agency shall determine the percentage or waive this requirement.

108.3 CORRESPONDENCE TO THE CONTRACTOR:

A written notice, to the Contractor from the Contracting Agency, shall be considered delivered and the service thereof completed, when said notice is posted, by certified mail, to the said Contractor at his last given address, or delivered in person to the Contractor or his authorized representative on the work.

108.4 CONTRACTOR'S CONSTRUCTION SCHEDULE:

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*For Improvement District Project: The words “superintendent of Streets” will be substituted for the word “Engineer.” Any Extension contract time will be determined by the Superintendent of Streets with the consent of the governing body.

The Contractor, when required, shall furnish the Engineer a construction schedule for his review. The Engineer's review of the Contractor's schedule is for purposes of: (1) the Contracting Agency's staffing the project as may be required; (2) to insure general compliance with the contract documents as it relates to the completion of all work; and (3) to monitor and evaluate the construction status for purposes of approving progress payments. In the event the schedule does not contain sufficient information to meet the above purpose, as determined by the Engineer, the Contractor shall resubmit a new schedule with the additional information requested by the Engineer. The right to determine the sequence of the work is a function vested solely in the Engineer and the construction schedule, when established, shall not be changed without the written consent of the Engineer. The orderly procedure of all work to be performed shall be the full responsibility of the Contractor.

Review of a submitted schedule by the Engineer shall in no way be construed as an affirmation or admission that the schedule is reasonable or workable which responsibilities remain the obligations of the Contractor. When the schedule shows a completion prior to the contract completion date, this extra time between the contract completion date and the scheduled completion date (float), may be used by the Contracting Agency without additional compensation to the Contractor. The Contracting Agency shall not be liable to the Contractor for any damages for delay if the Contractor completes the work prior to expiration of the original Contract completion date or as modified by approved change orders, if any.

108.5 LIMITATION OF OPERATIONS:

The Contractor shall conduct the work at all times in such a manner and sequence that will assure the least interference with traffic and inconvenience to the public. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience.

All traffic affected by the construction will be regulated in accordance with the current Traffic Barricade Manual prepared or adopted by the Contracting Agency's Traffic Engineering Department.

Except in emergencies endangering life or property, written permission shall be obtained from the Engineer to perform any work after regular working hours, on weekends, or legal holidays. Prior to the start of such work, the Contractor shall arrange with the Engineer for the continuous or periodical inspection of the work, surveys and tests of materials, when necessary.

If, in the opinion of the Engineer, the Contractor has fallen behind the approved progress schedule, the Contractor shall take such steps as may be required by the Engineer, including but not limited to, increasing the number of personnel, shifts, and/or overtime operations, days of work, and/or amount of construction equipment until such time as the work is back on schedule. He shall also submit for approval no later than the time of submittal of the next request for partial payment, such supplementary schedule or schedules as may be deemed necessary to demonstrate the manner in which the approved rate of progress will be regained, all at no additional cost to the Contracting Agency.

108.6 CHARACTER OF WORKMEN; METHODS AND EQUIPMENT:

The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by the specifications.

All workmen shall be competent and have sufficient skill, knowledge and experience in their class of work and in the operation of equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or any Subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed from the work by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer. The Contractor or Subcontractor shall keep the Contracting Agency harmless from damages or claims for compensation that may occur in the enforcement of this Section.

*For Improvement District Project: The words “superintendent of Streets” will be substituted for the word “Engineer.” Any Extension contract time will be determined by the Superintendent of Streets with the consent of the governing body

Should the Contractor or Subcontractor fail to remove such person as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until such orders are complied with.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that it will not damage property adjacent to the work area.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed, the Contractor is free to use any methods or equipment that he demonstrates to the satisfaction of the Engineer will accomplish the work in conformity with the requirements of the specifications.

When the specifications state the construction shall be performed by the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than those specified, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with the specifications. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet the specifications, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved nor in contract time as result of authorizing a change in methods or equipment under these provisions.

108.7 DETERMINATION AND EXTENSION OF CONTRACT TIME:

The number of calendar days allowed for the completion of the work included in the contract will be as stated in the proposal and will be known as the contract time.

When the contract time is on a calendar day basis it shall consist of the number of calendar days specified, including all weekends and legal holidays. All calendar days elapsing between the effective dates of any written notice from the Engineer to suspend work and to resume work following suspensions, not the fault of the Contractor, shall be excluded.

When the contract completion time is a fixed calendar date it shall be the date on which all work on the project shall be completed and meet final inspection.

If the Contractor finds it impossible for reasons beyond his control to complete the work within contract time as specified or as extended, he shall immediately submit a written request to the Engineer for an extension of time setting forth therein the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer* finds that the work was delayed because of conditions beyond the control and through no fault of the Contractor, he may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

108.8 GUARANTEE AND WARRANTY PROVISIONS:

The Contractor shall guarantee the work against defective workmanship and materials for a period of one year from the date of its final acceptance under the contract, ordinary wear and tear and unusual abuse or neglect excepted.

Any omission on the part of the Engineer to condemn defective work or materials at the time of construction shall not be deemed an acceptance, and the Contractor will be required to correct defective work or materials at any time before final acceptance and within one year thereafter.

*For Improvement District Project: The words “superintendent of Streets” will be substituted for the word “Engineer.” Any Extension contract time will be determined by the Superintendent of Streets with the consent of the governing body

Should any defects develop within one year from the date of final acceptance due to faults in workmanship or materials the Contractor shall, within 14 calendar days of receipt of written notice from the Contracting Agency begin making the necessary repairs to the satisfaction of the Engineer. Such work shall include the repair or replacement of other work or materials damaged or affected by making the above repairs or corrective work, all at no additional cost to the Contracting Agency.

If defects develop which are determined by the Engineer to be an emergency, the Engineer shall notify the Contractor, via the most expeditious means, regarding the nature and condition of the defects. In turn, the Contractor shall immediately dispatch necessary forces to correct the defect or the emergency condition. If the Contractor, in his initial action, resolves the emergency condition but not the defect, a letter as discussed above will follow and normal procedures for corrections will be employed. If immediate or appropriate action, satisfactory to the Engineer, is not taken by the Contractor, or if the Contractor cannot be contacted, the Engineer will deploy necessary forces to correct and/or secure the deficiency. Costs of the Engineer's action shall be paid by the Contractor and/or his bonding agency. Should it later be determined that the defects requiring such emergency action are not the responsibility of the Contractor, the Contractor will be paid for all costs incurred as a result of these demands in accordance with Subsection 109.5. Such action by the Engineer will not relieve the Contractor of the guarantees required by this Section or elsewhere in the Contract Documents.

In case of work, materials, or equipment for which written warranties are required by the special provisions, the Contractor shall provide or secure from the appropriate Subcontractor or supplier such warranties addressed to and in favor of the Contracting Agency and deliver same to the Engineer prior to final acceptance of the work. Delivery of such warranties shall not relieve the Contractor from any obligation assumed under any other provisions of the contract.

The warranties and guarantees provided in this subsection of the contract documents shall be in addition to and not in limitation of any other warranties, guarantees or remedies required by law.

108.9 FAILURE TO COMPLETE ON TIME:

For each and every calendar day that work shall remain incompleted after the time specified for the completion of the work in the proposal, or as adjusted by the Engineer, the sum per calendar day shown in Table 108-1, unless otherwise specified in the proposal form, may be deducted from monies due to or to become due to the Contractor, not as a forfeit or penalty but as liquidated damages. This sum is fixed and agreed upon between the parties because the actual loss to the Contracting Agency and to the public caused by delay in completion will be impractical and extremely difficult to ascertain and determine.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time fixed for its completion may have been extended, will in no way operate as a waiver on the part of the Contracting Agency of any of its rights under the contract

TABLE 108-1

LIQUIDATED DAMAGES

Original Contract Amount		**Daily Charges**
From More Than	To and Including	Calendar Day or Fixed Date
$ 0	$ 25,000	$ 210
25,000	50,000	250
50,000	100,000	280
100,000	500,000	430
500,000	1,000,000	570
1,000,000	2,000,000	710
2,000,000	5,000,000	1,070
5,000,000	10,000,000	1,420
10,000,000	—	1,780

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108.10 FORFEITURE AND DEFAULT OF CONTRACT:

It is further agreed to by the Contractor that if he:

(A) Fails to begin the work under the contract within a reasonable time, or

(B) Fails to perform the work with sufficient workmen and equipment or with sufficient materials to assure the prompt completion of said work, or

(C) Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

(D) Discontinues the prosecution of the work, or

(E) Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

(F) At any time colluded with any party or parties, or

(G) Allows any final judgment to stand against him unsatisfied for a period of 14 calendar days, or

(H) For any cause whatsoever, fails to carry on the work in an acceptable manner, the Engineer will give notice in writing to the Contractor and his surety of such delay, neglect, or default, and advise them that the work must be resumed immediately.

If the Contractor or surety, within a period of 14 calendar days after such notice, has not proceeded in accordance therewith, then the Contracting Agency will, upon written notification from the Engineer of the fact of such delay, neglect or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the prosecution of the work out of the hands of the Contractor. The Contracting Agency may appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Contracting Agency, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due said Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Contracting Agency the amount of such excess.

*108.11 TERMINATION OF CONTRACT

The Contracting Agency may terminate the contract or a portion thereof if conditions encountered during the progress of the work make it impossible or impracticable to proceed with the work or a local or national emergency exists.

When contracts, or any portion thereof, are terminated before completion of all work in the contract, adjustments in the amount bid for the pay items will be made on the actual quantity of work performed and accepted, or as mutually agreed for pay items of work partially completed or not started. No claim for loss of anticipated profits will be considered.

Termination of the contract or any portion thereof shall not relieve the Contractor of his responsibilities for the completed work nor the surety of its obligation for and concerning any just claims arising out of the work performed.

- End of Section -

*For Improvement District Project: The words “superintendent of Streets” will be substituted for the word “Engineer.” Any Extension contract time will be determined by the Superintendent of Streets with the consent of the governing body

SECTION 109

MEASUREMENTS AND PAYMENTS

109.1 MEASUREMENT OF QUANTITIES:

All work completed under the contract will be measured by the Engineer according to United States standard measures. The methods of measurement and computation to be used in determination of quantities of materials furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice. A station, when used as a definition or term of measurement, will be 100 linear feet.

Unless otherwise specified, longitudinal measurements will be made along the grade line.

Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the Engineer.

The term ton will mean the short ton consisting of 2,000 pounds avoirdupois.

Unless otherwise specified, structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

In computing volumes of excavations or fill, the average end area method or other acceptable methods as determined by the Engineer will be used.

Volumes will be computed at 60 F, using ASTM D1250 for asphalt or ASTM D633 for tars.

Lumber will be measured by the thousand board foot measure actually used in the work. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term lump sum, when used as a pay item, will mean complete payment for the work described.

Sundry items which have a basis for measurement and payment herein and which are incidental to or required in the construction of the work but are not included as items in the fee schedule shall be considered an integral part of the contract, and all labor, materials, etc. required for such items shall be furnished by the Contractor and the cost of same included in the unit price.

Where the units of measurement shown on the proposal form or the methods of measurement specified in the project special provisions differ from the measurement and payment provisions of the Uniform Standard Specifications, the project documents shall have precedence.

109.2 SCOPE OF PAYMENT:

Measurement and payment for pay items in the proposal will be as indicated in the applicable standard specification or in the special provisions.

When payment is specified to be made on the basis of weight, the weighing shall be done by a licensed public weighmaster or the weighmaster’s deputy on a device licensed or certified as defined by Arizona Revised Statutes Section 41-2091 and 41-2093. The Contractor shall furnish the Engineer with duplicate Weighmaster's Certificates showing the actual net weights together with the information required by the rules adopted by the Department of Weights and Measures as authorized by Arizona Revised Statutes Section 41-2065. The Contractor shall furnish the Engineer with duplicate Weighmaster’s Certificates at the time of delivery unless the Engineer designates a different submittal time. The Contracting Agency will accept the certificates as evidence of the weight delivered.

Payment for the various items in the proposal will be made at the unit price in the proposal, and shall be compensation in full for furnishing all labor, materials, equipment and appurtenances necessary to complete the work in a satisfactory manner as shown on the plans and as required in the specifications, with all connections, testing, and related work completed. Each item, fixture, piece of equipment, etc., shall be complete with all necessary connections and appurtenances, for the satisfactory use and

operation of said item. No additional payment will be made for work related to any item unless specifically called for in the proposal. This compensation shall also cover all risk, loss, damage or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of Section 107.

The unit prices shall include all costs for salaries and wages, all payroll additives to cover employee benefits, allowances for vacation and sick leave, company portion of employee insurance, social and retirement benefits, all payroll taxes, contributions and benefits imposed by any applicable law or regulation and any other direct or indirect payroll-related costs. The unit prices shall also include all costs for indirect charges, overhead, mileage, travel time, subsistence, materials, freight charges for materials to Contractor's facility or project site, equipment rental, consumables, tools, insurance costs, all applicable taxes and fees, as well as Contractor's fee and profit. The unit prices shall further include all site clean-up costs, hauling of construction debris, and proper disposal in accordance with all laws and regulations and the project plans and specifications.

Payment will be made for only those items listed in the proposal. All materials and work necessary for completion of the project are included in proposal items. Work or materials not specifically identified by a proposal item are considered as included in the unit price of related proposal items.

Unless otherwise specified, payment will not be made for unused materials.

109.2.1 Taxes and Fees: Taxes are deemed to include all sales, use, consumer and other taxes that are legally enacted at the time of submittal of the project fee proposal, whether or not they are yet effective or merely scheduled to go into effect. Any such taxes shall be paid by Contractor and shall be included in the unit prices.

The Contractor shall also be responsible to contact all municipalities and other governmental agencies having jurisdictional authority over the project or the project area to determine if they will charge the Contractor other fees (e.g., permit fees) for the project work. Unless otherwise specified in the project documents or on the proposal form, the Contractor shall include the cost of such fees in the unit prices on the proposal form.

109.3 ASSIGNMENT OF PAYMENTS:

The Contractor shall not assign payments of a contract or any portion thereof without approval of surety and written consent of the Contracting Agency.

Claims for monies due or to become due the Contractor may be assigned to a bank, trust company, or other financing institution, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Any assignment of money shall be subject to all proper setoffs and withholdings in favor of the Contracting Agency and to all deductions provided for in these specifications.

109.4 COMPENSATION FOR ALTERATION OF WORK:

All compensation due the Contractor for alteration of work shall be documented by a Change Order. Except in emergency situations or as otherwise directed by the Engineer, the Contractor shall not proceed with Change Order work until said Change Order has been approved by the Agency.

***109.4.1 By The Contracting Agency:**

(A) For a decrease greater than 20 percent in either the total cost of the contract or the total cost of a major item and when a reasonable cost analysis supports an increase in the pro rata share of fixed cost chargeable to this item in total, an increase adjustment in the monies due the Contractor may be made. This adjusted compensation will not exceed 80 percent of the

*Not applicable to Improvement District Projects

original lump sum contract amount or, if for a unit price item, the adjustment will not exceed 80 percent of the original extended unit price. This does not apply to items labeled as contingent items in the proposal.

(B) For an increase greater than 20 percent in either the total cost of the contract or the total cost of a major item, any adjustment made will only apply to that cost in excess of 120 percent of the original total cost of the contract or, in the case of a major item, in excess of 120 percent of the original proposed extended unit price. If either party presents a reasonable cost analysis that shows a change in the pro rata share of fixed costs chargeable to this item in total, an increase or decrease adjustment will be made. This increase or decrease adjustment will be made on such basis as is necessary to cover a reasonable estimate of cost, plus an allowance, not to exceed 15 percent, for overhead and profit. If the parties are unable to reach an agreement, the Engineer has the authority to order the excess work done on an actual cost basis as specified in Section 109.5.

(C) For either an increase or decrease in cost, no claim shall be made by the Contractor for any loss of anticipated profits.

***109.4.2 Due to Physical Conditions:**

(A) If the Engineer, after his investigation of the site conditions, agrees that they materially differ from those indicated in the contract and would cause an increase in the Contractor's cost of accomplishing the work, new unit prices or a lump sum cost (for the additional work only) may be negotiated. If the parties are unable to reach an agreement on price, the Engineer has the authority to order this additional work accomplished on an actual cost basis as specified in Section 109.5.

(B) If the Engineer, after his investigation of the site conditions, finds that these conditions do not materially differ from those indicated in the contract, he has the authority to order the work to be accomplished at the original price(s).

***109.4.3 Due to Extra Work:** If the Contractor can present valid, factual evidence, satisfactory to the Engineer, that the work in question is an item not provided for in the contract as awarded then a unit price or lump sum cost, for this item only, may be negotiated. If the parties are unable to reach an agreement on price or cost, the Engineer has the authority to order the extra work accomplished on an actual cost basis as specified in Section 109.5.

109.4.4 Made at the Contractor's Request: Any alterations, if approved, will be a reduction in cost or at no additional cost to the Contracting Agency.

109.4.5 Due to Failure of Contractor to Properly Maintain the Project:

(A) For any suspension of work during normal working hours due to failure of the Contractor to properly maintain the project, there will be no additional compensation or time allowed.

(B) If the Engineer provides the Contractor with a written order to provide adequate maintenance of traffic, adequate cleanup, and adequate dust control or to correct deficiencies resulting from abnormal weather conditions and the Contractor fails to comply in the time frame specified, the Contracting Agency may have the work accomplished by other sources. The Contracting Agency will deduct the cost of accomplishing the work from monies due or to become due to the Contractor. Computation of the cost will be in accordance with Section 109.5.4.2.

109.4.6 Allowable Mark-Ups: Only the allowable mark-ups as defined in Section 109.5 shall be allowed. Additional compensation for other items, including extended overhead and conditions, shall not be considered or allowed.

***109.5 ACTUAL COST WORK:**

The compensation for actual cost work performed by the Contractor (Subcontractor) shall be determined by the Engineer in the following manner.

*Not applicable to Improvement District Projects

109.5.1 Equipment: For all equipment, the use of which has been authorized by the Engineer, except for small tools and manual equipment, the Contractor will be paid in accordance with the latest Schedule of Equipment Rates used by the Arizona Department of Transportation. Payment for equipment will be made following the calculations in Section 109 of the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction. The value of 0.933 shall be used for the adjustment factor F used in the rental rate formulas (F = 0.933).

109.5.2 Material: For all material, accepted by the Engineer and used in the work, the Contractor will be paid the actual cost of such material including transportation cost, to which total cost will be added a sum equal to 15 percent thereof.

109.5.3 Labor: For all labor and for the foreman, when he is in direct charge of the operation, the Contractor will be paid:

(A) The actual wages paid plus the current percentage thereof as determined by the Arizona Department of Transportation which is deemed to cover the Contractor's cost incurred as a result of payment imposed by State or Federal Law and payments that are made to, or on behalf of, the workman other than the actual wage. Actual wage is defined as the required current hourly rate paid to the labor classification concerned and does not include any fringe benefits or dislocation allowances. If the Contractor is not required to pay fringe benefits equivalent to the Current rates published in the Federal Register, an equitable deduction will be made from the current percentage established by the Arizona Department of Transportation.

(B) For the first $50,000 of labor cost computed under paragraph (A) above, the Contractor will be paid an amount equal to (15) fifteen percent for overhead and profit.

(C) For all labor cost computed under paragraph (A) above, in excess of $50,000 but not exceeding $100,000, the Contractor will be paid an amount equal to (12) twelve percent for overhead and profit.

(D) For any labor cost computed under paragraph (A) above in excess of $100,000 the Contractor will be paid an amount equal to (10) ten percent for overhead and profit.

109.5.4 Work Performed by Subcontractors or Other Sources:

109.5.4.1 Work Performed by Subcontractors: If it is determined by the Engineer that portions of the Actual Cost Work to be performed requires specialized labor or equipment not normally used by the Contractor and such work is then authorized to be performed by a subcontractor(s), the subcontractor(s) will be paid by the Contractor in accordance with the actual cost work procedures outlined herein. The Contractor will be paid by the Contracting Agency the full amount of the subcontract plus the following percentages for administration and supervision.

(A) For the first $10,000 accumulated total of all change order work performed by subcontractors (less mark-up for overhead and profit), the Contractor will be paid an amount equal to 10 percent of the accumulated total for administration and supervision. If the accumulated total is $3,000 or less, the Contractor will be paid $300 for administration and supervision.

(B) For all change order work in excess of $10,000 accumulated total performed by subcontractors (less mark-up for overhead and profit), the Contractor will be paid an amount equal to five percent of the accumulated total for administration and supervision.

109.5.4.2 Work Performed by Other Sources: If the Contracting Agency has work performed by other sources, in accordance with Section 109.4.5 (B), the Contracting Agency will deduct, from monies due or to become due to the Contractor, the full amount of the cost of accomplishing the work by other sources plus the following percentages for administration and supervision:

(A) For the first $10,000 accumulated total of work performed by other sources, the Contracting Agency will deduct an amount equal to 10 percent of the accumulated total for administration and supervision. If the accumulated total is $3,000 or less, the Contracting Agency will deduct $300 for administration and supervision.

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(B) For all work in excess of $10,000 accumulated total performed by other sources, the Contracting Agency will deduct an amount equal to 5 percent of the accumulated total for administration and supervision.

109.5.5 Documentation:

(A) Except in emergency situations, the Contracting Agency will not be liable for any Actual Cost Work performed by the Contractor prior to written authorization by the Engineer or prior to full execution of a written agreement by all parties concerned.

(B) Payment for work performed on an actual cost basis will not be made until the Contractor has furnished the Engineer, on forms agreed to by the Contracting Agency, duplicate itemized statements of such work, including subcontractor(s) costs, detailed as follows:

(1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.

(2) Designation, dates, daily hours, total hours, rental rates and extension for each unit of equipment, and machinery.

(3) Quantities of material, prices, extension and transportation cost on a daily basis. These charges shall be substantiated by vendor invoices.

(C) The Engineer will compare his records with the statement furnished by the Contractor, resolving any differences and making the required adjustments. This statement when agreed upon and signed by both parties, shall be the basis of payment for the work performed.

109.5.6 Bonds and Insurance: The Contractor shall be paid for the actual cost plus (10%) ten percent for Administrative cost when the Contractor can provide evidence of payment for premiums on required payment and performance bonds, premiums on railroad and/or airport extended liability insurance, and premiums for property damage and/or public liability insurance. No duplication of payment for Contractor's costs included under Section 109.5.3 (A) will be allowed.

109.5.7 Authority of Engineer: The Engineer is in charge of Actual Cost Work and has the authority to direct which labor and equipment will be used, to suspend operations, and to refuse to pay for any labor or equipment which he feels is not doing productive work.

109.6 PAYMENT FOR IMPROVEMENT DISTRICT PROJECTS:

Payment to the Contractor shall be made in accordance with ARS Sections 48-523 to 48-613, both inclusive.

As soon as the Contractor has fulfilled his contract, the Superintendent of Streets shall estimate the benefits arising from the work and make assessments to cover the work performed and specified in the contract, including incidental expenses in accordance with ARS Section 48-589.

The Contractor agrees to accept payment in the form of Assessments with attached Warrants and/or Improvement Bonds at the rate of interest declared in the resolution of intention prepared by the Contracting Agency.

***109.7 PAYMENT FOR BOND ISSUE AND BUDGET PROJECTS:**

(A) Partial Payments: The Contracting Agency will make a partial payment to the Contractor on the basis of an estimate prepared by the Contractor or Engineer for work completed through the last day of the preceding calendar month. Payment will be within 14 calendar days after the estimate has been certified and approved by the Engineer and received by the owner.

*Not applicable to Improvement District Projects

The Contracting Agency will retain 10 percent of all estimates as a guarantee for complete performance of the contract in accordance with Arizona Revised Statutes Section 34-221 or 34-607, unless the Contractor elects to deposit securities in accordance with Arizona Revised Statutes Section 34-221, Paragraph C.5. or 34-607, Paragraph B.5.

When the Contractor is fifty percent completed, one-half of the amount retained shall be paid to the Contractor provided he is making satisfactory progress on the contract and there is no specific cause or claim requiring a greater amount to be retained. After the contract is fifty percent completed, no more than five percent of the amount of any subsequent progress payments made under the contract will be retained providing the Contractor is making satisfactory progress on the project. Except that, if at any time the owner determines satisfactory progress is not being made, ten percent retention shall be reinstated for all progress payments made under the contract subsequent to the determination.

Any material or equipment which will become an integral part of the completed project will be considered for partial payment in the Contractor's monthly progress payments. The intent of making partial payments is to provide the Contractor payment for direct material or equipment purchased. The purpose is to minimize the effect of escalating costs by procuring key materials. It is not the intent to pay for all materials but only those meeting the following conditions.

(1) A total value of all items requested for payment must be greater than $20,000. No payment will be processed until the material or equipment has been observed, reviewed or verified by the Contracting Agent representative. Only the material or equipment meeting the requirements of the plans and specifications will be paid. Payment for material or equipment does not constitute final acceptance.

(2) Materials or equipment must be stored or stockpiled either on site, in a warehouse, or secured storage area. The Contractor assumes all responsibility for protection of these materials or equipment and shall insure them to cover loss or damage to same without additional liability or added costs to the Agency for providing this security, insurance, and storage.

(3) The Contractor will provide access to the storage area or warehouse upon request of the Contracting Agent's representative for the purpose of verifying the inventory of items paid for under this Section. None of the materials or equipment paid for under this Section will be removed from the storage site until incorporated into the work of the project. The storage site shall be within the general geographical area of the project.

(4) The Contractor shall provide a paid invoice and/or lien waiver for items paid for under this Section. The Agency will not pay more than the invoice price for the item or items, less retention.

(5) The Engineer may exclude individual payment requests which in the Engineer's judgment do not warrant storage and prepayment under the intent of this Section.

(B) Final Payment: When the project has been accepted as provided in Section 105, and within 30 calendar days after final inspection of the work completed under the contract, the Engineer will render to the Contracting Agency and the Contractor, a final estimate which will show the amount of work performed and accepted under the contract. All prior estimates and partial payments will be subject to correction in the final estimate for payment.

Within sixty (60) calendar days after final acceptance, the Contracting Agency will pay the Contractor all amounts due him under the contract, except that before final payment will be made, the Contractor shall satisfy the Contracting Agency by affidavit that all bills for labor and materials incorporated in the work have been paid. The Contractor's Affidavit may be obtained from the Engineering Office of the Contracting Agency.

If payment will be longer than 60 days after final completion and acceptance, the owner will provide the Contractor specific written findings for reasons justifying the delay in payment.

The acceptance of the project and the making of the final payment shall not constitute a waiver by the Contracting Agency/Owner of any claims arising from faulty or defective work appearing after the completion or from failure of the Contractor to comply with the requirements of the contract documents.

109.8 PAYMENT FOR DELAY:

The procedures contained in this Section shall not be construed to void any provision of the contract which require notice of delays, provides for negotiation of other procedures for settlement or provide for liquidated damages.

109.8.1 Failure to Locate or Incorrect Location of Utilities: Arizona Revised Statutes 40-360.28 indicates that if a person (owner, operator, or agent) fails to locate or incorrectly marks the location of the underground facility in a timely manner, the person (owner, operator, or agent) becomes liable for resulting damages, costs and expense to the injured party." The Contracting Agency will deny any claims for damages or delays if another owner or operator is at fault.

109.8.2 Contracting Agency Delays: Arizona Revised Statutes 34-221 states "A contract for the procurement of construction shall include a provision which provides for negotiations between the Agent and the Contractor for the recovery of damages related to expenses incurred by the Contractor for a delay for which the Agent is responsible, which is unreasonable under the circumstances and which was not within the contemplation of the parties to the contract." In this case, if the Contractor sustains damages which could not have been avoided by the judicious handling of forces, equipment and plant or by reasonable revision in the Contractor's schedule of operation, the compensation for such damages will be negotiated. The Contractor shall notify the Engineer of the condition in writing by the next work day. Failure to notify the Engineer within this time may be just cause to reject any claims for such damages.

Compensation for such damages will be negotiated as follows:

(A) The Engineer shall be satisfied that the Contractor has made every reasonable effort to prosecute the work despite any delays encountered or revisions in the Contractor's scheduling of work.

(B) The Compensation paid to the Contractor shall be in accordance with Section 109.

109.8.3 Extension of Contract Time: For any such delays, the contract time will be adjusted in accordance with Section 108.7.

109.9 DOLLAR VALUE OF MAJOR ITEM:

TABLE 109-1	
DOLLAR VALUE OF MAJOR ITEM	
Original Contract Amount	Dollar Value of Major Item
$0.00 to $1,000,000.00	$50,000 or 10% of original contract amount, whichever is less
$1,000,000.00 to $5,000,000.00	5.0% of original contract amount
$5,000,000.00 or greater	$250,000.00 or 2.5% of original contract amount, whichever is greater

109.10 PAYMENT FOR MOBILIZATION/DEMOBILIZATION:

The Agency will compensate Contractor for a single round trip mobilization/demobilization of Contractor's personnel, equipment, supplies and incidentals, including establishment of offices, buildings and other facilities required for the performance of the work on the project, as well as preparatory work and operations prior to the commencement of the work on the project site.

Mobilization/demobilization will be measured for payment by the lump sum as a single complete unit of work. Payment for mobilization/demobilization will be made at the contract lump sum price. Payment shall be made in equal one-third portions. The first payment will be paid with the Contractor's initial billing. The second payment will be made when the total payments to the Contractor for the pay items, exclusive of payments for mobilization/demobilization, equal greater than one-half of the initial contracted amount, exclusive of mobilization/demobilization. The remaining one-third will be paid as part of the final payment due to the Contractor.

When other contract items are adjusted as provided in Section 109, and if the costs applicable to such items of work include mobilization costs, such mobilization costs will be considered as recovered by Contractor in the lump sum price paid for mobilization, and will be excluded from consideration in determining compensation under Section 109.

If the Contractor performs a second or additional mobilization/demobilization of personnel, material and/or equipment at the Engineer's express written request, the Agency will compensate the Contractor for such expenses at the Contractor's actual costs. The Contractor shall provide all documentation for these costs at the request of the Engineer.

For projects that do not list mobilization/demobilization as a pay item, a single round trip mobilization/demobilization shall be considered a non-pay item for said projects, the cost of which shall be spread across other appropriate items. Should a second or additional mobilization/demobilization be required at the Engineer's express written request, compensation for such shall be handled as detailed in the foregoing paragraph.

- End of Section -

SECTION 110

NOTIFICATION OF CHANGED CONDITIONS AND DISPUTE RESOLUTION

110.1 GENERAL:

When changes are initiated by the Contracting Agency, or as a result of decisions rendered by the Agency, inaction of the Agency or changed conditions unknown to all parties at the time of bid, the Contractor may request an adjustment to the contract amount and/or contract time. This Section does not preclude the use of legal remedies in the event of claims or litigation brought by third parties. The procedure for this adjustment is a two step process, (1) Initial Notification and Dispute Resolution and (2) Administrative Process for Dispute Resolution, as discussed below:

110.2 INITIAL NOTIFICATION AND DISPUTE RESOLUTION:

110.2.1 Notification: As required by these Specifications or any time the Contractor believes that the action or decision of the Contracting Agency, lack of action by the Contracting Agency, or for some other reason will result in or necessitate the revision of the contract, the Engineer must be notified immediately. If within two working days the identified issue has not been resolved between the Contracting Agency and the Contractor, the Contractor shall provide a written notice. At a minimum, the written notice shall provide a description of the nature of the issue, the time and date the problem was discovered, and if appropriate, the location of the issue. After initial written notice has been provided, the Engineer will proceed in accordance with Subsection 104.2. In addition to proceeding in accordance with Subsection 104.2, the Contracting Agency and the Contractor must make every effort to resolve the issue identified in the initial notice. Only if the issue cannot be quickly resolved will it be necessary to proceed to the next step in this subsection.

110.2.2 Dispute Resolution: Once the above process has been exhausted or within seven calendar days of the date of the initial written notice, whichever is sooner, the following steps will be taken:

(A) The Contractor shall provide in writing the following information to the Engineer. If known, a cost analysis may be included with the information.

(1) The date of occurrence and the nature and circumstances of the issue for which initial notice was given.
(2) Name, title, and activity of each Contracting Agency or all other persons knowledgeable of the issue.
(3) Identity of any documents and the substance of any oral communication related to the issue.
(4) Basis for an assertion that the work required is a change from the original contract work or schedule.
(5) Identity of particular elements of contract performance for which a change in compensation and/or time may be sought, including:
  (a) Pay item(s) that have been or may be affected by the issue and any adjustments to unit price(s) that are required;
  (b) Labor and/or materials that will be added deleted or wasted by the problem and what equipment will be idled or required;
  (c) Delay and disruption in the manner and sequence of performance that has been or will be caused;
  (d) Adjustments to delivery schedule(s), staging, and contract time due to the dispute and
  (e) Estimate of the time within which the Contracting Agency must respond to the notice to minimize cost, delay, or disruption of issue.
(6) Any other items or information germane to the dispute.
(7) The Contractor's written certification, under oath, attesting to the following:
  (a) The request is made in good faith.
  (b) Supportive data is accurate and complete to the Contractor's best knowledge and belief.
  (c) When provided, the amount requested accurately reflects the Contractor's actual cost incurred.

In complying with this request, the Contractor shall use the Contracting Agency's certification form.

(B) Within ten calendar days after the Contractor's submission in accordance with the above paragraph, the Engineer will respond in writing to the Contractor to:

(1) Confirm that a supplemental agreement is necessary and, when necessary, give appropriate direction for further performance, or

(2) Deny that the contract has been revised and, when necessary, direct the Contractor to proceed with the contract work, or

(3) Advise the Contractor that adequate information has not been submitted to decide whether (1) or (2) applies, and indicate the needed information and date it is to be received by the Engineer for further review. The Contracting Agency will respond to such additional information within ten calendar days of receipt from the Contractor.

110.2.3 Conditions: The failure of the Contractor to comply with the requirements of this subsection constitutes a waiver of entitlement to additional compensation or a time extension.

110.3 ADMINISTRATIVE PROCESS FOR DISPUTE RESOLUTION:

110.3.1 General: If the Contractor rejects the decision of the Engineer in Subsection 110.2.2 (B) above, the Contractor may begin the Administration Process to resolve the dispute.

The notice provision set forth in Subsection 110.2 is a contractual obligation assumed by the Contractor in executing the contract. It is understood that the Contractor will be forever barred from recovering against the Contracting Agency if the Contractor fails to give notice of any act or failure to act, by the Engineer, or the happening of any event, thing, or occurrence, in accordance with Subsection 104.2 Alteration of Work.

The administrative process for the resolution of disputes is sequential in nature and is composed of the following levels:

Level I. (Representative reviewed by: *e.g. Construction Engineer*)
Level II. (Representative reviewed by: *e.g. Assistant County/City Engineer*)
Level III. (Representative reviewed by: *e.g. County/City Engineer*)

Note: The above stated titles may vary depending on the Contracting Agency's organization.

These three levels of review; the specific titles; the financial authority of each: and the names of people assigned to each level shall be provided at the preconstruction conference. The equivalent information regarding the Contractor's organization shall also be provided at the preconstruction conference.

Except as provided elsewhere herein, no dispute will be accorded a particular level of review unless the dispute has been reviewed at the preceding level and the Contractor rejects the decision in writing within the time period specified, or both parties agree that the decision for compensation is above that levels authority.

Unless specifically requested otherwise by the Contracting Agency, submission of additional information by the Contractor or Engineer, at any level of the review process shall cause the process to revert to Level I.

110.3.2 Required Information: At a minimum, the information described in Subsection 110.2 must accompany each dispute. If the following applies, it shall also be provided in addition to the information required by Subsection 110.2.

(A) If additional compensation is sought, the Contractor shall submit the exact amount sought as required by Subsection 110.2.2 (A) (5) broken down into the following categories:

(1) Direct Labor
(2) Direct Materials
(3) Equipment
(4) Job Overhead
(5) General and Administrative Overhead
(6) Subcontractor's Work (broken down as 1, 2, 3 and 4 above)
(7) Other categories as specified by the Contractor.

(B) If additional time is sought, the Contractor shall provide a comprehensive time impact analysis showing the delay(s) and how they affect the critical path. The time impact analysis must include both the original and as-built critical path schedules and must be supported by documentation such as delivery schedules, invoices, correspondence, memoranda of telephone calls, payroll data, daily work schedules, etc. NOTE: The path of the longest

duration of continuous and dependent work activities through the schedule network is identified as the Critical Path and is the minimum amount of time required to build the project as depicted by the schedule.

(C) The Contractor shall also notify the Contracting Agency's Level I Representative in writing that all documentation in support of the dispute has been provided and that the administrative review process should begin. No formal action will be taken by the Level I Representative until this written notification is received. The documentation provided to the Level I Representative shall serve as the basis for evaluating the Contractor's position regarding the dispute throughout the administrative process.

110.3.3 Process: The Contracting Agency's Level I Representative will render a written decision regarding the matter in dispute within two working days of receipt of the Contractor's notification that the dispute resolution process should begin.

The Contractor shall, upon receipt of the decision by the Level I Representative, either accept or reject the decision in writing. If the Contractor does not reject the Level I Representative's decision within two working days of its receipt, the Contractor will be deemed to have accepted the decision, the dispute will be considered withdrawn from the administrative process, and there will be no further remedy.

If the Contractor rejects the decision of the Level I Representative, the dispute will be forwarded by the Level I Representative to the Level II Representative. The Level II Representative will, within seven working days of receipt of the dispute information from the Level I Representative, schedule and hold a meeting to review the dispute with the Contractor. This time limit may be extended by mutual agreement of the parties. The Level II Representative will, within seven working days of the meeting, issue a written decision, with justification, regarding the dispute.

The Contractor shall, within seven working days of receipt of the decision, either accept or reject it in writing. If the Contractor does not reject the Level II decision within seven working days, the Contractor will be deemed to have accepted the decision and the dispute will be considered withdrawn from the administrative process and there will be no further remedy.

If the Contractor rejects the decision of the Level II Representative, the Level II Representative will forward the dispute to the Level III Representative. The Level III Representative will, within fourteen working days of receipt of the dispute information from the Level II Representative, schedule and hold a meeting with the Contractor. This time limit may be extended by mutual agreement of the parties. The Level III Representative will, issue a written decision within fourteen working days of the meeting, with justification, regarding the dispute.

The Contractor shall, within fourteen working days of the receipt of the decision of the Level III Representative, either accept or reject it in writing. If the Contractor does not reject the Level III Representative's decision within fourteen working days, the Contractor will be deemed to have accepted the decision, the dispute will be considered withdrawn from the administrative process, and there will be no further remedy.

If the Contractor rejects the decision of the Level III Representative, there will be no further administrative review of the dispute. The resolution will then proceed as follows:

(A) Mediation: Prior to filing for arbitration or litigation, the Contractor may request non-binding mediation by filing a request for mediation in writing with the Engineer. If agreeable, the Engineer will then arrange for a mutually agreeable mediator. Such request for mediation shall be made within thirty calendar days from the date of the Level III Representative's decision as provided for in this subsection.

In connection with the mediation, each party shall bear its own costs, attorney's fees, and expert fees. Any fees and expenses assessed by the mediator shall be borne equally by the parties.

(B) Dispute Review Board/Arbitration**:** The decision of the Level III Representative in relation to the claim shall be final unless the dispute review board or arbitration is chosen as follows:

(1) Where the amount in controversy is less than or equal to the amount authorized in Subsection 110.3.4, the sole remedy shall be the Dispute Review Board as prescribed in Subsection 110.5 unless both parties mutually agree to utilize arbitration as prescribed in Subsection 110.4.

(2) Where the amount in controversy is more than authorized in Subsection 110.3.4, the Contractor reserves the right to initiate litigation pursuant to Section 12-821 et seq. of the Arizona Revised Statutes, or if mutually agreed upon, the parties may choose to resolve the controversy utilizing either the Dispute Review Board as prescribed in Subsection 110.5 or Arbitration as prescribed in Subsection 110.4.

110.3.4 Amount of Dispute: For the purposes of this subsection, the amount in controversy may not exceed $200,000.00. A claim for adjustment in compensation shall mean an aggregate of operative facts giving rise to the rights of the party for which it is seeking to enforce. That is to say, a claim under this subsection is defined as the event, transaction or set of facts that give rise to a claim for compensation, costs, expenses or damages.

In making a determination whether the amount in controversy is $200,000.00 or less, the parties shall not consider, quantify or take into account any requested extensions of contract time, or the release or remission of liquidated damages assessed or accrued prior to the dispute in question, under Subsection 108.7 and 108.9 of the Specifications.

Any party having a claim, adjustment or dispute for an amount in excess of $200,000.00 may waive or abandon the dollar amount of any such claim in excess of $200,000.00 so as to bring the claim, adjustment or dispute within the scope and coverage of this subsection, provided that the amount allowed to any such party by the arbitration award shall not exceed $200,000.00. Various damages claimed by the party for a single claim may not be divided into separate proceedings to create claims within the $200,000.00 limit.

110.4 ARBITRATION:

If the parties mutually agree to pursue arbitration as prescribed in Subsection 110.3.3, then a Demand for Arbitration shall be filed in writing with the American Arbitration Association or United States Arbitration and Mediation of Arizona, and a copy served thereof upon the Level III Representative or Contractor, whichever applicable. Such Demand for Arbitration shall be made by the party within thirty calendar days of the date of the Level III Representative's decision as provided for in Section 110.3 above, unless a mediation process is already underway, in which case the Demand for Arbitration shall be made within thirty days of the termination of the mediation process. The scope of the arbitration proceeding shall be restricted and limited to the matters originally presented to the Level III Representative for decision or determination and shall include no other matters. All arbitration of claims shall be conducted in Phoenix, Arizona or other mutually selected location in accordance with the rules of the arbitration service hearing the dispute.

The claim shall be submitted to a single arbitrator who shall be selected by the parties from a list of arbitrators furnished by the arbitration service. Each party shall alternately strike names from the list until only one name remains. The person whose name thus remains on the list of arbitrators is their first choice, but if that person is not available to serve, the two persons whose names were last stricken are acceptable, with the one whose name was last stricken being the first alternate.

Unless agreed to otherwise, the parties shall select the arbitrator within ten calendar days after each has received a copy of the list of arbitrators.

Each party to the arbitration shall bear its own costs, attorney fees and expert fees. Any other costs and fees assessed by the arbitration service shall be divided equally between the parties to the arbitration.

The decision or award of the arbitrator shall be supported by substantial evidence and, in writing, contain the basis for the decision or award and findings of fact. The decision or award by the arbitrator when made shall be final and nonappealable except as provided in Section 12-1512, Arizona Revised Statutes. Both parties to the Contract shall be bound by the Arbitration Award for all purposes and judgment may be entered upon it in accordance with applicable law in the Superior Court of Arizona.

110.5 DISPUTE REVIEW BOARD:

If the Dispute Review Board is utilized as prescribed in Subsection 110.3.3, the Engineer shall be notified within thirty days after the Level III Representative decision. The Dispute Review Board is a three member board independent of the parties involved in the issue. The Agency and Contractor shall each select a member for this board. The third member shall be a mutually agreed upon independent member. This Review Board must be selected within fourteen calendar days after notice to

the Level III Representative. Each member shall agree to impartially serve the Agency and Contractor. Fees and expenses of Board Members are to be shared equally by Agency and Contractor. The Dispute Review Board shall meet within thirty days of the selection of the board, unless, by mutual agreement, another date is selected. The scope of the Dispute Review Board shall be restricted and limited to the matters originally presented to the Level III Representative for decision or determination and shall include no other matters. The Board shall consider and evaluate the dispute and render a written decision that assigns financial responsibilities and allocates adjustments in the contact time, if applicable, within seven calendar days after the meeting. The decision of the dispute Review Board will be final.

110.6 FINAL DOCUMENTATION AND PAYMENT:

If at any step in the process a dispute is resolved, the Contractor must sign a supplemental agreement setting forth the resolution of the dispute and including an unconditional release as to any and all matters arising from the dispute. In addition, when the agreement results in a change in contract amount and/or time, a change order shall be prepared by the Contracting Agency for said changes and signed by both parties within 30 days from the date of the agreement. Payment of the change order will be made to the appropriate party(s) in accordance with Section 109.

- End of Section -

PART 200

EARTHWORK

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SECTION 201

CLEARING AND GRUBBING

201.1 DESCRIPTION:

This work shall consist of removing objectionable material from the right-of-way, easements and such other areas as may be specified in the special provisions. Clearing and grubbing shall be performed in advance of grading operations.

201.2 PRESERVATION OF PROPERTY:

Existing improvements, adjacent property, utilities and other facilities, and trees and plants not to be removed, shall be protected from injury or damage resulting from the Contractor's operations, see Section 107.

201.3 CONSTRUCTION METHODS:

The construction site and areas on each side of the roadway from centerline to the toe of an embankment, the top of a cut slope, the slope rounding limit or to a line 10 feet outside the edge of the surfaced area, whichever is greater, but not beyond the limits of the right-of-way, shall be cleared of all trees, stumps, brush, roots, rubbish, debris and other objectionable matter, except as follows.

All trees and shrubs found suitable for improvement and beautification, which will not interfere with excavation or embankment or cause disintegration of the improvements shall not be disturbed. In any event, the Contractor shall avoid, as far as practicable, injury to shrubbery, vines, plants, grasses and other vegetation growing outside of the clearing limits. The dragging and the piling of materials of various kinds and the performing of other work which may be injurious to vegetation shall, insofar as practicable, be confined to areas which have no vegetation or which will be covered by embankment or disturbed by excavation during grading operations.

For the full width of all water courses within the right-of-way lines, no stump, root or other obstruction shall be left higher than the natural stream bed.

From excavated areas, all stumps, roots and other obstructions 3 inches or over in diameter shall be grubbed to a depth of not less than 18 inches below finish grade.

In embankment areas or other areas to be cleared outside the road prism slope lines, all stumps, roots and other obstructions shall not be left higher than specified in Table 201-1.

TABLE 201-1
EMBANKMENT CLEARING AND GRUBBING

Height of Embankment Over Stump	Height of Clearing and Grubbing
0 Feet to 2 Feet	All stumps or roots 6 inches or over in diameter shall be grubbed to 18 inches below original grade. All others shall be cut flush with the ground.
2 Feet to 3 Feet	All stumps 1 foot and over in diameter shall be grubbed to 18 inches below original grade. All others shall be cut flush with the ground.
Over 3 Feet	No stumps shall be left higher than the stump top diameter, and in no case more than 18 inches.

Cavities left below subgrade elevation by removal of stumps or roots shall be carefully backfilled and compacted.

Tree branches extending over the roadway, which hang within 12 feet of the profile grade or that restrict sight distance shall be cut off close to the trunk or stem of the tree in a neat and workmanlike manner. The Contractor shall remove additional tree branches under the direction of the Engineer, in such a manner that the tree will present a balanced appearance. Scars resulting from the removal of branches shall be treated with a heavy coat of an approved tree sealant.

All tree trunks, stumps, brush, limbs, roots, vegetation and other debris removed in clearing and grubbing shall be removed to locations outside of and out of sight of the right-of-way, or otherwise disposed of so as to leave the construction site and adjacent areas in a neat and finished condition, free from unsightly debris.

201.4 REMOVAL AND DISPOSAL OF SALVAGEABLE ITEMS:

Items and materials of salvage value as determined by the Engineer, unless incorporated in the new work, shall remain the property of the Contracting Agency and shall be storaged in adjacent areas as directed by the Engineer. Such items and materials shall be carefully removed and in such a manner as to permit reuse.

201.5 PAYMENT, CLEARING AND GRUBBING:

Unless otherwise provided in the special provisions or bid proposal, no payment will be made for clearing and grubbing as such; the cost thereof shall be included in the bid price for the construction or installation of the items to which said clearing and grubbing are incidental or appurtenant.

201.6 MEASUREMENT, REMOVAL AND DISPOSAL OF TREES:

If the proposal includes separate estimates of quantities for the removal of trees, the tree will be classified by size as follows:

(A) Trees 12 inches or less in diameter at 1-foot above the original ground surface will be included in the bid price for clearing and grubbing or excavation and no additional compensation will be allowed therefore.

(B) Trees more than 12 inches in diameter at 1-foot above the original ground will be included as separate bid item and payment will be made at the unit bid price quoted in the proposal.

201.7 PAYMENT, REMOVAL AND DISPOSAL OF TREES:

Payment for removal of trees will be on a unit price for each tree measured and removed, in accordance with the above classifications, at the unit price stipulated in the proposal.

- End of Section -

SECTION 205

ROADWAY EXCAVATION

205.1 DESCRIPTION:

Roadway excavation shall consist of excavation involved in the grading and construction of roadways, except structure excavation, trench excavation and any other excavation separately designated.

205.2 UNSUITABLE MATERIAL:

Material shall be considered unsuitable for fill, subgrade, shoulders and other uses if it contains organic matter, soft spongy earth, or other matter of such nature that compaction to the specified density is unobtainable.

Material that is unsuitable for the intended use shall be excavated and removed from the site or otherwise disposed of as directed by the Engineer.

The removal and disposal of such unsuitable material will be paid for as roadway excavation.

205.3 OVERSHOOTING:

Material outside the authorized cross-section which may be shattered or loosened because of blasting shall be removed by the Contractor at no additional cost to the Contracting Agency. The Contractor shall discontinue any method of blasting which in the opinion of the Engineer leads to excessive overshooting or is dangerous to the public or destructive to property or to natural features.

205.4 SLIDES AND SLIPOUTS:

Material outside the planned roadway or ditch slopes which in the opinion of the Engineer is unstable and constitutes potential slides, material which has come into the roadway or ditch, and material which has slipped out of new or old embankments shall be excavated to designated lines or slopes either by benching or in such manner as directed by the Engineer. Such material shall be used in the construction of the embankments or disposed of as directed by the Engineer.

The removal and disposal of slide and slipout material as specified above, not resulting from overshooting as specified above, will be paid for at the contract prices for roadway excavation; however, if due to the character of the work, the removal and disposal of such material is not properly compensable at the contract prices for roadway excavation, the work may be paid for as extra work provided the Contractor requests in writing such payment prior to performing any such work.

Only those quantities of slide or slipout material which are actually removed as ordered by the Engineer will be paid for.

205.5 SLOPES:

Excavation slopes shall be finished in conformance with the lines and grades shown on the plans. Debris and loose material shall be removed. When completed, the average plane of the slopes shall conform to the slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope, except where excavation is in rock no point shall vary more than 2 feet from the designated plane of the slope. In no case shall any portion of the slope encroach on the roadbed.

Tops of excavation slopes and ends of excavations shall be rounded as shown on the plans and these quantities will not be included in the quantities of excavation to be paid for. This work will be considered as a part of finishing slopes and no additional compensation will be allowed therefore.

Embankment slopes shall be finished in conformance with lines and grades shown on the plans. When completed the average plane of slopes shall conform to slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope.

205.6 SURPLUS MATERIAL:

Unless otherwise shown on the plans, specified in the special provisions, or approved by the Engineer, no surplus excavated material shall be disposed of within the right-of-way. The Contractor shall make all arrangements for disposal of the material at off-site locations as may be approved by the Engineer, and shall upon request file with the Engineer the written consent of the owner of the property upon which he intends to dispose of such material.

If the quantity of surplus material is shown on the plans or specified in the special provisions, the quantity shown or specified is approximate only. The Contractor shall satisfy himself that there is sufficient material available for the completion of the embankments before disposing of any indicated surplus material inside or outside the right-of-way. Any shortage of material caused by premature disposal of surplus material by the Contractor, shall be replaced by him and no compensation will be allowed the Contractor for such replacement.

205.7 MEASUREMENT:

The following earthwork operations will be measured as roadway excavation for the quantities of material involved.

Excavating the roadway prism including public and private road approaches, connections and driveways; excavating unsuitable material when shown on the plans or specified in the special provisions; excavating slides and slipouts not resulting from overshooting; excavating surplus material; excavating selected material and topsoil from within the limits of project and removing such materials from stockpiles when stockpiling is ordered; excavating ditches and excavating borrow.

The Engineer will compute the quantities of material excavated by a method which in his opinion is best suited to obtain an accurate determination.

Excavation in excess of the planned or authorized cross-section will not be paid for, except as provided above. The Contractor shall backfill and compact unauthorized excavated areas to the original ground elevation of authorized section at no additional cost to the Contracting Agency.

Material resulting from excavating ditches or channels may be used to construct roadway embankments, dikes, or for other purposes, or disposed of, as directed by the Engineer.

Care shall be exercised to prevent excavating below the grade for the bottom of the ditch and areas excavated below grade shall be filled with suitable material and compacted by the Contractor at no additional cost to the Contracting Agency.

205.8 PAYMENT:

Quantities of roadway excavation will be paid for at the contract unit price per cubic yard. Such price shall include excavating, sloping, rounding tops and ends of excavations, loading, depositing, conditioning, spreading, and compacting the material complete in place and disposal of surplus material.

When the proposal does not include a pay item for roadway excavation the cost thereof shall be considered as being included in the price bid for the construction or installation of the items to which such roadway excavation is incidental or appurtenant.

- End of Section -

SECTION 206

STRUCTURE EXCAVATION AND BACKFILL

206.1 DESCRIPTION:

Structure excavation shall consist of the removal of material for the construction of foundations for bridges, manholes, retaining walls, box culverts, head walls for culverts, and other structures, and other excavation designated on the plans or in these specifications or in the special provisions as structure excavation.

Structure backfill shall consist of furnishing material, if necessary, and placing and compacting backfill material around structures to the lines designated on the plans or specified or directed by the Engineer.

Structure excavation and structure backfill shall include the furnishing of all materials and equipment and the providing of other facilities which may be necessary to perform the excavations and place and compact the backfill, and the subsequent removal of these facilities, except where they are required or permitted by the plans, special provisions or Engineer to remain in place.

206.2 FOUNDATION MATERIAL TREATMENT:

When footing concrete or masonry is to rest upon rock, the rock shall be fully uncovered and the surface thereof shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly leveled off or cut to approximate horizontal and vertical steps, and shall be roughened. Seams in the rock shall be grouted under pressure or treated as the Engineer may direct and the cost thereof will be paid for as extra work.

When no piles are used and footing concrete or masonry is to rest on an excavated surface other than rock, care shall be taken not to disturb the bottom of the excavation and final removal of the foundation material to grade shall not be made until just before the concrete or masonry is placed. Excavation below grade shall be replaced with the same class of concrete specified for the structure or with 1 ½ sack controlled low strength material as specified in Section 728. When the replacement material is structural concrete, the material shall be placed at the same time as the structure material. Placement of controlled low strength material shall be per Section 604 which will require a time lag between placement of the material and the structural concrete. The placement of the additional material shall be at no cost to the Agency except when over-excavation is directed by the Engineer.

The excavation for structures shall be completed to the bottom of the footings before any piles are driven therein, and excess material remaining in the excavation after pile driving shall be removed to the elevation of the bottom of the footings.

When piles are used and ground displacement results from pile driving operations, the Contractor shall at his expense excavate or backfill the footing area to the grade of the bottom of the footing as shown on the plans with structure backfill material.

206.3 INSPECTION:

When any structure excavation is completed, the Contractor shall notify the Engineer who will make an inspection of the excavation. No concrete or masonry shall be placed until the excavation has been approved by the Engineer.

206.4 STRUCTURE BACKFILL:

206.4.1 Preparation for Structure Backfill: Prior to the placement of structure backfill, the Contractor shall remove all loose, unstable materials from the sides of the structure excavation that may constitute a safety concern or impact proposed backfill operations. The Contractor shall then compact the bottom of the remaining open structure excavation to a uniform density of not less than 95 percent maximum dry density. With the approval of the compaction of the bottom of the open structure excavation by the Engineer, the Contractor may start the placement of the Structure Backfill.

206.4.2 Structure Backfill for Earth Retaining Structures: Structure Backfill to be placed against concrete structures designed to retain earth loads, such as bridge abutment backwalls and wingwalls, box culvert outside walls and wingwalls, and retaining walls:

(A) Shall conform to the material and the graduation requirements for Select Material, Type A or B in Table 702-1 unless otherwise approved by the Engineer.

(B) Shall not be placed until the concrete has reached its full design strength.

(C) Shall be placed in layers not more than 8 inches in depth before compaction, when compacted by pneumatic or mechanical tamping devices.

(D) Shall be uniformly compacted to at least 95 percent of maximum density.

EXCEPTION: Catch basins constructed in accordance with standard details and having the outlet invert depth equal to or less than six feet may place structure backfill when the concrete has attained a minimum compressive strength of 2500 psi in compression as specified in Section 725 and in no case less than 72 hours after casting.

206.4.3 Structure Backfill for Structures Other than Earth Retaining: Structure Backfill placed against concrete structures not designed to retain earth loads:

(A) Shall not be placed until the concrete has attained a minimum compressive strength of 2500 psi in compression as specified in Section 725 and in no case less than 72 hours after casting.

(B) Shall be uniformly compacted to at least 95 percent of maximum density.

206.4.4 Structure Backfill for Structures within Paved Areas: Where a structure is located within an existing street, proposed street, or paved area shall be compacted to the minimum density specified in Table 601-2, for Type I or shall be filled with ½ sack or 1 sack controlled low strength material as specified in Sections 604 and 728.

206.4.5 Structure Backfill for Precast Minor Structures: Minor structures, as defined in Section 505.1.1, when furnished as precast structures, shall be placed on a compacted layer of Structure Backfill at least 6 inches in depth that conforms to the material requirements of Section 206.4.2. The layer shall be shaped to fit the bottom surface of the precast unit and compacted to not less than 100 percent maximum density. The Structure Backfill shall be at or near optimum moisture content, as approved by the Engineer. After the unit has been initially set in place and checked for line and grade, it shall be removed, and any defects in its bearing area or line and grade shall be corrected by trimming and by placing and compacting similarly moistened Structure Backfill and the unit reset in place. If in the opinion of the Engineer the bearing area or line or grade of a set precast unit is defective, the Contractor shall remove the unit, correct the bearing area and reset the unit at no additional cost to the Agency. Precast units shall be installed on compacted, shape-conformed Structure Backfill in reasonable conformity with the lines and grades shown on the project plans.

206.4.6 Relative Compaction: Unless otherwise provided in the plans and/or special provisions the maximum density shall be determined using procedures defined in Section 301.

206.5 PAYMENT:

Unless otherwise provided in the special provisions or proposal, no payment will be made for structure excavation and backfill as such; the cost thereof shall be included in the contract price for the construction or installation of the items to which such excavation and backfill are incidental or appurtenant.

When the Special Provisions identify Structure Excavation and/or Structure Backfill as pay items, the following methods of measurement and payment shall be used:

206.5.1 Measurement

(A) **Structure Excavation:** Structure Excavation will be measured by the cubic yard, based on the volumes calculated from the measurement/pay limits shown on the Project Plans. If no limits are shown, the measurement for Structure Excavation shall be in accordance with the applicable details shown on the current Arizona Department of Transportation (ADOT) Standard Drawings B-19.30 and/or B-19.50.

No reduction in measurement for payment will be made when the Contractor elects to not excavate all material between the limits of the actual structure, and the pay limits shown on the Project Plans and/or the above referenced ADOT Standard Drawings.

No additional measurement for payment will be made for excavation resulting from lack of side support for structure excavations, nor due to carelessness of the Contractor.

(B) **Structure Backfill:** Structure Backfill will be measured by the cubic yard, based on the volumes calculated from the measurement/pay limits shown on the Project Plans. If no limits are shown, the measurement for Structure Backfill shall be in accordance with the applicable details shown on the current ADOT Standard Drawings B-19.40 and/or B-19.50.

206.5.2 Payment

Structure Excavation and Structure Backfill: The accepted quantities of Structure Excavation and the accepted quantities of Structure Backfill will be paid for at their respective contract unit prices.

Hauling, placing, and compacting surplus Structure Excavation in embankments, or otherwise disposing of the material, shall be included in the contract price paid for Structure Excavation.

- End of Section -

SECTION 210

BORROW EXCAVATION

210.1 LOCAL BORROW:

Local borrow shall consist of material excavated and used in the construction of fills or for use as selected material or for other construction purposes. Local borrow shall be obtained by widening cuts or by excavating from other sources outside the planned or authorized cross-section within the right-of-way and within the limits of the project. Local borrow shall be excavated to the lines and grades established by the Engineer.

210.2 IMPORTED BORROW:

Imported borrow shall consist of material required for construction and unless otherwise designated in the special provisions, the Contractor shall make arrangements for obtaining imported borrow and shall pay all costs involved. When designated sources for imported borrow are indicated on the plans, in the special provisions, the material shall be assumed approved by the Engineer.

Borrow material for fill within the roadway prism shall meet the following requirements:

The Plasticity Index (PI) (AASHTO T-90) and the percent passing the number 200 sieve (Minus 200) (ASTM C136) when used in the equation below, shall give a value of X that does not exceed 62.

X = (Minus 200) + 2.83 (PI)

When the percentage of the Minus 200 material is greater than 30, the PI for the soil shall be at least 5 and at the same time in compliance with the X value requirement.

The material shall be free from wood, vegetation, or other deleterious matter. The maximum size of this material shall not be greater than 2/3 the compacted thickness of the course placed in the subgrade.

The Contractor shall notify the Engineer sufficiently in advance of opening any material sites so that cross-section elevations and measurements of the ground surface after stripping may be taken and sufficient time for testing and material will be allowed.

Borrow pits shall be excavated to regular lines to permit accurate measurement; depth of excavation throughout the area of borrow pits shall be as uniform as practicable and the side slope shall be dressed to such slope as may be directed, leaving the borrow pit area in a clean and safe condition.

210.3 PLACING AND COMPACTING:

Local borrow and imported borrow shall be placed and compacted as specified in Section 211.

The Contractor shall satisfy himself that there is sufficient space available in fill locations for placing any excavated material, before placing borrow. Any excess excavation which develops as a result of placing borrow in advance of completing excavations shall be disposed of by the Contractor at no additional cost to the Contracting Agency in accordance with the provisions in Section 205 and a corresponding reduction in the quantity of borrow to be paid for will be made, for which the Contractor will have no claim for compensation.

210.4 MEASUREMENT:

Quantities of borrow will be measured as specified for roadway excavation in Section 205.

Material excavated at the borrow site and not used on the work will be deducted from the computed quantities and will not be paid for.

210.5 PAYMENT:

Quantities of borrow excavation will be paid for at the contract unit price per cubic yard. Such price shall include excavating, sloping and cleaning of borrow area, hauling, depositing, spreading and compacting the material complete in place, and disposal of surplus material, unless an alternate basis of payment is stipulated in the proposal.

- End of Section -

SECTION 211

FILL CONSTRUCTION

211.1 DESCRIPTION:

Fill construction shall consist of constructing embankments except as may otherwise be specified, including the preparation of the areas upon which they are to be placed; the construction of dikes; the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of material in holes, pits, and other depressions.

211.2 PLACING:

Rocks, broken concrete, or other solid material, which are larger than 4 inches in greatest dimension, shall not be placed in fill areas where piles are to be placed or driven.

When fill is to be made and compacted on hillsides or where new fill is to be compacted against existing fill or where embankment is built ½ width at a time, the slopes of original hillsides and old or new fills shall be benched a minimum of 4 feet horizontally as the fill is placed. A new bench shall be started where ever the vertical cut of the next lower bench intersects the existing ground. Material thus cut out shall be recompacted along with the new embankment material by the Contractor at no additional cost to the Contracting Agency, unless the width of the bench required exceeds 4 feet, in which case the excavated material in excess of 4 feet will be measured and paid for as excavation.

Clods or hard lumps of earth of 6 inches in greatest dimension shall be broken up before compacting the material in embankment, except as provided in the following paragraph:

When the fill material includes large rocky material, or hard lumps, such as hardpan or cemented gravel which cannot be broken readily, such material shall be well distributed throughout the fill. Sufficient earth or other fine material shall be placed around the larger material as it is deposited so as to fill the interstices and produce a dense, compact fill. However, such material shall not be placed within 2 feet of the finished grade of the fill.

211.3 COMPACTING:

Fill shall be constructed in compacted layers of uniform thickness and each layer shall be compacted in accordance with the requirements herein specified with the following exception.

Where fills are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping successive loads of suitable materials in a uniformly distributed layer of thickness not greater than that necessary to support the equipment while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

Unless specified herein, or in the special provisions, the construction of dikes, the placing and compacting of approved material within the right-of-way where unsuitable material has been removed, and the filling of holes, pits and other depressions within the right-of-way, shall conform to all of the requirements herein specified for compacting fills. Trenches, holes, depressions and pits outside of areas where fills are to be constructed shall be graded to provide a presentable and well-drained area.

Areas over which fills are to be placed shall be cleared and scarified to a depth of 6 inches to provide a bond between the existing ground and the material to be deposited thereon. Unless otherwise specified, the original ground area upon which fills are to be constructed shall be compacted to a uniform density of not less than 95 percent.

The loose thickness of each layer of fill material before compacting shall not exceed 8 inches, except as provided in the following paragraph for rocky material. Each layer shall be compacted in accordance with the following requirements to a uniform density of not less than 90 percent, except that where a new or widened roadway and appurtenances are required, density of the upper 2 feet and when the fill is within 2 feet of the above shall be not less than 95 percent.

When fill material contains by volume over 25 percent of rock larger than 6 inches in greatest dimension, the fill below a plane 3 feet below finished grade may be constructed in layers of a loose thickness before compaction not exceeding the maximum size of rock in the material but not exceeding 3 feet in thickness.

The interstices around the rock in each layer shall be filled with earth or other fine material and compacted. Broken Portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the fill with the following limitation:

(A) The maximum dimension of any piece used shall be 6 inches.

(B) Pieces larger than 4 inches shall not be placed within 12 inches of any structure.

(C) Pieces larger than 2 ½ inches shall not be placed within 12 inches of the subgrade for paving.

(D) Nesting of pieces will not be permitted.

At the time of compaction, the moisture content of fill material shall be such that the specified relative compaction will be obtained and the fill be firm and unyielding. Fill material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required relative compaction. Full compensation for any additional work involved in drying fill material to the required moisture content shall be considered as included in the contract price paid and no additional compensation will be allowed therefore.

Embankments shall be constructed so that each layer shall have a cross fall of at least 2 percent but no more than 5 percent.

211.4 TESTS:

Unless otherwise provided in the plans or special provisions the fill shall be thoroughly compacted to not less than the stated densities when tested and determined by AASHTO T-99, Method A, and T-191 or ASTM D6938 with the percent of density adjusted in accordance with the rock correction procedure for maximum density determination, standard detail, to compensate for the rock content larger than that which will pass a No. 4 sieve.

211.5 MEASUREMENT:

The quantities of fill construction used to construct embankments or dikes will be those of the complete bid item, in place, within the limits of dimensions shown on the plans.

The Engineer will compute the quantities of fill by a method which in his opinion is best suited to obtain an accurate determination.

211.6 PAYMENT:

Quantities of fill construction will be paid for at the contract unit price per cubic yard of fill as stipulated in the proposal. Such price shall include placing and compaction and all related work as specified above, unless an alternate basis of payment is stipulated in the proposal.

Unless otherwise provided in the special provisions, no payment will be made for fill construction to replace unsuitable material or for fill for holes, pits, and other depressions. The cost thereof shall be included in the price bid for the construction of the items to which such fill is incidental or appurtenant.

- End of Section -

SECTION 215

EARTHWORK FOR OPEN CHANNELS

215.1 DESCRIPTION:

Earthwork for open channels shall consist of clearing, stripping, excavation, fill, backfill, grading and disposal of excavated and removed material.

Open channels for the purpose of this Section shall mean open rectangular concrete channels and lined or unlined trapezoidal channels.

215.2 STRIPPING:

When stripping is indicated on the plans or specified in the special provisions, the Contractor shall strip the soil from the designated areas to the depths shown or specified or as directed by the Engineer.

The material obtained from stripping operations shall be disposed of away from the site unless otherwise specified, shown on the plans or authorized by the Engineer.

Soil loosened below the stripping depth specified or designated by the Engineer, shall be compacted. Soil removed below stripping depth shall be replaced with approved material and compacted up to the designated grade. All such filling and compacting shall be done by the Contractor at no additional cost to the Contracting Agency.

215.3 EXCAVATION:

Excavation in open cut for lined channels may be made so as to place concrete directly against the excavated surfaces providing the faces of the excavation are firm and unyielding; are such as will stand or can be made to stand without sloughing and are, at all points outside the concrete lines shown on the plans.

Excavation to provide a subgrade for lined channels, or subdrainage material, shall be to the lines indicated on the plans; and, excavation made below subgrade shall be backfilled and compacted to a uniform density of not less than 90 percent or, if approved by the Engineer, with concrete or other materials being placed. However, no payment will be made for such over-excavation or material used for such backfill.

Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, the voids remaining after the removal of such boulders or interfering objects shall be backfilled as specified below, or as otherwise approved by the Engineer.

(A) When the void is below the subgrade for reinforced concrete channel, it shall be filled with suitable material, as approved by the Engineer, and compacted to a uniform density of not less than 90 percent. With the approval of the Engineer, concrete of the same mix as used in the concrete channel, may be used.

(B) When the void is in the side of the excavation, it shall be filled with suitable material as approved by the Engineer, placed in the manner and to the same uniform density as the backfill in the vicinity of the void. With the approval of the Engineer, concrete of the same mix as used in the concrete channel may be used. If concrete is placed prior to lining, a lower grade concrete may be used only if approved by the Engineer.

It shall be understood that the removal of boulders or other interfering objects and the backfilling of voids caused by such removals shall be done by the Contractor at no additional cost to the Contracting Agency. The cost of such work shall be included in the prices bid for the various items of work.

If during the progress of excavation, material is encountered, which, in the opinion of the Engineer, is unsuitable for subgrade for the channel to be constructed on, the Engineer may direct the Contractor to excavate beyond the pay lines shown on the plans. However, the suitability of subgrade shall be determined by the Engineer on the basis of its ability to withstand the load of the proposed channel and not upon the capacity to withstand the loads which may be placed upon it by the Contractor's equipment. Should the Contractor be directed to excavate beyond the pay lines shown on the plans, said pay lines will be extended to include such ordered excavation; and the pay lines for subdrainage material, if used, will be adjusted accordingly.

Materials used or work performed by the Contractor, to stabilize the subgrade so it will withstand loads which may be placed upon it by his equipment shall be accomplished by the Contractor at no additional cost to the Contracting Agency.

215.4 FILL AND BACKFILL:

Unless otherwise specified in the special provisions, material obtained from the project excavations may be presumed to be suitable for use as fill or backfill provided that all organic material, rubbish, debris, and other objectionable material is first removed. However, stone, broken Portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the backfill or fill with the limitations as specified in Section 211.

Unless otherwise specified in the special provisions, the density of fills and backfills shall be at least 90 percent.

215.5 GRADING:

Grading of unlined channels, levees and access roads shall conform to the following tolerances:

(A) A vertical tolerance of none above and 3 inches below the specified grade will be allowed on:

(1) Channel bottom

(2) Channel side slopes in both cut and fill

(3) Levee and access road side slopes in cut

(B) A vertical tolerance of none below and 3 inches above the specified grade will be allowed on:

(1) Top surface of levee and access road in both cut and fill

(2) Levee and access road side slopes in fill

Regardless of the construction tolerances specified, excavation and grading shall be performed so that finished surfaces are in uniform planes with no abrupt breaks in the surface.

Construction tolerances specified above for grading are solely for purposes of field control.

215.6 TESTS:

Density tests shall be made in accordance with Section 211.

215.7 MEASUREMENT:

If compensation for stripping is included in the price paid for other items of work the Contractor shall notify the Engineer sufficiently in advance of excavation or other work so that cross-section elevations and measurements of the ground surface may be taken upon completion of stripping.

The Engineer will compute the quantity of excavation by a method which in his opinion is best suited to obtain an accurate determination.

215.8 PAYMENT:

Earthwork for open channels will be paid for on a lump sum basis or at the contract unit price per cubic yard of excavation as stipulated in the proposal. Such price shall include clearing, stripping, excavation, fill, backfill, compaction, grading, hauling, removal and disposal of excess excavated material and debris unless an alternate method of payment is stipulated in the proposal.

- End of Section -

SECTION 220

RIPRAP CONSTRUCTION

220.1 DESCRIPTION:

Riprap construction shall consist of furnishing and placing stone, with or without grout, and underlain with filter material of granular filter blankets or erosion control geosynthetic fabric. The depth and type of riprap shall be as shown on the plans or in the special provisions.

220.2 MATERIALS

Riprap shall conform to the requirements of Section 703.

Erosion control geosynthetic fabric shall conform to the requirements of Table 796-3 in Section 796.

Waste or sacked concrete shall not be permitted for use as riprap.

The Contractor, at no additional cost, shall provide mechanical equipment, a sorting site, and labor needed to assist in checking riprap gradation.

Granular filter blankets shall consist of processed natural material conforming to the requirements of Section 701, with the gradation and thicknesses as specified on the plans or in the special provisions.

220.3 PREPARATION OF GROUND SURFACES

The bed for placement of riprap shall be shaped and trimmed to provide even surfaces.

220.4 PLACEMENT OF EROSION CONTROL GEOSYNTHETIC FABRIC:

Fabric shall be placed at the locations shown on the project plans. The Contractor shall provide a surface free of obstructions, depressions, debris, and soft yielding surfaces prior to the placement of fabric. The fabric shall be loosely laid (not in a stretched condition), aligned and placed with no fold over wrinkles.

The fabric shall be placed to provide a minimum 24-inch of overlap for each joint. On horizontal joints, the uphill fabric shall overlap the downhill fabric. On vertical joints, the upstream fabric shall overlap the downstream fabric.

Bedding material shall be placed uniformly on the fabric to the depth specified on the plans and shall be free of mounds, dips, and windrows. Bedding material shall not be compacted.

220.5 RIPRAP PLACEMENT:

Riprap shall be carefully placed on filter material consisting of a granular filter blanket or the bedding material on erosion control geosynthetic fabric. Placement shall not damage the underlying filter blanket or geosynthetic fabric. If the Engineer determines that the placement of stone has damaged or displaced the filter material to the extent that it cannot function as intended, the Contractor, at his expense, shall remove the placed riprap stone and properly correct the damage to, and/or the displacement of, the filter material. Such correction may include the removal of the filter material, re-grading the affected area, and subsequent replacement of the filter material and riprap stone as required by the Engineer.

Riprap shall be placed in a manner which will produce a dense, reasonably well-graded mass without segregation and with a minimum amount of voids. The larger stone shall be evenly distributed through the riprap mass. The individual placement of larger riprap stones may be required to obtain a uniform distribution of stone size. The riprap placement shall be supplemented by such hand methods as are required to obtain a uniform finished surface. Allowable tolerance from the slope lines and grades shown for the finished riprap surfaces shall not exceed a distance equal to 1/3 of the nominal D_{50} size above or below the design surfaces. The final surface elevations shall be lower than any adjacent apron or pipe invert elevations and shall not obstruct the operation of adjacent structures. The flow line within riprap shall provide positive drainage with minimal ponding. Individual stones shall depress below the finished grades no lower than a distance equal to 1/2 of the nominal D_{50} size. Special care shall be exercised in placing riprap within 3 feet of structures to avoid damage to such structures.

220.6 GROUTED RIPRAP:

Place riprap as specified in Section 220.5, excluding the use of filter material and secure in place with Portland cement grout meeting the requirements of Table 220-1. Place grout to the depth as shown on the plan but in no case less than 70 percent of the depth of riprap. Consolidate grout into place with suitable spades, trowels or other approved means to provide a dense stone and mortar layer with all voids and interstices filled. After grout has been placed, the rocks shall be thoroughly brushed so that their top surfaces are exposed. If required, use water pressure to clean stone faces after the mortar has achieved sufficient strength. The outer rocks shall project 1/3 to 1/4 their diameter above the grouted surface.

TABLE 220-1
Grout for Riprap

Minimum Cementitious Material (lbs)	Maximum W/CM Ratio	Slump (in)	Air Content (%)
850	0.60	9 +/- 2	0 % - 8 %

The cementitious materials shall meet the requirements of Section 725.2. Up to 25 percent by weight of the Table 220-1 minimum cementitious materials requirements may be an approved fly ash or natural pozzolan. The aggregates shall meet the applicable requirements of ASTM C33, #8 (3/8") coarse aggregate grading and fine aggregate (sand) grading. All Ready Mixed Grout volume calculations shall be based on "absolute volume" with the total volume per cubic yard equal to 27 cubic feet. Coarse aggregate volume shall be a maximum of 35% of the total aggregates volume. All mixing shall be in accordance with the applicable requirements of Section 725.7.

The amount of slump shall be the minimum amount needed to permit gravity flow into the interstices with limited spading and brooming. The consistency of the grout shall be as approved by the Engineer.

220.7 MEASUREMENT:

The completed, in place riprap construction within the limits of the dimensions shown on the plans shall be measured. Measurement will be in cubic yards rounded to the nearest cubic yard.

No separate measurement will be made for erosion control geosynthetic fabric, bedding material, or grout.

220.8 PAYMENT:

Payment for riprap will be made for the accepted complete in-place riprap construction at the contract unit price. Riprap construction shall include excavation, ground surface preparation, erosion control geosynthetic fabric (if used for the project), bedding material, riprap stone, grout (if used for the project) and backfilling.

Payment for riprap shall be full compensation for furnishing all material, labor and equipment for riprap construction.

- End of Section -

SECTION 230

DUST PALLIATIVE APPLICATION

230.1 DESCRIPTION:

This Section shall govern the application of dust control palliatives (agents) on unpaved roads, traffic surfaces, vacant lots, construction sites and road shoulders. Dust palliatives may also be used to protect erosion of slopes, embankments, sediment control and re-vegetated areas.

Dust palliatives may be applied as topical treatments to penetrate an undisturbed surface, or may be applied to larger areas using mixing methods that blend the product with surface material and then compact the mixture to provide a stabilized, dust resistant, surface course.

230.2 MATERIALS:

Materials to be used as dust palliatives shall conform to the requirements of Section 792. The specific dust palliative to be used shall be as shown on the plans or as directed by the Engineer.

Water used for diluting dust palliatives and for pre-wetting of treated subgrade shall be either potable or from a source compatible with dust palliative ingredients.

230.2.1 Product Verification: The Contractor, in the presence of the Engineer or his designee, shall obtain samples of the bulk, undiluted liquid dust palliative/stabilizer product as it is delivered to the job site. Samples shall be taken from each bulk tanker that delivers the liquid dust palliative/stabilizer for product verification testing purposes. If the bulk undiluted liquid dust palliative/stabilizer is delivered in containers, a sample must be taken from each container delivered to the job site. The Engineer will select the exact locations and times of sampling. The obtained liquid dust palliative/stabilizer samples will be split in three equal portions (minimum 2 ounce each), whereby the Contractor may retain one sealed portion for verification testing, and the Engineer will retain two sealed portions. One portion of the Engineer's samples will be provided to an AASHTO accredited test lab chosen by the Contractor. The other sample will be held for backup until the testing is completed. Sample containers will be labeled and sealed under the supervision of the Engineer.

The accredited lab will test the product in accordance with ASTM D2834 to confirm that the liquid dust palliative/stabilizer meets the requirements of Section 792.2 for active solids. Contractor is responsible for the cost of product verification testing.

If the test reports indicate that the minimum acceptable active solids content value as specified in Section 792.2 is not met, the quality of the liquid dust palliative/stabilizer product shall be deemed deficient by the Engineer. The delivery and application of a deficient product shall be stopped. Work shall not resume until all product verification testing is complete or the Contractor replaces the product and initial tests on the new material show compliance.

The Contractor may perform additional verification testing on the split samples. In case of dispute where the verification tests produce different results by the Contractor than the Engineer, the Engineer will hire a different independent AASHTO accredited testing laboratory to perform a third round of testing. Such testing and the results of the testing shall be considered final by both the Engineer and Contractor for verification.

230.3 COMPLIANCE:

At least two weeks prior to the start of work, the Contractor shall provide the Engineer the following Applicator qualifications: (a) Information showing that the Applicator has at least three years of experience within the last five years serving as either a primary contractor or subcontractor in delivering and applying dust palliative/stabilizer product services, (b) A minimum 3 local references (including company/organization name, contact person and telephone number) to demonstrates that the Applicator is familiar with local environmental and permitting requirements associated with soil stabilization and dust palliative, and (c) Copy of the Applicator's State of Arizona Registrar of Contractors License.

At least two weeks prior to the start of work, the Contractor shall provide the Engineer the proposed application methods and equipment for the project. The information provided shall include: (a) curing time for each application method required for the project, (b) application and dilution rates proposed for the project, and (c) equipment to be used during all phases of application that are in conformance with Section 230.4.

Prior to the commencement of any work, the Contractor shall provide copies of all required environmental/dust control permits, any required notices of intent, and the current Material Safety Data Sheet (MSDS) for the dust palliative/stabilizer product. The MSDS must include all chemical compounds present in concentrations greater than 1% for dust palliative/stabilizer product.

230.4 EQUIPMENT:

The Contractor shall provide all equipment necessary to complete the work. The equipment may include but not be limited to motorized graders, distribution trucks, mixing and pulverizing equipment, pneumatic-tired rollers, sprinkler systems, etc. All equipment used for this work is subject to approval by the Engineer. Equipment which fails to provide an acceptable application of properly diluted dust palliative/stabilizer product or does not perform satisfactorily shall be removed from the job and replaced with acceptable equipment meeting the requirement of this specification.

Distributor trucks shall be designed, equipped, maintained and operated so that dust palliative/stabilizer product may be applied uniformly on variable widths of surface up to 16 feet at readily determined and controlled rates from 0.03 to 1.0 gallons per square yard, with uniform pressure, and with an allowable transverse variation from any specified rate not to exceed 10% or 0.02 gallon per square yard, whichever is less. The maintenance and calibration of this vehicle shall be checked periodically. The record of maintenance and calibration shall be submitted to the Engineer for review upon request.

Distributor trucks proposed for use shall have been tested within 6 months from the date of spreading to determine the rate of the transverse spread. If requested, the Contractor shall furnish the Engineer with evidence that the transverse spread of the distributor truck, when the trucks were approved for use, was as uniform as practicable and under no condition was there a variance on any of the test pads greater than the allowable transverse variation; however, the Engineer may require that each distributor truck be tested to determine the rate of the transverse spread. The rate of the transverse spread shall be determined in accordance with the requirements of Arizona Test Method 411.

230.5 PREPARATION OF SURFACE:

All surface preparation shall be in conformance with Maricopa County Rule 310 and 310.01 as applicable.

230.5.1 Topical Preparation: Prior to the application of the dust palliative, the surface shall be graded to provide drainage.

Dust palliatives shall not be applied when the surface is excessively wet or saturated. Surfaces shall be pre-moistened only if required by the product manufacturer.

230.5.2 Surface Course Preparation: Areas to receive dust palliative shall be graded and scarified to at least the minimum depth and width shown on the plans. The soil shall be scarified/loosened by tilling, disking, ripping, or by other soil preparation methods, which achieves uniform results to the minimum depth shown on the plans. The material shall be damp at time of scarification to reduce dust and aid in pulverization. Soil clods shall be pulverized until all material, exclusive of gravel or stone, will past a 2-inch sieve.

All debris, weeds, organic material, stone larger than 4 inches, etc., shall be removed from the site. Surface gravel or stones shall be removed or thoroughly mixed with the surrounding soils to obtain a homogeneous mixture.

If pre-wetting is required, ample amount of water shall be added and mixed with the in-place material to obtain a moisture content near optimum. This moisture content shall be established prior to and maintained until the application of the dust palliative. The methods to establish and maintain the moisture shall be done in accordance with manufacturer's recommendations. The moisture must be uniformly distributed throughout the surface course and over the underlying undisturbed soil. Dust palliatives shall not be applied when the soil is excessively wet or saturated. Moisture content shall be determined in accordance with either ASTM D6938 or ASTM D4944.

230.6 APPLICATION:

230.6.1 General: The dust palliative shall be applied by a pressure type distributor vehicle equipped with a power unit for the pump, full circulation spray bars adjustable laterally and vertically, and computer controls. The distribution vehicle shall be calibrated to ensure a controlled application method. Spray bars and extensions shall be of the full circulating type. Valves which control the flow from nozzles shall be of a positive active design so as to provide a uniform, unbroken spread of dust palliative on the surface.

Corners or surface that cannot be accessed by the distributor truck shall be hand sprayed by means of hoses or bars pressurized by a gear pump or air tanks.

Distributor equipment shall be equipped with a tachometer and pressure gauge. To provide for accurate, rapid determination and control of the amount of dust palliative being applied, distributor equipment shall include one or more of the following: accurate volume measuring devices, a calibrated tank, and/or a certified meter or weight tickets and calibration charts relating to the specific gravity of the concentrate and/or dilution.

The dust palliative shall be applied at the dilution ratio and application rate specified in accordance with Section 792, unless otherwise directed by the Engineer. The Contractor shall dilute the dust palliative product as needed, with the dilution ratio adjusted within the ranges specified in Section 792, to bring the mixture to the desired moisture content. Products may be applied in multiple passes at reduced application rates to meet the total application rate specified and/or assure uniform coverage.

The Contractor shall notify the Engineer a minimum of 5 working days prior to any application of dust palliative.

230.6.2 Topical Application: Topical applications shall be rolled only when recommended by the manufacturer. Complete penetration of palliative will be required prior to the surface rolling. Complete penetration occurs when the compaction equipment will not track or pick up the dust palliative and/or the top layer of the surface material.

230.6.3 Surface Course Application: The stabilization product shall be applied, incorporated and thoroughly blended into the soil until the homogeneous mixture is obtained to the full depth of treatment. Mixing shall be done in-place using mixing equipment or by motorized grader (blade mixing). The blending methods utilized shall result in a uniformly treated mixture of soil and dust palliative at or near optimum moisture content (minus any post-compaction dust palliative top coat application quantity). The dilution ratio may be adjusted to bring the mixture to the desired moisture content. The amount of area treated each day shall be limited to that which the Contractor can thoroughly mix and compact within that work day.

Complete penetration of palliative will be required prior to compaction. Complete penetration occurs when the compaction equipment will not track or pick up the blended material.

The blended material shall be shaped to the required grade line and cross-section shown on the plans and be compacted at least 95% of maximum density in accordance with ASTM D698, unless otherwise directed by the Engineer. The final surface shall be rolled to a smooth and even grade. Sufficient grading shall be done to provide reasonable drainage within the limits of existing drainage patterns. Immediately after the compaction, a top coat of dust palliative shall be applied.

230.7 CURING:

No equipment or traffic will be permitted on the treated surface for 24 hours unless otherwise approved by the Engineer. Once cured, the dust palliative final coat shall form a skin at the surface or a crusted surface. For purpose of this work, a “skin” on the surface will be a formation of any palliative on the surface of the soil that cannot be dislodged from the soil by winds. Any formation of the palliative on the soil surface must adhere to the underlying soil to a depth of 1/8th inch when applied topically.

230.8 WEATHER CONDITIONS:

Dust palliative/stabilizer product shall be applied only when the ambient temperature is above 50°F. Application should be avoided during high wind or when there is the chance of rain within the next 8 hours. The Contractor shall be responsible to retreat at no additional cost if the application is degraded by weather within the first 24-hours of placement.

230.9 QUALITY CONTROL

The Contractor must provide manufacture-trained personnel for on-site technical assistance during initial delivery and application. This technical assistance is to assure that the dust palliative/stabilizer product is applied at proper dilution ratios and application rates on various soil, and subgrade types for optimum results.

At the start of each work day, the bulk tanker will be measured to verify the gallons of liquid dust palliative/stabilizer product brought to the job site. At the end of the day, the bulk tanker will be measured to verify the gallons of liquid dust palliative/stabilizer product remaining at the job site. The distributor truck shall be inspected to insure it is empty at the end of the day. The total gallons of liquid dust palliative/stabilizer product used for the day will be established by the start and end of day measurements of the bulk tanker.

A daily "Gallon Use Report" will be filled out by the distributor truck driver. The report will also identify the size of area treated for the day. It will be verified and signed by the Engineer or his designee. This report will be used to verify application rate and total product used. If the report indicates that the minimum application rate was not achieved, the work shall be deemed deficient by the Engineer.

230.10 DEFICIENCIES AND WARRANTY

If applied product active solids content is found deficient per Section 230.2.1, the Engineer may allow the Contractor to apply to any surfaces already treated by the deficient product additional topical coats of the dust palliative/stabilizer product to remedy the deficiency. Otherwise, the Contractor shall be required to repeat all work as directed by the Engineer with a different approved liquid dust palliative/stabilizer product that is compatible with the original product and will not result in adverse effects. The Contractor shall bear the cost of all remediation work for deficient product.

If the application rate as determined by the methods described in Section 230.9 or as agreed to in the contract documents is found to be deficient, the Contractor shall apply additional product within 24-hours of the original application to bring the total application rate to at least the minimum specified amount. If liquid dust palliative/stabilizer product was used as a soil stabilizer per Section 230.6.3, as directed by the Engineer, the Contractor shall re-scarify the stabilized section to its full depth and re-apply product at the original application rate. The Contractor shall bear the cost of all remediation work for deficient application rate.

For non-traffic areas (less than 150 vehicle trips per day), application of the dust palliative/stabilizer product placed in accordance with this Section shall provide a surface meeting the stabilization requirements of Maricopa County Rule 310 Section 302 and Maricopa County Rule 310.01 Section 302 for a minimum of 12 months from acceptance by the Engineer.

During the warranty period, the Contractor shall provide and install the product free of charge if the finished product fails to meet the performance requirement and specification/criteria outlined under this technical specification. The Contractor shall provide additional applications when within five working days of notification from the Engineer of performance failure.

230.11 MEASUREMENT:

Dust palliative surface course application shall be measured by the square yard, in place, treated, compacted, to the proper depth and accepted.

Dust palliative materials will be measured by the ton of undiluted material. Any conversion from volumetric quantities shall be done with Contractor-supplied calibration charts relating to the specific gravity of the concentrate and/or dilution.

230.12 PAYMENT:

Payment will be made for the applicable items at the Contract unit price and shall constitute full compensation for the item complete in place.

- End of Section -

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PART 300

STREETS AND RELATED WORK

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SECTION 301

SUBGRADE PREPARATION

301.1 DESCRIPTION:

This Section shall govern the preparation of natural or excavated areas prior to the placement of sub-base material, pavement, curbs and gutters, driveways, sidewalks or other structures. It shall include stripping and disposal of all unsuitable material including existing pavement and obstructions such as stumps, roots, rocks, etc., from the area to be paved.

301.2 PREPARATION OF SUBGRADE:

With the exception of areas where compacted fills have been constructed as specified in Section 211, in the areas where new construction is required, the moisture content shall be brought to that required for compaction by the addition of water, by the addition and blending of dry, suitable material or by the drying of existing material. The material shall then be compacted to the specified relative density. If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency.

Subgrade preparation shall also include preparing the subgrade to the required line and grade for paved or unpaved shoulders, tapers, turnouts, and driveways, and at all other project locations where aggregate base and/or select material courses are used in accordance with the Project Plans.

301.2.1 The Contractor may use removed existing asphalt concrete and other existing bituminous roadway surfacing materials originating on the project site, as embankment fill. All materials used shall be thoroughly crushed to sizes not exceeding four inches, or as approved by the Engineer. These asphalt/bituminous materials shall be placed not less than two feet below finished subgrade elevation.

Project earthwork quantities when included as separate contract pay items will include removed asphalt/bituminous material volumes, unless otherwise specified in the Special Provisions.

All unsuitable material and all excess material shall be disposed of in accordance with the requirements of Sections 205.2 and 205.6, respectively. When additional material is required for fill, it shall conform to Section 210.

301.3 RELATIVE COMPACTION:

The subgrade shall be scarified and loosened to a depth of 6 inches. Rock 6-inches or greater in size that becomes exposed due to scarification shall be removed from the scarified subgrade. When fill material is required, a layer of approximately 3 inches may be spread and compacted with the subgrade material to provide a better bond. The subgrade cut and fill areas shall be constructed to achieve a uniform soil structure having the following minimum compaction, measured as a percentage of maximum dry density when tested in accordance with AASHTO T-99, Method A, and T191 or ASTM D6938 with the percent of density adjusted in accordance with the rock correction procedures for maximum density determination, ARIZ-227c[1] to compensate for the rock content larger than that which will pass a No. 4 sieve. Unless otherwise noted in the project plans or project specifications, compaction shall be performed within 2 percentage points of the optimum moisture content.

(A) Below pavement, curb and gutter, attached sidewalk, roadway shoulders, and other areas within right-of-way subject to vehicular traffic — 95 percent

(B) Below detached sidewalk not subject to vehicular traffic — 85 percent

301.4 SUBGRADE TOLERANCES:

Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed shall not vary more than 1/4 inch from the specified grade and cross-section. Subgrade upon which sub-base or base material is to be placed shall not vary more than 3/4 inch from the specified grade and cross-section. Variations within the above specified tolerances shall be compensating so that the average grade and cross-section specified are met.

[(1)] Arizona Department of Transportation test method.

301.5 GRADING OF AREAS NOT TO BE PAVED:

Areas where grade only is called for on the plan shall be graded to meet the tolerances for the subgrade where subbase or base material is to be placed. The surface shall be constructed to a straight grade from the finished pavement elevations shown on the plans to the elevation of the existing ground at the extremities of the area to be graded.

301.6 PROTECTION OF EXISTING FACILITIES:

The Contractor shall exercise extreme caution to prevent debris from falling into manholes or other structures. In the event that debris should fall into a structure it shall immediately be removed.

301.7 MEASUREMENT:

Measurement for Subgrade Preparation will be by the square yard. The area to be measured will be the total accepted area of new asphalt concrete pavement and new portland cement concrete pavement (PCCP), including paved shoulders, tapers, turnouts, and unpaved roadway shoulders. Subgrade Preparation area measured will also include the accepted surface area of driveways that are surfaced with aggregate base, or select materials and non-surfaced areas designated for vehicle traffic.

Except for PCCP, the area under portland cement concrete surfaces such as concrete curb and gutter, sidewalk, concrete driveways and driveway entrances, and concrete alley entrances will not be included in the Subgrade Preparation measurement.

Project earthwork quantities for Roadway Excavation, Borrow Excavation, and Fill Construction shall not be separately measured when they are not listed as separate line items on the fee proposal form. In such case, unless otherwise specified, payment for said earthwork items shall be included in the unit price for Subgrade Preparation.

301.8 PAYMENT:

Payment for Subgrade Preparation will be made only when it is performed for street or roadway paving projects.

Payment shall be compensation in full for stripping, scarifying, grading, excavating, hauling, filling, compacting, and disposing of excess or unsuitable materials, together with all costs incidental thereto.

- End of Section -

[(1)]Arizona Department of Transportation test method.

SECTION 306

MECHANICALLY STABILIZED SUBGRADE - GEOGRID REINFORCEMENT

306.1 DESCRIPTION:

Mechanically stabilized subgrade shall consist of furnishing and placing a geogrid material within or below untreated base to provide a stabilized platform on which paving materials are placed. Geogrid type, fill thickness, pavement cross-section and associated details, shall be as shown on the contract drawings.

306.2 MATERIALS:

The geogrid material shall be supplied in accordance with and conform to the material requirements of Section 796 and Table 796-4.

306.3 SUBGRADE PREPARATION:

The geogrid shall not be placed when weather or surface conditions do not meet the manufacturer's recommendations for installation.

306.3.1 Placing Geogrid on Soft Subgrade: Prior to placement of geogrid material, soft subgrade shall be lightly proof rolled to provide a firm surface, brought to grade and shaped to conform to the typical sections, lines and grades as shown on the plans. The surface on which the geogrid will be placed shall be free of rock and other material that could damage the geogrid. The placement of the geogrid shall be approved by the Engineer before placement of overlaying materials.

Subgrade tolerances shall be in accordance with MAG Section 301.4.

306.3.2 Placing Geogrid Within Untreated Base: Subgrade shall be prepared in accordance with MAG Section 301.

306.4 EQUIPMENT:

Mechanical or manual laydown equipment shall be capable of laying the geogrid properly and smoothly, in compliance with the manufacturer's recommendations.

306.5 GEOGRID PLACEMENT:

The geogrid shall be installed in accordance with the installation guidelines provided by the manufacturer or as directed by the Engineer.

The geogrid may be temporarily secured in place with ties, staples, pins, sand bags or acceptable fill material as required by fill placement procedures, weather conditions, or as directed by the Engineer. A 12-inch minimum secured overlap is required at all joints (both transverse and longitudinal). At transverse joints, the preceding roll shall overlap the following roll in the direction that the aggregate base will be placed. The geogrid shall be rolled out along the alignment in the direction of advancing construction. All wrinkles and folds shall be removed.

The geogrid shall be tensioned by hand and anchored to the ground at the edges, including overlaps, and in the center of the roll at 30-foot intervals along the roll length, at the corners if applicable, or as directed by the Engineer. Securing locations may be reduced or eliminated if it can be shown to the satisfaction of the Engineer that an alternative installation process will provide satisfactory results.

Geogrid shall be placed to obtain full coverage of the indicated area. Placement of geogrid on irregular shaped areas and radii may require cutting of the geogrid material and the use of diagonal overlapping joints. Buckling of geogrid material will not be allowed.

306.6 PLACING AND COMPACTING AGGREGATE FILL:

The aggregate shall be back dumped and spread in a uniform lift maintaining the design aggregate thickness at all times. The aggregate material shall be bladed on the geogrid in such a manner that the aggregate rolls forward onto the grid ahead. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over geogrid reinforcement at slow speeds (less than 10 mph). Sudden stops and turning by trucks shall be avoided on the geogrid. Traffic shall not be allowed onto coated geogrid materials. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

Any ruts which develop during spreading or compacting aggregate fill shall have additional aggregate added rather than bladed from surrounding areas. Placing additional aggregate into the rutted areas limits disturbance to the underlying geogrid keeping it intact.

Untreated base shall be compacted as specified in Section 310. Untreated base material shall not be mixed or processed on the geogrid. Base materials will be uniformly blended and sampled for acceptance prior to placement on the geogrid material. Contamination and segregation of base materials during placement shall be minimized.

306.7 REPAIR:

Any geogrid material damaged before, during or after installation shall be replaced by the contractor at no additional cost to the Agency.

Replacement of geogrid reinforcement shall consist of removal and replacement of the geogrid and aggregate fill from the defective area. The aggregate fill shall be removed at least 3 feet beyond the limits of the defective area. The replacement geogrid shall be installed with proper overlaps. Aggregate fill replacement shall not commence until placement of the geogrid material has been inspection and approved.

306.8 PAYMENT:

The surface area of accepted in-place geogrid reinforcement will be measured to the nearest square yard.

Payment for geogrid reinforcement at the contract unit price shall be full compensation for furnishing all labor, material, equipment, and installing complete in place the geogrid as shown on the project plans.

- End of Section -

SECTION 309

LIME STABILIZATION OR MODIFICATION OF SUBGRADE

309.1 DESCRIPTION:

This section shall consist of constructing a mixture of soil, lime and water for the stabilization or modification of subgrade soils. The work shall be performed in conformity with the lines, grades thickness, and typical cross sections shown on the plans.

According to the National Lime Association, "Stabilization: When adequate quantities of lime and water are added, the pH of the soil quickly increases to above 10.5, which enables the clay particles to break down. Determining the amount of lime necessary is part of the design process and is approximated by tests such as the Eades and Grim test (ASTM D3276). Silica and alumina are released to react with calcium from the lime to form calcium-silicate-hydrates (CSH) and calcium-aluminate-hydrates (CAH). CSH and CAH are cementitious products similar to those formed in Portland cement. They form the matrix that contributes to strength of lime-stabilized soil layers. As this matrix forms, the soil is transformed from a sandy, granular material to a hard, relatively impermeable layer with significant load bearing capacity. The process begins within hours and can continue for years in a properly designed system. The matrix formed is permanent, durable, and significantly impermeable, producing a structural layer that is both strong and flexible."

Lime modification may be used to "Dry-up of wet soil at a construction sites" or "include treating fine-grained soils or granular base materials to construct temporary haul roads or construction platforms."

309.2 MATERIALS:

309.2.1 Soil or Subgrade: For lime stabilization applications, the soil or subgrade material used for this work shall consist of materials on the site or imported, and shall be free of roots, sod, weeds and stones larger than 3 inches and have a plasticity index (PI) greater than 10, when tested in accordance with AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90. For lime modification applications, the allowable soil or subgrade properties will be determined by the Engineer.

309.2.2 Quicklime and Hydrated Lime: Lime used shall be either quicklime or hydrated lime and shall conform to the requirements of ASTM C977. All lime shall come from a single source. If a source change is requested, a new mix design shall be submitted using lime from the proposed new source. The new design must be approved by the Engineer prior to use.

309.2.3 Lime Slurry: Lime slurry shall be a pumpable suspension of solids in water. The solids portion of the mixture, when considered on the basis of solids content, shall consist principally of hydrated lime of a quality and fineness sufficient to meet Section 309.2.2 requirements. A certificate of compliance shall be provided to the Engineer for each load of lime applied at the project.

309.2.4 Water: Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall be tested in accordance with and shall meet the suggested requirements of AASHTO T-26. Water known to be of potable quality may be used without test.

309.3 COMPOSITION:

309.3.1 Lime Stabilization Mix Design: Before commencing lime treatment work, the Contractor shall submit for approval by the Engineer, a proposed mix design. The proposed mix design shall be prepared by a testing laboratory under the direction and control of a registered professional engineer. The mix design shall be determined using the soils or subgrade material to be stabilized and lime from the proposed supplier, and shall determine the following:

For soil stabilization applications, the mix design shall report and comply with the following requirements:

Untreated Soil:
(a) Sulfates: Tested per ARIZ 733, AASHTO T-290, or ASTM C1580.
(b) Moisture-Density Relationship (Proctor): Tested per ASTM D698A.
(c) Plasticity Index: Test method AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90.
(d) Sieve Analysis and Minus No. 200 Wash: Test methods ASTM C136 and ASTM D1140.

Lime Treated Soil:
(a) pH: Lime saturation content per ASTM C977 APPENDIX or ASTM D6276.
(b) Plasticity Index: Less than 3, per AASHTO T-146 Method A, AASHTO T-89 Method A, and T-90.
(c) Swell Potential: Maximum expansive potential of 1.0 per ARIZ 249 using passing No. 4 sieve material. The maximum expansive potential shall be determined on a sample compacted to approximately 95 percent of the ASTM D698A maximum dry density at approximately 2% below optimum moisture content. The sample should be confined under a 100 psf surcharge and inundated.
(d) Unconfined Compressive Strength: Minimum 160 psi per ASTM D5102 Procedure A, after five days curing at 100°F, sealed in air-tight condition.
(e) Mellowing time and mellowing moisture content for treated soil sections b and c to be determined by design engineer. Mellowing time and mellowing moisture content for treated soil section d determined by ASTM D5102.
(f) Hydrated Lime Content: The design engineer shall designate the minimum percentage of lime by dry weight of the dry soil to satisfy the criteria for Section 309.3.2 requirements. The percentage of lime specified shall be sufficient to allow for expected variations during the mixing process. A minimum of 5.0% hydrated lime by dry weight of the dry soil is required for all mix designs.

309.3.2 Lime Modification: For soil modification purposes only, the Engineer shall specify the minimum amount of hydrated lime or lime slurry required to meet the desired improved soil properties.

309.4 CONSTRUCTION:

309.4.1 General: It is the primary requirement of this specification to secure a completed subgrade containing a uniform lime mixture free from loose segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface suitable for placing subsequent courses.

Prior to beginning any lime stabilization or modification, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines and grades as shown on the plans.

Lime shall be applied at the mix design rate for the depth of subgrade stabilization or modification shown on the plans or requested by the Engineer.

When the design requires treatment to a depth greater than 12 inches, the subgrade soil shall be treated in equal layers. The top layer(s) of soil shall be removed and stockpiled. The lower layer of soil to be treated shall then be treated and allowed to cure in place. After final mixing, the lower layer shall be compacted in maximum 12 inch thick compacted lifts. The stockpiled soil shall then be placed, treated, mixed and compacted in successive maximum 12 inch thick compacted lifts.

309.4.2 Weather Limitation: Lime treated subgrade shall not be constructed if the ambient temperature is below 40° F or when conditions indicate that temperatures may fall below 40° F within 24 hours.

309.4.3 Equipment: Contractor shall provide all equipment necessary to complete the work including grading and scarifying equipment, a spreader of the lime, mixing and pulverizing equipment, sheepsfoot and pneumatic rollers, sprinkling equipment and trucks. Gravity feed or tailgate spreading, defined as not having automatic controls, will not be permitted. The spreader shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds. All equipment used for this work is subject to approval by the Engineer.

309.4.4 Application: Lime shall be spread only on that area where the mixing operation can be completed during the same working day. The lime application rate shall be at the design content to +0.5%, based on weight of dry soil. The Engineer reserves the right to vary the rate of application of lime from the mix design during the progress of construction as necessary to maintain a pH of the lime/soil mixture above 12.0 and the desired characteristics of the treated subgrade.

For all lime applications, the Contractor shall provide the Engineer with daily application quantities.

309.4.4.1 Quicklime Application: Quicklime shall only be applied by approved spreader trucks equipped with operating dust collectors to minimize dust issues while loading. Additionally, dust control measures must be utilized during the spreading and soil mixing of quicklime. Contractor shall exercise safety measures when mixing quicklime with water.

309.4.4.2 Dry Hydrated Lime Application: Hydrated lime shall only be applied by approved spreader trucks equipped with operating dust collectors to minimize dust issues while loading. Additionally, dust control measures must be utilized during the spreading and soil mixing of dry lime.

309.4.4.3 Lime Slurry Application: Lime slurry shall be mixed in a portable mixing unit and spread with trucks equipped with an approved distribution system. Lime slurry shall be applied at a rate that will yield the required lime percentage determined by the mix design.

309.4.5 Mixing: The full depth of the treated subgrade shall be mixed with an approved mixing machine. The use of disc plows or blades are strictly prohibited except in areas specified by the Engineer. To insure a complete chemical reaction of the lime and soil or subgrade, water shall be used as required to maintain moisture content at optimum to +4% above the optimum of the lime treated mix design proctor, prior to beginning compaction. During the interval of time between application and mixing, lime that has been applied, unmixed and exposed to the open air for 10 hours or more will not be accepted. No traffic other than the mixing equipment will be allowed to pass over the spread of lime until after completion of mixing.

After mixing and prior to compaction, clay lumps shall meet the following criteria:

	Percent
Minimum of clay lumps passing 1-1/2 inch sieve	100
Minimum of clay lumps passing No. 4 sieve	60

309.4.6 Compaction: Compaction of the mixture shall begin after final mixing and shall be accomplished in accordance with the design specifications. Areas inaccessible to conventional rolling equipment shall be compacted to the required density by methods approved by the Engineer. Mellowing time and mellowing moisture content shall be specified by the mix design and performed prior to final compaction.

The material shall be aerated or watered as necessary to provide and maintain required moisture content. A composite of treated soil or subgrade materials from a minimum of five (5) random locations, per soil type, within the area to be stabilized shall be used to determine the maximum dry density and optimum moisture content in accordance with ASTM D698. The field density of the compacted mixture shall be at least 95 percent of the maximum dry density of the field sampled proctor. The in-place compacted field density shall be determined in accordance with ASTM D1556, sand cone, or ASTM D6938, nuclear gauge. In the event of disputed results, the nuclear gauge density shall be correlated to the referee sand cone density while the nuclear water content shall be correlated to the referee ASTM D2216 water content. The adjustment for rock larger than the no. 4 sieve shall be performed in accordance with ASTM D4718.

After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements and finished requirements, it shall be reworked to meet requirements at no additional cost to the Contracting Agency.

309.4.7 Thickness: The thickness of the lime treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than 1000 square yards per layer. If more than one layer, the method used to remove material to determine the depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the Contracting Agency, the material where depth tests are taken.

All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereupon or the work is accepted. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges or loose materials.

Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion, shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at no cost to the Agency.

309.4.8 Finishing and Curing: After the final layer or course of lime treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the plans. The completed section shall then be finished by rolling with a pneumatic or other suitable roller.

Each layer of lime treated subgrade shall be maintained in a moist condition until the next layer of pavement structure is placed. If required, a fog seal for curing, in compliance with Section 333, shall be furnished and applied to the surface of the final layer of the lime stabilized material as soon as possible after the completion of final rolling and before the temperature falls below 40° F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface. The exact rate will be determined by the Engineer.

After curing begins, all traffic, except necessary construction equipment shall be kept off the lime stabilized subgrade for a minimum of 7 days or until the final pavement structure layer(s) are placed. As an alternative, the Contractor may place a loose lift of aggregate base course over the curing subgrade. The aggregate base course should be kept moist during the curing process.

309.4.9 Maintenance: The Contractor shall maintain, at his/her own expense, the entire lime treated subgrade in good condition from the start of work until all the work has been completed, cured and accepted by the Engineer.

309.5 MEASUREMENT:

The quantity of lime slurry treated soils shall be measured by the square yard, measured in place, treated, compacted, to the proper depth, and accepted.

The quantity of curing seal shall be measured by the ton.

309.6 PAYMENT:

The lime treated soils measured as provided above, will be paid for at the contract price per square yard, which price shall be full compensation for the item complete, as herein described and specified.

The Owner or Engineer reserves the option to pay for the lime separately. Should this option be chosen, the lime treated soils measured as provided above will be paid for at the contract price per square yard which shall include full compensation for the item less lime, as herein described and specified. The lime materials will be paid for by the contract price per ton based on hydrated lime. If quicklime in slurry form is used there will be an additional pay factor of 1.3 applied to determine the actual amount of hydrated lime placed.

Payment for curing seal will be by the ton, based on the rate of application as requested by the Engineer.

- End of Section -

SECTION 310

PLACEMENT AND CONSTRUCTION OF AGGREGATE BASE COURSE

310.1 DESCRIPTION:

Aggregate base course shall comply with Section 702 unless the use of a different type of material is specifically authorized in the special provisions.

310.2 PLACEMENT AND CONSTRUCTION:

The compacted lift thickness shall not exceed 6 inches, unless approved by the Engineer. Based on the type of material, type of equipment and compaction methods used, the Contractor may propose a greater lift thickness to the Engineer for approval.

After distributing, the aggregate base course material shall first be uniformly watered and then graded to a uniform layer that will net, after compacting, the required thickness. The grading operation shall be continued to such extent as may be necessary to minimize segregation. The quantity of water applied shall be that amount which will assure proper compaction resulting in the density required by Section 310.3.

After placement, the aggregate base course surface shall be true, even and uniform conforming to the grade and cross-section specified. In no case shall the aggregate base course vary by more than ½ inch above or below required grade.

310.3 COMPACTION

The contractor is responsible for providing appropriate equipment and techniques to achieve the compaction results required by this specification. The aggregate base course shall be compacted in lift thicknesses as allowed by Section 310.2.

The laboratory maximum dry density and optimum moisture content for the aggregate base course material shall be determined in accordance with AASHTO T-99. (Note: when testing base materials – use method “C” or “D” as required based upon the gradation of the material.) Field ‘one-point’ maximum dry density and optimum moisture procedures shall only be allowed upon approval of the Engineer.

The in-place density shall be determined in the field by nuclear density testing in accordance with AASHTO T-310 or sand cone density testing in accordance with AASHTO T-191. In the event nuclear density testing is selected, and density results are in question, a sand cone correlation will be performed by the accepting agency at the contractor’s request, not to exceed one sand cone for each ten nuclear density tests.

A rock correction, to compensate for rock content larger than the #4 or ¾ inch sieves (as required by the laboratory maximum dry density and optimum moisture procedure selected), shall be performed in accordance with AASHTO T-224. Care should be taken to account for the specific gravity of the oversize particles particularly if recycled materials are utilized for aggregate base course. The specific gravity shall be determined in accordance with ARIZ-227c, as applicable.

For roadway construction, a minimum of one field density test shall be performed per lift per 660 feet per lane. For other aggregate base course applications, a minimum of one field density test shall be performed for each 800 square yards.

Unless otherwise noted in the project plans or project specifications, the moisture content of the aggregate base course at the time of compaction shall be the optimum moisture content +/- 3%.

The following percent compaction is required:

(A) Below asphalt concrete pavement	100%
(B) Below Portland cement concrete pavement, driveways, curb & gutter, sidewalks, and roadway shoulders	95%
(C) All other areas not subject to vehicular traffic	85%

Areas which fail initial testing for density and/or moisture content shall be reworked until passing tests for density and/or moisture content are achieved. Lower moisture content percentages at the time of field density testing may be allowed if significant time has passed since the time of compaction and the required density has been achieved.

310.4 THICKNESS AND/OR PLASTICITY INDEX DEFICIENCY:

When in the opinion of the Engineer there is reason to believe that a deficiency in thickness, or an excess of plasticity exists, measurements or samples will be taken in the same pattern as that defined in Section 321. If the base has been covered or it is otherwise impractical to correct the deficiency, the corrective measures in Table 310-1 shall be taken by the Contractor at no additional cost to the Contracting Agency.

TABLE 310-1

THICKNESS AND PLASTICITY DEFICIENCY

Type	Deficiency	Corrective Measure
I	Less than 1/2 inch of the required thickness	No corrective measure required.
II	1/2 inch or more but less than 1inch of the required thickness	(1) The contractor may choose to add additional material and rework the grade to meet the specification requirements. (2) The contractor may choose to increase the thickness of asphalt concrete by the amount of the aggregate base course thickness deficiency at no additional cost to the Owner. Required grade shall be met.
III	Thickness deficiency by greater than 1 inch	(1) The contractor will remove the aggregate base course and regrade the subgrade to allow the required aggregate base course layer thickness to be constructed. (2) If grades allow, the contractor may propose that the thickness of asphalt concrete be increased by the amount of the aggregate base course deficiency at no additional cost to the Owner.
IV	A plasticity index of 6 to 7 inclusive or gradation deficiency	(1) An Engineering Analysis (EA) that includes R-value testing may be prepared by the contractor to evaluate the expected performance of the aggregate base course layer. The EA may provide mitigation options for the Engineer to consider. If the Engineer accepts the plasticity index as a result of the EA, the material will be accepted at full payment. If the Engineer rejects the EA, the contractor will perform either option 2 or 3 below. (2) The contractor may choose to reprocess or treat the existing material to bring it within specification limits or remove deficient material from affected area and replace with material complying with the specifications. (3) If grades allow, the contractor may increase the thickness of asphalt concrete by ½-inch at no additional cost to the Owner.
V	A plasticity index of over 7	(1) The contractor may choose to reprocess or treat the existing material to bring it within specification limits or remove deficient material from affected area and replace with material complying with the specifications.

310.5 PAYMENT:

Payment for aggregate base course will be made on the basis of the contract unit price per ton unless an alternate basis of payment is provided in the proposal.

- End of Section -

SECTION 311

PLACEMENT AND CONSTRUCTION OF CEMENT TREATED SUBGRADE

311.1 DESCRIPTION:

This item shall consist of a cement treated subgrade composed of a mixture of local soil, Portland cement, and water compacted at optimum moisture content.

311.2 MATERIALS:

Portland cement and water shall comply with Sections 725. The soil for the mixture shall consist of the material in the area to be paved. The material shall not contain more than 5 percent gravel or stone retained on a 3 inches sieve. It shall be demonstrated by laboratory tests that the plasticity and strength characteristics as defined in Section 311.4.5 of the soil will be adequately modified by the specified cement content.

311.3 EQUIPMENT:

An ample number of machines, combination of machines and equipment shall be provided and used to produce the complete soil cement treated layer meeting the requirements for soil pulverization, cement distribution, water application, incorporation of materials, compaction, finishing, and for application of the curing material as provided in these specifications.

Mixing shall be accomplished by means of multiple-pass soil-cement mixer, single-pass soil-cement mixer or central plant mixer.

Water may be applied through the mixer or with the water trucks equipped with pressure sprays. Water trucks providing fine fog-type sprays shall be furnished for finishing and curing. Properly adjusted garden type nozzles on a pressure bar may be used to produce fog spray if approved by the Engineer.

Cement spreader shall be a specially constructed device to distribute bulk cement at the specified rate. The spreader shall have the ability to maintain a consistent spread rate over variable travel speeds.

311.4 CONSTRUCTION METHODS:

Prior to construction, the contractor shall remove all deleterious material, organic material, and particles retained on the 3 inch sieve from the area to be treated. The soil shall be brought to a compacted condition, true to line and grade as directed by the Engineer or as shown on the plans. The compacted soil and surface shall be approved by the Engineer prior to proceeding with mixing.

The material shall be scarified, pulverized, mixed with water and cement, compacted, finished and cured in lengths permitting the full roadway width to be complete in not more than 4 hours from the time that cement is exposed to water. Such lengths will generally be not less than 600 feet or the length of one City block and preferably more. Where a gutter section exists the material shall be pulled back from the gutter face for the full depth of the course before processing.

311.4.1 Pulverizing: Prior to application of cement, soil to be processed shall be scarified to depth of base. The material shall be damp at time of scarifying to reduce the dust generation and to aid in pulverization. Soil shall be pulverized until not less than 80 percent, exclusive of gravel or stone, will pass a No. 4 sieve.

311.4.2 Application of Cement: The quantity of cement shall be by weight as a percentage of the dry weight of the soil as determined by the laboratory and/or as directed by the Engineer and shall be applied uniformly on the soil in a manner satisfactory to the Engineer. The allowable deviation in uniformity shall not exceed 10 percent. The entire operation of spreading and mixing shall be conducted in such a manner as will result in a uniform soil cement and water mixture for the full design width and depth.

The percentage of moisture in the soil, at the time of cement application, shall not exceed the quantity that will permit a uniform and intimate mixture of the soil and cement during mixing operations, and it shall not exceed the specified optimum moisture content for the soil cement mixture.

311.4.3 Mixing: Mixing with addition of water as required shall be continued until the product is uniform in color and at optimum moisture content to +4% of optimum moisture content as determined in accordance with ASTM D558. Any mixture of soil and cement which has not been compacted and finished shall not remain undisturbed for more than 30 minutes but shall be agitated by remixing.

311.4.4 Optimum Moisture: Optimum moisture requirements and field tests of moisture density shall be determined in accordance with ASTM D558, and D6938, with moisture content periodically corrected in accordance with AASHTO T-217 on representative samples of soil cement mixture obtained from the area being processed. At the time of compaction~~,~~ the moisture content shall not be below optimum moisture, and shall be less than that quantity which will cause the base course to become unstable during the compaction and finishing process. Any area which becomes so unstable shall be removed and replaced with new cement stabilized material.

311.4.5 Compressive Strength: Laboratory compressive strength testing of the cement treated subgrade is required to evaluate the proposed amount of cement and/or verify the compressive strength achieved during construction. Laboratory compressive strength testing shall be done in accordance with ARIZ-241.

311.4.6 Compaction: After mixing is complete, the mixture shall be carefully placed in a uniform loose depth which will provide a surface true to grade and section when compacted. Unless otherwise directed by the Engineer, initial compaction shall be by means of a tamping, grid, or pneumatic roller. After the tamping roller has partially walked out, pneumatic rollers shall be used. Density of final product shall be not less than 95 percent as determined by ASTM D6938 as specified above.

311.4.7 Finishing: As compaction nears completion, the surface of the base course shall be shaped to required lines, grades and cross-section. When required, the surface shall be lightly scarified with spike tooth harrows or other approved equipment to remove imprints left by equipment or to prevent slippage planes. During the finishing process the surface shall be kept moist by means of fog-type sprays. Surface finish and final compaction shall be completed in not more than 2 hours from the time the cement is exposed to water. The completed base course shall be true to line, grade, cross-section and shall not vary more than ½ inch in thickness and not more than 1 inch in surface tolerance when tested with a 10 foot straight edge. It shall be free of surface cleavage planes, cracks, or loose material. As a final operation, the surface shall be very lightly scalped with a motor grader, wet with a fog spray and rolled with a pneumatic roller as directed by the Engineer.

311.4.8 Thickness Deficiency: The Engineer may choose to have cores obtained to evaluate the thickness of the treated cement stabilized subgrade layer. Should the thickness of the treated layer not meet the project specifications, the Engineer may require the contractor to submit an Engineering Analysis (EA) to address the pavement section. The EA will provide an opinion as to the anticipated performance of the pavement section as a result of the reduced cement treated layer thickness and make recommendations on possible corrective actions. The Engineer shall determine what corrective actions, if any, are required.

311.4.9 Curing: Each layer of cement treated subgrade shall be maintained in a moist condition until the next layer of pavement structure is placed. If required, a fog seal for curing in compliance with MAG Section 333, shall be furnished and applied to the surface of the final layer of the cement stabilized material as soon as possible after completion of final rolling and before the ambient temperature falls below 40º F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface. The exact rate shall be determined by the Engineer.

After curing begins, all traffic, except necessary construction equipment shall be kept off the cement stabilized subgrade for a minimum of 7 days or until the final pavement structure layer(s) are placed. As an alternative, the contractor may place a loose lift of aggregate base course over the curing subgrade. The aggregate base course shall be kept moist during the curing process.

311.4.10 Construction Joints: At the end of each day's work, a construction joint shall be made transverse to the centerline of the road by cutting back into the work to provide a full depth vertical joint. Except where specifically authorized by the Engineer, no other construction joints will be permitted. Where authorized, such joints shall be full depth vertical joints.

311.4.11 Maintenance: The Contractor shall maintain the surface until it has been covered with the designated bituminous wearing course. In case it is necessary to replace any soil cement, it shall be for the full depth. No skin patches or soil cement will be permitted. Minor surface pits may be filled with compacted bituminous surfacing, if authorized by the Engineer. Immediately prior to the placing of the bituminous wearing course, the surface shall be broomed to remove all loosened material from the surface.

311.5 MEASUREMENT:

Measurement of soil cement will be the number of square yards constructed to the required depth, completed and accepted.

Measurement of Portland cement will be the number of tons of cement mixed with local soil.

311.6 PAYMENT:

Payment will be made for the applicable items at the contract unit prices bid in the proposal, and shall constitute full payment for furnishing all material, equipment, tools, labor and incidentals necessary to complete the work and for carrying out the maintenance provisions.

No measurement or payment will be made for any imported earth materials.

- End of Section -

SECTION 312

CEMENT TREATED BASE

312.1 DESCRIPTION:

Cement treated base shall consist of a combination of base material and Portland cement as specified in Section 705.

312.2 GENERAL:

When the mixing of cement treated base in a stationary mixer is required, it will be so specified. Otherwise, cement treated base may be mixed in either a traveling plant or in a stationary plant, at the option of the Contractor.

If the cement treated aggregate is mixed in a central plant, it shall not contain moisture in excess of 1 percent above or below optimum at the time of delivery on the grade. Certain types of transit mixers will not discharge such material unless it is greatly in excess of optimum moisture. Use of such mixers will not be permitted.

If the material is mixed in place, the machine or combination of machines used shall be capable of thoroughly mixing the cement and aggregate, when using the granular material specified, in a single pass. No lift thickness shall exceed 8 inches. If the thickness required is in excess of 8 inches, it shall be mixed in 2 separate lifts of equal thickness.

312.3 CONSTRUCTION METHODS:

Mixing of materials, regardless of the type of mixer used or method employed shall be continued until the cement and water are evenly distributed throughout the aggregate, and a mixture of uniform appearance is obtained.

The amount of cement used shall conform to requirements of Section 705. Cement delivered in standard sacks from commercial producers will be assumed to weigh 94 pounds per sack and need not be weighed. Bulk cement or fractional sacks of cement shall be weighed.

The amount of water used shall be that required to give optimum moisture content. A portion of the required water may be added to the aggregate prior to the addition of the cement, if approved. Moisture content of the material delivered to the grade shall be checked for moisture content a minimum of four times per shift using AASHTO T-217. Batch adjustments shall be made as necessary to correct for deficiencies.

After spreading, the cement treated base shall be compacted to a density of at least 95 percent of the maximum density as determined by the mix design. Density testing shall be performed using ASTM D6938, with moisture content periodically corrected in accordance with AASHTO T-217.

Compressive strength of the cement treated base material shall be tested a minimum of twice per shift using Arizona ARIZ-241. Strength specimens shall be compacted on site and protected from moisture loss or disturbance by any practical means. Specimens shall be kept in this manner on site for 18-24 hours inside a hard outer shelled container that will protect the specimens from external environmental elements. The specimens shall be carefully transported to the laboratory for moist curing after this initial 18-24 hour cure.

After compaction, the surface of the cement treated base course shall not deviate at any point more than 3/8 inch from the lower edge of a 10-foot straightedge laid parallel to the centerline of the roadway.

A construction joint shall be made at the end of each day's construction by trimming the end of the compacted mixture to a straight vertical plane, normal to the centerline of the roadway and with the vertical edge in thoroughly compacted material.

Cement shall not be added to more material than will be mixed, compacted and sealed the same day. Cement treated base shall not be mixed or placed when either the aggregate or subgrade is frozen. The air temperature shall be at least 40°F. in the shade and rising at the time of mixing.

In areas which are inaccessible to the mixing, spreading or compacting equipment designated herein, other methods and equipment acceptable to the Engineer may be utilized.

The mixed material shall not remain undisturbed on the subgrade for more than 30 minutes and not more than 3 hours shall elapse between the time water is added to the mixture and final compaction is accomplished.

The mixed materials shall be spread for the full width of the base under construction, either by one spreader or by several spreaders operating in a staggered position across the subgrade, unless permission is granted to do part-width construction. Should permission be granted for part-width construction, not more than 30 minutes shall elapse between the times of placing the material in adjacent lanes at any location, and the longitudinal joint against which additional mixed material is to be placed shall be trimmed to a straight vertical plane parallel to the centerline of the roadway. Trimming shall be done in such a manner as to cause the least possible loosening of the compacted base material and to leave no loose material on the subgrade. The material cut away in trimming may be used in the construction of the shoulders or the adjacent lanes if approved, or shall be disposed of in a satisfactory manner.

During mixing, spreading and compacting and until the application of the curing seal, any moisture lost by evaporation shall be replaced by the addition of water by means of a light fog or fine spray.

The mixed base materials shall be covered as soon as possible after final compaction and shall be cured in accordance with this specification.

312.4 TRAVELING PLANT MIXING:

312.4.1 Placing Aggregate: The aggregate to be treated shall be placed on the roadway either as a uniform layer which, when compacted, will produce a base of the depth and width shown on the plans or as one or more windrows which, when spread, will yield a uniform layer which will compact to the prescribed dimensions. If the aggregate is placed in one or more windrows, a windrow sizer will be required. The number and size of the windrows may vary, depending on the width and depth of treatment and on the capacity of the machine, but regardless of size, the windrow shall be uniform in cross-section and shall not be larger than can be handled by the plant.

Care shall be exercised during the placement of the aggregate to prevent segregation of the fine and coarse portion of the aggregate.

312.4.2 Placing Cement: Cement shall be added to the uniform layer or windrow of aggregate by means of mechanized equipment which will spread the cement in correct and uniform quantities. For any section of roadway, the quantity of cement placed by mechanical spreaders shall not deviate more than 10 percent from the computed quantity for the section. When cement is applied to a windrow, the top of the windrow shall be slightly trenched to retain the spread of cement.

If storm winds cause a loss of spread cement, spreading operations shall be halted until such winds subside and, at the first indication of losses, prompt action shall be taken to avoid further losses. If cement losses are deemed excessive, the deficient quantity shall be furnished and added in the proper amount by the Contractor at no additional cost to the Contracting Agency.

312.4.3 Mixing: Mixing shall be accomplished by means of an approved single pass traveling continuous mixing machine, or combination of machines, of the pug or auger type. The machine shall be so constructed that the device for picking up or mixing the aggregate can be controlled and during the mixing operations it shall be set to mix the aggregate, cement and water to the design depth without cutting into or disturbing the subgrade or picking up any material other than that material to be processed. The machine shall be equipped so that water may be introduced at the time of mixing through a metering device which will accurately and uniformly control and measure the amount of water being used.

The cement and aggregate shall be mixed in the machine simultaneously with the adding, through the machine, of the additional amount of water required.

The material shall be spread immediately after mixing, in reasonably close conformity to the lines, grades and dimensions established or shown on the plans.

312.4.4 Stationary Plant Mixing: If the stationary plant method of mixing is employed, the aggregate, cement and water shall be mixed at a central plant using either a batch pug mill type or a continuous type mixer. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected, either by a reduction in the weight of materials or by other adjustments.

312.4.5 Batch Mixing: If a batch pug mill type mixer is used, the aggregate and cement shall be proportioned by batch weights. Cement shall be weighed on separate scales from the aggregate batching scales.

The weight of the charge in a batch mixer shall not exceed that which will permit complete mixing of all materials. The period of mixing shall not be less than 30 seconds from the time all materials are in the mixer. Water may be proportioned by volume or by weight.

312.4.6 Continuous Mixing: If a continuous type mixer is used, the materials shall be proportioned by volume.

The continuous type mixer shall be equipped with metering devices and feeders which will introduce the cement, aggregate and water into the mixer in the specified proportions. The water pump shall be equipped with a means of varying the rate of delivery. The metering devices and feeders shall be interlocked and so synchronized as to maintain a constant ratio of cement and water to the aggregate.

The rate of feed to a continuous type mixer shall not exceed that which will permit complete mixing of all the material.

312.4.7 Spreading: The treated material shall be transported from the plant to the prepared subgrade in approved equipment.

The surface on which the material is to be placed shall be thoroughly moistened and kept moist, but not excessively wet, until covered by the material.

Plant mixed cement treated base shall be spread by approved spreader boxes or finishing machines. The machines shall be constructed and operated so as to produce a layer of uniform density and cross-section an in sufficient quantity to provide a compacted base reasonably conforming to the lines, grades and cross-sections established or shown on the plans.

312.4.8 Compacting: Initial compaction shall begin immediately after mixing and spreading. Successive passes of compacting equipment shall overlap the previous adjacent pass by at least 25 percent of its width. Following initial compaction and before final compaction, the treated material shall be bladed with a motor grader or a Planning machine to obtain a surface reasonably true to the lines, grades and cross-sections established or shown on the plans. During and immediately following the shaping operations, if required, the Contractor shall lightly scarify the surface with a nail drag or other approved equipment to prevent the formation of surface compaction planes.

Extreme care shall be exercised by the Contractor during the blading operation so that no more material than is necessary is disturbed and so that this operation can be completed as quickly as possible. Material thus cut shall be wasted if so directed. Compaction shall proceed without interruption, except as stated above, until the required degree of compaction is obtained.

312.5 INVERTED SECTION:

Where the cement treated base is to be covered with an aggregate base material to prevent shrinkage crack reflection and overloading of the cement treated base, the minimum thickness of the aggregate base shall be 4 inches, unless otherwise specified in the special provisions. In order to provide for free internal drainage of the aggregate base course overlaying the cement treated material, it shall be non-plastic and the percentage of material passing the No. 200 sieve shall not exceed 8. The cement treatment shall be held back approximately 1 foot from each curb line so as to permit drainage of any water that may become trapped between the cement treated base material and the bituminous surfacing.

312.6 CURING:

The mixed cement treated base materials shall be covered as soon as possible after final compaction with a bituminous curing seal. Application shall be by means of a pressure distributor in accordance with the requirements of Section 330. The approximate quantity of bituminous material to be used shall be as specified; however, the exact amount will be determined by the Engineer at the time of application.

After the bituminous curing seal has been applied, the cement treated base course shall be kept free of equipment and traffic for a period of at least 7 days or until it will not pick up under traffic. Curing seal shall conform to the requirement of Section 712 or 713 for the type specified.

In lieu of the curing seal, the Contractor may, at his option, keep the surface of the compacted base continuously moist until overlaid with the aggregate base course. The aggregate base or the surfacing may be placed as soon as the cement treated base has been compacted. The spray equipment on the water truck shall be approved by the Engineer prior to the use of this equipment to spray the soil cement base course. The spray equipment must produce a fine, even spray to prevent washing of the

surface of the base course. A cement treated section may be opened to all traffic immediately after placement and compaction of the surfacing.

312.7 DEFICIENCY:

When, in the opinion of the Engineer, there is reason to believe that a deficiency in thickness exists in the cement treated base, cores will be taken in the same pattern as that defined in Section 321. If the base has been covered or it is otherwise impractical to correct the deficiency of ½ inch or more in thickness, the corrective measure listed in Table 310-1 for Type II deficiency shall be taken by the Contractor at no additional cost to the Contracting Agency.

312.8 PAYMENT:

Payment for the Portland cement will be made by the tons of cement complete in place.

Payment for base material will be made by the tons of aggregate complete in place including mixing, spreading, and compacting.

No separate payment will be made for curing.

- End of Section -

SECTION 315

BITUMINOUS PRIME COAT

315.1 DESCRIPTION:

Bituminous prime coat shall consist of furnishing bituminous material and applying this bituminous material to a prepared base course, in accordance with these specifications.

315.2 MATERIALS:

Bituminous material shall conform to the requirements of Section 712 for the type and grade specified.

315.3 CONSTRUCTION METHODS:

315.3.1 Preparation of Surface: The surface on which the bituminous prime coat is to be placed shall be uniformly smooth and firm and reasonably true to grades and cross-sections as shown on the plans, and shall be so maintained throughout the period of placing the prime coat. In no event shall a prime coat be placed on a soft, uneven base. Any holes, depressions or irregularities shall be repaired by the removal of all loose and unsuitable material and replacement by suitable material, which shall be compacted to produce a dense surface conforming to the adjacent area. Uniformity of surface texture is of the utmost importance.

When required, the surface on which the prime coat is to be placed shall be lightly bladed and rolled immediately prior to the application of bituminous material.

315.3.2 Application of Bituminous Material: Bituminous material shall be applied only when the surface is either slightly damp or dry. For extremely dry areas, a light application of water may be required prior to the application of bituminous material.

The approximate quantity of bituminous material to be used will be specified; however, the exact amount used will be determined by the Engineer at the time of application. The bituminous material shall be uniformly applied to the prepared surface at the rate so designated and in one application.

The application of bituminous material and distributing equipment shall conform to the requirements of Section 330.

When it is deemed necessary, areas having excess bituminous material shall be blotted with material as directed.

When so directed, the surface of the complete prime coat shall be rolled with a pneumatic-tired roller.

315.3.3 Maintenance of Surface: Traffic shall be kept off the bituminous material until it has penetrated the base or subgrade and cured sufficiently.

The integrity of the prime coat shall be maintained at all times until the next course is placed or until the final acceptance. In the event traffic has caused holes or breaks in the surface, such holes or breaks shall be satisfactorily repaired by the Contractor.

315.4 MEASUREMENT:

The accepted quantities of bituminous material for bituminous prime coat will be measured by the ton undiluted for the bituminous material used.

No measurement or direct payment will be made for rolling.

Materials necessary for repair of holes or breaks in the surface after the prime coat has been accepted, when such holes or breaks are caused by traffic other than that of the Contractor, will be measured for payment under the respective contract item for the materials used.

315.5 PAYMENT:

Payment for the bituminous material will be on the basis of the price bid per ton, undiluted, complete in place. Payment for furnishing, applying and removing blotter material will be paid for as an extra work item.

- End of Section -

SECTION 317

ASPHALT MILLING

317.1 DESCRIPTION:

The work under this section shall consist of **milli**ng existing asphalt concrete pavement where shown on the Plans or requested by the Engineer.

317.2 CONSTRUCTION REQUIREMENTS

Contractor is responsible for locating all milling hazards on and below the surface within the areas to be milled including areas requiring special milling. Special milling is not a separate pay item and shall be paid for as Asphalt Milling.

The milling cut depth shall be the depth indicated on the Plans plus or minus 1/8 inch. The milling machine shall have electronic grade controls. Contractor shall remove the milled material and sweep the roadway clean with a power pick-up broom to the satisfaction of the Engineer.

Asphalt pavement adjacent to manholes, valve boxes, small radius curbs and other fixed objects that produce confined area shall be removed with milling equipment specifically designed to operate in constricted areas. The equipment shall be capable of removing asphalt concrete of the specified thickness without damage to, or displacement of, the adjacent object(s).

The Contractor shall be responsible for continually checking the milling operation to determine that the proper depth of milling has been achieved, that the proper profile and cross slope are achieved, and that the surface texture is (a) free from longitudinal ridges, and (b) has a uniform pattern.

The Contractor shall immediately notify the Engineer when:

- The existing pavement thickness is found to be less than anticipated and breaking of the underlying material occurs.
- Delamination of underlying material occurs.

The work shall result in a clean milled surface to the specified depth for the area indicated by the construction documents including the areas immediately around and next to any individual hazard within the area to be milled. The edge of milled area shall form a straight clean cut line.

For milled surfaces on major streets (arterial and collector streets) that will be subject to traffic prior to overlay, a tack coat per Section 329 may, when authorized by the Engineer, be applied to the milled surface as a dust control measure. The tack coat shall be applied after sweeping and prior to allowing traffic on the milled surface. The tack coat application rate shall be half of the prescribed tack rate or contract amount or an alternate rate as prescribed by the Engineer. The Contractor shall be responsible for clean-up of any tack coat tracking that occurs.

317.3 MEASUREMENT AND PAYMENT:

Measurement for Asphalt Milling will be by the square yard and shall only include area milled to the required depth and cross-section.

Payment for Asphalt Milling at the contract unit price shall be full compensation for the work, complete-in-place, including all asphalt milling, milling around structures, removal and disposal of milled materials, and sweeping.

Engineer approved tack coat applied for dust control will be paid at the contract rate for tack coat. No additional payment for the application of dust control tack coat shall be made.

- End of Section -

SECTION 320

ROAD-MIXED SURFACING

320.1 DESCRIPTION:

Road-mixed surfacing shall consist of a mixture of mineral aggregate and bituminous binder mixed on the roadbed or other area, spread and compacted on a prepared subgrade or base course in conformity with the lines, grades, and dimensions shown on the plans or typical cross-section, or as specified in the special provisions.

320.2 MATERIALS:

Materials shall conform to the requirements of Sections 710 and 712 for the type and grade specified on the special provisions.

320.3 PRIME COAT:

When a prime coat is required, it shall be applied as specified in Section 315.

320.4 SPREADING AGGREGATE:

The mineral aggregate shall be deposited in a windrow along one side of the roadbed by means of approved spreader box equipped with a readily adjustable strike off device or other suitable equipment. The maximum lift for blade mixing and laying shall not exceed 1 cubic yard per running foot. If the mineral aggregate is delivered to the roadbed in separate sizes, each size of aggregate shall be spread in a windrow of the required quantity for that size of material, after which the windrows of various sizes shall be blended into one windrow alongside of the roadbed.

The aggregate shall be so spread that the windrows will be uniform and equal in size and will contain the proper quantity of material to provide surfacing of the required width and thickness. Care shall be exercised to prevent the aggregate from becoming mixed with earth or shoulder material. Preparatory to applying the liquid asphalt, a portion of the material from the windrow shall be spread uniformly over one-half the width of the roadbed.

Unless permitted by the Engineer, no more aggregate shall be spread on any one day than can be mixed with liquid asphalt within 72 hours. If traffic conditions require, the Engineer may require spread or flattened windrows.

320.5 APPLICATION OF LIQUID ASPHALT:

The temperature of the liquid asphalt, when applied, shall be in accordance with Section 712, and 16 to 22 gallons shall be applied for each cubic yard of road-mix material, in not less than 2 approximately equal applications.

Unless otherwise approved by the Engineer, no liquid asphalt shall be spread when weather conditions are unsuitable, or when the moisture content of the mineral aggregate exceeds 3 percent by weight of the dry aggregate. When the aggregate is unusually porous, the permissible moisture content may be increased and liquid asphalt spread at the discretion of the Engineer, when laboratory tests indicate that such increased moisture content will not produce an unstable mixture.

Liquid asphalt shall be prevented from spraying upon adjacent pavements, structure, guard rails, guide posts, culvert markers, trees and shrubbery, adjacent property and improvements, and other highway improvements or facilities not specifically mentioned herein, or that portion of the traveled way being used by traffic.

320.6 MIXING:

Immediately following each successive application of liquid asphalt, the surfacing material shall be thoroughly mixed by means of a blade. After the final application, the material shall be bladed into a windrow and the windrow bladed back and forth between the center and the edge of the area to be surfaced with a heavy blade grader having a wheel base not less than 16 feet long, until a satisfactory mixture of uniform appearance is obtained.

Should the mixture show an excess or deficiency of liquid asphalt, or uneven distribution thereof, prior to spreading and compacting, the condition shall be corrected by adding mineral aggregate or liquid asphalt, as the need may be, and remixing the material to produce a satisfactory mixture. If necessary, all compressed masses of material shall be broken up.

After mixing, the material shall be placed in a windrow prior to spreading.

After the material has been mixed as above specified all of the mixed material shall be bladed into a single windrow in the center of the roadbed and the entire mass of treated material turned not less than 4 complete times by blading first to one side of the road and then to the other.

In lieu of mixing the material as above specified, a road-mixing machine or any equipment other than that required above may be employed which will produce a completed mixture equal to that which would be produced by means above specified. The Engineer reserves the right to order the use of any equipment discontinued which, in his opinion, fails to produce a satisfactory mixture.

Road-mixing machines shall be of the pug mill or auger type or other suitable equipment capable of picking up the loosened material completely from the roadbed, leaving practically no loose material on the ground, and which will introduce the liquid asphalt through a metering device at the time of mixing. The machine shall be equipped with the positive control of the amount of liquid asphalt introduced into the mix which can be readily adjusted to changes in grading of the road material.

The rate of movement of the machine along the roadway, the amount of material mixed and the amount of mixing shall be so regulated that a uniform mixture of unchanging appearance is obtained and all particles of aggregate are thoroughly coated with liquid asphalt. Before mixing on the roadbed the loosened material shall be placed in windrows or in a blanket of uniform cross-section and of such size that all the material in the windrow or blanket can be passed through the mixing machine at each mixing operation. Sufficient material, as determined by the Engineer, shall be placed in windrows or in a blanket in advance of mixing.

No mixed material shall be spread and compacted until the mixture has been approved by the Engineer.

The amount of material mixed on any one day shall not be more than can be spread and compacted on the following day, except that when directed by the Engineer mixed material shall remain in the windrow for a longer period.

Mixing the liquid asphalt with the mineral aggregate prior to delivery on the roadbed will be permitted, provided that the complete mixture is uniform in character and the same consistency with respect to grading, asphalt content and moisture as that specified for road-mixing.

Liquid asphalt added to mineral aggregate at a central mixing plant shall be accurately weighed by means of dial scales or other approved weighing devices. Liquid asphalt added to mineral aggregate in a traveling mixing plant shall be accurately measured by means of meters or other approved measuring device. Weighing or measuring liquid asphalt being added to mineral aggregate at mixing plants in accordance with the above specified methods shall be for the purpose of properly proportioning the material and not for determining the pay quantities of liquid asphalt.

320.7 SPREADING AND COMPACTION:

Spreading shall be in increments not exceeding 1 inch in thickness.

Rolling shall be continuous throughout the spreading operations until all the loose material has been laid and consolidated.

Segregation of coarse or fine particles shall be avoided and the surfacing as spread shall be free from lumps or pockets of coarse or fine material. Segregated materials or lumps shall be remixed by blading.

After spreading on the roadbed, should the moisture content of the mixture exceed 3 percent it shall be reduced by blading and reblading the mixture and allowing it to dry before the final spreading. Should blading and reblading of the mixture fail to reduce the moisture content below that above specified, the mixture shall be scarified, turned and respread until the moisture content does not exceed 3 percent by weight of the dry aggregate, with the exception, however, that in certain special cases, when the mineral aggregate is unusually porous the permissible moisture content may be increased at the discretion of the Engineer, when laboratory tests indicate that such increase will not result in an unstable mixture.

During blading and rolling, all lumps or compressed masses of the mixture shall be remixed and again rolled. On completion of the blading operations all loose stones shall be swept to the outside of the surfaced area and incorporated with the shoulder material or picked up and disposed of.

The edges of the completed surfacing shall be trimmed uniformly to the required cross-section and width before the shoulders are finally rolled and shaped.

The completed surface, when ready for acceptance, shall be thoroughly compacted, smooth and even, true to grade and cross-section, and free from ruts, humps, depressions, or irregularities. When a 10 foot straightedge is laid on the finished surface and parallel with the center line of the road, the surface shall vary in no place more than 1/8 inch from the lower edge of the straightedge.

Should pneumatic-tired roller be used, the final finishing shall be done with a tandem roller. Sufficient blading and rolling equipment shall be furnished.

Where shown on the plans or specified in the special provisions, road-mixed material shall be placed and compacted around spillway assemblies, drop inlets and manholes outside the area to be surfaced, upon road approaches and connections, over gutter, ditch and dike areas, and over other areas, to the thickness shown on the plans or ordered by the Engineer.

At locations where the surfacing is to be placed over areas inaccessible to the required spreading and compacting equipment or over areas where the use of required spreading and compacting equipment would be impractical, the mixed material may be spread and compacted by other methods when approved or so ordered by the Engineer. Road-mixed surfacing placed on road approaches and connections shall be placed to the thickness and as specified for surfacing to be placed on the roadbed.

After final rolling the finished surface course shall have a density of at least 92 percent of the theoretical maximum density possible to obtain with the same materials in like proportions when computed without voids by specific gravity tests.

320.8 MEASUREMENT:

Measurements for determining the area to be paid for will be made horizontally unless otherwise specified.

320.9 PAYMENT:

Payment for road-mixed surfacing will be made on the basis of the price bid per square yard unless an alternate basis of payment is provided in the proposal. The price bid per square yard shall include the furnishing of all labor, materials, tools, compaction, asphalt and the dressing of the subgrade, or base course necessary to complete the work. Prime coat, when required, will be paid for by the ton, undiluted, complete in place.

- End of Section -

SECTION 321

PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

321.1 DESCRIPTION:

This section is to provide specifications for furnishing all materials, mixing at a plant, hauling and placing a mixture of aggregate materials, mineral admixture and asphalt binder to form a pavement course for placement upon a previously prepared base or sub base.

321.2 MATERIALS AND MANUFACTURE:

The materials shall conform to Section 710 for the type specified. Warm Mix Asphalt (WMA) technologies may be used within the mixture provided all requirements of the specifications are met, and the technology is on the ADOT Approved Product list. The specific required mix type shall be called out in the contract documents or as directed by the Engineer.

321.3 WEATHER AND MOISTURE CONDITIONS:

Asphalt concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 40 degrees F. (50 degrees F for Asphalt Concrete lift less than 2 inch thick) or above. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base or sub base on which the material is to be placed is unstable. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

321.4 APPLICATION OF TACK COAT:

A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete. The tack coat may be deleted when a succeeding layer of asphalt concrete is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1h or CSS-1h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer. This shall be addressed in the project specifications prior to the bidding of the project.

321.5 MIX DESIGN:

The mix design shall be submitted to the Engineer at least five working days prior to the start of asphalt concrete production. Mix designs provided by the agency may be utilized on projects at the Engineer's discretion. The Engineer will review and approve the mix design to assure it contains all of the required information as outlined in Section 710.3.1. If WMA technologies are used within the mix design, the type of WMA technology used shall be indicated on the mix design. The target values for gradations, binder contents, and air voids will be established as the accepted Job Mix Formula (JMF) based upon the mix design. Mix designs not containing all of the information will be returned within five working days of receipt of all mix design information, for action and resubmission by the contractor.

Once the mix design has been approved by the agency and the mixing plant selected, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer.

If the contractor elects to change its source of material, the contractor shall furnish the Engineer with a new mix design, which meets the requirements of Section 710, as amended by the Project Specifications.

The contractor may make self-directed target changes to the approved mix design within the limits shown below. Requests for self-directed target changes shall be made in writing and acknowledged by the Engineer prior to the start of production of a lot and will remain in effect until such time as any additional changes are implemented. The self-directed target changes must meet the contract requirements for mix design criteria and gradation limits.

TABLE 321-1
ALLOWABLE SELF-DIRECTED TARGET CHANGES

MEASURED CHARACTERISTICS	ALLOWABLE SELF-DIRECTED TARGET CHANGES
Gradation (Sieve Size)	
3/8 inch	± 4% from mix design target value
No 8	± 4% from mix design target value
No 40	± 2% from mix design target value
No 200	+0.5% from mix design target value
Binder Content	± 0.2% from mix design target value
Effective Air Voids	None

The contractor may propose target changes, other than self-directed changes, to the approved mix design for the approval of the Engineer. The Engineer will determine if the proposed target change will result in mix production that meets the contract requirements for mix design criteria and gradation limits. The target changes will not be retroactive for the purpose of acceptance.

321.6 MIX PRODUCTION:

All materials shall be proportioned by weight in a hot mix asphalt plant in the proportions required by the mix design to provide a homogeneous and workable mass. Each hot mix asphalt plant shall be inspected in accordance with the provisions contained in the 'Hot Mix Asphalt Production Facilities' by the Arizona Rock Products Association and shall have a current inspection certificate. All measuring devices shall be calibrated at least annually by a technician licensed by the Arizona Bureau of Weights & Measures. Mixing plants shall conform to the requirements of AASHTO M-156, except as modified herein. If WMA technology is being used, any equipment associated with the production of hot mix asphalt shall be calibrated and in proper working order according to the WMA equipment specifications. If there are any deviations in the production or compacting temperatures of the hot mix asphalt with WMA technology, the mix design shall state the differences.

In drum mix plants the mineral admixture shall be added and thoroughly mixed with the mineral aggregate by means of a mechanical mixing device prior to the mineral aggregate and mineral admixture entering the dryer. The moisture content of the combined mineral aggregate shall be a minimum of three percent by weight of the aggregate during the mixing process.

For drum-mix plants, the mineral admixture shall be weighed across a weight belt, or other approved alternative weighing system, with a weight totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer that is in good working condition. The rate of the aggregate feed shall not exceed the mixing device's capacity in ton per hour. The mixer shall be constructed to minimize the loss of mineral admixture and shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected. The mixing device shall be capable of effective mixing in the full range of the asphalt concrete production rates.

The hot plant and equipment shall be constructed and operated to prevent loss of mineral admixture through the dust collection system of the plant.

A positive signal system shall be provided and utilized during production whereby the mixing shall automatically be stopped if the mineral admixture is not introduced into the mineral aggregate. The plant will not be permitted to operate unless the signal system is in good working condition.

The introduction of bituminous material shall be controlled by an automated system fully integrated with the controls or the mineral aggregate and mineral admixture. The production of the plant shall be controlled by the rate required to obtain a uniform mixture of all components. Drying and heating shall be accomplished in such a manner as to preclude the mineral admixture from becoming coated with un-spent fuel. The completed asphalt concrete may be held in storage for up to 12 hours in insulated or heated silos, providing the minimum temperature noted herein for placement and compaction is met behind the placement device. If the Engineer determines that there is an excessive amount of heat, heat loss, drain down, segregation

and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued.

The temperature of the asphalt concrete, with unmodified binders, upon discharge from the mixer shall not exceed 335 degrees F. The discharge temperature may be increased on the recommendation of the binder supplier, when approved by the Engineer. If the asphalt concrete is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the asphalt concrete will be minimized.

321.7 TRANSPORTATION:

Petroleum distillates or other substances that will have a detrimental effect on the asphalt concrete shall not be used as a release agent.

The beds of all transportation units shall be clean and smooth to allow the free flow of material into the paving machine's hopper.

Tarpaulins shall be furnished on all trucks and used when weather condition warrant, or if directed by the Engineer.

321.8 PLACEMENT:

Placement of asphalt concrete pavement shall not commence until authorized by the Engineer. The Engineer's authorization to allow commencement of asphalt concrete paving will generally require all newly constructed valley gutters, curbing, and curb and gutters which new pavement is to be placed against to be in-place and in an acceptable condition. While it is preferred to have all newly constructed concrete items against which new pavement is to be placed be in an acceptable condition, the Engineer may allow paving to commence based on weather, the amount of defective concrete, or other considerations.

321.8.1 Placing: All courses of asphalt concrete shall be placed and finished by means of a self-propelled paving machine equipped with an automatically actuated control system, except under certain conditions or at locations where the Engineer deems the use of a self-propelled paving machine impracticable.

The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternatively when directed, by controlling the elevation of each end independently.

The control system shall be capable of working with one of the following devices:

(a) Ski or non-contact device of not less than 30 feet in length, supported throughout its entire length
(b) Taut stringline or wire set to grade
(c) Short ski or sonar sensing units from curb control
(d) Joint matching shoe

Failure of the control system to function properly shall be cause for the suspension of asphalt concrete production. In order to achieve a continuous operation, the speed of the paving machine shall be coordinated with the hot mix plant and transport units.

If the asphalt concrete is dumped from the hauling vehicles directly into the paving machine, care shall be taken to avoid jarring the machine or moving it out of alignment. No vertical load shall be exerted on the paving machine by the truck.

If asphalt concrete is dumped upon the surface being paved and subsequently loaded in the paving machine, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphalt concrete shall be picked up and loaded into the paving machine.

Self-propelled paving machines shall spread the mixture without segregation or tearing, true to line, grade and crown indicated on the Project plans. Pavers shall be equipped with hoppers and augers that will distribute the mixture uniformly in front of an adjustable floating screed. The raising of the hopper wings must be minimized and the paving machine will not be operated when in an empty condition.

Screeds shall include any strike-off device operated by tamping or vibrating action which is effective, without tearing, shoving or gouging the mixture and which produces a course with a uniform texture and density for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required. In the

case of the screed, auger extensions and vibrators shall be installed wherever the screed is extended more than one (1) foot beyond the end of the base auger or auger extension. However, when placing material against an extremely uneven curb or edge over a short distance, the Engineer may waive the auger extensions and vibrators.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers to provide a uniform and smooth layer over the entire area compacted in this manner.

321.8.2 Joints: Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth exposing a fresh face. The fresh face shall be tack coated prior to placement of the new asphalt concrete. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than 1/4 inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline.

Longitudinal joints of each asphalt course shall be staggered a minimum of 6 inches with relation to the longitudinal joint of the immediate underlying course's cold longitudinal construction joint.

Longitudinal joints with existing or cold (more than 32 hours old) asphalt concrete shall require the existing pavement to be trimmed to a vertical face for its full depth exposing a fresh face. The fresh face shall be tacked prior to placement of the adjacent course. Longitudinal joints with an existing asphalt pavement that is less than 32 hours old that has had its edge protected from damage may have adjacent new asphalt concrete placed after applying the required tack coat. After placement and finishing of longitudinal joints, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, in any direction.

321.8.3 Asphalt Leveling Course: A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course. If a leveling course is being applied on an Asphalt surface, a tack coat shall be applied. The compaction requirements contained in Section 321.10 do not apply to leveling courses.

321.8.4 Compaction; Asphalt Base Course and Surface Course: It is the contractor's responsibility to perform Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. The temperature of the asphalt concrete immediately behind the laydown machine shall meet the minimum requirements of Table 321-2 unless WMA technology is being used. If WMA technology is being used then the minimum requirements will be stated within the mix design recommended by the WMA manufacturer. A probe type electronic thermometer with a current calibration sticker attached will be used to measure the temperature of the asphalt concrete mixture. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat. The minimum temperatures in Table 321-2 do not guarantee that the asphalt mix will be compacted to the required density. The contractor is responsible to achieve the required compaction.

TABLE 321-2

MINIMUM ASPHALT CONCRETE PLACEMENT TEMPERATURE

Base [(1)] Temp (°F)	Mat Thickness (inches)					
	1/2	3/4	1	1 1/2	2	3 and greater
40 – 50	---	---	310	300	285	275
50 – 60	---	310	300	295	280	270
60 – 70	310	300	290	285	275	265
70 – 80	300	290	285	280	270	265
80 – 90	290	280	270	270	265	260
+90	280	275	265	265	260	255

(1) Base on which mix is to be placed

Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements. During the rolling operation, the speed of the roller shall not exceed 3 miles per hour, unless otherwise approved by the Engineer.

Pneumatic tired compactors shall be equipped with skirt-type devices mounted around the tires so that the temperature of the tires will be maintained during the compaction process.

The Engineer will determine the acceptability of the pavement compaction in accordance with Section 321.10.

321.8.5 Smoothness: The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth (¼) inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway.

321.8.6 Asphalt Concrete Overlay: Asphalt concrete overlay consists of the placing and compacting plant mix asphalt concrete over existing pavement. The mix design and thickness of the overlay shall be as shown on the plans or as specified in the special provisions.

Except when the existing asphalt surface is to be preheated and remixed, pavement surfaces shall be prepared as follows:

(a) Areas designated for pavement repair by the contract documents (which may include severely raveled areas, severely cracked areas, over-asphalted areas, and other defects) shall be cut out and replaced. Pavement repairs shall be completed and approved before placing asphalt concrete overlay.

(b) Before placing asphalt concrete overlay, milling shall be done as shown on the plans or specified in the special provisions and shall be in accordance with Section 317.

(c) After pavement repairs and milling have been completed the entire surface shall be cleaned with a power broom.

(d) After surfaces have been prepared to the satisfaction of the Engineer, they shall receive a tack coat per Section 321.4. Traffic will not be permitted to travel over surfaces which have received a tack coat, except when tack coat is applied to milled surfaces in compliance with Section 317.2 for dust control purposes. When the overlay is to extend onto a concrete gutter, the gutter shall be thoroughly cleaned of loose dust and cement particles and shall be tack coated.

Asphalt concrete overlay shall be placed as specified in Section 321.8.1 and compacted as specified in Section 321.8.4. The surface smoothness shall meet the tolerances specified in Section 321.8.5.

Frames and covers of manholes, survey monuments, valve boxes, clean-outs and other existing structures shall be adjusted in accordance with Section 345 to set flush with the finished surface of the new pavement. During adjustment if pavement or base materials are removed or disturbed, they shall be replaced with approved materials installed in a manner acceptable to the Engineer.

On roads without curb and gutter, the existing unpaved shoulder elevation shall be adjusted by the Contractor to match the elevation at the edge of the new overlay and slope away from the new pavement surface at a rate that the existing quantity of shoulder material will allow. Shoulder material shall be compacted to a minimum of 95% of maximum density, determined in accordance with Section 301.3. Shoulder adjustment to match the new pavement surface elevation shall not be measured. The cost of shoulder adjustment shall be included in the price paid for the asphalt concrete overlay or other related pay items. When the Engineer determines an insufficient amount of material is available for shoulder adjustment, the Engineer may require the Contractor to provide additional material. Acceptable material for shoulders includes the existing shoulder material, millings, untreated base materials, or a granular material approved by the Engineer. Engineer requested imported material for shoulder adjustment is not included in the price paid for the asphalt concrete overlay.

321.8.7 Pavement Fabric Interlayer: Pavement fabric interlayer shall be used only when specified on the plans or in the specifications.

Pavement fabric interlayer shall be in accordance with Table 796-1 and be the class designated on the plans or in the specifications.

Asphalt binder coat used to bond the fabric to the pavement shall be paving asphalt PG 70-10 asphalt cement conforming to the requirements of Section 711. The application and distributing equipment for the asphalt binder shall conform to the requirements of Section 330. The asphalt binder coat shall be uniformly spray applied to the prepared pavement surface at the rate of 0.20 gallons per square yard for Class B fabric or at the rate of 0.25 gallons per square yard for Class A fabric. Some underlying surfaces may require a higher or lower application rate. A test strip may be necessary to determine the proper

application rate. The width of liquid asphalt cement application shall be the fabric width, plus six inches.

Neither the asphalt binder coat or fabric interlayer shall be placed when weather conditions, in the opinion of the Engineer, are not suitable. The asphalt binder and fabric interlayer shall only be placed when the pavement is dry, the ambient air temperature is 50 degrees F and rising, and pavement temperature is 40 degrees F and rising.

Equipment for placing the fabric shall be mechanized and capable of handling full rolls of fabric. The equipment shall be able to lay the fabric smoothly to maximize pavement contact and remove air bubbles. Stiff bristle brooms shall be used to smooth the fabric. The equipment used to place the fabric shall be in good working order and is subject to approval by the Engineer.

Pavement fabric interlayer shall not be placed if the in-place binder is hotter than 325 degrees F or has cooled to 180 degrees F or below (as determined by non-contact thermometer).

Pavement fabric interlayer shall be placed onto the asphaltic binder with the heat bonded side up with a minimum amount of wrinkling or folding. Remaining wrinkles or folds 1-inch and larger shall be removed or slit and shingle-lapped in the direction of paving. Burning or torching of wrinkles is not allowed. Fabric shall overlap three to six inches to insure full closure of the joint. Transverse joints shall be shingle-lapped in the direction of paving to prevent edge pickup by the paver. A second application of hand-placed asphalt binder may be required at laps and repairs as determined by the Engineer to ensure proper binding of the narrow double fabric layer.

All areas where fabric has been placed shall be paved with asphaltic concrete during the same workshift. Placement of the asphaltic concrete shall closely follow fabric lay down. The temperature of the asphaltic concrete immediately behind the laydown machine shall not exceed 325 degrees F, unless modified by the WMA technology being used. If WMA technology is being used then the minimum requirements will be stated within the mix design recommended by the WMA manufacturer. In the event that the asphalt binder coat bleeds through the fabric causing construction problems before the overlay is placed, the affected areas shall be sanded with a sand blotter in compliance with Section 333. Excess sand shall be removed before beginning the paving operation. In the event of rainfall prior to the placement of the asphaltic concrete, the fabric shall be allowed to dry before the asphalt concrete is placed.

Turning of the paving machine or of other vehicles on the fabric shall be gradual and kept to a minimum to avoid damage to the fabric. Should equipment tires stick to the fabric during pavement operations, small quantities of paving asphalt concrete shall be broadcast on the fabric to prevent pick-up. Decrease of binder rate in order to minimize pick-up on tires is not allowed.

321.8.8 Thickened Edge: When the depth of the thickened edge extends four inches or more below the bottom of the asphalt pavement, the portion of the thickened edge extending below the asphalt pavement shall be placed and compacted prior to placement of the asphalt pavement. Placement of tack coat on the surface of the compacted thickened edge asphalt may be omitted when additional asphalt pavement is placed on the same day and the Engineer agrees that the surface of the thickened edge asphalt has remained clean.

When the depth of the thickened edge extends less than four inches below the bottom of the asphalt pavement, the portion below the asphalt pavement may be placed and compacted with the asphalt pavement in a single operation.

321.8.9 Safety Edge: The finished safety edge slope shall be planar forming a 30° ± 5° angle with the adjacent roadway surface and extend a minimum of five inches (5”) below the roadway pavement’s finished surface.

The safety edge shall be constructed with the top or final paving lift of a new pavement or overlay using a device that is mounted to or is a part of the screed portion of the laydown machine. The safety edge device shall be capable of constraining the asphalt concrete material to increase density of the extruded profile by reducing the volume. A conventional single strike-off plate is not acceptable. Compaction obtained from the extruded safety edge shall be acceptable when the extruded shape conforms to the specified shape.

During laydown operations if the extruded safety edge does not conform to the specified shape, the Contractor shall take immediate actions to correct the deficiency and to repair all non-compliant sections of safety edge. The Contractor shall stop paving operations until corrections to the laydown operation have been made and resumption of paving is approved by the Engineer or his designated representative.

321.8.10 Protection for Asphalt Base Course: Arterial roadway traffic shall not be allowed on a new asphalt base course that is less than five inches (5") in thickness without the written consent of the Engineer.

321.9 QUALITY CONTROL:

It is the contractor's responsibility to perform Quality Control monitoring and/or testing during asphalt concrete production to achieve the required compaction and to perform Quality Control monitoring and/or testing during asphalt concrete production to achieve the required mix properties. The Engineer may obtain samples of any portion of any material at any point of the operations for his own use. Also, the Engineer may order the use of any drying, proportioning and mixing equipment or the handling of any material discontinued which, in his/her opinion, fails to produce a satisfactory mixture.

The asphalt concrete produced shall conform to the requirements of the production tolerances established in section 321.10. When the asphalt concrete does not conform to the production tolerances, it shall be reported to the Engineer, and corrective quality control measures shall be implemented, or production shall cease immediately at no additional cost to the contracting Agency.

Requests for Referee Testing as described in 321.11 will only be considered based on quality control test results performed by a laboratory accredited by the AASHTO Accreditation Program (AAP) for the tests being performed or a laboratory listed in the current ADOT Directory of Approved Materials Testing Laboratories for the set of tests in question. The laboratory shall use properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications).

321.10 ACCEPTANCE:

321.10.1 Acceptance Criteria: Asphalt concrete will be divided into lots for the purpose of acceptance. A lot shall be one day's production. Each lot shall be divided into sublots of 500 ton or fraction thereof. Tests used to determine acceptance will be performed by a laboratory accredited by the AASHTO Accreditation Program (AAP) for the tests being performed. The contracting agency shall provide an appropriately accredited laboratory or laboratories to perform the acceptance testing. Laboratories shall use properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications). The acceptance laboratory will take representative samples of the asphalt concrete from each sublot to allow for testing of gradation, binder content, air voids, pavement thickness and compaction of base and surface courses. Acceptance of each sublot will be based on the test data from the sample(s) from that sublot. All acceptance samples shall be taken using random locations or times designated by the Engineer in accordance with ASTM D3665.

321.10.2 Gradation, Binder Content and Air Voids: The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T-168 from each sublot. The minimum weight of the sample shall be 45 pounds. Asphalt binder content and gradation shall be determined in accordance with AASHTO T-308 using the ignition furnace for each sublot. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T-308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report. The bulk density for Marshall Mix designs shall be tested in accordance with AASHTO T-245. The bulk density for Gyratory mix designs shall be determined in accordance with AASHTO T-312. The maximum theoretical density shall be determined in accordance with the requirements of AASHTO T-209 including fan drying per AASHTO T209 Section 15. Effective voids of the laboratory compacted specimens will be determined at a minimum of once per lot in accordance with the requirements of AASHTO T-269. Should the testing for effective air voids not meet the "Full Payment" or "No Corrective Action" requirements of Table 321-5, additional testing for laboratory air voids on the remaining sublots will be performed as necessary to determine the extent of the deficiency. Acceptance testing results will be furnished to the contractor and the supplier within five working days of receipt of samples by the acceptance laboratory.

During production, the allowable deviations from the mix design gradation targets are listed in the tables below. The allowable production tolerances may fall outside of the mix design gradation bands.

TABLE 321-3A GRADATION ACCEPTANCE LIMITS FOR MARSHALL MIXES				
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	Base Mix
1 inch	---	---	---	±7%
3/4 inch	---	---	±7%	±6%
1/2 inch	---	±7%	---	---
3/8 inch	±7%	±6%	±6%	±6%
No. 8	±6%	±6%	±6%	±6%
No. 40	±4%	±4%	±4%	±4%
No. 200	±2%	±2%	±2%	±2%

TABLE 321-3B GRADATION ACCEPTANCE LIMITS FOR GYRATORY MIXES			
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix
3/4 inch	---	---	±7%
1/2 inch	---	±7%	±6%
3/8 inch	±7%	±6%	---
No. 8	±6%	±6%	±6%
No. 40	±4%	±4%	±4%
No. 200	±2%	±2%	±2%

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3A or 321-3B as applicable, a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits the Contractor shall cease production of asphalt concrete. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in Table 321-3A or 321-3B as applicable.

If the asphalt binder content is within ± 0.40% of the mix design target value, the asphalt concrete will be paid for at the contract unit price. If the asphalt binder content deviates by more than ± 0.40% from the mix design target value, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient sample. The asphalt content of the original deficient sample will be averaged with the asphalt binder content of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the asphalt binder content deviates by more than ± 0.40% from the mix design target value, then Table 321-4 shall apply to the sublot. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 321-4 ASPHALT BINDER CONTENT ACCEPTANCE AND PENALTIES		
Deviation from that permitted	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Over 0.2% above that permitted	Removal* or EA	Removal* or EA
Over 0.1% to 0.2% above that permitted	$6.00	EA
Over 0.0% to0.1% above that permitted	$2.00	EA
Within permitted range	Full Payment	No Corrective Action
Over 0.0% to0.1% below that permitted	$2.00	EA
Over 0.1% to 0.2% below that permitted	$6.00	EA
Over 0.2% below that permitted	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 321.10.6

If the laboratory air voids fall within a range of 2.8% to 6.2%, the asphalt concrete will be paid for at the contract unit price. If the laboratory air voids are outside of this range, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient sample. The laboratory air voids of the original deficient sample will be averaged with the laboratory air voids obtained from each of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the laboratory air voids is outside the indicated range, then Table 321-5 shall apply to the sublot. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 321-5 LABORATORY VOIDS ACCEPTANCE AND PENALTIES		
Laboratory Air Voids (Measured at N_{des} or 75 blows as applicable)	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Less than 1.5%	Removal* or EA	Removal* or EA
1.5-2.0%	$5.00	EA
2.1-2.7%	$2.00	EA
2.8-6.2%	Full Payment	No Corrective Action
6.3-6.9%	$2.00	EA
7.0-8.0%	$5.00	EA
Greater than 8.0%	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient
EA = Engineering Analysis per Section 321.10.6
Removal for In-place Air Voids Greater than 11.0% is not eligible for Section 321.10.6.

If an agency or Engineer is purchasing asphalt concrete directly from a commercial material supplier, the agency or Engineer will use Section 321.10, and specifically Tables 321-3A or 321-3B as applicable, 321-4 and 321-5 from Section 321.10, when determining the acceptance of the asphalt concrete with the material supplier.

321.10.3 Surface Testing: If directed by the Engineer surface drainage test shall be performed. The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer's satisfaction at the Contractor's expense. Water for this testing shall be provided and paid for by the Contractor.

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

321.10.4 Asphalt Pavement Thickness: Asphalt Pavement thickness will be determined from cores secured from each lift of each sublot. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found in Section 321.14. Each core location will be patched by the party responsible for the testing.

Acceptance or assessment of penalties for asphalt pavement thickness will be based on the combined total thickness of all asphalt concrete layers omitting all layers of asphalt-rubber asphalt concrete. If the final total pavement thickness exclusive of all ARAC layers is deficient from the target thickness by 0.25 inches or less, it will be paid for at the contract unit price.

If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is not the owner (i.e. permits) the following steps will apply:

(1) If the thickness deficiency of the pavement exceeds 0.25 inch, the limits of the deficient area will be evaluated by coring at maximum intervals of 100 feet from the deficient core. The thicknesses of the original deficient core will be averaged with the thicknesses of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements. If the resulting average thickness deficiency is greater than 0.25 inch, additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

(2) If the pavement thickness from step one above deviates from the target thickness by more than 0.25 inch but not more than 0.50 inch, corrective action will be required. This corrective action will consist of application of a Type II slurry seal coat in accordance to Section 715. The Contractor may present an engineering analysis outlining other proposed remedial measures for the consideration of the Engineer. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures.

(3) If the pavement thickness from step one above deviates from the target thickness by more than 0.50 inch, corrective action will be required. The deficient area shall be overlaid with no less than a 1 inch thick lift, for the full width of the pavement to meet or exceed the designed thickness, with appropriate end and edge milling, with a mixture approved by the Engineer. The Contractor may present an engineering analysis outlining other proposed remedial measures for the Engineer's consideration. The Engineer will review the engineering analysis and decide within 10 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the engineering analysis, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

If the contracting Agency is the owner and the pavement thickness deficiency is greater than 0.25 inches but less than 0.50 inches Table 321-6 will apply. If the pavement thickness deficiency is greater than 0.5 inches the deficient area shall be overlaid with no less than a 1-inch thick lift for the full width of the pavement to meet or exceed the designed thickness using an asphalt mixture approved by the Engineer. The Contractor shall provide appropriate end and edge milling. The overlay and milling shall be accomplished by the Contractor at no additional cost to the Contracting Agency.

TABLE 321-6	
ASPHALT PAVEMENT THICKNESS PAYMENT REDUCTION For Thickness Deficiency of More Than 0.25 inches and less than 0.50 inches	
Total Specified Asphalt Pavement Thickness exclusive of ARAC (if any)	**Reduction in Payment Applied to asphalt concrete Except ARAC layers (if any)**
Less than 1.5 inches	50%
1.50 inches to 1.99 inches	33%
2.00 inches to 2.49 inches	25%
2.50 inches to 2.99 inches	20%
3.00 inches and over	17%

321.10.5 Density:

321.10.5.1 Pavement 1-1/2 Inches or Less in Nominal Thickness:

Compaction shall consist of a "Rolling Method Procedure" using an established sequence of coverage with specified types of compactors. A pass shall be defined as one movement of a compactor in either direction. Coverage shall be the number of passes as are necessary to cover the entire width being paved.

The rolling sequence, the type of compactor to be used, and the number of coverages required shall be as shown in Table 321-7.

TABLE 321-7				
ROLLING SEQUENCE FOR LIFT THICKNESS 1½" OR LESS				
Rolling Sequence	**Type of Compactor**		**No. of Coverages**	
	Option No. 1	**Option No. 2**	**Option No. 1**	**Option No. 2**
Initial	Static Steel	Vibrating Steel	1	1
Intermediate	Pneumatic Tired	Vibrating Steel	4	2- 4*
Finish	Static Steel	Static Steel	1-3	1-3
* Based on the roller pattern which exhibits the best performance.				

The Contractor shall select the option for compaction and, when pneumatic-tired compactors are used will designate the tire pressure. Steel wheel compactors shall not be used in the vibratory mode for courses of one inch or less in thickness nor when the temperature of the asphaltic concrete falls below 180 degree F. Initial and intermediate compaction shall be accomplished before the temperature of the asphaltic concrete falls below 200 degree F.

Compaction will be deemed to be acceptable on the condition that the asphaltic concrete is compacted using the type of compactors specified, ballasted and operated as specified, and with the number of coverages of the compactors as specified.

321.10.5.2 Pavement Greater than 1-1/2 Inches in Nominal Thickness:

Achieving the required compaction is the responsibility of the contractor. The number and types of rollers is the contractor's responsibility and shall be sufficient to meet these requirements.

In-place air voids shall be determined in accordance with AASHTO T-269 utilizing cores taken from the finished pavement. The maximum theoretical density used in the determination of in-place air voids will be the average value from the acceptance samples determined for the Lot as outlined in 321.10.1.

The Engineer will designate one random test location for each sublot and the acceptance laboratory will obtain one core from that location. Regardless of sublot quantities or boundaries, a minimum of one core will be obtained per residential street and a minimum of one core per travel lane for collector and arterial streets. The outside one foot of each pass of the pavement course

or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found in Section 321.14. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

If the pavement density has in-place voids of 8.0% or less, the asphalt concrete will be paid for at the contract unit price. If the pavement density has in-place voids greater than 8.0%, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient core(s). If both cores in a sublot are deficient, 3 to 4 additional cores may be necessary to re-evaluate acceptance. The in-place voids of all the original core(s), whether deficient or acceptable, will be averaged with the in-place voids of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-8 shall apply to the sublot. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 321-8

PAVEMENT DENSITY PENALTIES

Limits of In-place Air Voids for design lift thicknesses 1.5 inches and greater	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Below 3.0%	Removal* or EA	Removal* or EA
3.0% to below 4.0%	$10.00	EA and Type II Surry Seal
4.0% to 8.0%	Full Payment	No Corrective Action
Greater than 8.0% to less than 9.0%	$6.00	EA
9.0% to 10.0%	$10.00	EA and Type II Surry Seal
Greater than 10.0%	Removal* or EA	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 321.10.6
Removal for In-place Air Voids greater than 11.0% is not eligible for Section 321.10.6.

321.10.6 Engineering Analysis (EA): Within 10 working days after receiving notice that a lot or sublot of asphalt concrete is deficient and is found to fall within the "Removal or EA" band per Table(s) 321-4, 321-5, and/or 321-8 the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties along with possible remediation(s) listed in the "Removal or EA" category. Engineering Analysis can also be proposed for non-removal categories of "Corrective actions" when the contracting agency is not the owner (i.e. permits).

The Engineering Analysis shall contain an analysis of the anticipated performance of the asphalt concrete if left in place. The Engineering Analysis shall also detail the effect of any proposed corrective action to the material(s) in place as it relates to the in-place material's performance. The Engineering Analysis shall be performed by a professional engineer experienced in asphalt concrete testing and mix designs.

If a lot or sublot is accepted for referee testing and the referee test results still show a deficiency, the contractor shall have ten working days to submit an engineering analysis beginning upon notification of referee test results.

When an Engineering Analysis recommends that a specific lot or sublot should not be removed, the Engineering Analysis will recommend that the following penalties (Table 321-9) be paid when the contracting agency is the owner, for the specific criteria being reviewed by the EA.

TABLE 321-9

ENGINEERING ANALYSIS PENALTIES for REMOVAL* LOTS/SUBLOTS LEFT IN-PLACE

Acceptance Criteria	Acceptance Limits	Penalty When Contracting Agency is the Owner ($/Ton)
Asphalt Binder Content	Over 0.2% points from that Permitted	$9.00
Laboratory Air Voids (Measured at N_{des} or 75 blows as applicable)	Less than 1.5% or Greater Than 8.0%	$7.50
Limits of In-place Air Voids	Less than 3% or Greater than 10.0%	$15.00

Within 15 working days, the Engineer will determine whether or not to accept the contractor's proposed Engineering Analysis.

321.11 REFEREE:

If the Contractor has reason to question the validity of any of the acceptance test results, the Contractor may request that the Engineer consider referee test for final acceptance. Any request for referee testing must describe the contractor's reasons for questioning the validity of the original acceptance test results and must clearly describe which set of acceptance tests are in question. The engineer may either accept or reject the request for referee testing. When referee testing is accepted the Contractor (at the Contractors own expense) will engage an independent laboratory accredited by the AAP or a laboratory listed in the current ADOT Directory of Approved Materials Testing Laboratories as appropriate the acceptance tests that are being questioned. The independent referee laboratory shall use properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications). For the set of test results in question the referee laboratory shall perform a new set of acceptance tests (as required by Section 321.10 representing the area for the set of tests in question). The referee tests will replace the original acceptance tests that were in question.

These tests may include asphalt binder content, aggregate gradation, Marshall or Gyratory unit weight, maximum theoretical unit weight, laboratory air voids and in-place air voids (compaction). Samples for referee testing shall come from representative samples obtained from the completed pavement, as directed by the Engineer.

The number of samples taken will be the same as specified in Section 321.10. The independent laboratory shall compile the test results and transmit them to both the Engineer and the contractor. The independent laboratory shall include a report sealed and signed by an Engineer registered in the State of Arizona, who is experienced in asphalt concrete testing and mix design development. The signed report shall give an opinion that the material evaluated does or does not comply with project specifications, shall clearly describe any deficiencies, and the results will be binding between all parties.

321.12 MEASUREMENT:

Asphalt concrete pavement will be measured by the ton, or by the square yard, for the mixture actually used as allowed above, which shall include the required quantities of mineral aggregates, asphalt binder, and mineral admixture. Measurement shall include any tonnage used to construct intersections, roadways, streets, or other miscellaneous surfaces indicated on the plans or as directed by the Engineer.

321.13 PAYMENT:

The asphalt concrete measured as provided above will be paid for at the contract price per ton or square yard, as adjusted per Section 321.10, which price shall be full compensation for the item complete, as herein described and specified.

Payment for tack coat will be by the ton diluted, based on the rate of application, as directed by the Engineer.

No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and the mix design unit weight. The calculations and payment for overrun will be by individual pay item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit price.

Agency required repairs of existing pavement prior to roadway overlay operations will be paid for as a separate pay item.

Except as otherwise specified, no separate payment will be made for work necessary to construct miscellaneous items or surfaces of asphalt concrete.

321.14 ASPHALT CORE METHOD: Core Drilling of Hot Mix Asphalt (HMA) for Specimens of 4" or 6" diameter

321.14.1 Scope: This method is to establish a consistent method of the use of a diamond bit core to recover specimens of 4 or 6 inch diameter for laboratory analysis and testing. The method will require the use of: water, ice (bagged or other suitable type), dry ice, and a water-soap solution to be utilized when coring asphalt rubber concrete. Individuals doing the specimen recovery should be observing all safety regulations from the equipment manufacturer as well as the required job site safety requirements for actions, and required personal protective equipment.

321.14.2 Core Drilling Device: The core drilling device will be powered by an electrical motor, or by an acceptable gasoline engine. Either device used shall be capable of applying enough effective rotational velocity to secure a drilled specimen. The specimen shall be cored perpendicularly to the surface of pavement, and that the sides of the core are cut in a manner to minimize sample distortion or damage. The machinery utilized for the procedure shall be on a mounted base, have a geared column and carriage that will permit the application of variable pressure to the core head and carriage throughout the entire drilling operation. The carriage and column apparatus shall be securely attached to the base of the apparatus; and the base will be secured with a mechanical fastener or held in place by the body weight of the operator. The core drilling apparatus shall be equipped with a water spindle to allow water to be introduced inside of the drill stem while operating. The cutting edge of the core drill bit shall be of hardened steel or other suitable material with embedded diamond chips in the cutting surface. The core barrel shall be of sufficient diameter to secure a specimen that is a minimum of four or six inches or whichever is prescribed for necessary testing. The core barrel shall not be missing more than one of the teeth used for cutting; if so it shall be discarded and another barrel shall be used. The core barrel shall also be a minimum of two inches longer than the anticipated depth of pavement in accordance with project paving plans.

321.14.3 Accessory Equipment: A sufficient supply of ice and dry ice shall be provided to sufficiently cool the pavement prior to securing the samples from the designated areas in the pavement. The ice should also be used to adjust the temperature of the water used to cool the core bit. A water supply (usually a plastic 35 – 55 gal drum) with sufficient hose to introduce the water into and through the spindle of the coring device by gravity feed. The drum should be white or light in color to minimize excessive thermal heating of the water (*for coring of asphalt rubber cores see Note 1*). At no time shall the water utilized in the coring operation exceed 65^{o} F during the coring operation. Ice shall be utilized to ensure the temperature control of the water being introduced during the cutting operation. An ice chest or other suitably insulated container that can maintain a temperature of less than 70^{o} F shall be used to secure the specimens during transport. The container will be equipped with flat shelving that will support the drilled cores throughout the entire specimen dimension during transport back to the testing facility.

Miscellaneous hand tools to remove the drilled specimen from the drill hole or the core barrel taking great care in not disturbing the specimen more than necessary (refer to fig. 1 in ASTM D5361).

321.14.4 Process: The pavement surface at the time of coring shall not exceed a temperature of 90^{o} F; the pavement shall be conditioned with ice or dry ice to ensure that this requirement is met. Immediately after it has been ensured that the pavement has dropped to the required temperature, core drilling shall begin. The operator will then apply an even and continuous pressure (Note 2) to penetrate through the full depth of the pavement. The operator will concurrently ensure that enough water is moving over the core surface as to adequately remove any and all cuttings that could damage the drilled core. After the pavement thickness has been penetrated the core shall be carefully removed from either the drill hole or the core barrel and be immediately transferred to an ice chest or other suitable container. Each individual core shall be placed on a shelf in the cooler with the exposed side of the specimen facing down, or the "top side" down. If the specimen is a two lift core, the only acceptable means of separating lifts is with a power or other acceptable wet saw type of equipment (conforming to ASTM D5361); however, at no time shall cores be split using a mallet and screwdriver or metal straight edge when being tested for bulk density. Perpendicularity of the specimen shall be checked in the field after the specimen has been extracted from the

surface. The core operator shall hold the core up to eye level and place the core top side down in a "speed square" or small carpenters square. The specimen placed in the square shall not depart from perpendicular to the axis more than 0.5^{o} (approximately equivalent to 1/16 of an inch in 6 inches). If the specimen is outside of this distance from square it shall be discarded in the field and another sample cored that falls within tolerance. The cores upon arriving at the laboratory for testing shall be carefully cleaned and measured for thickness in accordance with ASTM D3549. A speed square shall be utilized to measure perpendicularity as compared to a 90^{o} degree angle and shall not depart from perpendicular to the axis more than 0.5^{o} (approximately equivalent to 1/16 of an inch in 6 inches). All remaining testing shall be done within the parameters of the current project and / or agency required specification.

*Note 1 – It should be noted that when the material to be cored is a rubberized asphalt mixture a wetting agent such as liquid dish soap shall be added to the water barrel to hinder the material from sticking or allowing the binder to spread during coring.
*Note 2 – This refers to pressure exerted on the core barrel and machine during the coring process. Too much pressure can cause damage to the core barrel and the motor; and too little pressure can cause a glazing of the diamonds, reducing cutting efficiency and premature wear of the barrel.

- End of Section –

SECTION 324

PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

324.1 DESCRIPTION:

This item shall consist of construction of a pavement composed of plain jointed portland cement concrete on a prepared subgrade. The Contractor shall furnish all labor, materials and equipment necessary for the construction of the pavement in accordance with these specifications and in reasonably close conformity to the lines, grades, thicknesses and details indicated by the plans or as established by the Engineer. All tests shall be performed by a laboratory approved by the Engineer.

324.2 MATERIALS:

324.2.1 Portland Cement Concrete: Portland cement concrete shall conform to the applicable requirements of Section 725 and the additional requirements of this section.

Concrete shall comply with Table 725-1 for Class AA, 4000 psi unless otherwise specified by the Engineer.

The maximum concrete slump shall be as determined by the approved mix design in accordance with Section 725.9(A)(1).

324.2.2 Reinforcement: Tie bars shall be deformed billet steel reinforcing bars conforming to the requirements of ASTM A-615, Grade 40.

Dowel or load transfer bars shall conform to the requirements of ASTM A-615, Grade 40. An approved support system shall be used to hold bars in position.

324.2.3 Curing Materials: Materials for curing concrete shall conform to the requirements of Section 726.

324.2.4 Joint Materials: Joint sealant shall be poured type, conforming to the requirements of Section 729.2 or as approved by the Engineer. Preformed expansion joint filler shall conform to the requirements Section 729.1 or as approved by the Engineer.

324.3 CONSTRUCTION METHODS:

324.3.1 General: Pavement shall be constructed with mechanical equipment utilizing stationary side forms or by the use of slipform paving equipment without stationary side forms. Manual methods of placing and finishing concrete with stationary side forms may be permitted by the Engineer for areas inaccessible for mechanical equipment.

All curb and gutter shall have the same class of concrete as the adjacent PCCP. Gutter sections shall have the same thickness as the PCCP section. All curbs or combined curb and gutter joints shall align with roadway joints.

324.3.2 Equipment: Design, capacity, and mechanical condition of equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer. Equipment shall be at the jobsite sufficiently ahead of the start of concrete paving operations to permit thorough examination and approval by the Engineer prior to start of concrete paving.

Equipment used to place concrete may consist of one or more machines, shall be capable of uniformly distributing and consolidating the concrete as it is placed without segregation and shall be capable of producing concrete pavement which will conform to the required cross-section with a minimum of hand work. The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to the concrete delivery rate.

Vibrators shall be used to consolidate concrete; the rate of vibration shall be not less than 3,500 cycles per minute for surface vibrators and not less than 8,000 cycles per minute for internal vibrators. Power to vibrators mounted on mechanical equipment shall be so connected that vibration ceases when forward or backward motion of the machine is stopped. Contractor shall furnish a tachometer or other suitable device for measuring and indicating the frequency of vibration.

Slipform pavers shall be equipped with high frequency internal vibrators mounted with axes either parallel or normal to pavement alignment for the full paving width. Vibrators mounted with axes parallel with pavement alignment shall be spaced at intervals not to exceed 24 inches, measured center-to-center. Vibrators mounted with axes normal to pavement alignment shall be spaced so that lateral clearance between individual vibrating units does not exceed 6 inches.

Slipform paving equipment which will be wholly or partially supported on subgrade shall be equipped with traveling side forms of sufficient dimensions, shape and strength to support the concrete at free edges laterally for a sufficient length of time during placement to produce pavement of the required cross-section, and shall be equipped and operate with automatic sensing and control devices such that the machine automatically senses deviations from the established guideline and performs the necessary corrective maneuvers to overcome variations from correct grade and alignment.

When concrete will be placed adjacent to existing pavement or curb and gutter, that part of the equipment supported on the existing pavement or curb and gutter shall be equipped with protective pads on crawler tracks or rubber-tired wheels with bearing surfaces offset a sufficient distance from the edge of the pavement or curb and gutter to avoid edge damage, or the surface of the existing pavement or curb and gutter shall be otherwise protected against such damage in a manner approved by the Engineer.

324.3.3 Subgrade and Base Preparation: Subgrade and base shall conform to the applicable compaction requirements of Section 601 and elevation tolerances specified for the material involved, shall be kept smooth and compacted, and shall be free of all loose and extraneous material when concrete is placed.

The surface of the subgrade shall be uniformly moist when concrete is placed. The surface of the subgrade shall be moistened immediately prior to placement of concrete, if necessary to produce a uniformly moist condition. Any excess water standing in pools or flowing on the surface shall be removed prior to placing concrete.

324.3.4 Stationary Side Forms and Setting of Forms: Side form sections shall be straight, free from warps, bends, indentations or other defects. Side forms shall be of metal, have a base width of at least four inches and a minimum depth equal to the thickness of the pavement. No section shall show a variation from a true plane greater than 1/8 inch in ten feet on the top of the form or more than 1/4 inch in ten feet on the inside face. Flexible or curved forms of proper radius shall be used for curves of 100 feet radius or less. Suitable materials other than metal may be used to form end closures or at other locations where use of metal forms is not practical. Forms shall be thoroughly cleaned and oiled each time they are used.

Forms shall be of such cross section and strength and so secured and supported on the subgrade as to resist the pressure of the concrete when placed and the impact and vibration of any equipment they are to support without springing or settlement. The method of connection between sections shall be such that the joints shall not move in any direction.

Subgrade under forms shall be compacted and cut to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. Forms shall be so supported and secured during the entire operation of placing and finishing that they will not deviate vertically at any point more than 1/8 inch from the proper elevation. Forms shall be set to the required lines and grades well in advance and for a distance sufficient to prevent delay in placing concrete, and shall be approved by the Engineer prior to placing concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

Side forms shall remain in place until the day after placing concrete, and in all cases until the edge of the pavement no longer requires the protection of the forms. Forms shall be carefully removed in such a manner as to avoid damage to the pavement. Use of pry bars between the pavement and the forms will not be permitted.

324.3.5 Placing, Spreading and Compacting: Construction equipment shall not operate on the subgrade in the paving lane when conditions of the job will permit operation from outside the lane. When job conditions make it necessary to operate equipment on the subgrade in the paving lane, suitable runways or other precautions shall be taken to prevent rutting or displacement of subgrade material. The grade shall be checked and corrected immediately ahead of concrete placement and all disturbed grade shall be properly recompacted. Except when otherwise approved by the Engineer, concrete shall be deposited on the subgrade and spread full width using mechanical methods that result in minimal handling and segregation. Necessary hand spreading shall be done with shovels, not rakes. Placement shall be continuous between transverse joints without the use of intermediate bulkheads.

The Contractor shall make adequate advance arrangements for preventing delay in delivery and placing of concrete. An interval of more than 15 minutes between placing of any two consecutive batches shall constitute cause for stopping operations, and Contractor shall remove all concrete placed beyond the last scheduled joint or install a joint of the type and at the location as directed by the Engineer.

Concrete shall be deposited as near to expansion and construction joints as possible without disturbing them but shall not be dumped onto a joint assembly. Concrete shall be thoroughly consolidated against and along the faces of all forms, adjacent

pavement or curb and gutter, and on both sides of all joint assemblies. Vibrators shall not be permitted to come in contact with joint assemblies, the grade, or side forms, and shall not be operated longer than 15 seconds in any one location.

Manual methods of placing, spreading, and compacting may be used in the construction of pavement lanes of irregular width or widths less than 10 feet, and sections of intersections or other locations with complex variable surface configurations when permitted by the Engineer. Workmen shall not be allowed to walk in the freshly placed concrete.

324.3.6 Shaping and Initial Finishing: Concrete shall be struck off, consolidated, and float-finished with a slipform paver, mechanical finishing machine, vibrating screed, or by hand finishing methods when approved by the Engineer so that the complete pavement will conform to the thickness and cross section requirements of the plans and specifications. When the pavement being constructed is contiguous to existing parallel concrete pavement or curb and gutter, the elevation of the new pavement surface shall conform as closely as possible to the elevation of the existing pavement or gutter surface in a manner which will prevent ponding. The difference in elevation shall not exceed 1/4 inch.

Water shall not be applied to the pavement surface during screeding and finishing operations in excess of the amount lost by evaporation. Adding water to the surface of the concrete to assist in finishing operations shall not be permitted. When applications of water to the surface are required to prevent rapid evaporation of water from the surface during finishing operations, it shall be applied as a fog spray and with approved spray equipment.

(A) Slipform Supported on Subgrade Method: When concrete pavement will be placed with slipform paving equipment which will be supported and operate on the subgrade, the subgrade and slipform paver track area shall be brought to proper grade and cross section by means of a properly designed and operated machine. The equipment shall spread, consolidate, screed and float-finish the concrete in one complete pass of the machine. The machine shall be operated with as nearly a continuous forward movement as possible and all paving operations shall be so coordinated as to provide uniform progress with stopping and starting of the paver held to a minimum. Sliding side forms shall be rigidly held together to prevent spreading. Any edge slump of the pavement, exclusive of edge rounding, in excess of 1/4 inch shall be corrected.

No abrupt changes in longitudinal alignment of the pavement will be permitted. The horizontal deviation shall not exceed one inch from the alignment established by the Engineer.

While concrete is being spread, compacted and shaped, vibrating units shall be operated within fresh concrete so that the longitudinal axis, at the center of each unit, is not more than 6 inches above the top of the subgrade. Amplitude of vibration shall be sufficient to be perceptible on the surface of concrete along the entire length of vibrating units and for a distance of at least one foot.

(B) Mechanical Equipment Supported on Fixed Form Method: When concrete is spread without the use of internal vibration, the finishing machine shall be equipped with vibrating equipment that will internally vibrate the concrete for the full paving width and with not less than two oscillating or reciprocating screeds. Concrete shall be struck off and consolidated so that the surface will conform to the finished grade and cross section shown on the project plans and with sufficient material on the surface for floating operations.

After the concrete has been struck off and consolidated, it shall be floated with a longitudinal float of a type approved by the Engineer.

A slipform paver or a single machine which will effectively spread, consolidate, screed, and float in one operation may be used in lieu of separate finishing and floating equipment.

(C) Manual Methods with Fixed Forms: Concrete shall be deposited, spread and struck off to such an elevation that, when properly consolidated, the surface will conform to the required lines and grades. Concrete shall be consolidated by internal vibration as it is struck off with a screed. A slight excess of concrete shall be kept in front of the screed at all times during the strike-off operation.

After consolidation and screeding, concrete shall be tamped to the proper surface elevation and cross section using either a heavy plank with a length in excess of the width of pavement being placed by one foot or more, or with a mechanical vibrating unit spanning the full width between forms. The tamping plank, if used, shall be stiffened as necessary to prevent sag and shall have the lower tamping edge shod with metal. The tamping plank shall be moved forward with a combined vertical tamping and longitudinal screeding motion so that the concrete will be thoroughly consolidated and the surface screeded to the required elevation. A small surplus of concrete shall be kept in front of the tamper or vibrating unit.

Tamping or vibrating shall continue until the specified cross section is obtained and the mortar flushed slightly to the surface. On grades in excess of 5 percent a second strike board shall follow from 25 to 50 feet behind the tamper or vibrating unit and shall be used in the same manner to remove waves caused by the flow of concrete behind the first strike board.

Methods other than the tamping plank may be utilized for screeding when approved by the Engineer.

Pavement shall be finished smooth and true to grade with suitable manually operated floats or powered finishing equipment.

324.3.7 Final Finishing: After the pavement has been float-finished, it shall be scraped with a 10-foot long straightedge equipped with a handle to permit operations from the edge of the pavement, and excess water and laitance shall be removed from the surface. The straightedge shall be operated parallel to the centerline of the pavement and shall be moved forward one-half length after each pass. Irregularities shall be corrected by adding or removing concrete, and disturbed places shall be again straight-edged.

Long-handled floats shall be used only in areas not accessible to finishing equipment and in emergencies, and use of such floats shall be confined to a minimum.

The addition of water to the surface of the concrete to assist in finishing operations shall not be permitted unless approved by the Engineer. When the evaporation rate on the concrete surface exceeds the rate of bleeding of the concrete, measures shall be taken to prevent the rapid evaporation of water from the surface during finishing operations. When allowed by the Engineer, the addition of water to the surface may be permitted when applied as a fog spray with approved spray equipment immediately after screeding and/or between finishing operations. A commercial evaporation reducer that forms a monomolecular film may also be sprayed onto the concrete surface in accordance with the Manufacturer's recommendations. When either of these methods is approved and used it does not take the place of proper curing methods per Section 324.3.8.

Pavement edges and joints shall be edged in accordance with details shown on the project plans or as directed by the Engineer.

In advance of curing operations, pavement shall be textured. Texturing shall be performed with an artificial turf drag with a board added to assure the weight needed to obtain an approved surface. Artificial turf shall be a molded composite structure with polyethylene face, nylon and polyester backing, a pile height of 0.85 inches, and total weight of 75 oz./sq. yd. The surface obtained during initial surface texturing shall be subject to approval by the Engineer. The texturing approved on the initial construction shall not be changed without the Engineer's approval. Each time the construction is stopped or causes the texturing to stop, the artificial turf must be shaken clean before continuing.

324.3.8 Curing: Curing shall begin immediately following surface texturing and edging. Before concrete placement begins, Contractor shall have at hand and ready to install the materials and equipment needed for adequate curing.

After finishing operations have been completed, the newly placed concrete shall be cured by moist curing methods, by application of a white pigmented liquid membrane compound conforming to the requirements of Section 726, or by a combination of these methods. All surfaces not covered by reasonably waterproof forms shall be kept damp by applying water with a nozzle that so atomizes the flow of water that a fog mist and not a spray is formed until the surface is covered with liquid membrane compound, the surface has hardened sufficiently to permit sprinkling of the surface, or moist curing by covering with wet burlap or other approved materials can be initiated. Moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow and erode the surface. Moist curing shall be continued until liquid membrane curing compound or other type of curing membrane is applied.

Membrane curing compound shall be applied to all pavement by automatic mechanical method from a construction bridge.

The edges of concrete slabs exposed by the removal of forms shall be protected immediately to provide these exposed surfaces with continuous curing treatment equal to the method selected for curing the pavement surface.

The membrane method of curing may be applied behind the final finishing operation after all free water has disappeared from the surface. Complete and uniform coverage at the rate of one gallon per 100 square feet, or as otherwise recommended by the manufacturer, shall be required. Compound shall be kept agitated to prevent pigment from settling.

324.3.9 Joints: Joints shall be provided in the pavement of the type, dimensions and at the locations as indicated in the plans or as specified herein.

Joints in concrete pavement will be designated as transverse expansion joints, longitudinal or transverse construction joints, longitudinal or transverse weakened plane joints, or isolation joints. The faces of all joints shall be perpendicular to the pavement surface. Joints shall be constructed in accordance with the details shown or referenced in the plans and in accordance with the following provisions.

At all times prior to acceptance of the construction, joints shall be maintained clean and free of soil, gravel, and other foreign material except approved types of joint filler materials.

(A) Longitudinal Joints: Longitudinal joints shall be weakened plane or construction joints. Longitudinal weakened plane joints shall be constructed by sawing or by insertion of a parting strip in the plastic concrete to be left in place. Longitudinal construction joints shall be constructed with tie bars or keyways as indicated in the plans.

(B) Transverse Joints: Transverse joints shall be weakened plane, construction or expansion joints. All transverse weakened plane joints will be constructed by sawing and in accordance with the details shown in the project plans. Transverse construction joints shall be constructed in accordance with the details shown or referenced in the project plans. Transverse expansion joints shall be constructed in accordance with the details shown or referenced in the project plans.

Dowel bars when required shall be supported with an approved support system.

(C) Joint Location: Longitudinal and transverse joints shall be constructed at locations as indicated in the project plans.

Isolation joints shall be provided around manholes, catch basins, or other elements which extend into or project through the pavement and act as point of restraint to horizontal or vertical movement of the pavement. Isolation joints shall be located in accordance with Detail 224 or as directed by the Engineer.

324.3.9.1 Construction of Joints:

(A) Sawed Joints: Sawed joints shall be constructed by cutting a groove in the pavement using a single or multiple-blade power saw. The groove shall be cut to the dimensions shown on the project plans. Suitable guidelines or devices shall be used to ensure joints are cut true to the lines as shown on the project plans.

If joints are sawed in stages, the initial saw cut shall be of the minimum width specified and sawed to the required depth. The depth of the initial saw cut in the construction of weakened plane joints shall be a minimum of 1/4 of slab thickness.

Sawing of weakened plane joints shall be done before uncontrolled cracking takes place, and after the concrete has hardened to the extent that tearing or raveling of the edges of the saw cut is not excessive. The exact time for all sawing shall be determined by the Contractor when not otherwise specified.

Any procedure for sawing joints that result in premature, uncontrolled cracking shall be revised immediately. The Contractor shall be responsible for replacing or repairing areas containing uncontrolled cracking and for repairing spalled or chipped concrete along the edges of sawed joints to the satisfaction of the Engineer.

After saw cutting of the joint and just prior to sealing the joint, the internal joint surfaces shall be cleaned of all dirt, curing compound residue, laitance and other foreign materials. The internal joint surface shall be defined as the sawed portion of the joint and the resultant crack for the full depth of the pavement.

Sealing of sawed joints where required shall be completed prior to the opening of the pavement to traffic unless otherwise approved by the Engineer. When delayed sealing of sawed joints is permitted, saw cuts and formed recess to be filled with sealant shall be protected to ensure thorough curing of the concrete along the edges of the joint recesses and to prevent entry of foreign materials into the joint. At the Contractor's option, inert compressible joint filler material such as plastic backer rod or upholstery cord may be inserted into joints immediately after sawing or forming of the joint recess to provide curing protection and prevent entry of foreign material. If absorptive filler material is used, it shall be thoroughly moistened either before or immediately after installation in the sawed groove. When filler material is rope, or similar material which does not fill the entire depth of sawed groove, it shall be depressed not less than 1/2 inch below the pavement surface before the pavement is opened to traffic.

(B) Expansion and Construction Joints: Longitudinal and transverse expansion and construction joints shall be as required by the project plans.

(C) Isolation Joints: Isolation joints unless otherwise detailed in construction documents shall be 1/2 inch wide expansion joints in accordance with Detail 224 or as directed by the Engineer.

(D) Sealing of Joints: Sealant shall be applied in accordance with the sealant manufacturer's recommendations. A primer shall be furnished and applied after the joint has been cleaned and prepared to receive sealant when indicated in the manufacturer's recommendations.

Prior to the application of the sealant, an approved type of inert, compressible joint filler material such as plastic backer rod or upholstery cord, or an approved type of bond breaker, shall be inserted along the joint in accordance with the details shown on the project plans. The joint shall then be filled with sealant to a level not less than 1/8 inch or more than 1/4 inch below the elevation of the pavement surface adjacent to the joint edge.

The equipment used to apply sealant shall be as recommended by the sealant manufacturer. Sealant shall not be spilled on the surface of the concrete pavement, and Contractor shall remove any sealant inadvertently spilled on the pavement surface.

(E) Repair of Cracks, Spalls, Raveling and Tearing: Contractor shall be responsible for replacing or repairing all areas of pavement containing uncontrolled cracking, surface spalls, or other types of surface. Repairs when authorized shall be made and completed by methods acceptable to the Engineer.

324.4 TESTS OF FINISHED PAVEMENT:

324.4.1 Smoothness: The pavement surface including pavement in intersections will be tested with a ten-foot straight-edge placed parallel to the centerline of the pavement in each lane. Ordinates measured from the face of the straight-edge to pavement surface shall at no place exceed one-quarter inch. Areas that do not meet the required surface accuracy as determined by straight-edge testing shall be marked, and Contractor shall at his own expense and as required by the Engineer either:

(1) Grind down areas higher than 1/4 inch but not more than 1/2 inch above the correct surface.

(2) Correct areas lower than 1/4 inch but not lower than 1/2 inch below the correct surface by grinding down the adjacent areas.

(3) Remove and replace pavement when the deviation exceeds 1/2 inch from the correct surface. Area replaced shall be of a length, width and depth as required to allow formation of a new slab of the required quality. The area replaced shall be compatible with the joint layout shown on the project plans as determined by the Engineer.

After grinding, the finished surface of the ground area shall be provided with a uniform texture acceptable to the Engineer. The method of texturing shall be approved by the Engineer.

324.4.2 Pavement Thickness: Concrete pavement shall be constructed in accordance with the thickness requirements of the plans and specifications. Tolerances for base and subgrade construction and other provisions of these specifications which may affect thickness shall not be construed to modify such thickness requirements.

Pavement thickness testing shall begin after achieving pavement smoothness compliance. For the purpose of determining acceptability for thickness, cores shall be drilled by the Contractor at the locations specified by the Engineer. Cores shall have a minimum diameter of four inches. Length of cores will be determined in accordance with the requirements of AASHTO T-148.

In calculating average length, cores which have a length in excess of the thickness specified by more than 0.25 of an inch will be deemed to have a length of the specified thickness plus 0.25 of an inch. Field length measurements will be acceptable in lieu of average length measurement in accordance with the requirements of AASHTO T-148, provided the original core in any secondary unit meets or exceeds the specified thickness. Measurements in accordance with the requirements of AASHTO T-148 will be required on any questionable thickness measurements and on the three cores used to determine the average length for payment, regardless of length.

A primary unit of pavement shall be the area of pavement placed in each day's paving operation. Each intersection or special section shall be considered as a primary unit.

A secondary unit of pavement shall consist of 1,000 linear feet, or fraction thereof, of each traffic lane. Each 1,300 square yards of pavement in intersections, etc., shall be considered a secondary unit regardless of when the concrete was placed.

One core shall be drilled in each secondary unit. If the length of that core is not deficient by more than 0.25 of an inch, that secondary unit will be measured for payment at 100 percent. If the length of that core is deficient by more than 0.25 of an inch but less than 1.0 inch, two additional cores shall be drilled within that secondary unit and the length of the three cores averaged. If the average length is not deficient by more than 0.25 of an inch, that secondary unit will be measured for payment at 100 percent. If the average length of the three cores is deficient by more than 0.25 of an inch, that secondary unit will be measured for payment in accordance with the requirements of Table 324-1.

If the core in the secondary unit is deficient by more than 1.00 inch, that core will not be used in determining the average thickness of that secondary unit. Additional cores shall be drilled at intervals not to exceed ten feet in each direction from the deficient core, parallel to the main-line centerline, until one core is obtained in each direction which is not deficient by more than 1.00 inch. The pavement between these two cores will be evaluated separately from the balance of the pavement in that secondary unit. The limits for evaluation shall be between the longitudinal weakened plane or construction joint on each side of the core and between the next transverse weakened plane, construction, or expansion joint beyond each of the last two cores. Unless the Engineer allows the pavement to remain, it shall be removed and replaced with pavement of the specified thickness and no payment will be made for the removed pavement.

If the pavement in the deficient area is removed, either by the order of the Engineer or at the option of the Contractor, it shall be removed between the limits of the evaluation. After the pavement has been replaced, one core shall be drilled at random in that secondary unit after deducting the area of the replaced pavement and one core shall be drilled in the new pavement. Pavement represented by the core drilled in the secondary unit, less the replaced pavement, will be measured for payment as hereinbefore specified. The core drilled in the replaced pavement shall be not less than the specified thickness; otherwise that pavement will not be measured or paid for.

At all locations where cores have been drilled, the resulting holes shall be filled with concrete in a manner satisfactory to the Engineer.

324.5 PROTECTION OF PAVEMENT:

The Contractor shall be responsible for taking adequate steps to protect concrete placed during rain, or hot or cold weather as defined in ACI Standards. Any concrete damaged by rain or extreme temperatures shall be removed and replaced at the Contractor's expense.

When ordered by the Engineer, pavement crossings shall be constructed for the convenience of public traffic. Where motor vehicles are encountered, a temporary bridge to span the newly placed concrete will be provided.

No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement until the concrete has developed a compressive strength of 3500 psi.

Equipment for sawing joints will be permitted on the pavement when, in the Contractor's judgment, the concrete has developed sufficient strength to support the equipment without damage to the concrete. In case of visible cracking or other damage to the pavement, operation of the equipment on the pavement shall be immediately discontinued.

Any damage to the pavement resulting from early use of pavement by the Contractor's equipment shall be repaired by the Contractor at his expense.

324.6 METHOD OF MEASUREMENT:

Portland Cement Concrete Pavement will be measured by the square yard. Any opening in excess of one square yard will not be measured for payment.

324.7 BASIS OF PAYMENT:

The accepted quantities of Portland Cement Concrete Pavement, measured as provided for herein, will be paid for at the contract unit price complete in place, except that where the average length of cores indicates pavement deficient in thickness by more than 0.25 of an inch but not more than 1.00 inch, payment will be made as specified in Table 324-1. Payment will be made to the nearest cent.

No additional payment will be allowed for pavement constructed in excess of the thickness specified on the project plans.

TABLE 324-1	
PAVEMENT THICKNESS PAYMENT REDUCTION (PCCP)	
Core Thickness, Less Than Specified Thickness, Inches	Percent of Contract Unit Price Allowed
0.00 to 0.25	100
0.26 to 0.35	93
0.36 to 0.45	85
0.46 to 0.55	75
0.56 to 0.75	63
0.76 to 1.00	50

End of Section -

SECTION 325

PLACEMENT AND CONSTRUCTION OF ASPHALT-RUBBER ASPHALT CONCRETE

325.1 DESCRIPTION:

Asphalt-rubber asphalt concrete (ARAC) consists of supplying, placing and compaction of plant-mixed, gap-graded ARAC over asphalt surfaces. The thickness of the finished ARAC overlay shall be within the range of one to two inches as shown on the plans or as specified in the special provisions.

325.2 MATERIALS:

ARAC shall consist of a mixture of aggregate, mineral admixture and asphalt-rubber binder (ARB) as specified in Section 717.

325.2.1 Mixing of Asphalt-Rubber Binder: Mixing of asphalt-rubber binder (ARB) may take place in a dedicated blending and storage unit connected to the hot plant or at the asphalt binder supplier's facility. In either case, the temperature of the asphalt cement shall be between 375° F and 425° F prior to the addition of crumb rubber. No agglomerations of crumb rubber particles in excess of 2 inches in the least dimension shall be allowed in the mixing chamber. The crumb rubber and asphalt cement shall be accurately proportioned in accordance with the ARB design as identified in 717.2.14 and thoroughly mixed prior to the beginning of the one hour reaction period. Reaction time may be decreased to 45-minutes if documentation is provided that the physical properties of the mix design requirements are consistently met using a 45-minute reaction period. The Contractor or supplier shall document that the proportions are accurate and that the crumb rubber has been uniformly incorporated into the mixture. Additionally, the Contractor or supplier shall demonstrate that the crumb rubber particles have been thoroughly mixed into the base asphalt cement. The occurrence of crumb rubber floating on the surface or agglomerations of crumb rubber particles shall be evidence of insufficient mixing. The temperature of the ARB immediately after mixing shall be between 350° F and 400° F. Reaction time shall start after all of the material for the batch has been mixed and the minimum reaction temperature of 350° F has been achieved.

Prior to use, the viscosity of the ARB shall be tested by the use of a rotational viscometer, which is to be furnished by the Contractor or supplier. The Contractor or supplier shall provide a qualified person to perform the testing.

325.2.2 Handling of ARB: Once the ARB has been mixed, it shall be kept thoroughly agitated during periods transport and use to prevent settling of the crumb rubber particles. During the production of ARAC the temperature of the ARB shall be maintained between 325° F (163°C) and 400° F (204°C). However, in no case shall the ARB be held for more than 10 hours at these temperatures. It may be allowed to cool to a temperature of 250° F (121°C) or lower and held at that temperature for not more than four days. The process of cooling and reheating shall not be allowed more than one time for a batch of ARB.

For each load or batch of ARB, the Contractor or supplier shall provide the Engineer with the following documentation:

(A) The source, grade, amount and temperature of the asphalt cement prior to the addition of crumb rubber.

(B) The source, type and amount of crumb rubber and the rubber content expressed as percent by the weight of total ARB.

(C) Times and dates of the crumb rubber additions, resultant viscosity test, and the elapsed reaction time at which the viscosity test was taken.

(D) A record of the temperature, with time and date reference for each load or batch. The record shall begin at the time of the addition of crumb rubber and continue until the load or batch is completely used. Readings and recordings shall be made at every temperature change in excess of 20° F, and as needed to document other events which are significant to batch use and quality.

325.3 WEATHER AND MOISTURE CONDITIONS:

ARAC shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 55° F or higher. No ARAC shall be placed when the weather is foggy or rainy. ARAC shall be placed only when the Engineer determines that weather conditions are suitable.

325.4 APPLICATION OF TACK COAT:

A tack coat shall be applied to all existing and to each new course of ARAC prior to the placing of a succeeding lift of ARAC. The tack coat may be deleted when a succeeding layer of ARAC is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1h or CSS-1h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer. This shall be addressed in the project specifications prior to the bidding of the project.

325.5 MIX PRODUCTION:

All materials shall be proportioned by weight in a hot mix asphalt plant in the proportions required by the mix design to provide a homogeneous and workable mass. Each hot mix asphalt plant shall be inspected in accordance with the provisions contained in the 'Hot Mix Asphalt Production Facilities' by the Arizona Rock Products Association and shall have a current inspection certificate. All measuring devices shall be calibrated at least annually by a technician licensed by the Arizona Bureau of Weights & Measures. Mixing plants shall conform to the requirements of AASHTO M-156, except as modified herein.

In drum mix plants the mineral admixture shall be added and thoroughly mixed with the mineral aggregate by means of a mechanical mixing device prior to the mineral aggregate and mineral admixture entering the dryer. The moisture content of the combined mineral aggregate shall be a minimum of three percent by weight of the aggregate during the mixing process.

For drum-mix plants, the mineral admixture shall be weighed across a weigh belt, or other approved alternative weighing system, with a weight totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer that is in good working condition. The rate of the aggregate feed shall not exceed the mixing device's capacity in ton per hour. The mixer shall be constructed to minimize the loss of mineral admixture and shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected. The mixing device shall be capable of effective mixing in the full range of the ARAC production rates.

The hot plant and equipment shall be constructed and operated to prevent loss of mineral admixture through the dust collection system of the plant.

A positive signal system shall be provided and utilized during production whereby the mixing shall automatically be stopped if the mineral admixture is not introduced into the mineral aggregate. The plant will not be permitted to operate unless the signal system is in good working condition.

The introduction of ARB shall be controlled by an automated system fully integrated with the controls for the mineral aggregate and mineral admixture. The production of the plant shall be controlled by the rate required to obtain a uniform mixture of all components. Drying and heating shall be accomplished in such a manner as to preclude the aggregate or mineral admixture from becoming coated with un-spent fuel. The completed ARAC may be held in storage for up to 12 hours in insulated or heated silos, providing the minimum temperature noted herein for placement and compaction is met behind the placement device. If the Engineer determines that there is an excessive amount of heat, heat loss, drain down, segregation and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued.

The temperature of the ARAC, with unmodified binders, upon discharge from the mixer shall not exceed 350° F. The discharge temperature may be increased, when approved by the Engineer. If the ARAC is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the ARAC will be minimized.

325.6 TRANSPORTATION:

Petroleum distillates or other substances that will have a detrimental effect on the asphalt concrete shall not be used as a release agent.

The beds of all transportation units shall be clean and smooth to allow the free flow of material into the paving machine's hopper.

Tarpaulins shall be furnished on all trucks and used when weather condition warrant, or if directed by the Engineer.

325.7 PLACEMENT:

325.7.1 Surface Preparation:

Before placing ARAC on existing pavements, severely raveled areas or cracked areas that are depressed more than 3/4" from the adjoining pavement shall be cut out and patched at least 48 hours prior to the resurfacing operation. Over-asphalted (bleeding or flushing) areas or rough high spots shall be removed by burning or blading. Large shrinkage cracks shall be filled with asphalt sealing compound acceptable to the Engineer. The entire surface shall be cleaned with a power broom. Raveled areas that do not require removing shall be cleaned by hand brooming. The above surface cleaning requirements are included as part of the ARAC paving operations, and the cost thereof shall be included in the ARAC pay item. Pavement repairs and crack sealing when required are to be compensated for by other appropriate contract pay items.

Prior to placing the ARAC on milled surfaces, pot-holes left by the milling operation shall be repaired by the Contractor, as a related non-pay item and as required by the Engineer. The milled area shall be swept.

After surfaces have been prepared to the satisfaction of the Engineer, they shall receive a tack coat as specified in Section 325.4.

Traffic will not be permitted over surfaces which have received a tack coat. When the overlay is to extend onto a concrete surface, the concrete surface shall be thoroughly cleaned of loose dust and cement particles and shall be tack coated.

325.7.2 Placing and Construction Methods:

All courses of ARAC shall be placed and finished by means of a self-propelled paving machine equipped with an automatically actuated control system, except under certain conditions or at locations where the Engineer deems the use of a self-propelled paving machine impracticable.

The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternatively when directed, by controlling the elevation of each end independently.

The control system shall be capable of working with one of the following devices:

(A) Ski or non-contact device of not less than 30 feet in length, supported throughout its entire length
(B) Taut stringline or wire set to grade
(C) Short ski or sonar sensing units from curb control
(D) Joint matching shoe

Failure of the control system to function properly shall be cause for the suspension of asphalt concrete production. In order to achieve a continuous operation, the speed of the paving machine shall be coordinated with the hot mix plant and transport units.

The ARAC shall be dumped from the hauling vehicles directly into the paving machine, unless otherwise approved by the Engineer.

Care shall be taken to avoid jarring the machine or moving it out of alignment. No vertical load shall be exerted on the paving machine by the truck.

If ARAC is dumped upon the surface being paved and subsequently loaded in the paving machine, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the ARAC shall be picked up and loaded into the paving machine. If ARAC is placed in a windrow during paving, the windrow shall not exceed a distance greater than 150 feet in front of the paving machine.

Self-propelled paving machines shall spread the mixture without segregation or tearing, true to line, grade and crown as indicated on the project plans. Pavers shall be equipped with hoppers and augers that will distribute the mixture uniformly in front of an adjustable floating screed. The raising of the hopper wings shall be minimized and the paving machine shall not be operated when in an empty condition.

Screeds shall include any strike-off device operated by tamping or vibrating action which is effective, without tearing, shoving or gouging the mixture and which produces a course with a uniform texture and density for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required. In the case of the screed, auger extensions and vibrators shall be installed wherever the screed is extended more than one (1) foot beyond the end of the base auger or auger extension. However, when placing material against an extremely uneven curb or edge over a short distance, the Engineer may waive the auger extensions and vibrators.

325.7.3 Compaction: It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. The temperature of the ARAC immediately behind the laydown machine shall be at least 275° F. A probe type electronic thermometer with a current calibration sticker attached will be used to measure the temperature of the asphalt concrete mixture. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat. When the pavement lift is less than 1.5-inches, the temperature of the material shall be measured in the truck by inserting a calibrated probe type electronic thermometer, or other approved measuring device, to a point at least 6" below the surface of material.

Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements. Pneumatic tired compactors shall not be used.

The Engineer will determine the acceptability of the pavement compaction in accordance with Section 325.9. At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers to provide a uniform and smooth layer over the entire area compacted in this manner.

325.7.4 Lime Water: An application of lime water shall be applied by the Contractor to the compacted ARAC surface after final compaction, prior to opening the roadway to traffic, or when requested by the Engineer to cool the pavement to prevent tracking and pick-up. The lime water solution shall be applied at the rate of approximately ½ gallon/square yard. The lime shall be mixed using a minimum of one (1) 50-pound bag per 3,000 gallons of water.

325.7.5 Adjustments: After installation of an overlay course all necessary frame and cover adjustments for manholes, valve boxes, survey monuments, sewer clean-outs, etc., shall be completed by the Contractor within the given segments being surfaced.

On roads without curb and gutter, the existing shoulder elevation shall be adjusted by the Contractor to match the elevation at the edge of new overlay and slope away from the new pavement surface at a rate that the existing quantity of shoulder material will allow. Shoulder material includes the existing shoulder, millings, untreated base materials, or a granular material approved by the Engineer. Shoulder material shall be compacted to a minimum of 95% of maximum density, determined in accordance with Section 301.3.

325.8 QUALITY CONTROL:

It is the contractor's responsibility to perform Quality Control monitoring and/or testing during ARAC production to achieve the required compaction and the required mix properties. The Engineer may obtain samples of any portion of any material at any point of the operations for his own use. Also, the Engineer may order that the use of any drying, proportioning or mixing equipment or the handling of any material be discontinued which, in his/her opinion, fails to produce a satisfactory mixture.

The ARAC produced s hall conform to the requirements of the production tolerances established in Section 325.9. When the ARAC does not conform to the production tolerances, it shall be reported to the Engineer, and corrective quality control

measures shall be implemented, or production shall cease immediately at no additional cost to the contracting Agency or Engineer.

325.9 ACCEPTANCE:

325.9.1 Acceptance Criteria: The ARAC will be divided into lots for the purpose of acceptance. A lot shall be one day's production. Each lot shall be divided into sublots of 500 tons or fraction thereof. Tests used to determine acceptance will be performed by a laboratory accredited by the AASHTO Accreditation Program (AAP), for the tests being performed. The contracting agency shall provide an appropriately accredited laboratory or laboratories to perform the acceptance testing. The acceptance laboratory will take representative samples of the ARAC from each sublot to allow for determination of gradation, binder content, and air voids. Each sublot will be accepted based on the test data from the sample(s) from that sublot. All acceptance samples shall be taken using random locations or times designated by the Engineer in accordance with ASTM D3665. The laboratory shall use properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications).

325.9.2 Gradation and Binder Content: Acceptance testing for gradation and binder content will be performed in one of the following ways; A) Plant-based testing of the mineral aggregate and binder content using cold feed samples and a nuclear asphalt content gauge or B) End-product testing of the ARAC using an ignition furnace with the gradation being performed on the resulting aggregate. The specifics of these methods are detailed in the following subsections.

During production, the allowable deviations from the mix design gradation targets are listed in Table 325-1 below. The allowable production tolerances may fall outside of the mix design gradation bands.

TABLE 325-1

GRADATION ACCEPTANCE LIMITS FOR ASPHALT-RUBBER MIXES

Sieve Size	1" & 1 ½" Lift Thickness	2" Lift Thickness
1 inch	100%	100%
3/4 inch	100%	92-100%
1/2 inch	92-100%	±6%
3/8 inch	±6%	±6%
No. 4	±6%	±6%
No. 8	±6%	±6%
No. 30	±4%	±4%
No. 200	±2%	±2%

325.9.2.1 Plant-Based Sampling and Testing

325.9.2.1.1 Mineral Aggregate Gradation: The acceptance laboratory will take a sample of the mineral aggregate in accordance with the requirements of Arizona Test Method 105 on a random basis for each sublot. For batch plants, the sample shall be taken from the hot bins. For plants other than batch plants, the sample shall be taken from the cold feed belt. Samples will be taken by means of a sampling device which is capable of obtaining representative samples. The device, which shall be approved by the Engineer, shall be furnished by the contractor. In any shift that the production of ARAC is less than 500 tons, at least one sample will be taken.

Samples will be tested for conformance with the mix design gradation, with or without mineral admixture as appropriate, in accordance with the requirements of Arizona Test Method 201. If the results from a single acceptance sample fall outside of the acceptance limits in Table 325-1 a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits in Table 325-1 the Contractor shall cease production of asphalt concrete. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in Table 325-1.

325.9.2.1.2 Binder Content: During production of ARAC, the contractor shall maintain at the plant site a nuclear asphalt content gauge calibrated and operated in accordance with Arizona Test Method 421. At the discretion of the Engineer, the

Owner may choose to prepare the calibration samples for use by the contractor. Under the observation of the Engineer, the contractor shall determine the ARB content by means of the nuclear asphalt content gauge a minimum of four times per full shift. The Engineer shall determine the times that the samples are taken. The contractor's technicians performing the testing, including the calibration of the nuclear gauge, shall meet the technician requirements given in the Arizona Department of Transportation (ADOT) System for the Evaluation of Testing Laboratories. The requirements may be obtained from ADOT Materials Group, 1221 North 21st Avenue, Phoenix, AZ 85009.

Production of ARAC shall cease immediately and the plant and/or the nuclear asphalt content gauges re-calibrated if any single test result varies by an amount greater than ± 0.60%, or the average of three consecutive test results varies by an amount greater than ± 0.40%, from the mix design target. Material that has already been produced may be used on the project if the single test value representative of that material varies by an amount from ± 0.61% to ± 0.75%, inclusive, from the mix design target. Material that has already been produced may not be used on the project if the single test value representative of that material varies by an amount greater than ± 0.75% from the mix design target unless, by retesting, the material is found to be acceptable.

When there is cause to question the ARB content being obtained via nuclear asphalt content gauge, or if approved by the Engineer, the ARB content may be determined using inventory data provided by the supplier as detailed in the following paragraphs. This will only apply for plants providing ARAC exclusively for the subject project or if an asphalt cement tank is dedicated for the shift of ARAC production.

The determination of the actual ARB content by inventory methods may include weighing of asphalt cement deliveries, invoice quantities, volumetric tank measurements using a calibrated rod (tank stickings) corrected for temperature, computerized mass-flow meter, and accounting for wasted materials. If a computerized mass-flow meter is used, documentation of its calibration shall be submitted to the Engineer prior to ARAC production. At any time during ARAC production, the Engineer may require that a new calibration of the mass-flow meter be performed.

If there is a difference of greater than 0.2% ARB between the ARB content measured by nuclear asphalt content gauge testing and the actual ARB content as determined by inventory, the contractor may request that the ARB content be determined by inventory. The contractor must make such a request in writing within two working days after receiving the test results for the first day of ARAC production.

325.9.2.2 End Product Sampling and Testing

325.9.2.2.1 Mineral Aggregate Gradation and Binder Content: The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T-168 from each sublot. The minimum weight of the sample shall be 45 pounds. Asphalt binder content and gradation shall be determined in accordance with AASHTO T-308 using the ignition furnace for each sublot. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T-308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report.

During production, the allowable deviations from the mix design gradation targets are listed in Table 325-1 above. The allowable production tolerances may fall outside of the mix design gradation bands.

If the results from a single acceptance sample fall outside of the acceptance limits in Table 325-1 a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits in Table 325-1 the Contractor shall cease production of asphalt concrete. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in Table 325-1.

If the asphalt binder content is within ± 0.60% of the mix design target value, the asphalt concrete will be paid for at the contract unit price. If the asphalt binder content deviates by more than ± 0.60% from the mix design target value, the deficient area will be evaluated within the sublot by coring at maximum intervals of 100 feet from the deficient sample. The asphalt content of the original deficient sample will be averaged with the asphalt binder content of the cores taken for re-evaluation to determine compliance with the acceptance requirements. If the resulting average of the asphalt binder content deviates by more than ± 0.60% from the mix design target value, then Table 325-2 shall apply to the sublot. Additional cores may be required to define the limits of the deficient area, and shall not be used for re-evaluating acceptance.

TABLE 325-2 ARB CONTENT ACCEPTANCE AND PENALTIES	
Deviation from that permitted	($ per ton of asphalt concrete)
Over 0.2% above that permitted	Removal* or EA
Over 0.1% to 0.2% above that permitted	$6.00
Over 0.0% to0.1% above that permitted	$2.00
Within permitted range	Full Payment
Over 0.0% to0.1% below that permitted	$2.00
Over 0.1% to 0.2% below that permitted	$6.00
Over 0.2% below that permitted	Removal* or EA

NOTES: *The Contractor shall remove and replace the entire sublot that is deficient.
EA = Engineering Analysis per Section 325.9.6

325.9.3 Marshall Air Voids: For purposes of determining Marshall air voids, the acceptance laboratory will designate one sample of the ARAC in accordance with the requirements of Section 2(h) of Arizona Test Methods 104 or AASHTO T-168 for each day's production or as directed by the Engineer's. The minimum weight of the sample shall be 45 pounds. The bulk density shall be tested in accordance with AASHTO T-245. The maximum theoretical density shall be tested in accordance with the requirements of AASHTO T-209, including fan drying per AASHTO T-209 Section 11. Effective voids determined on the laboratory compacted specimens will be determined in accordance with the requirements of AASHTO T-269. Should the testing for effective air voids not meet the "Full Payment" or "No Corrective Action" requirements of Table 325-3, additional testing for laboratory air voids on additional samples will be performed as necessary to determine the extent of the deficiency.

TABLE 325-3 LABORATORY VOIDS ACCEPTANCE AND PENALTIES		
Marshall Air Voids (Measured at 75 blows) Deviation from Mix Design Target	When the contracting agency is the owner: Payment Reduction ($ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
± 0% to 2.0%	Full Payment	No corrective action
± 2.1% to 2.9%	$1.00	EA (see 325.9.5)
± 3.0% to 4.0%	$2.50	EA (see 325.9.5)
± Greater than 4.0%	Removal* or EA per 325.10.4	Removal* or EA per 325.9.5

325.9.4 Requests for Referee Testing as described in 325.10 will only be considered based on quality control test results performed by a laboratory accredited by the AASHTO Accreditation Program (AAP) for the tests being performed or a laboratory listed in the current ADOT Directory of Approved Materials Testing Laboratories for the set of tests in question. The laboratory shall use properly certified technicians in accordance with ASTM D3666, Section 7 (Personnel Qualifications).

325.9.5 Density: The temperature of ARAC just prior to compaction shall be at least 275° F. The Engineer may change the rolling procedure if in the Engineer's judgment the change is necessary to prevent picking up of the ARAC.

325.9.5.1 Equipment: Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's

recommendations and the project requirements. The compactors shall be self -propelled and shall be operated with the drive wheel in the forward position. The compactors shall weigh not less than eight tons. Compactors shall not be used in the vibratory mode for courses of one inch or less in nominal thickness. The wheels of compactors shall be wetted with water, or if necessary soapy water, or a product approved by the Engineer to prevent the ARAC from sticking to the steel wheels during rolling

325.9.5.2 Compaction Procedures

325.9.5.2.1 Pavement Lift Thickness 1½ Inches or Less: Achieving the required compaction is the responsibility of the contractor. A minimum of three static steel-wheel compactors shall be provided; however, sufficient compactors must be provided so that the drums of the compactors when staggered will cover the entire width of the paving machine on the initial forward pass while a static compactor remains to complete final rolling. The roller(s) for final compaction shall follow as closely behind the initial breakdown as practical, such that a uniformly smooth surface is achieved. As many passes as are possible shall be made with the compactors before the temperature of the ARAC falls below 220° F.

At the Engineer's discretion, cores may be taken and used to evaluate thickness.

325.9.5.2.2 Pavement Lift Thickness Greater than 1½ Inches: Achieving the required compaction is the responsibility of the contractor. The number and types of rollers is the contractor's responsibility and shall be sufficient to meet these requirements. Initial breakdown rollers shall follow as closely behind the paving machine as practical. The roller(s) for final compaction shall follow as closely behind the initial breakdown as practical, such that a uniformly smooth surface is achieved.

Compaction will be determined using a correlated nuclear density gauge and will be monitored for acceptability continuously during construction. The density of the compacted mixture shall not be less than 95% of the laboratory unit weight composed of the same mixture compacted by the 75 blow method of AASHTO T-245 at the job mix design specified compaction temperature. The outside one foot of each pass of the pavement course or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

Nuclear Density Gauge Correlation - During placement of the test strip or on the first day of paving, the pavement surface shall be tested with a nuclear density gauge at a minimum of four locations. These same locations shall then be cored, using a 4-inch diameter core barrel, and tested for bulk density (AASHTO T-166A, or T-275) and a correlation value developed between the nuclear density gauge and the asphalt cores.

At the Engineer's discretion, cores may be taken and used to evaluate density and/or thickness.

325.9.5.3 Compacting Miscellaneous Items and Surfaces: ARAC used in the construction of miscellaneous items and surfaces shall be compacted using compactors, hot-hand tampers, smoothing irons, mechanical vibrating hand tampers, or with other devices to the extent considered necessary by the Engineer.

325.9.6 Engineering Analysis (EA): Within 10 working days after receiving notice that a lot or sublot of ARAC is deficient and is found to fall within the "Removal or EA" band per Table(s) 325-2 or 325-3, the contractor may submit a written proposal (Engineering Analysis) to accept the material in place at the applicable penalties along with possible remediation(s) listed in the "Removal or EA" category. An Engineering Analysis can also be proposed for non-removal categories of "Corrective actions" when the contracting agency is not the owner (i.e. permits).

The Engineering Analysis shall contain an analysis of the anticipated performance of the ARAC if left in place. The Engineering Analysis shall also detail the effect of any proposed corrective action to the material(s) in place as it relates to the in-place material's performance. The Engineering Analysis shall be performed by a professional engineer experienced in asphalt concrete testing and mix designs. If the lot or sublot is submitted for referee testing by the contractor, the ten working days allowed to prepare an engineering analysis will begin upon notification of referee test results.

When an Engineering Analysis recommends that a specific lot or sublot should not be removed, the Engineering Analysis will recommend that the following penalties (Table 325-4) be paid when the contracting agency is the owner, for the specific criteria being reviewed by the EA.

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TABLE 325-4		
ENGINEERING ANALYSIS PENALTIES for REMOVAL* LOTS/SUBLOTS LEFT IN-PLACE		
Acceptance Criteria	**Acceptance Limits**	**Penalty When Contracting Agency is the Owner ($/Ton)**
Laboratory Air Voids (Measured at 75 blows)	Deviation from Target Greater Than ± 4.0%	$3.75

Within 15 working days, the Engineer will determine whether or not to accept the contractor's proposed Engineering Analysis.

325.10 REFEREE:

In the event the contractor elects to question the acceptance test results for laboratory air voids, the Contractor may make a written request for additional testing of the affected material. Any request for referee testing must describe the contractor's reasons for questioning the validity of the original acceptance results and must clearly describe which set of acceptance tests are in question. The Contractor will engage an independent laboratory (at the Contractor's own expense) who is accredited by AAP in all of the acceptance test methods. The independent laboratory shall be acceptable to the Engineer and shall perform a new set of acceptance tests as required by Section 325.9.2.3 representing the area or set of tests in question. The results of these determinations will be binding on both the contractor and the agency.

These tests will include Marshall unit weight, maximum theoretical unit weight, and laboratory air voids. Samples for referee testing shall come from representative samples obtained from the completed pavement, as directed by the Engineer.

The number of samples taken will be the same as specified in Section 325.9.2.3. The independent laboratory shall compile the test results and transmit them to both the Engineer and the contractor. The independent laboratory shall include a report signed by an Engineer registered in the State of Arizona, who is experienced in asphalt concrete testing and mix design development. The signed report shall give an opinion that the material evaluated either does or does not comply with project specifications, shall clearly describe any deficiencies, and the results will be binding between all parties.

325.11 MEASUREMENT:

ARAC shall be measured by the ton, for the mixture actually used, which shall include the required quantities of mineral aggregates, filler material, asphalt-rubber binder and admixture.

Application of lime water shall be measured by the square yard. The measured area shall be the area of ARAC pavement to which the lime water is applied. The measured area shall only be counted one time regardless of the number of applications applied to the ARAC pavement section.

Shoulder adjustment to match the new pavement surface elevation shall not be measured. The cost of this work shall be included in the price paid for ARAC or other related pay items.

325.12 PAYMENT:

Payment for asphalt milling will be as specified in Section 317.

Payment for tack coat will be by the ton diluted, based on the rate of application, as directed by the Engineer.

Payment for ARAC will be at the contract unit price, complete in place.

Application of Lime Water as approved by the Engineer will be paid at the contract unit price.

Payment for frame and cover adjustments will be at the contract unit prices specified in the proposal.

- End of Section -

SECTION 327

HOT IN-PLACE RECYCLING

327.1 DESCRIPTION

This work shall consist of rehabilitating the surface layer of existing asphalt concrete pavement. Rehabilitation shall be accomplished with specially designed equipment in a simultaneous multistep process of heating, scarifying, applying an asphalt recycling agent and thoroughly remixing and reshaping the old asphalt concrete surface to an average depth of 1", and then placing an overlay of new hot mix asphalt concrete in compliance with the lines, grades, thickness and typical cross-sections shown on the plans (typically 1" to 2"). NOTE: This work shall be performed with a single machine that heats, scarifies, recycles and spreads new asphalt concrete hot mix, all in one continuous pass. Additional preheaters may be utilized to achieve specified depth and temperature.

327.2 MATERIALS:

Asphalt Recycling Agent used to restore the existing pavement shall be approved by the Engineer prior to use. A manufacturer's certification shall be submitted for each load of recycling agent delivered to the project.

Hot Mix Asphalt Concrete (HMAC) shall meet the requirements of Section 710 or Section 717.

327.3 EQUIPMENT

The Contractor shall specify, in the bid proposal, the type of equipment intended for use. The equipment shall be on the project in operating condition a minimum of 2 days before beginning operations to allow evaluation by the Engineer. The Engineer reserves the right to reject equipment deemed not suitable for the intended purpose, at no additional cost to the Agency.

The recycling equipment shall meet the following minimum requirements:

Repaver: The equipment for this work shall be a self-contained, self-propelled, automated unit capable of heating, scarifying (or milling), mixing, redistributing and leveling the existing asphalt concrete pavement to the specified depth, all in a single pass.

It shall have a means of automatically applying an asphalt recycling agent at a uniform rate as shown on the plans, special provisions, or as requested by the Engineer. It shall be capable of applying a new HMAC layer over the hot, partially compacted recycled mixture.

Heating Unit: This unit shall be hooded to prevent damage to adjacent property, including trees and shrubs. It shall be capable of heating the pavement surface to a temperature high enough (375° - 400° F.) to allow scarification to the required depth without breaking aggregate particles or charring the pavement surface.

Scarifying or Milling Units: The scarifiers or rotary millers shall be able to penetrate the pavement surface to a depth shown, up to a maximum of one inch in one pass. Scarifiers or millers shall be equipped with separate, automatic height adjustments which allow clearance over manholes and other obstructions.

Recycling Agent Applicator: This system shall automatically add recycling agent to the scarified material at a uniform rate as shown on the plans, special provisions or as requested by the Engineer. The application rate shall be synchronized with the machine's forward speed to maintain a tolerance, within 5% of the specified rate.

Conveying System: Shall consist of a receiving hopper and conveying system to collect and transport new hot mix asphalt concrete material to the finishing unit.

Recycling Unit: A system that mixes, distributes and levels the scarified material over the width processed to produce a uniform cross-section of recycled material.

Finishing Unit: This unit shall have automatic screed controls to produce a surface conforming to that shown on the plans. The unit shall be capable of producing a uniform slope, grade and texture.

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327.4 CONSTRUCTION METHODS:

The contractor shall be responsible to clean the pavement to be treated shall be cleaned of trash, debris, earth or other deleterious substances present in sufficient quantity to interfere with the work to be performed.

The heating shall be sufficient to soften the pavement to the extent that it can be scarified or milled to the depth specified. Due to the varying properties of the existing asphalt pavement, depth of the scarification material may be varied, if requested by the Engineer. Heating shall be done in a manner that will assure uniform softening and will not char the asphalt.

The Contractor shall be responsible for protecting the area adjacent to the work from heat damage. If damage occurs, the Contractor shall replace all damaged areas, landscape, curb, parked vehicles, etc. at no cost to the Agency.

To provide a welded longitudinal joint, the standing edge of the adjoining asphalt pavement shall be fully heated to a width at least 2 inches beyond the width to be scarified and recycled.

Immediately following heating, the pavement surface shall be scarified (or milled) to the specified depth. The scarified material shall have a temperature between 225° F. and 265° F. unless otherwise requested by the Engineer. The material shall be leveled, mixed and treated with a recycling agent. The application rate shall be as shown on the plans, special provisions or as requested by the Engineer. Application rate for the recycling agent may be adjusted as necessary to maintain a uniform mixture.

The reclaimed material shall be gathered by a leveling device and spread to a uniform depth over the width being processed. After it is placed and while it still has a residual temperature of at least 190° F., a layer of new HMAC conforming to the job mix formula shall be placed over it. The application rate of new material shall be sufficient to provide the required pavement thickness.

Construction, compaction and smoothness of the surface shall be in accordance with Section 321 except as modified in this Section.

327.5 WEATHER CONDITIONS:

This work shall not be done when it is raining or if there is a threat of rain. The ambient temperature shall be at least 50° F. and rising and the application shall cease when the temperature reaches 55° F. and falling.

327.6 AIR QUALITY:

The equipment and process shall meet all Arizona Department of Environmental Quality (ADEQ) and County air quality regulations and the Contractor shall have the appropriate ADEQ air quality control permit prior to the issuance of the notice to proceed.

327.7 MEASUREMENT:

Pavement Recycling will be measured by the square yard completed and accepted. Recycling Agent will measure by the gallon of actual material used in place. Hot Mix Asphalt Concrete (HMAC) will be measured by the ton in place.

327.8 PAYMENT:

The accepted quantities of pavement recycling will be paid at the contract unit price per square yard. Payment shall include cleaning the existing pavement surface and heating, scarifying, redistributing, leveling and compacting HMAC pavement. Asphalt Recycling Agent will be paid for by the gallon used in place. Hot Mix Asphalt concrete (HMAC) will be paid for by the ton in place.

- End of Section -

SECTION 329

TACK COAT

329.1 DESCRIPTION:

Tack coat for bituminous paved surfaces shall consist of the application of emulsified asphalt as specified in Section 713.

329.2 PREPARATION OF SURFACE:

Surfaces to be treated shall be cleaned of all loose material as specified in Section 330.

329.3 APPLICATION:

Tack coat shall be diluted in the proportion of 50 percent water and 50 percent emulsion and applied at the rate of 0.05 to 0.10 gallons per square yard. Application shall be made in advance of subsequent construction as ordered by the Engineer.

329.4 EQUIPMENT:

Tack coat shall be applied by distributor trucks designed, equipped, maintained and operated in accordance with Section 330. Hand spray by means of hose or bar through a gear pump or air tank shall be acceptable for resurface work, corners or tacking of vertical edges. Care shall be taken to provide uniform coverage. Equipment that performs unsatisfactory shall be removed from the job.

329.5 PROTECTION FOR ADJACENT PROPERTY:

According to Section 333.

329.6 MEASUREMENT:

Bituminous emulsion that is diluted prior to application will be measured by the ton of diluted material. Any conversion from volumetric quantities shall be in accordance with Section 713.

329.7 PAYMENT:

Payment for the emulsified bituminous tack coat will be by the ton, diluted.

- End of Section -

SECTION 330

ASPHALT CHIP SEAL

330.1 DESCRIPTION:

This work shall consist of the application of a bituminous material followed by the application of a cover material.

330.2 MATERIALS:

330.2.1 Asphalt: The type of grade of the bituminous material will be specified in the contract documents.

Paving grade asphalt shall meet the requirements to Section 711.

Liquid Grade asphalt shall meet the requirements of Section 712.

Emulsified asphalt shall meet the requirements of Section 713.

330.2.2 Aggregate: The cover material (chips) shall meet the requirements of Section 716. Gradation of the chips shall be as specified in Table 716-1 or Table 716-2.

330.3 TIME OF APPLICATION AND WEATHER CONDITIONS:

Chip seal shall not be applied for at least 7 days after completion of new bituminous paving.

The chip seal shall be placed only when the roadway surface is dry and there is no imminent threat of rain. The ambient temperature must be at least 60°F. and rising.

Caution should be exercised in the placement of asphalt chip seal between the dates of Oct. 1 and April 1.

330.4 CONSTRUCTION METHODS:

330.4.1 Preparation of surfaces: Immediately before applying the bituminous material, the area to be surfaced shall be cleaned of dirt and other objectionable material. In urban areas, the surface shall be cleaned with a self-propelled pickup sweeper. In rural areas, power brooms may be used. When necessary, cleaning shall be supplemented by hand brooms.

The bituminous material shall not be applied until an inspection of the surface has been made by the Engineer and he has determined that it is suitable.

For chip seals using paving grade asphalt as the binder, a bituminous tack coat shall be applied prior to sealing. The tack coat shall comply with Section 329. The exact rate shall be determined by the Engineer.

330.4.2 Application of Bituminous Material: The bituminous material shall be applied as soon as possible after preparation of surfaces. At the time of application, temperatures of the asphalt shall be within the ranges specified in Table 330-1 and Table 330-2 or in Sections 711, 712 and 713 for each specified asphalt type. The Engineer may require a specific temperature within the ranges.

The quantity of liquid or emulsified asphalts will be between the range of 0.20 and 0.40 gals. /sq. yd. The quantity of paving grade asphalt will be between the range of 0.17 and 0.31 gals. /sq. yd. The exact rate of application will be determined by the Engineer.

The bituminous material shall be placed using a distributor as specified in Section 330. Application methods shall insure that a uniform distribution is obtained over the area to be sealed.

The chips shall be spread before the bituminous material sets. The maximum distance that the bituminous material is applied in advance of the chips will be determined by the Engineer.

TABLE 330-1		
APPLICATION TEMPERATURES OF LIQUID ASPHALTS		
All types of Liquid Asphalt	Distributor Application Temperature, Degree F.	
	Min.	Max.
70	105	175
250	140	225
800	175	255
3000	215	290

TABLE 330-2		
APPLICATION TEMPERATURE OF EMULSIFIED ASPHALTS		
Grade of Emulsified Asphalts	Distributor Application Temperature, Degree F.	
	Min.	Max.
RS-1, CRS-1, CRS-1h	75	140
RS-2, CRS-2, CRS-2h	125	185
SS-1, CSS-1	75	130
SS-1h, CSS-1h	75	130

The surfaces of structures, trees and shrubbery adjacent to the areas being seal coated shall be protected in such manner as to prevent their being spattered with bituminous material or marred. The Contractor shall be responsible for all damage to such structures or landscaping.

330.4.3 Application of Cover Material: Immediately following the application of the bituminous material, the chips shall be spread with a self-propelled mechanical spreader. The chip spreading equipment shall be capable of applying a uniform application of cover material. The self-propelled requirement may be waived for projects under 10,000 sq. yds.

At the time of application, precoated aggregate shall be within the temperature range of 250 degrees F. and 350 degrees F. measured at a point 6 to 12 inches below the top of the load.

At the time of application, uncoated chips shall not contain moisture in excess of a saturated, surface dry condition when liquid or paving grade asphalt are used as the seal coat binder.

At the time of application, chips shall be surface wet but free from running water when emulsified asphalt is used as the seal coat binder.

The precise application rate for cover material will be determined by the Engineer within the ranges of 15 to 25 pounds per square yard for the 1/4 in. size and 20 to 30 pounds per square yard for the 3/8 in. size.

When so directed by the Engineer and within 48 hours after application of the precoated chips, all chipped surfaces on major streets shall receive a flush coat in accordance to Section 333. The exact rate of application shall be as directed by the Engineer.

330.4.4 Rolling: Immediately following the application of the cover material, the surface shall be rolled with self-propelled pneumatic-tired rollers. Three coverages shall be made with a pneumatic roller. Each roller shall carry a minimum of 2,000 pounds on each wheel and a minimum of 60 psi in each tire. The roller shall not travel in excess of 12 miles per hour. A minimum of 3 self-propelled pneumatic rollers shall be required for projects over 10,000 sq. yds. On projects under 10,000 sq. yds. one roller may be used provided it performs the same number of coverages.

330.4.5 Joints: All joints shall be constructed as approved by the Engineer such that there will be a uniform application of cover material and bituminous material.

330.4.6 Surplus Aggregate Removal: Surplus aggregate shall be removed from the surface using methods specified in Subsection 330.4.1 and stockpiled in the location indicated on the plans or as directed by the Engineer. In no event shall surplus aggregate be left on the pavement for more than one day (24 hours).

330.4.7 Distributing Equipment: Distributor trucks shall be of the pressure type with insulated tanks. Gravity distributors will not be permitted.

Spray bars and extensions shall be of the full circulating type. The spray bar shall be adjustable to permit varying height above the surface to be treated.

The nozzle spacings, center to center, shall not exceed 6 inches. The valves shall be operated so that one or all valves may be quickly opened or closed in one operation. The valves which control the flow from the nozzles shall be of a positive acting design so as to provide a uniform, unbroken spread of bituminous material on the surface.

The distributor shall be equipped with devices and charts to provide for accurate, rapid determination and control of the amount of bituminous material being applied. The distributor shall be equipped with a tachometer of the auxiliary wheel type registering speed in feet per minute. The distributor shall also be equipped with pressure gauges and an accurate thermometer for determination of the temperature of bituminous material. The spreading equipment shall be designed so that uniform application of a bituminous material can be applied in controlled amounts ranging from 0.05 to 2.0 gallons per square yard. Transverse variation rate shall not exceed ten (10) percent of the specified application rate. The distributor shall be equipped with a hose and nozzle attachment to be used for spotting skipped areas and areas inaccessible to the distributor. Distributor and booster tanks shall be maintained as to prevent dripping of bituminous material from any part of the equipment.

Equipment that fails to perform satisfactorily shall be removed from the job.

330.5 TRAFFIC:

Traffic will not be permitted on the surface until the cover aggregate has set. Traffic control shall be in accordance with Section 401 as supplemented by the Contracting Agency.

When using paving grade or liquid grade asphalt chip seal, the speed limit must be maintained at 25 mph for all equipment and traffic until the cover material is swept.

When using emulsified asphalt chip seals, only emergency or local access traffic will be allowed until the seal coat has had time to set.

330.6 MEASUREMENT:

Certified weight slips of all material shall be delivered to the Engineer before the materials are applied. Certified weight slips of any material being weighed back in for credit shall be delivered to the Engineer the next day.

330.7 PAYMENT:

Quantities of materials for this work will be paid for at the contract unit price.

(A) Asphalt Cement, Liquid Asphalt, Emulsion, Diluted Emulsion Ton

(B) Chips Ton

There will be no payment for materials not placed in accordance with this specification.

- End of Section -

SECTION 331

MICROSURFACING SPECIFICATIONS

331.1 GENERAL:

The work covered by this specification consists of furnishing all labor, equipment, and materials for the application of a "quick traffic solid/polymer microsurface."

This specification covers the equipment and construction procedures for rut filling and/or resurfacing of existing paved surfaces. The microsurface shall be a mixture of cationic polymer modified asphalt emulsion, mineral aggregates, mineral filler, water and other additives properly proportioned, mixed and spread on the pavement surface.

331.2 MATERIALS:

The Contractor shall supply all materials necessary for the performance of the work in accordance with the specifications. The asphalt emulsion, aggregate, and mineral filler shall be as specified in Section 714. Materials shall be approved by the Engineer prior to the start of construction. Certificates of Compliance shall accompany each delivery of emulsion.

The Contractor shall be responsible for the safety of all materials of which he has taken delivery until they are in place on the road, and shall take all necessary precautions to avoid loss by fire or theft, or damage by water, and shall bear the cost of replacing any such material that is lost, spilt, destroyed or damaged after delivery.

331.3 PROPORTIONING:

The microsurface shall be proportioned in accordance with the mix design. Calibrated sign flowmeters shall be provided to measure both the addition of water and additives to the pugmill. Emulsion and cement flow shall be tied directly to aggregate flow. All additive flows shall be calibrated.

331.3.1 Performance: The microsurface mixture shall be proportioned per the mix design to ensure:

(A) Trafficability - the material will permit controlled traffic without damage to the surface within thirty (30) minutes and uncontrolled traffic without damage within sixty (60) minutes, per Section 331.4.2.2.

(B) Prevent development of bleeding, raveling, separation or other distress for seven (7) days after placing the microsurface.

331.4 MIX DESIGN:

331.4.1 General:

331.4.1.1: The Contractor shall provide a job mix formula from an approved laboratory and present certified test results for the Engineer's approval. Compatibility of the aggregate and polymer modified emulsion shall be certified by the emulsion manufacturer. All the materials used in the job mix formula shall be representative of the materials proposed by the Contractor for use in the project.

331.4.1.2: All the products used in the construction shall have certifications from the suppliers and they shall be given to the Engineer upon delivery to the project.

331.4.1.3: Mix design and proportioning will be approved by the Engineer prior to the start of the project.

331.4.2: Specifications:

331.4.2.1: The Engineer shall approve the mix design prior to use. The specification limits are as follows:

Residual Asphalt	(ASTM D244)	6% - 11.5% by dry weight of aggregate
Mineral Filler	(ASTM C136)	0.1% - 1% by dry weight of aggregate
Polymer Content/Type		4% min. (see Section 714.4)

Additive	As required for mix properties
Water	As required for mix properties
Aggregate Grading	Meets Section 331.4.2.4
Consistency (ISSA T-106)	2.5 to 3.0 cm
Traffic Time	See Section 331.4.2.2
Abrasion Loss (ISSA TB-100)	75 g/ft^2 maximum
Adhesion (ISSA TB-114)	90% minimum
Loaded Wheel Sand Adhesion	See Section 331.4.2.3

331.4.2.2 Modified Cohesion Test (ISSA TB-139): Furnish laboratory test data showing the mix design to be trafficable thirty (30) minutes after application at 77 F conforming to the following criteria in accordance with test methods described in the applicable specifications.

Set Time Test: 30 minutes	12 kg-cm minimum.
Early Rolling Traffic Time: 60 minutes	20 kg-cm minimum.

331.4.2.3 Loaded Wheel Sand Adhesion Test (ISSA TB-109): Furnish laboratory test data showing the mix design conforming to the following criteria in accordance with test methods described in the appropriate specifications.

Vehicles/day	Minimum Sand Adhesion
0-30	70 g/ft^2
250-1500	60 g/ft^2
1500-3000	55 g/ft^2
greater than 3000	50 g/ft^2

331.4.2.4 The laboratory shall further report the quantitative effects of moisture content in the unit weight of the aggregate (bulking effect). The report must clearly show the theoretical recommended proportion of aggregate, mineral filler (Min. & Max.), water (Min. & Max.), additive(s), and asphalt, and how the proportions are based (dry aggregate weight, total mix, etc.).

331.5 TESTING: Samples for quality assurance will be taken throughout the project per ISSA TB101 for testing by an approved laboratory as required by the Engineer. Materials with test results not meeting these specifications shall be corrected immediately. Testing shall be at the expense of the Agency for the following:

(A) Asphalt content
(B) Aggregate gradation
(C) Percent polymer content and type—certified by supplier

331.6 EQUIPMENT:

331.6.1 General: All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

331.6.2 Mixing Equipment: The mixing machine shall be a self-propelled or truck mounted mixing machine which shall be able to accurately deliver and proportion the aggregate, mineral filler, water, additive, and polymer-modified asphalt emulsion to a revolving multi-blade mixer capable of minimum speeds of 200 RPM and discharge the product on a continual flow basis. The machine shall have sufficient storage capacity for aggregate, polymer modified asphalt emulsion, mineral filler, water, and additive to maintain an adequate supply to the proportioning controls.

331.6.3 Material Control:

331.6.3.1 Calibration: Each mixing unit to be used in the performance of the work shall be calibrated prior to construction. Calibration data, if done within the calendar year, using the same material, may be used, providing a verification of the aggregate feed agrees.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided, and shall be accessible to the Engineer. Each material control device shall be calibrated prior to work and documented for inspection by the Engineer.

331.6.3.2 Aggregate Feed: The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time.

331.6.3.3 Emulsion Pump: The emulsion pump shall be the positive displacement type with a jacketed housing for uniform heating. A revolution counter or similar device shall be fitted so that the amount of emulsion used may be determined at any time.

331.6.3.4 Fines Feeder: An approved fines feeder is required that will provide a uniform, positive, accurately metered range of 0 to 1 percent by dry aggregate weight. The fines feeder shall have a counter so the amount of mineral filler can be determined at any time.

331.6.3.5 Liquid Additive: The mixing machine shall be equipped with a liquid additive system that provides a pre-determined amount of additive to the mixing chamber. This additive system must be equipped with a counter that can determine the amount used at any time.

331.6.3.6 Water System: The mixing machine shall be equipped with a water system that provides a pre-determined amount of water to the mixing chamber. This water system must be equipped with a counter that can determine the amount used at any time.

331.6.4 Operator Controls: Controls will allow the operator to sequence and proportion the material per the mix design.

331.6.5 Spray Bars: The mixing machine shall be equipped with a water pressure system that provides a water spray immediately ahead of and outside the spreader box.

331.6.6 Spreading Equipment:

331.6.6.1: The paving mixture shall be spread uniformly by means of mechanical type laydown box attached to the mixer, equipped with agitation, to spread the materials throughout the box without any dead zones. The paddles shall be designed and operated so all the fresh mix will be agitated. Flexible seals, front and rear, shall be in contact with the road surface to prevent loss of mixture from the box. The spreader box shall be equipped with hydraulic cylinders for controlling the thickness of the spread mixture.

331.6.6.2: The rut filling spreader box shall have 6 to 8 skids to provide for leveling and filling uneven depressed areas. Two adjustable steel strike-off plates are required. The rear flexible seal shall act a final strike-off and shall be adjustable. The steel strike-offs shall be controlled by hydraulic cylinders placed at the rear of the spreader box.

331.6.6.3 The spreading equipment shall be maintained free from build-up of the mixture on the paddles or side walls. Skips, lumps, or tears will not be allowed in the finished product.

331.7 APPLICATION:

331.7.1 General: The microsurface shall be of the desired consistency when deposited in the spreader box and nothing more shall be added to it. The mixing time shall be sufficient to produce a complete and uniform coating of the aggregate and the mixture shall be chuted into the moving spreader box at a sufficient rate to maintain an ample supply across the full width of the strike-off squeegee at all times.

331.7.2 Weather: Microsurfacing shall not be placed if either the pavement or air temperature is below 50 degrees F and falling, but may be applied if both the air and pavement temperature are at least 45 degrees F and rising, and it is not raining.

331.7.3 Protection of Existing Surfaces: The Contractor shall take all necessary precautions to prevent microsurface or other material used from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridge or culvert decks, and other road fixtures. Immediately after resurfacing, the Contractor shall clean off any such material and leave any grating, manholes, etc. in a satisfactory condition.

331.7.4 Fogging Pavement: The surface shall be pre-wetted by Fogging ahead of the spreader box. The rate should be adjusted as dictated by the pavement temperature, surface texture, humidity, and dryness of existing pavement.

331.7.5 Mix Stability: The mix shall possess sufficient stability so that premature breaking of material in the spreader box does not occur. The mixture shall be homogeneous during mixing and spreading; it shall be free of excess water or emulsion, and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

331.7.6 Application Rate: The application rates, pounds per square yard of mix specified, are average rates; the surface texture variation throughout the work will dictate the actual spreading rates. The strike-off squeegee shall be adjusted to provide a microsurface thickness which will completely fill the surface voids and provide an additional thickness not exceeding one and one-half times the largest top-size stone. The requirement of 1-1/2 stone depth does not apply to rut filling operations as these depths vary greatly according to the surface irregularities.

331.7.7 Joints: No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints. A maximum of 4.0" overlap will be permitted on longitudinal joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the work. Half passes and odd width passes will be used in minimal amounts. If half passes are used, they cannot be the last pass on any area. Care shall be taken to ensure straight lines along curbs and shoulders. No runoff will be permitted on these areas. Construction joints shall be neat in appearance and shall be tapered or feathered to conform to the existing surface. All excess material shall be removed from the surface upon completion of each run.

331.7.8 Handwork: Approved squeegees and lutes shall be used to spread the mixture in areas inaccessible to the spreader box and in other areas where hand spreading may be required.

331.7.9 Protection of the Microsurface: Adequate means shall be provided by the Contractor to protect the uncured product. Any damage done to the product shall be repaired at the Contractor's expense.

331.7.10 Damage to the Microsurface: The Contractor's responsibility to replace microsurface damaged by unexpected rain after spreading shall be limited to the period within four (4) hours of placement of the microsurface.

331.8 PAYMENT:

The micro-surfacing shall be paid for by the weight of the aggregate and weight of emulsified asphalt, as shown on certified weight tickets from the supplies delivered to the project, less weigh backs. The price shall be full compensation for furnishing, mixing and applying all materials; and for all labor, equipment, tools, design tests, and incidentals necessary to complete the job as specified herein.

- End of Section -

SECTION 332

PLACEMENT AND CONSTRUCTION OF ASPHALT EMULSION SLURRY SEAL COAT

332.1 DESCRIPTION:

The work covered by this specification consists of furnishing all labor, equipment, and materials necessary to perform all operations required for the application of an asphalt emulsion slurry surface.

NOTE: THESE SPECIFICATIONS DO NOT COVER THE APPLICATION OF COAL TAR SLURRY SEALS.

332.2 MATERIALS:

The asphalt emulsion material, mineral aggregate and mineral filler shall be as specified in Section 715.

332.3 EQUIPMENT:

332.3.1 General: When requested by the Engineer, descriptive information on the slurry seal mixing and applications equipment to be used will be submitted for approval no less than 7 days before the work starts.

332.3.2 Self Contained Slurry Machine: The mixing machine will be a continuous flow type. It will be capable of accurately delivering a predetermined proportion of pre-wetted aggregate, mineral filler, water and asphalt emulsion to the mixing chamber and discharging the thoroughly blended mixture on a continuous basis. The mixing machine will be equipped with a mineral filler feeder. The feeder will have an accurate metering device or method to introduce a predetermined proportion into the mixer. The filler will be introduced into the mixing chamber at the same time and location as the aggregate.

The mixing machine will be equipped with a water pressure system and fog-type spray bar, adequate for complete water fogging of the surface to be sealed.

The mixing machine will be mounted on a truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation to ensure the slurry is spread evenly and all cracks are filled.

332.3.3 Slurry Spreading Equipment: Attached to the mixer machine shall be a mechanical type squeegee spreader equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained to prevent loss of slurry on varying grades and crown by adjustments to assure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width. The box shall be kept clean. Build-up of asphalt and aggregate on the box shall not be permitted. The use of burlap drags or other drags shall be approved by the Engineer.

332.3.4 Rollers: Rollers shall be approved by the Engineer.

332.3.5 Cleaning Equipment: Power brooms, pick-up brooms, air compressors, water flushing equipment, and hand brooms shall be suitable for cleaning the surface and cracks of the old surface.

332.3.6 Auxiliary Equipment: Hand squeegees, shovels, and other equipment shall be provided as necessary to perform the work.

332.4 PREPARATION OF THE SURFACE:

332.4.1 Immediately before applying the slurry, the area to be surfaced shall be cleaned of dirt, loose material, and other objectionable material. In urban areas, the surface shall be cleaned with a self-propelled pick-up sweeper. In rural areas, power brooms may be used. When necessary, cleaning shall be supplemented by hand brooms. Water flushing will not be permitted in areas where cracks are present in the pavement surface.

The slurry shall not be applied until an inspection of the surface has been made by the Engineer and he has determined that it is suitable.

332.4.2 Tack Coat: When specified, a tack coat shall be applied in accordance with Section 329 using the same type and grade of asphalt emulsion as specified for the slurry seal.

332.4.3 Water Fogging: When required by local conditions, the surface, directly ahead of the slurry box, shall be pre-wetted by fogging. The fogging shall be accomplished in such a manner that the entire surface is damp with no apparent flowing water or puddles.

332.5 WEATHER LIMITATIONS:

The slurry seal shall not be applied unless the pavement temperature is at least 45°F. and rising. The mixture shall not be applied during unsuitable weather.

332.6 PROTECTION OF UNCURED SURFACE:

Adequate means shall be provided by the Contractor to protect the uncured product. Any damage done to the product shall be repaired at the Contractor's expense.

332.7 MIXING AND APPLICATION:

The mixing time shall not exceed four minutes. Excessive mixing will not be allowed. The resulting mixture shall have the desired consistency, when placed on the surface. If breaking, hardening, segregation, balling or lumping occurs during the mixing process, the batch will be discarded.

A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that a complete coverage is obtained.

No streaks caused by oversized aggregate shall be left in the finished surface. Build-up on longitudinal and transverse joints will be kept to a minimum. Approved squeegees shall be used to spread slurry in areas nonaccessible to the slurry mixer.

332.8 ROLLING:

As soon as the asphalt slurry has been set sufficiently to prevent any material from being picked up, it shall be rolled until all ridges have been ironed out and a uniform surface is obtained.

332.9 MEASUREMENT:

Quantities and materials for this work will be paid for at the contract price per unit of measurement for each of the following pay items as indicated in the proposal.

(A) Bituminous tack coat if specified	Ton (Diluted)
(B) Emulsified asphalt for slurry	Ton (Undiluted)
(C) Aggregate for slurry	Ton (Surface Dry)

- End of Section -

SECTION 333

FOG SEAL COATS

333.1 DESCRIPTION:

Fog seal coats on bituminous paved surfaces shall consist of the application of emulsified asphalt and a sand blotter when necessary.

333.2 TIME OF APPLICATION AND WEATHER CONDITIONS:

Fog seal coats on new pavements shall be applied within 24 hours. This time restriction may be extended by the Engineer.

Emulsified asphalt shall not be applied when the surface is wet or when there is a threat of rain. The ambient temperature shall be at least 50 degrees F. and rising and the application shall cease when the temperature is 55 degrees F. and falling.

333.3 MATERIALS:

333.3.1 Emulsified Asphalt: Unless otherwise specified in the special provisions, emulsified asphalt may be a grade SS-1h, CSS-1h, or CQSH, as specified in Section 713. The emulsified asphalt shall be diluted in proportions of 50% water and 50% emulsified asphalt.

333.3.2 Sand Blotter: The sand shall be as specified in Section 701.3 and shall be graded in accordance with Table 333-1.

TABLE 333-1
SAND BLOTTER GRADATION

Sieve Size	Percentage Passing (by weight)
3/8 inch	100%
No. 4	90-100%
No. 200	0-12%

333.4 TESTS, TEST REPORTS AND CERTIFICATIONS:

Asphalt emulsion shall meet requirements of Section 713.

Test reports and certifications shall be as specified in Section 711.

333.5 PREPARATION OF SURFACES:

Immediately before applying the emulsion, the area to be surfaced shall be cleaned of dirt and loose material by means of power brooms, or pick-up brooms supplemented by hand brooms if necessary. The fog seal shall not be applied until an inspection of the surfaces has been made by the Engineer and he has determined that the surfaces are suitable.

333.6 APPLICATION OF ASPHALT EMULSION:

The diluted material shall be well mixed before application. It shall be applied by a distributor truck equipped with fog nozzles at the approximate rate of 0.10 gallon per square yard. The exact rate shall be as directed by the Engineer. The distributor truck shall be as specified in Section 330.

333.7 SAND BLOTTER:

A sand blotter shall be applied as directed by the Engineer where there is an excess of asphalt emulsion. After the treated area has been opened to traffic, any excess asphalt emulsion that comes to the surface shall be immediately covered with additional sand.

333.8 PROTECTION FOR ADJACENT PROPERTY:

Care shall be taken to prevent the spraying of asphalt emulsion on adjacent pavements, including that portion of the pavement being used for traffic, on structures, guard rails, guide posts, markers, trees, shrubs, and property of all kinds.

333.9 PROTECTION OF TREATED SURFACE:

The treated surface shall be protected by barricades until the asphalt emulsion will not be picked up by traffic.

333.10 PAYMENT:

Payment for asphalt emulsion in place will be by the ton, diluted.

Payment for furnishing and applying sand blotter in place will be paid for by the ton.

- End of Section -

SECTION 334

PRESERVATIVE SEAL FOR ASPHALT CONCRETE

334.1 DESCRIPTION:

The asphalt concrete preservative seal shall be composed of an emulsified asphalt or asphalt rejuvenate, or an asphalt sealant to preserve the asphalt concrete pavement.

Preservative seals are applicable for asphalt pavements as directed on the plans, special provisions, or the Engineer.

334.2 MATERIALS:

The preservative seal shall be one of the following materials as specified by the Engineer:

Type	Description	Material Conformance
A	Rejuvenating emulsion	Section 718
B	Petroleum hydrocarbon emulsion	Section 718
C	"Filled" asphalt sealer such as TRMSS or equal	Section 718
D	Acrylic polymer emulsion	Section 718
Other	Diluted asphalt emulsion, CSS-1 or SS-1h	Section 713

334.3 CONSTRUCTION METHOD:

The material shall be approved by the Engineer in accordance to this specification. The application rates, dilution and curing shall be directed by the Engineer in accordance with this specification.

The contractor shall be responsible to clean the pavement to be treated free of trash, debris, earth or other deleterious substances present in sufficient quality to not interfere with the work to be performed.

The application rate will be based upon a typical surface condition test site with application rate trials to determine the needed rate. All application rates specified in Section 712 shall be a diluted 50-50 emulsified asphalt and water, except as recommended by the manufacturer for Type B and C. Any over applied seal will be sanded as directed by the Engineer. Application equipment shall be in accordance with Section 330.

Before opening a treated area to traffic, the surface shall be checked for slipperiness and/or tackiness. If the treated portion of the roadway must be opened to traffic prior to the disappearance of slipperiness and/or tackiness, the surface shall be sanded with a minimum of 1 ½ pounds per square yard or as directed by the Engineer. Sand Blotter shall comply with Section 333.

334.4 MEASUREMENT:

Preservative seal for asphalt concrete will be measured by the gallon or ton applied.

334.5 PAYMENT:

Payment will be made on the basis of the unit price bid in the proposal. Payment shall be full compensation for preservative seal complete and in place.

- End of Section -

SECTION 335

PLACEMENT AND CONSTRUCTION OF HOT ASPHALT-RUBBER SEAL

335.1 DESCRIPTION:

This work shall consist of applying an application of asphalt-rubber binder, a combined mixture of hot paving grade asphalt and crumb rubber modifier. It shall be immediately covered with a cover material.

The work involves furnishing and placing all materials on existing pavement surfaces in accordance with this specification.

335.2 MATERIALS:

The asphalt-rubber binder shall comply with Section 717. Sand Blotter shall comply with Section 333. Cover material shall be precoated and comply with Section 716. Fog seal coats shall comply with Section 333.

335.2.1 Certification and Quality Assurance: Prior to application, the Contractor shall submit certification of compliance to the Engineer at least 7 days prior to application for all materials to be used in the work. For example: Asphalt-rubber binder designs (Section 717), cover material test results (Section 716), sand blotter material (Section 333), fog seal coats (Section 333), and any additional materials used on the project.

335.3 EQUIPMENT:

335.3.1 General: The method and equipment for combining the crumb rubber modifier and hot paving grade asphalt shall be so designed and accessible that the Engineer can readily determine the percentage by weight of each of two materials being incorporated into the mixture.

All equipment shall meet requirements of Section 330 with the following modifications:

(A) Pneumatic-tired rollers: At least three pneumatic-tired rollers shall be used. Each roller shall carry a minimum of 5,000 pounds on each wheel and a minimum of 90 psi in each tire. Rollers shall not travel in excess of 12 mph.

(B) Distributor: The distributor must be equipped with a mechanical mixing device.

335.3.2 Mechanical Pre-Blender: Crumb rubber modifier and the hot paving grade asphalt for the asphalt-rubber binder may be pre-blended prior to introduction of the blend into the distributor.

The mechanical pre-blender shall be equipped with an asphalt totalizing meter in gallons and a flow rate meter in gallons per minute.

335.4 MIXING:

Mixing shall be done in accordance with Section 717. Application shall proceed immediately upon the asphalt-rubber binder requirements being met.

335.5 CONSTRUCTION:

Prior to placing the hot asphalt-rubber binder, soil and other objectionable materials shall be removed from the pavement surface.

The application rate of the hot asphalt-rubber binder shall be 0.55 to 0.70 gallons per square yard or as directed by the Engineer based on field conditions. Material shall be applied at temperatures of 350 degrees F. to 400 degrees F. The application of the cover material shall follow as close as possible behind the distributor truck.

The cover material shall be preheated immediately prior to application and precoated as specified in Section 716 - PRECOATED. The temperature of the precoated chips shall be in accordance with Section 330.

Hot asphalt-rubber binder with hot precoated cover aggregate shall be placed only when the ambient temperature is at least 60 degrees F. and rising, on a dry surface and there is no imminent threat of rain.

The rate of application of the cover material shall be from 18 to 25 pounds per square yard for the Low Volume Chip or 28 to 35 pounds per square yard for the High Volume Chip, or as directed by the Engineer.

The rolling of the cover material shall proceed immediately after application in order to insure maximum embedment of the aggregate. Sufficient rollers shall be used for the initial rolling to cover the width of the aggregate spread with one pass. The first pass shall be made immediately behind the aggregate spreader. If the spreading is stopped for an extended period, the spreader shall be moved ahead or off to the side so that all cover material may be immediately rolled. Three (3) complete passes with rollers shall be made with all rolling completed within one (1) hour after the application of the cover material.

The Contractor shall sweep all joint edges clean of overlapping cover material prior to the adjacent application of asphalt-rubber binder. Transverse joints shall be made by placing building paper over the ends of the previous applications. The joining application shall start on the building paper. Once the application process has progressed beyond the paper, the paper shall be removed and disposed of to the satisfaction of the Engineer. All reasonable precautions shall be taken to avoid skips and overlaps at joints and to protect the surfaces of adjacent structures, trees and shrubs, etc., from being spattered or marred. Correction of any such defects will be required at no additional cost to the Contracting Agency.

Traffic will not be permitted on the surface until after sweeping operations have finished and the cover aggregate has set. Traffic control shall be in accordance with Section 401 as supplemented by the Contracting Agency.

At signalized intersections, an application of 2 to 5 pounds of sand blotter per square yard shall be applied through the intersection and for a distance of 200 feet each way from the near curb returns after rolling and before opening a lane to traffic. Sand Blotter shall meet requirements of Section 333.

After sweeping and prior to striping, a fog seal coat shall be applied to the asphalt-rubber seal consisting of 0.05 to 0.10 gallons per square yard according to Section 333. The application of the fog seal coat may be delayed to facilitate curing or to avoid placement under unfavorable high temperature conditions.

Note: The fog seal coat shall not be applied to the area 200 feet either side of and through signalized intersections.

335.6 MEASUREMENT:

Certified weight slips of all materials shall be delivered to the Engineer before the materials are applied.

Certified weight slips of any bituminous material being weighed back in for credit shall be delivered to the Engineer for the next day.
Quantities of materials for this work will be paid for at the contract price per unit of measurement for each of the following pay items actually used on the project.

(A) Cover Material (Precoated)	Ton
(B) Asphalt Rubber Binder	Ton
(C) Emulsified Asphalt (Fog Seal)	Ton (diluted)
(D) Sand Blotter	Ton (surface dry)

335.7 PAYMENT:

Payment will be full compensation for furnishing and placing all materials specified and used, with no allowance for waste, and shall include labor, equipment, tools, and incidentals necessary to complete the work as prescribed in the specifications and as directed by the Engineer.

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Asphalt cement for precoating chips will be included in the price per ton for hot precoated chips.

No payment will be made for materials rejected due to improper placing, improper proportions of materials, or materials found to be defective.

- End of Section -

SECTION 336

PAVEMENT MATCHING AND SURFACING REPLACEMENT

336.1 DESCRIPTION:

Street and alley pavement and surfacing within the Contracting Agency's rights-of-way, removed by construction activities or to be widened or matched in connection with the improvement of Public Works, shall be placed as shown on the plans and applicable standard details, in accordance with this specification and/or the special provisions.

Asphalt concrete roadway pavement replacement shall be constructed in accordance with Type A, B, or T-Top of Standard Detail 200-1 and as indicated on the plans or in the special provisions.

Portland cement concrete pavement replacement shall be in accordance with Type C of the Standard Detail 200-1 and as required by Section 324.

All other surface replacement in the right-of-way but not in paved roadways shall be constructed in accordance with Type D of Standard Detail 200-1 and as indicated on the plans.

Temporary pavement replacement shall be constructed as required herein.

Pavements to be matched by construction of new pavements adjacent to or at the ends of a project shall be milled or saw cut in accordance with these specifications and where shown on the plans.

Pavement and surfacing replacement within ADOT rights-of-way shall be constructed in accordance with their permits and/or specification requirements.

336.2 MATERIALS AND CONSTRUCTION METHODS:

Materials and construction methods used in the replacement of pavement and surfacing shall conform to the requirements of all applicable standard details and specifications, latest revisions.

336.2.1 Pavement Widening or Extensions: Existing pavements which are to be matched by pavement widening or pavement extension shall be trimmed to a neat true line with straight vertical edges free from irregularities with a device specifically designed for this purpose. The minimum depth of cut shall be 1 ½ inches or D/4, whichever is greater.

The existing pavement shall be cut and trimmed after placement of required ABC and just prior to placement of asphalt concrete for pavement widening or extension, and the trimmed edges shall be painted with a light coating of asphalt cement or emulsified asphalt immediately prior to constructing the new abutting asphalt concrete pavements. No extra payment shall be provided for these items and all costs incurred in performing this work shall be incidental to the widening or pavement extension.

The exact point of matching, termination, and overlay may be adjusted in the field, if necessary, by the Engineer or designated representative.

336.2.2 Pavement to be Removed: Existing asphalt pavement to be removed for trenches or for other underground construction or repairs shall be cut by a device capable of making a neat, straight and smooth cut without damaging adjacent pavement that is not to be removed. The Engineer's decision as to the acceptability of the cutting device and manner of operation shall be final.

In lieu of cutting trenches across driveways, curbs and gutters, sidewalks, alley entrances, and other types of pavements, the Contractor may, when approved by the Engineer, elect to tunnel or bore under such structures and pavements.

When installations are within the street pavement and essentially parallel to the center line of the street, the Contractor, with approval of the Engineer, may elect to bore or tunnel all or a portion of the installation. In such installations, the seal coat requirements, as discussed in Section 336.2.4, will be modified as follows:

(A) If the pavement cuts (bore pits, recovery pits, etc.) are 300 feet or more apart, the bore or tunneled distance will not be considered as part of the open trench and the seal coat may not be required.

(B) If the pavement cuts (bore pits, recovery pits, etc.) are less than 300 feet apart, the distance between the cuts will be considered the same as a trench cut and the distance will be added to any trench cut distances.

336.2.3 Temporary Pavement Replacement: Temporary pavement replacement, as required in Section 601, may be with cold-mix asphalt concrete, with a minimum thickness of 2 inches, using aggregate grading in accordance with Marshall mix design of Section 710. Permanent pavement replacement shall replace temporary repairs within 5 working days after completion of temporary work.

Temporary pavement replacement shall be used in lieu of immediate placement of single course permanent replacement or the first course of two course pavement replacement only on transverse lines such as spur connections to inlets, driveways, road crossings, etc., when required by the Engineer, by utilities or others who subcontract their permanent pavement replacement, under special prior arrangement; or for emergency conditions where it may be required by the Engineer. Temporary pavement replacement shall be placed during the same shift in which the backfill to be covered is completed.

Rolling of the temporary pavement replacement shall conform to the following:

(A) Initial or breakdown rolling shall be followed by rolling with a pneumatic-tired roller. Final compaction and finish rolling shall be done by means of a tandem power roller.

(B) On small areas or where equipment specified above is not available or is impractical, the Engineer will approve the use of small vibrating rollers or vibrating plate type compactors provided comparable compaction is obtained.

The surface of the temporary pavement shall be finished off flush with the adjacent pavement.

336.2.4 Permanent Pavement Replacement and Adjustments:

336.2.4.1 Permanent Pavement Replacement: All pavement replacement shall match gradation and thickness of the existing pavement. Pavement replacement shall be compacted to the same density specified for asphalt concrete pavements in Section 321. The compacted thickness of all courses shall conform to the requirements of Table 710-1.

Unless otherwise noted, pavement replacement shall comply with the following:

(A) Single course pavement replacement shall consist of a 1/2" or 3/4” mix in accordance with Section 710.

(B) The base course(s) of a multi-course pavement replacement shall consist of a 3/4” mix in accordance with Section 710.

(C) The surface course of a multi-course pavement replacement shall consist of a 3/8” or 1/2" mix in accordance with Section 710 to match the existing surface.

(D) Where the base course is to be placed with non-compactive equipment, it shall be immediately rolled with a pneumatic-tired roller.

(E) Where the trench is 6 feet or more in width, all courses shall be placed with self-propelled spreading and compacting equipment. When the trench is from 6 to 8 feet in width, self-propelled spreading and compacting equipment shall not be wider than 8 feet.

(F) Placement of the surface course is to be by means which will result in a surface flush with the existing pavement.

The pavement replacement surface shall not vary more than 1/4 inch from the lower edge of a straightedge placed across the replacement pavement surface between edges of the existing matched surfaces. When the pavement replacement includes replacement of the roadway crown, the surface smoothness shall comply with requirements of Section 321.

Laying a single course or the base course(s) of the asphalt concrete pavement replacement shall never be more than 600 feet behind the ABC placement for the pavement replacement.

The trench must be compacted to its required density, and required ABC must be in place and compacted prior to the placement of the asphalt concrete.

For cuts greater than 300 feet in length the entire area shall then be slurry seal coated in accordance with Section 332 or as otherwise specified. This seal coat shall extend from the edge of pavement or lip of gutter to the street centerline except that on residential streets less than 36 feet face to face of curb or where the pavement patch straddles the centerline, the entire width of street shall be seal coated.

In lieu of placing the seal coat as required previously, and with approval of the Contracting Agency, the Contractor may deposit with the Contracting Agency for credit to the Street Maintenance Department, a negotiated agreed upon amount. The Street Maintenance Department will incorporate this work into their street maintenance program.

336.2.4.2 Adjustments: When new or existing manholes, valves, survey monuments, clean outs, etc. fall within the limits of the permanent pavement replacement as discussed in this Section, the Contractor shall be responsible for adjusting the various items to the new pavement surface or as directed by the Engineer. This will include but not be limited to slurry and chip seals.

The Contractor will coordinate with the Engineer and with representatives of the various utilities regarding the adjustment and inspection of the work. The Contractor shall be responsible for obtaining and complying with all specifications, special requirements, details, etc. of the Utility Company regarding the adjustments. When adjusting the Agency's utilities, survey monuments, etc., the adjustment will comply with these Specifications and Details.

The work will be done in compliance with OSHA standards and regulations regarding confined space entry. The Contractor shall remove all material attached to the lids and/or covers including that of prior work. The method of removal shall be approved by the Engineer and/or the Utility Representative.

336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT:

Normally, the type of pavement replacement and backfill required will be noted on the plans or specified in other portions of the contract documents and construction will be in accordance with Detail 200-1 and 200-2. If a type is not noted on the plans or specified in the special provisions, the following criteria will govern:

Type A trench repair will be utilized on all streets where the excavation is essentially longitudinal or parallel to traffic.

T-Top trench repair will be utilized on all streets where the excavation is essentially transverse or not parallel to traffic, including trenches that go through an intersection. Type B trench repair may be used to repair transverse trenches if specified by the Agency.

Type C trench repair will be used to repair existing Portland cement concrete pavement.

Type D trench repair will be utilized to repair surfaces other than asphalt concrete or Portland cement concrete pavement. It may also be used when the condition of the existing pavement does not justify construction of Type A, Type B or T-Top trench repair. Prior written approval of the Engineer is required for this condition.

Where a longitudinal trench is partly in pavement, the pavement shall be replaced to the outside edge of the existing pavement, on a straight line, as indicated on the plans. Measurements for payment shall be from the inner limit of pay width allowed below, to the outside edge of the existing pavement as defined herein.

Where no part of a trench is in pavement, surfacing replacement will only be specified where existing surfacing materials have been removed.

When a trench cut is in aggregate surfaced area, the surfacing replacement shall be of a like type and depth as the existing material, compacted to the densities required in Section 601.

336.4 MEASUREMENT:

Measurement for payment and surfacing replacement shall be by the square yard, based upon actual field measurement of the area covered except as noted below.

(A) In computing pay quantities for replacement Types B and E, pay widths will be based on the actual field measured width; however the boundaries of the measurement will not extend further than ½ the distance, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel.

(B) In computing pay quantities for replacement Types T-Top, A, C and D, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than ½ the distance plus 12 inches, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel. In all cases, the minimum pay width for replacement Types T-Top, A and D shall be 48 inches.

(C) Where a longitudinal trench is partly in pavement, computations of pay quantities shall be based on the limitations specified above.

(D) The length of pavement and surfacing replacement shall be measured through any manhole, valve box, or other structure constructed in the pipe line, and any pavement or surface replacement and/or seal treatment in excess of the above pay widths shall be considered and included in the bid item for such structure.

(E) Any pavement replacement in excess of the specified pay widths necessitated by the installation of valves, tapping sleeves and valves, valve by-passes, and concrete thrust blocks shall be included in the bid price for these items.

(F) When special provisions allow deviations from the trench widths specified in Section 601, the above allowed pay widths for pavement replacement may be altered where so specified.

(G) Measurement of pavement and surfacing replacement shall be made along the finished surface of the ground to the nearest foot, and shall be computed to the nearest square yard.

336.5 PAYMENT:

Direct payment for pavement or surfacing replacement will be made for replacement over all pipe trench cuts except as otherwise allowed in the special provisions. Payment for replacements over other work shall be included in the cost of constructing that work, in accordance with the applicable standard details and specifications.

Payment for temporary pavement replacement shall be included in the cost of the pipe.

Payment for pavement replacement shall include the replacement cost of any existing pavement markings that have been obscured, obliterated or removed by underground trench construction or repairs.

When a Contractor has the option of jacking and/or boring or open cut construction, and elects to construct a pipeline by the jacking and/or boring method, he will be paid for the replacement of such items of work as pavement, curb and gutter, sidewalk, driveway, and alley entrances, as allowed for open cut construction.

End of Section -

SECTION 337

CRACK SEALING

337.1 DESCRIPTION:

This work consists of furnishing and placing sealant material in Contractor prepared cracks and joints of asphalt concrete or Portland cement concrete pavements. All cracks and joints, including the space between asphalt concrete pavement and the curb and gutter, which have a clear opening of one-quarter inch (¼") or greater, shall be sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width. The Contractor shall notify the Engineer when cracks are encountered that have an opening greater than one inch (>1"). The Engineer shall specify the treatment requirements for cracks having an average clear opening greater than one inch (>1").

337.2 MATERIALS:

Sealant materials shall be a premixed, single component mixture of asphalt cement, aromatic extender oils, polymers, and granulized rubber in a closely controlled manufacturing process. Materials shall conform to the following specifications when heated in accordance with ASTM D5078 and the manufacturer's maximum safe heating temperature.

TEST	REQUIREMENT
Cone Penetration (ASTM D5329)	20-40
Resilience (ASTM D5329)	30% Minimum
Softening Point (ASTM D113)	210°F (99°C) Minimum
Ductility, 77°F (25°C) (ASTM D113)	30 cm Minimum
Flexibility (ASTM D3111 *Modified)	Pass at 30°F (-1°C)
Flow 140°F (60°C) (ASTM D5329)	3 mm Maximum
Brookfield Viscosity 400° (204°C) (ASTM D2669)	100 Poise Maximum
Asphalt Compatibility (ASTM D5329)	Pass
Bitumen Content (ASTM D4)	60% Minimum
Tensile Adhesion (ASTM D5329)	400% Minimum
Maximum Heating Temperature	400°F (204°C)
Minimum Heating Temperature	380°F (193°C)
Flash Point (ASTM D92)	450°F Minimum

*Specimen bent 90° over a 1-inch mandrel within 10 seconds.

337.2.1 Certification and Quality Assurance: Prior to application, the Contractor shall submit certification of compliance to the Engineer for all materials to be used in the work.

337.3 EQUIPMENT:

The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. It must be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant to meet the requirements of Appendix X1.1 of ATSM D6690. The sealant shall be applied to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.

337.4 CLEANING AND PREPARING CRACKS OR JOINTS:

Immediately prior to application of sealant, all cracks and joints shall be cleaned of debris and dust. Cracks and joints shall be vacuumed during final cleaning.

337.4.1 Routing: Routing, when specified, shall create a sealant reservoir. Cutting should remove at least ⅛" from each side and produce vertical, intact surfaces with no loosely bonded aggregate. Routing of joints and cracks shall produce a reservoir having a nominal size of ¾" wide x ¾" deep. Variations from the nominal size are subject to acceptance or rejection at the engineer's discretion.

337.4.2 Vacuuming: Final cleaning shall thoroughly clean cracks and joints to a minimum depth of 1". The vacuum unit shall use high pressure 90 psi minimum, dry oil free compressed air to remove remaining dust. The high pressure tool shall be integral with a vacuum unit to collect the dust and residue. Both sides of the crack or joint shall be cleaned. Surfaces will be inspected to assure adequate cleanliness and dryness.

337.5 APPLICATION:

337.5.1 Weather: In no case shall sealant be placed during damp roadway conditions such as wet roadway surfaces or damp material inside the cracks. Operations stopped by the Engineer, due to weather, shall be at no additional cost to the contracting Agency. If installing at night, ensure that dew is not forming on the pavement surface.

Sealant material shall only be applied when pavement temperature exceeds 40°F (4°C). If pavement temperature is lower than 40°F (4°C), it may be warmed using a heat lance that puts no direct flame on the pavement.

337.5.2 Temperature: Sealant temperatures should be maintained at the maximum heating temperature recommended by the manufacture.

337.5.3 Placement of Sealant: The sealant shall be applied in cracks, joints, and sealant reservoirs uniformly from bottom to top and shall be filled without formation of entrapped air or voids.

Cracks and joints shall be slightly overfilled then leveled with a 3" sealing disk or v-shaped squeegee to create a neat band extending approximately 1" on each side of the crack or joint for surface waterproofing. The band shall be as thin as possible and shall not extend more than ⅛ inch above the pavement surface.

If the pavement is to be overlaid with Hot Mix Asphalt within six months of sealant application, cracks shall be routed, and sealant placement shall be recessed ¼" in the crack or joint reservoir with no over band. If routing is not used, the sealant over band thickness and width should be kept as narrow and thin as possible.

During and after placement of the sealant, the Contractor shall protect against harm to persons or animals that may be exposed to the hot material.

337.5.4 Unacceptable Work: The Contractor, at no additional cost to the contracting Agency, shall correct unacceptable work. Unacceptable work shall include, but not be limited to, unsealed cracks, material wastage on the sides of the roadway, and excess quantities of material on the roadway that adversely affects driving.

Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work. The Contractor shall not progress to a new area until the unacceptable work is corrected to the satisfaction of the Engineer.

337.5.5 Reporting Requirements: The Contractor shall meet with the Engineer or the Engineer's designated representative on a daily basis and supply a signed daily report indicating the amount of crack sealant material applied for the day in total pounds and total square yards of pavement sealed. In addition, the Contractor shall supply the Engineer with the dates of completion of each road segment.

337.6 OPENING TO TRAFFIC:

Sealant material shall not be exposed to traffic until fully cured. If the sealed area must be open to traffic, blotter material shall be applied to the surface of all uncured sealant material.

All sealed cracks that have an average clear opening of 1½ inches or greater shall have blotter material applied prior to opening to traffic.

337.6.1 Blotter: On two lane roads or where traffic may come in contact with the hot sealant before it cures, a blotter or specialized bond breaking material shall be used to prevent asphalt bleeding and/or pickup of sealant by vehicular traffic. Blotter material shall be compatible with the crack sealant and any surface treatment being used.

337.7 MEASUREMENT:

Accepted pavement crack sealing shall be measured as indicated in the fee proposal by one of the following methods: square yards of pavement surface area sealed, pounds of sealant placed, or linear feet of cracks sealed.

337.8 PAYMENT:

Payment for pavement crack sealing at the contract unit price shall be full compensation for all labor, materials, equipment, tools, and incidentals used for surface preparation, placement of crack sealant and blotter materials, and cleanup.

- End of Section -

SECTION 340

CONCRETE CURB, GUTTER, SIDEWALK, CURB RAMPS, DRIVEWAY AND ALLEY ENTRANCE

340.1 DESCRIPTION:

The various types of concrete curb, gutter, sidewalk, curb ramps, driveways and alley entrances shall be constructed to the dimensions indicated on the plans and standard detail drawings.

340.2 MATERIALS:

Concrete shall conform to the requirements of Section 725. Concrete class shall be as noted on the standard details.

Expansion joint filler shall be ½-inch thick preformed bituminous material in compliance with Section 729, unless otherwise noted.

340.2.1 Detectable Warnings: Truncated dome dimensions and spacing for detectable warnings are defined by the Americans with Disabilities Act Accessibilities Guidelines (ADAAG) for optimal detect-ability and public safety. Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the ADAAG. Truncated domes shall have the following nominal dimensions: base diameter of 1.0 inches (0.9 inches minimum) top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and height of 0.2 inches. Dome center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Dome center-to-center spacing for radial installations shall be 1.6 inches minimum and 2.4 inches maximum with a base-to-base spacing of 0.65 inches minimum. Detectable warning edges shall be sized and installed so that dome spacing is maintained across adjoining edges. Each dome shall have a minimum static friction of coefficient of 0.8 as tested per ASTM C1028.

340.2.1.1 Color and Contrast: Detectable warnings shall contrast visually with adjoining surfaces, either light-on-dark or dark-on-light. Specific colors to be used shall be approved by the local jurisdictional agency prior to installation. Detectable warnings shall have integral color throughout.

340.2.1.2 Materials: Detectable warning materials shall be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. All detectable warnings shall be approved by the local jurisdictional agency prior to installation.

340.2.1.3 Attachment System: Detectable warnings shall be either placed in freshly poured concrete (wet-set) or recessed into pre-formed concrete. Detectable warnings using wet-set placement shall have an anchoring method that assures constant contact of the detectable warning bottom surface with the concrete as it cures, thus rendering the ramp a single monolithic structure. The thicker and heavier detectable warnings lowered into pre-formed recesses in the concrete substrate must demonstrate a firm fitting into metal reinforced frames without gaps along the edges that can channel water, sand, or debris. They must also be able to resist movement (i.e. sliding, rocking, or lifting) once in service. All attachment systems shall be approved by the local jurisdictional agency.

340.3 CONSTRUCTION METHODS:

Existing concrete shall have a clean vertical edge where it is to be joined by new construction. Sawcutting is required when the existing matching edge is not a straight vertical edge.

340.3.1 Subgrade Preparation: The subgrade shall be constructed and compacted true to grades and lines shown on the plans and as specified in Section 301. All soft or unsuitable material shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with material satisfactory to the Engineer. Removal and replacement of soft or unsuitable materials will be paid for as extra work.

Subgrade classified as marginally expansive or expansive as defined in Table 340-1 shall be treated as follows unless the construction documents require alternative measures for mitigation of expansive soils. The upper 6 inches of marginally expansive soils shall be compacted per Section 301.3 at a moisture content between 0% to 3% above optimum moisture per ASTM D698. Expansive soils shall be considered unsuitable and shall be treated or removed and replaced with material as directed by the Engineer. Alternate corrective measures contained in an existing geotechnical report or new site analysis can be submitted to the Engineer for approval. The submittal of alternative corrective measures must be a recommendation of an

Arizona registered engineer and have the professional seal affixed.

Table 340-1

Description	Percent Fines (– #200 sieve) (1)	Plasticity Index (2)	Additional Testing
Non-expansive	> 20%	≤ 15	None
Potentially expansive		> 15	Perform Swell Test (3)

Description	% Swell (3)
Non-expansive	< 1
Marginally expansive	1 – 3
Expansive	> 3

(1) Tested in accordance with ASTM C117

(2) Tested in accordance with AASHTO T-90 (wet prep per AASHTO T-146)

(3) Swell Test: Samples for swell tests shall be re-molded in accordance with ARIZ 249 (ADOT Materials Testing Manual) to 95% of maximum dry density at optimum moisture as determined by ASTM D698 and tested for one-dimensional expansion in accordance with the applicable portions of ASTM D4546 applying a surcharge of 144 psf.

Material removed for construction shall not be placed on the base and/or surfacing material already in place on the roadway nor shall the excavated material be placed in such a manner as to interfere with access to property or traffic flow in the street.

340.3.2 Formwork: Concrete curbs, gutters and sidewalks shall be constructed by the conventional use of forms, or may be constructed by means of an appropriate machine when approved by the Engineer.

If machines designed specifically for such work and approved by the Engineer are used, the results must be equal to or better than that produced by the use of forms. If the results are not satisfactory to the Engineer, the use of the machine shall be discontinued and the Contractor shall make necessary repairs at his own expense. All applicable requirements of construction by use of forms shall apply to the use of machines.

Forms conforming to the dimensions of the curb, gutter, sidewalk, curb ramps, driveway, and alley entrance shall be carefully set to line and grade, and securely staked in position. The forms and subgrade shall be watered immediately in advance of placing concrete.

Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

340.3.3 Concrete Placement: The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface. The surface shall then be struck off and worked to grade and cross section with a float.

If machine placement is used, the machine shall place, consolidate and finish the concrete in one complete pass, requiring a minimum of hand finishing producing a dense and homogeneous section. A form shall trail behind the machine for such a distance that no appreciable concrete slumping will occur. Final finishing shall be as specified in Section 340.3.7, Form Removal and Finishing.

340.3.4 Joints: Shall be constructed in a straight line, vertical plane and perpendicular to the longitudinal line of the sidewalk, curb and gutter, single curb, etc., except in cases of curved alignment, where they shall be constructed along the radial lines of the curve.

Curb and gutter joints shall match the location of concrete pavement joints when abutting concrete pavement.

The space between joints in curbs and gutters (space between contraction joints or between contraction and expansion joints) shall not exceed ten feet.

Sidewalk that abuts curb or gutter shall have joints that match the curb or gutter joints.

The space between sidewalk joints shall not exceed 125% of the sidewalk width (for example: maximum joint spacing for 5 foot wide sidewalk is 6.25 feet).

340.3.4.1 Expansion Joints: Expansion joints shall be constructed to the full depth and width of the concrete. The expansion joint material shall extend fully through the concrete and one inch into the subgrade with the top of the expansion joint material one-quarter inch below the top surface. Expansion joint material shall be secured in place prior to placement of concrete.

Expansion joints shall be installed along all abutting structures to provide complete separation from the structure.

Sidewalk, curb, and gutter expansion joints shall be installed at all radius points, at both sides of each driveway, at both sides of each alley entrance. The maximum distance between expansion joints shall be 50 feet.

340.3.4.2 Contraction Joints: Unless otherwise specified, the large aggregate in contraction joints shall be separated to either side of the joint for a minimum depth equal to 25% of the concrete thickness; the finished depth shall be a minimum of 3/4 inch.

340.3.5 Edges: All exposed edges shall be shaped with a suitable tool to form edges having the shape as indicated on the referenced detail.

340.3.6 Detectable Warnings: Detectable warnings shall be installed perpendicular to the direction of pedestrian/wheelchair travel and have a minimum width of 24 inches measured perpendicular to the edge of the roadway or rail crossing. The base surface of detectable warnings shall be installed flush with the adjacent walkway surface; the truncated domes shall extend above the walkway surface. The boundary between detectable warnings and the adjacent walkway shall provide a flush uniform surface that will not cause ponding of water nor present a tripping hazard. Partial domes at the edge of the detectable warning shall be made flush to match the base surface of the detectable warning. Detectable warnings installed on curb ramps shall extend the full width of the ramp depression.

Detectable warnings installed on curb ramps shall modify the sidewalk concrete thickness at the detectable warning to provide a minimum concrete thickness of four-inches (4”). When detectable warnings are modules inset into the curb ramp, the bottom surface of the sidewalk shall be lowered a distance equal to or greater than the module thickness to maintain the minimum sidewalk thickness. The sidewalk bottom surface shall have a minimum transition taper length of 12” between the thickened and normal depth sections of sidewalk. The detectable warning surface shall be located so that the edge nearest the curb line is 6 inches minimum and 8 inches maximum back from the face of curb.

Detectable warning surfaces for pedestrian at-grade rail crossings not located within a street or highway shall be installed on each side of the rail crossing, located as shown on plans. Detectable warnings shall extend the full width of the pedestrian walkway.

340.3.7 Form Removal and Finishing: The front face form shall not be removed before the concrete has taken initial set and has sufficient strength to carry its own weight. Gutter forms and rear forms shall not be removed until concrete has hardened sufficiently to prevent damage to the edges. Any portion of concrete damaged while stripping forms shall be repaired or replaced at no additional cost to the Contracting Agency.

After the forms are removed, the joints shall be tooled and the surface finished with a float to remove all imperfections. As needed, retool joints after finishing to prevent groove bonding. In all cases, the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The concrete work shall have a true surface; shall be free from sags, twists, or warps; have a uniform appearance; and be true to the lines, grades, and configurations indicated on the drawings.

Surfaces shall be light broom finished; flow lines shall be troweled for a smooth finish.

If the evaporation rate on the concrete surface exceeds the rate of bleeding of the concrete due to weather conditions, materials used, or for any other reason, and there is any likelihood of the fresh concrete checking or cracking before the curing operation, measures shall be taken to prevent the rapid evaporation of water from the surface during finishing operations. When allowed by the Engineer, the addition of water to the surface may be permitted as an indirect fog spray with approved spray equipment immediately after screeding and/or between finishing operations. A commercial evaporation reducer that forms a monomolecular film may also be sprayed onto the concrete surface in accordance with the manufacturer’s recommendations. At no time will free water/evaporation reducer be worked into the concrete surface. Approved measures shall continue until curing operations per Section 340.3.8, Curing, are started in the particular area affected.

The Contractor shall stamp the company name and year on each end of the sidewalk or curb ramp constructed. The letters shall not be less than 3/4 inch in height and the depth of the stamped impression shall be between 1/8-inch and 1/4-inch.

340.3.8 Curing: As soon after the completion of the finishing operation as the condition of the concrete will permit, all exposed surfaces shall either be sprayed with a pigmented curing compound or sealed with a material conforming to Section 726. Curing compound shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely seal all exposed concrete surfaces with a uniform film. The membrane shall be applied in two applications for a total coverage of 150 square feet per gallon. Concrete surfaces shall be kept damp until the curing compound is applied. Should the curing compound seal be broken or damaged before the expiration of 10 days after the placing of the concrete, the break shall be immediately repaired by the application of additional curing compound over the damaged area.

The need for adequate curing is greatest during the first few hours after placement of the concrete.

340.3.9 Tolerances: The face, top, back, and flow line of the curb and gutter shall not deviate in excess of 1/4-inch over 10 feet, as tested with a 10-foot straightedge or curve template, longitudinally along the surface.

The surface of concrete sidewalk or curb ramp shall not deviate in excess of 1/8-inch over 5 feet as tested with a 5-foot straightedge except for the 1/4-inch recess of the preformed material in expansion joints.

All finished concrete elevations shall not deviate from the elevations shown on the plans, or indicated by typical sections or standard details referenced within the construction documents, by more than 1/2 inch.

When required by the Engineer, gutters shall be water tested. The Contractor shall establish flow in the length of gutter to be tested by supplying and distributing water from a hydrant, tank truck or other source. After the supply of water is shut off and water has stopped flowing, the gutter shall be inspected for evidence of ponding or improper shape. The work shall be deemed deficient if water is found ponded in the gutter to a depth greater than 1/2 inch or ponding extends onto the adjacent asphalt pavement.

Areas between elevations shown on the plans shall be straight graded or smoothly transitioned through a vertical curve in a manner approved by the Engineer or as otherwise indicated on the construction documents.

340.3.10 Deficiencies: Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency. Replacement or reconstruction shall be from joint to joint.

Concrete work that does not comply with tolerance requirements of Section 340.3.9, Tolerances, shall be removed and replaced. Remove and replace gutters that exceed the ponding tolerance. Grinding shall only be allowed if approved by the Engineer.

340.4 BACKFILLING:

Unless otherwise specified the Contractor shall backfill behind the curbs, sidewalk or curb ramps with soil native to the area to the lines and grades shown on the plans.

340.5 MEASUREMENT:

Concrete curbs and gutters of the various types shown on the plans and in the proposal will be measured along gutter flow line through inlets, catch basins, driveways, curb ramps, etc., by the lineal foot to the nearest foot for each type, complete in place. Measurement for curb terminations and transitions shall be included with the linear measurement of the various types of curb or curb and gutter as shown on the plans and in the proposal.

Curb and gutter type shall be based on the configuration of the final exposed surfaces. The increased curb and gutter depth required at valley gutter aprons or driveways shall not be measured as a separate pay item; any additional Contractor cost shall be included in the unit cost associated with the valley gutter, driveway or other associated item.

Concrete sidewalks, driveways, alley intersections, valley gutters and aprons will be measured to the nearest square foot complete in place.

Detectable warnings shall not be measured for payment. Detectable warnings are considered integral to the walking surface that they form a part of and the cost is included in the related pay item.

Curb ramp installations shall be measured as complete installed units and shall include the ramp curb and the walking surfaces between the ramp curb and back of curb and gutter or single curb. Single curb or curb and gutter located at the edge of roadway shall be measured and paid for separately. The surface area of curb ramps shall not be included in the measured quantity for sidewalk.

340.6 PAYMENT:

Payment will be made in accordance with the unit prices or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

Over-excavation of soft, expansive or unsuitable materials and installation granular materials will be paid as a separate pay item, not included with the above measured pay items.

- End of Section -

SECTION 342

DECORATIVE PAVEMENT
CONCRETE PAVING STONE

342.1 GENERAL:

The Contractor shall furnish all necessary labor, material, tools and equipment to complete the proper installation of decorative concrete pavers used in medians, crosswalks, intersections or as otherwise noted in the Contract Documents. This includes furnishing a 10-foot straightedge to accomplish the level test when required by this specification.

The decorative pavement shall be true in line and grade and installed to coincide and align with the adjacent work elevation. All edges shall be retained to secure the pavers and sand laying course.

The Contractor shall construct a sample panel 10-feet by 10-feet for inspection and approval by the Engineer, prior to the actual installation for the project. Once approved, the panel shall be used as a standard for the remainder of the work. The panel shall remain undisturbed throughout the construction of the pavers and final approval by the Engineer.

342.2 MATERIALS:

342.2.1 Aggregate Base Course: Aggregate Base Course shall be per Table 702-1.

342.2.2 Portland Cement Concrete: When the pavers are subject to vehicular traffic, Portland Cement Concrete shall be Class A per Section 725. All other locations, the Portland Cement Concrete shall be a minimum of Class B per Section 725.

342.2.3 Sand: Sand used for laying course shall conform to ASTM C33 except for the gradation. The gradation shall comply with Table 342-1.

TABLE 342-1
SAND GRADATION

Sieve Size	3/8 inch	No. 4	No. 8	No. 16	No.30	No. 50	No. 100	No. 200
Percent Passing	100	95-100	85-100	15-85	25-60	10-30	2-10	0-1

342.2.4 Concrete Pavers: Pavers shall have a minimum of thickness of 80 mm (3.15) when installed in traffic bearing areas and 60 mm (2.36 in.) When installed in non traffic bearings areas. Pavers shall be of an interlocking design conforming to ASTM C936-82. Pavers shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. The Contractor shall submit two samples of each type of pavers used on the project for review and approval by the Engineer prior to any work. The pavers and materials used in their manufacture shall conform to the following:

(A) Compressive Strength: Pavers shall have a minimum compressive strength of 8,000 psi in accordance with ASTM C140.

(B) Absorption: The average absorption shall not be greater than 5 percent, with no individual unit absorption greater than 7 percent.

(C) Portland Cement: Cement shall comply with Section 725.2, Type II.

(D) Aggregates: Aggregates shall conform to ASTM C33 (washed, graded sand and rock, no expanded shale or lightweight aggregates).

(E) Other Constituents: Coloring pigments shall be applied integrally to the concrete. Air entraining admixtures, coloring pigments, integral water repellents, and finely ground silica shall be previously established as suitable for use in concrete and either shall conform to ASTM standards where applicable, or shall be shown by test or experience not to be detrimental to the concrete.

(F) Physical Properties: The size, shape, design and color of the pavers shall be as noted in the Contract Documents.

342.2.5 Expansion Joint: Expansion joint filler material shall be 1/2-inch premolded and comply with Section 729 and ASTM D1751.

342.3 CONSTRUCTION PROCEDURES:

342.3.1 Subgrade: The subgrade shall be constructed true to grades and lines shown on the plans and compacted to a minimum dry density of 95% as specified in MAG Section 301.

342.3.2 Aggregate Base Course: When aggregate base course is specified, the aggregate base course shall be constructed true to grades and lines shown on the plans and compacted to a minimum dry density of 100% per Section 301 with the surface of the aggregate base course not varying by more than +1/8-inch in 10-feet.

342.3.3 Concrete Header and Base Slab: Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the Portland Cement concrete.

The Portland Cement concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. Compacted by mechanical vibrators may be used when approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate has been tamped below the surface.

All edges shall be shaped with a suitable tool to form a rounded edge of radius as directed in Detail 225.

The Portland Cement concrete header face form shall not be removed before the concrete has taken the initial set and has sufficient strength to carry its own weight. The concrete header outer form shall not be removed until the concrete has hardened sufficiently to prevent any damage to the concrete. Any porting of concrete damaged while stripping forms shall be repaired or if the damage is severe, replaced at no additional cost to the Contracting Agency. The face and top of the concrete header shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface. Any deviation in excess of 1/4-inch in 10-feet shall be corrected at no additional cost to the Contracting Agency.

Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.

Finishing and curing of the concrete shall be done in the manner specified in Section 340.

342.3.4 Expansion Joints: Expansion joints shall be constructed to the full depth and width of the concrete with the top of the material one-half inch below the top surface as depicted in Detail 225 unless otherwise specified. After the concrete is cured, the top one-half inch shall be filled to the surface of the concrete with a premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant, ASTM C920, Type S, Grade NS, Class 25, Sikaflex-lA or equal.

Joints shall be constructed in a straight line and vertical place perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. In the case of base slabs, pavers shall be placed continuously over the expansion joints.

342.3.5 Contraction Joints: Contraction joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to a depth of one inch with rounded edges and placed at 10-foot intervals. Contraction Joints shall be filled to the surface of the surrounding concrete with elastomeric sealant specified in 342.3.3.

342.3.6 Sand Laying Course: The maximum thickness of the sand course shall be one-inch. Screeding boards shall be used to ensure a uniform thickness. The sand shall not be compacted, walked on or wet down.

342.3.7 Concrete Paving Stones: The concrete pavers shall be clean and free of foreign materials before installation. Paving work shall be plumb, level and true to line and grade and shall be installed to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter pavers and the sand laying course. The pavers shall be laid in such a manner that the desired pattern is maintained and joints between the pavers are as tight as possible.

The Contractor shall lay the pavers starting from the longest straight line and from a true 90-degree corner. The pavers shall be installed hand-tight and level on the undisturbed sand course in a manner that eliminates gaps between the stones and the edge retention header. String lines shall be used to hold all pattern lines true. The gaps at the edge of the paver surface shall be filled with pavers cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic (vehicular or pedestrian) surface using a masonry saw cut.

After the pavers are in place, they shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force. This will require two passes at 90 degrees to each other. After vibration, approximately 1/4-inch of clean masonry sand containing at least 30 percent of 1/8-inch particles shall be placed over the paver surface, allowed to dry, and vibrated into the joints with additional vibrator passes and brushing so as to completely fill joints. Excess sand shall be swept from the surface.

The finished paver surface shall be tested longitudinally and transverse to the concrete header or curb with a 10-foot straightedge along the surface. Any deviation in excess of 1/8-inch shall be corrected at no additional cost to the Contracting Agency.

Any broken or damaged pavers shall be removed and replaced. Replacement pavers shall be tamped into place and the joints filled with masonry sand as specified herein. The completed installation shall be cleaned of all debris, surplus material and equipment.

342.4 MEASUREMENT AND PAYMENT:

Measurement will be the square foot. Payment will be made at the unit bid price per square foot. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work.

- End of Section -

SECTION 343

EXPOSED AGGREGATE PAVING

343.1 DESCRIPTION:

Exposed aggregate paving consists of placing a concrete slab with exposed aggregate in the surface of the finished concrete. This exposed aggregate paving is designed for decorative or pedestrian use only. It should not be used in areas subject to vehicular traffic.

343.2 MATERIAL:

343.2.1 Concrete: Concrete shall be Class A per Section 725 with a maximum slump of 3 inches.

343.2.2 Exposed Aggregate: The exposed aggregate shall be uncrushed riverrun rocks. The Contractor shall provide at least a 10-pound sample for approval by the Engineer prior to any aggregate paving.

(A) When the paving is for decorative use only, no pedestrian traffic, the aggregate shall not be larger than 3 inches or smaller than 1 ½ inches.

(B) When the paving is to be used for pedestrian traffic, the aggregate shall be not larger than 2 inches or smaller than 1 inch.

343.3 CONSTRUCTION PROCEDURE:

The Contractor shall construct a sample panel 3 feet by 3 feet for inspection and approval by the Engineer, prior to actual construction. When approved, this panel shall be used as a standard for the remainder of the work.

After the slab has been placed, screeded and darbied, the aggregate shall be hand-scattered so that the entire surface is evenly covered. The surface shall be reworked so that the aggregate will be embedded just beneath the surface. The concrete shall completely surround and lightly cover the aggregate leaving no holes or voids.

A non-staining surface retarder will be applied to provide a surface penetration of at least 1/8-inch and the surface will be lightly screed to ensure penetration. The surface will be covered with a protective material for the period of time recommended by the retarder manufacturer. After this time has elapsed, the upper, retarded layer of concrete will be removed using a water jet stream and a brush. The protective cover will be replaced and the concrete allowed to cure. After curing, the surface shall be cleaned and a silicone seal applied.

343.4 MEASUREMENT AND PAYMENT:

Measurement will be by the square foot. Payment will be made at the unit bid price per square foot. This price shall be full compensation for all labor, material, tools, and equipment required to complete the work.

- End of Section -

SECTION 345

ADJUSTING FRAMES, COVERS, VALVE BOXES METER BOXES AND PULL BOXES

345.1 DESCRIPTION:

The Contractor shall furnish all labor, materials, and equipment necessary to adjust all frames, covers and valve boxes as indicated on the plans or as designated by the Engineer. The frames shall be set to grades established by the Engineer.

The Contractor may elect to remove old frames, covers, and valve boxes and then install new frames and/or boxes in accordance with standard detail drawings at no additional cost to the Contracting Agency.

The Contractor shall be responsible for maintaining an accurate description and location of all items to be adjusted. The locations shall be referenced with map documentation by the use of swing ties or GPS locations. This information shall be supplied to the Engineer and utility owner(s) prior to taking any action that would hide or restrict access to the items to be adjusted.

Any missing or defective frames, covers, valve boxes or related hardware shall be reported to the Engineer in writing during the initial location process to allow for timely replacement. The Engineer shall be responsible for providing replacement items to the contractor. The contractor is responsible for providing items required to accomplish the required adjustments such as additional adjusting rings, valve box extensions, meter box extensions, and pull box extensions.

345.2 LOWERING PROCEDURE:

If required, manholes, valve boxes, or survey monuments located within the paved areas to be milled or reconstructed shall be lowered to an elevation that will allow required work to be accomplished without damaging the facilities. Care shall be taken to prevent entrance of any material into the lowered facilities. Lowering shall be to a depth that will prevent damage to the utility during the construction activities.

All manhole frames, valves boxes, survey hand hole frames and related items removed by the contractor during the lowering process shall be maintained in a secure area, and the contractor shall bear full responsibility for the material. Any hardware items lost or damaged by the contractor shall be replaced in kind, at no additional cost to the Contracting Agency.

Preparation for Milling: Temporary asphalt concrete shall be placed over the steel plate filling the excavated area. The temporary pavement shall be maintained until removed during the adjustment to final grade. For manholes located on major streets that are to be kept opened to vehicular traffic, hot mix asphalt shall be used to backfill the excavated areas and compacted flush with the existing pavement prior to opening up to traffic. In residential or low volume streets with minimal traffic, cold mix or other approved product may be used for temporary pavement. No measurement or payment shall be made for temporary pavement placement or removal.

345.3 ADJUSTING FRAMES:

The Contractor shall loosen frames in such a manner that existing monuments, cleanouts, manholes, and valve boxes will not be disturbed or damaged. Debris shields shall be used to prevent debris from entering sanitary or storm sewers. All loose material and debris shall be removed from the excavation and the interiors of structures prior to resetting frames. If dirt or debris enters the sewer system the contractor shall be responsible for cleaning the sewer system for a minimum of one reach (the next downstream structure from the contamination point.)

Frames shall be set to match finished grade or the elevations and slopes established by the Engineer. Manhole frames shall be firmly blocked in place with masonry or metal supports. Spaces between the frame and the facility shall be sealed on the inside to prevent any concrete from entering the hand hole or manhole. A Class AA concrete collar shall be placed around and under the frames to provide a seal and properly seat the frame at the required elevation and slope. Concrete shall be struck off flush with the top of the existing pavement.

Adjustments of utilities, if located within the asphalt pavement, shall be made after placing the final surface course when there is only a single lift of pavement required. When there are multiple lifts of pavement required, adjustments may be made before the final surfacing or as directed by the Engineer.

After removal of the temporary asphalt pavement in the area of adjustment, and prior to placement of the final concrete collar ring (as shown on Details 270 and 422) the asphalt pavement in proximity of the adjustment shall be be rolled with a self-propelled steel wheel roller if requested by the Engineer.

345.4 ADJUSTING VALVE BOXES:

Valve boxes shall be adjusted to the new elevations indicated on the plans, or as established by the Engineer.

Adjustable valve boxes shall, if possible, be brought to grade by adjustment of the upper movable section. Any excavated area shall be filled with Class AA concrete to the level of the existing pavement, or as directed by the Engineer.

Concrete pipe valve boxes in areas not subject to vehicular traffic shall be adjusted to grades by installing a suitable length of metal or concrete pipe, of the same inside diameter as the present valve box, and reinforcing the outside with a concrete collar extending from at least 2 inches below the joint up to and flush with the top of the valve box extension. This collar shall be of Class AA concrete. The dimension from the outside of the box to the outside of the collar shall not be less than 2 inches. This adjustment will be known as Type B.

In areas subject to vehicular traffic and where the existing valve box is a Type B, the adjustment to the new elevation shall be made using the old cover and installing a new 8 inch frame in accordance with the standard detail for installation of valve boxes in vehicular traffic areas. This adjustment shall be known as Type BA.

Adjustment of existing Type A valve boxes to the new elevations shall be as described in Subsection 345.2. This adjustment shall be known as Type A.

345.5 ADJUSTING MANHOLE AND VALVE COVERS WITH ADJUSTMENT RINGS:

Adjusting rings may be used to raise manhole covers in asphalt pavements when deemed acceptable by the Engineer. The amount of adjustment, thickness of seal or overlay, and cross slope will be considered when using adjusting rings. Each location where an adjusting ring is used must have a sufficient depth of asphalt to assure the proper installation and operation of the ring. The rings shall be made of a concrete, non-metallic, polypropylene or fiberglass material and installed per the manufacturer's specifications. The rings shall be approved by the Engineer.

The concrete collar ring around the frame or valve box shall be circular, and shall be a minimum of eight (8) inches thick, placed flush with the adjacent new pavement surface. Concrete shall be a minimum of Class AA on all paved streets. All concrete shall be obtained from plants approved by the Engineer.

If required by the Contracting Agencies specifications or details, a single No. 4 rebar hoop will be placed in each adjustment collar. The hoop diameter shall be such that its placement is centered between the edge of the manhole frame or valve box, and the outer edge of the concrete collar, the depth of the hoop shall be centered in the thickness of the collar. Each concrete ring shall be scored radially at quarter-circle points. Score lines shall be ¼ -inch wide by ½ - inch deep. The concrete collar surface shall be rough broom finished. (See Details 270 and 422).

Traffic shall not be allowed on the concrete collars until the concrete had reached a minimum compressive strength of 2500 psi on residential and 3000 psi on collector and major streets. On major streets the contractor shall use "high-early" in the concrete mix, approved by the Engineer, to minimize delay in reopening the street(s) to traffic.

345.6 MEASUREMENT:

The quantities measured will be the actual number of frames, covers and valve boxes of each type, adjusted and accepted.

345.7 PAYMENT:

Accepted quantities, will be paid for at the contract unit price. Payment shall be compensation in full for all materials, labor, equipment and incidentals necessary to complete the work.

- End of Section -

SECTION 350

REMOVAL OF EXISTING IMPROVEMENTS

350.1 DESCRIPTION:

This work shall consist of removal and disposal of various existing improvements, such as pavements, structures, pipes, conduits, curbs and gutters, and other items necessary for the accomplishment of the improvement.

350.2 CONSTRUCTION METHODS:

350.2.1 Utilities

The removal of existing improvements shall be conducted in such a manner as not to injure active utilities or any portion of the improvement that is to remain in place.

A utility may be abandoned in place below a new major structure that is part of the work only if approved by the Agency and solidly filled with grout using methods approved by the Agency. All abandoned utilities to remain and the approved abandonment method shall be noted on the installation record drawings.

Utilities to be removed by the Contractor shall be disconnected and taken out in accordance with the requirements of the utility owner to the limits shown on the plans. Utility removal shall not be performed until a release has been obtained from the utility stating that their respective service connection and appurtenant equipment have been disconnected, removed or sealed and plugged in a safe manner.

The Engineer shall be notified when utilities are encountered that are not shown on the plans.

350.2.2 Others

Sidewalks shall be removed to a distance required to maintain a maximum slope for the replaced portion of sidewalk, for one inch per foot and all driveways shall be removed to a distance as required by standard details.

Portland cement concrete pavements, curbs and gutters and sidewalks designated on the plans for removal shall be saw-cut at match lines, in accordance with Section 601 and removed.

Portions of asphalt concrete pavements designated on the plans for removal shall be done in accordance with Section 336.

Removal of trees, stumps, roots, rubbish, and other objectionable materials in the right-of-way shall be done in accordance with Section 201.

350.2.3 Backfill and Disposal

Backfill of all excavated areas below structures shall be in accordance with Section 206.4. Backfill and compaction of all other excavated areas shall be compacted to the densities as prescribed in Section 601 (trenches) or Section 211 (holes, pits or other depressions).

All surplus materials shall be immediately hauled from the jobsite and disposed of in accordance with Section 205.6.

350.3 MISCELLANEOUS REMOVAL AND OTHER WORK:

This work shall include, but not be limited to the following, where called for on the plans:

(A) Relocate existing fence and gate.

(B) Remove and reset mail boxes.

(C) Remove signs and bases in right-of-way.

(D) Remove planter boxes, block walls, concrete walls, footings, headwalls, irrigation structures, and storm water inlets.

(E) Install plugs for pipes and remove existing plugs as necessary for new construction.

(F) Remove wooden and concrete bridges.

(G) Remove median island slabs.

(H) Remove pavements and aggregate base where called for outside the roadway prism.

350.4 PAYMENT:

Payment for removals will be made at the unit proposal price which price shall be full compensation for the item complete, as described herein or on the plans.

- End of Section -

SECTION 355

UTILITY POTHOLES-KEYHOLE METHOD

355.1 DESCRIPTION:

This specification covers the requirements for coring, vacuum excavation, backfilling, and reinstatement of the asphalt core into asphalt pavement.

355.2 EXCAVATION:

Excavation requires coring a circular hole through asphalt pavement using drilling/coring equipment and removal of the intact asphalt pavement core. The vertical alignment of the coring operation shall be perpendicular to the horizon and cutting shall be extended the full depth of the existing pavement section.

Pavement cores shall not be greater than 24 inches in diameter, shall not be spaced closer than 3 feet between cores (edge to edge), shall not contain a joint or any pavement cracks greater than 1/8-inch wide, and shall only be obtained from pavements where the asphalt concrete section is at least 4 inches thick.

Contractor shall place a temporary mark (paint or chalk) on the pavement core and adjacent pavement prior to cutting to insure that the pavement core when replaced will have the same orientation as found in the original pavement.

Pavement cores shall be either removed from the work site or stored in a safe and secure on-site location. The cores shall be made readily available for reinstatement into the pavement.

Soil shall be removed by air/vacuum extraction methods to expose utilities. The zone of soil removal shall remain essentially within a vertical plane extending below the edges of the core hole.

The Contractor shall dispose of all excess materials.

355.3 BACKFILL AND COMPACTION:

355.3.1 Backfill Using Mechanical Compaction: Backfill shall be aggregate base per Section 702 or native backfill material per Section 601, placed in maximum 6 to 8-inch loose lifts.

Backfill compaction shall be determined by use of a compression wave amplitude monitoring device manufactured specifically for the purpose of measuring soil compaction. This device shall measure the compression wave amplitude as compaction progresses using below grade piezoelectric transducer wave sensors and an above-grade electronic monitor. The device shall signal the operator of successful compaction (the compaction wave amplitude becomes asymptotic for continued compaction effort) for each lift.

At time of compaction backfill material shall have sufficient available moisture to be compacted based on the physical appearance (soil ball) method as specified in USDA Soil Conservation Service Agricultural Information Bulletin 199, described as follows:

> Firmly squeeze a palm-size sample of soil into a ball by hand. Granular soils with sufficient available moisture will tend to ball under pressure, but seldom holds together for long. Cohesive soils with sufficient available moisture will form a ball that can be rolled into approximate ¼" wide ribbons between the palms of the hands without breaking apart, leaving no free water on the hand.

A compaction sensor shall be placed at the bottom of the first loose lift. A new sensor shall be placed for every 48 inches of compacted fill depth.

Pneumatic compaction equipment (pneumatic rammers or equivalent) shall be used for compaction of the backfill material. The size of the compactor shall not exceed one-half the diameter of the hole.

Mechanical compaction on each lift shall be continued until the electronic monitor signals that compaction is complete. A new lift shall not be placed until a positive signal has been received. Remove backfill soil and sensor if the monitor does not give a positive compaction signal after repeated compaction efforts. Repeat backfilling and compaction with a new sensor.

Contractor shall provide compaction documentation to the Agency upon request.

355.3.2 Slurry Backfill: If mechanical compaction is not used, the Contractor shall use ½-sack CLSM as backfill in accordance with Section 728.

355.3.3 Leveling Course: A 1-1/2-inch to 2-inch thick leveling course of compacted crushed gravel meeting the requirements of ASTM C33, No. 8 coarse aggregate shall be placed above the backfill and directly below the asphalt concrete pavement section.

355.4 PAVEMENT RESTORATION

The pavement surface shall be restored to its original condition by setting the reinstated pavement core flush with and in its original orientation.

Bonding agent meeting the requirements of Section 708 shall be used for pavement core reinstatement. Excess bonding material shall be removed from the restored pavement surface. A "patched" appearance shall be avoided in surface restoration wherever possible.

The contractor shall reinstate the pavement core within 24 hours of cutting the pavement. Holes left open longer than 24 hours after cutting shall be covered with an approved steel road plate capable of supporting traffic loads. The steel plate must be rounded with a fitted collar that, when inserted into the hole, will prevent the steel plate from tipping, tilting, bouncing or spinning out of the hole under traffic conditions. An asphalt mix shall be used to ramp pavement up to the steel plate along all edges.

355.5 SURFACE TOLERANCES

The reinstated core shall be flush and level with the adjacent pavement. Gaps attributable to the positioning of the core shall be less than 1/16-inch between the bottom of a minimum 3-foot long straightedge and the surface of the pavement in any direction on the surface of the keyhole core, except across the pavement crown or drainage gutters.

355.6 DEFICIENCIES

Where the pavement core is found to be fractured or defective upon removal, or becomes damaged after removal and prior to reinstating, the defective or damaged core shall not be used to reinstate the pavement. Pavement repair shall be performed in accordance with Detail 212, Type A Pavement Repair.

A pavement core is considered unacceptable when one of the following conditions exist:

(a) The core contains any vertical cracks wider than 1/8-inch extending full depth or partial depth through the core; or

(b) Any deteriorated piece of the core is larger than 10 percent of the overall area of the core.

(c) Two or more successive layers of asphalt concrete in the core become horizontally delaminated and cannot be rebounded to each other with the bonding compound.

All unacceptable pavement cores shall be removed from the job site.

355.7 MEASUREMENT

Each acceptable utility pothole repair shall be counted. No distinction shall be made based on size of the utility pothole or method of repair.

355.8 PAYMENT

Payment at the contract price for utility pothole repair complete in place shall be full compensation for all labor, equipment and material required for a complete in place installation. Payment includes traffic control and disposal of all excess materials.

- End of Section -

SECTION 360

TELECOMMUNICATIONS INSTALLATION

360.1 DESCRIPTION:

This work shall consist of the installation of underground telecommunications facilities within the public right-of-way.

360.2 TRENCHING, BACKFILL AND RESTORATION:

All work shall be done in accordance with Section 601.

360.3 CABLE INSTALLATION:

(A) "Trunk Lines" Cable providing telecommunications service by connecting regions or states or by connecting central offices within a metropolitan area. Such cable shall be installed as described below:

(1) If the cable is to be installed within an open trench, the cable shall be placed within schedule 40 PVC conduit or equal with a minimum inside diameter of 4 inches. The conduit shall be buried at a minimum depth of 48 inches below finished grade measured to the top of the conduit. A color coded plastic warning tape with a minimum thickness of 5 mil and a minimum width of 3 inches shall be installed in the trench and centered over the PVC conduit at a depth of from 18 to 30 inches below finish grade.

(2) Cable crossings under existing paved streets shall be accomplished by jacking or boring unless open trenching is authorized by the Engineer or Agency. The cable shall be placed within a schedule 40 PVC conduit or better at a minimum depth of 48 inches.

(B) Telecommunications cables other than "trunk lines" shall be installed as described below.

(1) If a cable is to be installed within the right-of-way of an arterial or collector street, it shall be placed at a minimum depth of 36 inches below finished grade. A color coded plastic warning tape as described in "A" shall be placed 18 inches below the surface.

(2) If a cable is to be installed within the right-of-way of a local/residential street it shall be placed at a minimum depth of 24 inches below finished grade.

(3) Cable crossings under existing, paved streets shall be accomplished by jacking or boring unless open trenching is authorized by the Engineer or Agency.

360.4 CABLE LOCATING (FIBER OPTIC):

If a cable which is to be installed is fiber optic a tracing or locating wire shall be installed with the cable.

360.5 PAYMENT:

Payment will be made at the contract unit price bid per lineal foot.

- End of Section -

PART 400

RIGHT-OF-WAY AND TRAFFIC CONTROL

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SECTION 401

TRAFFIC CONTROL

401.1 DESCRIPTION:

Traffic control shall consist of traffic control devices and flagmen or pilot cars. All traffic control devices, the application of traffic control measures, and traffic regulation in these specifications are to supplement and are not intended to delete any of the provisions of the Contracting Agency's Traffic Barricade Manual, the Uniform Manual on Traffic Control Devices or any agency's Supplements to these Uniform Standard Specifications.

401.2 TRAFFIC CONTROL DEVICES:

Traffic control devices shall consist of providing, erecting, and maintaining necessary and adequate devices for the protection of the work, the workmen and the traveling public as approved by the Engineer.

(A) Temporary traffic control devices shall be used to guide traffic through construction areas. They include traffic cones to channelize traffic, portable barricades for warning, vertical panel channelizing devices to divert traffic, and lighting devices between the hours of sunset and sunrise.

(B) Advance warning devices shall be used to alert the motorist of an obstruction in the roadway. They include diamond-shaped signs, flags, and flasher type high level warning devices mounted 8 feet above the roadway.

401.3 FLAGMEN OR PILOT CARS:

Flagmen or pilot cars shall consist of providing sufficient flagmen, uniformed off-duty law enforcement officers or pilot cars to expedite the safe passage of traffic.

401.4 TRAFFIC CONTROL MEASURES:

The application of all traffic control measures shall be based primarily upon the conditions existing at the time that such measures are deemed necessary. Prior to the start of any work that would interrupt the normal flow of traffic; sufficient and adequate devices and measures shall be provided and erected as directed by the Engineer. These devices shall be immediately removed when no longer needed.

401.5 GENERAL TRAFFIC REGULATIONS:

A traffic lane shall be a minimum of 10 feet of clear street width with a safe motor vehicle operating speed of at least 25 miles per hour.

An intersection shall be all of the area within the right of way intersection streets plus 300 feet beyond the edge of the intersected right of way on all legs of the intersection.

A minimum of two traffic lanes, one for each direction, shall be maintained open to traffic at all times on all major streets.

(A) On Bond Issue and Budget Projects: All existing traffic lanes on major streets shall be maintained open to traffic at signalized intersections between the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. weekdays unless otherwise specified in the special provisions.

(B) On Improvement District Projects: All existing traffic lanes on major streets shall be maintained open to traffic between the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. weekdays. All work that enters or crosses a major street must be done at times other than 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. unless otherwise specified in the special provisions.

Local access shall be maintained to all properties on the project at all possible times. When local access cannot be maintained, the Contractor must notify the affected property owner at least 24 hours in advance and restore access as soon as possible.

A traffic lane shall not be considered as satisfactorily open to traffic unless it is paved with hot mix or cold mix asphalt paving if surrounded by or adjacent to existing pavement. Where pavement did not previously exist or where all of the existing pavement has been removed, a traffic lane shall not be considered as satisfactorily open to traffic unless it is graded reasonably smooth and maintained dust free as directed by the Engineer.

Arrangements for partial or complete street closure permits shall be handled through the Engineer on local projects or the Arizona Highway Department, Resident Engineer on Federal Aid Projects, to the Contracting Agency's Traffic Engineering Department. An advance notice of 48 hours for major streets and 24 hours for local streets and alleys is required from the Contractor.

The Contractor shall provide and maintain all necessary traffic controls to protect and guide traffic for all work in the construction area.

The Contractor shall maintain all existing STOP, YIELD, and street name signs erect, clean, and in full view of the intended traffic at all times. If these signs interfere with construction, the Contractor shall temporarily relocate the signs away from construction but still in full view of the intended traffic.

The Traffic Engineering Department will reset all STOP, YIELD, and street name signs to permanent locations.

Existing traffic signs other than STOP, YIELD, and street name signs shall be maintained by the Contractor until such time as construction renders them obsolete. At that time the Contractor shall remove signs and posts without damage and deliver them as directed by the Engineer. The Traffic Engineering Department will reinstall all traffic signs.

Subject to the approval of the Traffic Engineer, the Contractor shall furnish and install the 25 MPH Construction Zone Speed Limit Signs. The Contractor shall maintain the signs erect, clean and in full view of the intended traffic at all times. Should the signs interfere with construction, the Contractor shall relocate the signs as necessary.

At any time project construction shall require the closure or disruption of traffic in any roadway, alley, or refuse collection easement such that normal refuse collection will be interfered with, the Contractor shall prior to causing such closure or disruption, make arrangements with the Contracting Agency's Sanitation Department in order that refuse collection service can be maintained.

Special traffic regulation will be listed in the special provisions.

401.6 MEASUREMENT:

No measurement will be made for traffic control devices.

Flagmen, uniformed off-duty law enforcement officers or pilot cars, with driver, will be measured by the hour for each individual, including vehicle and equipment, required to perform traffic control. When an officer is used less than 3 hours, a minimum of 3 hours will be charged. Anything over 3 hours will be measured by the hour.

401.7 PAYMENT:

Payment will be made at the contract bid price in the proposal for uniformed, off-duty law enforcement officer. If the officer is utilized in excess of 8 hours in any calendar day or in excess of 40 hours in any calendar work week, payment shall be at the rate of 1 1/2 times the contract bid price for all hours worked in excess in either of the above time periods.

- End of Section -

SECTION 405

SURVEY MONUMENTS

405.1 DESCRIPTION:

This work shall consist of furnishing and installing survey monuments at the locations shown on the plans or directed by the Engineer. The work also includes the preparation and recording of a corner record or results of survey in accordance with the Arizona State Board of Technical Registration requirements.

Monuments shall conform to the standard details or details shown on the plan.

405.2 MATERIALS:

The concrete portion of monuments shall be constructed in accordance with the provisions in Sections 725 and 505. Concrete shall be Class B.

Brass caps for survey monuments shall be furnished by the Contractor unless otherwise specified.

405.3 CONSTRUCTION:

Monuments may be cast in drilled holes without the use of forms.

Survey monuments shall be set vertically in the ground.

The brass cap assembly shall be firmly embedded in the concrete cylinder before the concrete has acquired its initial set. The concrete cylinder shall be so located that, the reference point will fall within a 1 inch circle in the center of the brass cap.

The tops of survey monument covers shall be set flush with the pavement surface.

405.4 MEASUREMENT:

Survey monuments will be measured by the number of units of each type of monument constructed and accepted.

405.5 PAYMENT:

Payment for monuments will be at the contract unit price and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the monuments, complete in place, as shown on the plans or as directed by the Engineer including preparing and recording a corner record or results of survey.

– End of Section –

SECTION 410

PRECAST SAFETY CURBS

410.1 DESCRIPTION:

This work shall consist of furnishing and installing precast safety curbs as shown on standard details or as detailed on the plans, or as directed by the Engineer.

410.2 MATERIALS:

Portland cement concrete shall be Class A, conforming to the applicable requirements of Section 725.

Steel reinforcing shall conform to the requirements of Section 727. The dimensions of the precast curb shall be as indicated on the plans and standard details.

Dowels shall conform to ASTM A615 plain, intermediate grade, 1/2 inch round by 24 inches.

Mastic may be either a fiberized mastic cement or an epoxy cement. The Contractor shall submit to the Engineer, the type of mastic and manufacturer's recommended procedures for use, within 10 days after the date of award of contact which will enable the Engineer to determine that the proposed material is acceptable.

410.3 CONSTRUCTION METHOD:

Back of safety curbs shall be set at the property line unless otherwise shown on the plans. Curbs shall be kept a minimum distance of 5 feet from driveways.

Precast safety curb installed on natural earth or gravel surfaces shall be secured in place with a minimum of 2 steel dowels through each curb. A minimum 12 inches diameter by 12 inches deep Class B concrete cylinder or approved equal shall be poured in place around each dowel.

Precast safety curb installed on Portland cement concrete or asphalt concrete surfaces shall be bedded in a continuous layer of mastic cement under its complete base area and secured with a minimum of 2 steel dowels driven through the safety curb.

Dowels shall extend into the sub-surface and/or concrete cylinder a minimum of 18 inches. When installed, the top of each dowel shall be flush with the top of the safety curb.

The Engineer will verify locations of all safety curbs in the field at time of construction.

410.4 MEASUREMENT:

Measurement will be the number of safety curbs furnished and installed, complete in place.

410.5 PAYMENT:

Payment will be made at the unit price bid each in the proposal for the following:

(A) Safety curbs installed on natural earth or gravel.
(B) Safety curbs installed on Portland cement concrete.
(C) Safety curbs installed on asphalt concrete.

- End of Section -

SECTION 415

FLEXIBLE METAL GUARDRAIL

415.1 DESCRIPTION:

The work under this section shall consist of furnishing all materials, constructing new guardrail, and delineating guardrail sections at the locations shown on the plans.

Guard rail end treatments shall be as specified on the plans or special provisions.

415.2 MATERIALS:

The rail elements, bolts, nuts and other fittings shall conform to the specifications of AASHTO M 180, except as modified in this section. The rail metal shall conform to AASHTO M 180, Type I, Class A and in addition to the requirements of AASHTO M 180, shall withstand a cold bend, without cracking of 180 degrees around a mandrel of a diameter equal to 2 1/2 times the thickness of the plate.

Three certified copies of mill test reports of each heat from which the rail element is formed shall be furnished to the Engineer.

All materials shall be new, except as otherwise noted on the plans or special provisions.

Railing Parts furnished under these specifications shall be interchangeable with similar parts regardless of source. All surfaces of guardrail elements that are exposed to traffic shall present a uniform, pleasing appearance and shall be free of scars, stains or corrosion.

Nails shall be 16 penny common galvanized.

Bolts shall have shoulders shaped to prevent the bolts from turning.

Unless otherwise specified the rail elements, terminal sections, bolts, nuts, and other fittings shall be galvanized in accordance with Section 771. Where galvanizing has been damaged, the coating shall be repaired in accordance with Section 771.

Guardrail reflector tabs shall be either 3003-H14 Aluminum strip 0.063 ± 0.004 inches thick, or steel strip 0.078 ± 0.008 inches thick galvanized in accordance with ASTM A 653 coating designation G 90. The reflector material shall be high-reflectivity sheeting, either silver-white or yellow and shall conform to the requirements of Arizona State Department of Transportation Standard Specifications for Road and Bridge Construction. Adhesive for sheeting attachment to the metal tab shall be of the type and quality recommended by the sheeting manufacturer. Reflector tabs shall conform to the Reflector Tab Detail of Maricopa County Department of Transportation Standard Detail 3002.

Timber for posts and blocks shall be rough sawn (unplanned) or S4S with the nominal dimensions indicated. Any species or group of woods graded in accordance with the requirements for Timber and Posts of the Western Wood Products Association may be used. Timber shall be No. 1 or better, and the stress grade shall be as follows:

6” by 8” Post and Block	1200 psi
8” by 8” Post and Block	900 psi
10” by 10” Post and Block	900 psi

When the plans show guardrail systems using 8” by 8” timber posts and blocks, the Contractor may use 8 1/4” nominal size posts and blocks with a stress grade of 825 pounds per square inch.

At the time of installation, the dimensions of timber posts and blocks shall vary no more than plus or minus 1/2” from the nominal dimensions as specified on the project plans. The size tolerance of rough sawn block in the direction of the bolt holes shall vary no more than plus or minus 3/8”.

All timber shall have a preservative treatment as per the requirements of AASHTO M 133.

Structural steel shapes shall conform to the requirements of ASTM A36 and be galvanized in conformance with the appropriate requirements of AASHTO M 111. Dimensions shall meet the dimensional requirements of the American Institute of Steel Construction.

Steel tubes shall conform to the material requirements of ASTM A500 or A501 and be galvanized in conformance with the requirements of AASHTO M 180, Type 1.

415.3 CONSTRUCTION REQUIREMENTS:

415.3.1 General: The construction of the various types of guardrail shall include the assembly and erection of all component parts complete at the locations shown on the project plans or as directed by the Engineer.

Posts shall be as indicated by plans, standard details, or special provisions. Only one type and size of post and block shall be used for any one continuous length of guardrail.

Terminal sections shall be installed in accordance with the manufacturer's recommendations.

Workmanship shall be equivalent to good commercial practice and all edges, bolt holes and surfaces shall be free of torn metal, burrs, sharp edges and protrusions.

The various types of guardrail shall be constructed with wood posts and wood blocks, except as otherwise noted on the plans.

The bolted connection of the rail element to the post shall withstand a 5,000 pound pull at right angles to the line of the railing. All metal work shall be fabricated in the shop. No punching, cutting or welding shall be done in the field, except as provided for by the project plans. All metal cut in the field shall be cleaned and the galvanizing repaired in accordance with Section 771.

Where field cutting or boring of wood posts and blocks is permitted, the affected areas shall be thoroughly swabbed with at least two passes of the same type of wood preservative as initially used.

Where wood posts with rectangular sections are used, the posts shall be set so that the longest dimension is perpendicular to the rail.

All bolts shall extend beyond the nuts a minimum of two threads, except that all bolts adjacent to pedestrian traffic shall be cut off flush to the nut.

Bolts extending more than 2" beyond the nut shall be cut off to less than ½" beyond the nut.

Unless otherwise shown on the plans, bolts shall be torqued as follows:

Diameter of Bolt	Torque, Foot/Pounds
5/8"	45-50
3/4"	70-75
7/8" and larger	120-125

All bolts, other than those specified to be torqued, shall be securely tightened.

When guardrail is being constructed under traffic, the work shall be conducted so as to constitute the least hazard to the public. Guardrail work shall be performed in the direction of traffic flow when feasible.

Any section of guardrail that is removed for modification shall be replaced within five calendar days of the date the guardrail is removed, unless otherwise directed by the Engineer. At the end of each day, incomplete guardrail sections having an exposed end toward oncoming traffic shall have an appropriate temporary protective end treatment acceptable to the Engineer set securely in place together with approved overnight traffic control devices set in place.

415.3.2 Delineation: The maximum spacing between reflector tabs shall not exceed six posts. The slotted part of the tab shall be installed under the mounting bolt head so that the Reflectorized surface of the tab faces oncoming traffic. The exposed ends of the slotted part of the tab shall be bent up against and then over the top of the bolt head. The color of the reflective portion of the barrier markers shall conform to the color of the adjacent edge line. Silver-faced reflector tabs shall be installed on the right

hand side of all roadways, and yellow-faced tabs shall be installed on the left-hand side of one-way, or median divided roadways.

415.3.3 Roadway Guardrail: Wood posts shall be used for new guard rail installations unless otherwise indicated by plans or special provisions. Wood posts shall either be driven or placed in manually or mechanically dug holes; however, driven posts will not be permitted at locations where damage to the curb, gutter, sidewalk, buried items, shoulders or pavement might occur. The Engineer will be the sole judge as to whether driving of posts will be allowed. Driving of posts shall be accomplished in a manner that will prevent battering, burring, or distortion of the post. Any post which is damaged to the extent it is unfit for use in the finished work, as determined by the Engineer, shall be removed and replaced at no additional cost to the Agency.

The posts shall be firmly placed in the ground. The space around posts shall be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer shall be moistened and thoroughly compacted to the density of the surrounding material.

Where pavement is disturbed in the construction of guardrail, the damaged surfacing shall be repaired as approved by the Engineer.

Where a culvert or other obstacle is at an elevation which would interfere with full depth post placement, guardrail installation shall comply with requirements of Section 415.3.4 Bolted Guardrail Anchors or Section 415.3.5 Nested Guardrail.

Wood blocks shall be toe nailed to the wood post with one 16 penny galvanized nail on each side of the top of the block. Wood blocks shall be set so that the top of the block is no more than ½" above or below the top of the post, unless otherwise shown on the project plans.

Rail elements shall be spliced at 25 foot intervals or less. Rail elements shall be spliced at posts unless otherwise shown on the project plans and shall be spliced by lapping in the direction of traffic in the nearest adjacent lane. Rail elements at joints shall have full bearing. When the radius of curvature is 150 feet or less, the rail elements shall be shop curved.

The Contractor shall dispose of surplus excavated material remaining after the guard railing has been constructed.

415.3.4 Bolted Guardrail Anchors: Where the elevation of the top surface of a concrete box culvert or other similar installation prevents the placement of a post of the specified length, the posts shall be shortened and anchored in accordance with Maricopa County Department of Transportation Standard Detail 3010.

415.3.5 Nested Guardrail: This work shall consist of furnishing and constructing nested guardrail, Type 1, 2, or 3, as shown in Maricopa County Department of Transportation Standard Details 3008-1 through 3008-3.

415.3.6 Guardrail to Structure Transitions: Guardrail transitions shall be constructed in accordance with requirements shown on the plans and special provisions.

415.4 MEASUREMENT:

The limits of measurement for roadway guardrail shall be as detailed in Maricopa County Department of Transportation Standard Detail 3016, except as otherwise noted on the plans or special provisions. Guardrail, of the type shown on the project plans, will be measured by the linear foot along the face of the rail element from center to center of posts, exclusive of guardrail terminals, guardrail end terminal assemblies, nested guardrail (Types 1, 2 and 3) and guardrail transitions.

Delineation is considered a part of installation of guardrail and hence will not be measured as a separate item.

The accepted quantities of guardrail posts secured with bolted guardrail anchors will be measured by the unit each.

Nested guardrail, Types 1, 2, or 3, and guardrail transitions will be measured by the unit each, complete in place and accepted as shown on the plans.

415.5 PAYMENT:

Payment for accepted quantities of each type of guardrail will be made at the contract unit price. Payment shall be full compensation for furnishing materials and installing guardrails, complete in place including excavation, backfill, and disposal of surplus material.

Payment for Bolted Guardrail Anchors will be at the contract unit price, and shall be full compensation for the work, complete in place, including steel brackets, hardware, excavation, backfill, removing and replacing surfacing, cutting and fitting steel beam posts or timber posts, drilling anchor bolt holes in steel posts, timber posts, and box culverts, and disposal of surplus materials.

Payment for guardrail transitions will be at the contract unit price. Payment shall be full compensation for furnishing materials and installing guardrail transitions, complete in place including excavation, backfill, and disposal of surplus material.

- End of Section -

SECTION 420

CHAIN LINK FENCES

420.1 DESCRIPTION:

This work shall consist of constructing chain link fences at the locations and in accordance with the details shown on the plans, and as provided in these specifications and the special provisions. When installation procedures are not covered within these specifications, standard details, special provisions, plans or other documents, installation will comply with ASTM F567.

420.2 MATERIALS:

Chain link fence material shall conform to the requirements of Section 772. Portland cement concrete shall conform to the requirements of Section 725.

420.3 CONSTRUCTION METHODS:

420.3.1 Fence Construction: Before any fence is installed, the Contractor shall submit to the Engineer for approval, shop drawings showing the details of all fittings and gates proposed to be furnished.

Posts shall be spaced at not more than 10 foot intervals, measured from center to center of posts, and shall be placed in a vertical position.

Changes in line or grade where the angle of deflection is 30 degrees or more shall be considered as corner and slope points, respectively, and corner or slope posts shall be installed at these points.

All posts shall be set in Class C concrete footings, which footings shall be crowned at the top to shed water. Footings for line posts for 72 inch fabric or less shall not be less than 30 inches deep and 8 inches in diameter, and footings for line posts for fabric more than 72 inches shall be shown on plans. All other footings, unless otherwise indicated on the plans or in the special provisions, shall be not less than 36 inches deep and 12 inches in diameter.

End, corner, slope and gate posts shall be braced to the midpoint of the nearest line post or posts with horizontal braces used as compression members and the said line posts trussed from the brace back to the bottom of the end, corner, slope or gate post with 3/8 inch steel truss rods with turnbuckles used as tension members.

Unless otherwise specified all fence shall be installed with a top rail and a bottom tension wire and the post tops shall be secured to the post by bolts or rivets. When top rail is omitted, a top and bottom tension wire shall be used.

The fabric shall be placed on the outward facing side of the posts and shall be installed so that the top edge projects above the top rail of the fence to form a knuckled or barbed projection. The fabric shall be stretched taut and securely fastened to the posts, the top rail, and the bottom tension wire. The tension wire shall be installed on a straight grade between posts by excavating the high points of ground and in no case will filling of depression be permitted. Unless otherwise specified the bottom of the fence shall be on a line approximately 2 inches above the ground surface.

The fabric shall be fastened to end, corner, slope and gate posts with 3/16 inch × 3/8 inch high carbon steel tension bars and not less than 12 gage × 1 inch steel tension bar bands spaced at 16 inch intervals; and to line posts, top rail and tension wire with 11 gage or heavier tie wires or metal bands. Tire wires or metal bands shall be placed on line posts at intervals of approximately 16 inches, and on top rail and tension wire at intervals of approximately 18 inches.

Barbed wire shall be installed on the fence only when specifically required by the plans or special provisions. When required, it shall be installed on extension arms of a type specified under Section 772.

420.3.2 Construction of Gates: The widths of any gates to be installed will be indicated on the plans or in the special provisions. Gates in which the width of the leaf is greater than 6 feet shall be constructed with an internal horizontal or vertical stiffener of the same diameter as the frame; the frame shall be trussed with a 3/8 inch adjustable tension rod. Gates in which the width of the leaf is 6 feet or less will not require a stiffener and will require only 1 truss rod.

The corners of gate frames shall be fastened together and reinforced with a fitting designed for the purpose or by welding. All welds shall be ground smooth.

Chain link fence fabric shall be attached to the gate frame by the use of tension bars and tie wires as specified for fence construction, and suitable tension connectors spaced at approximately 16 inch intervals.

The swing gates shall be hung by at least 2 steel or malleable iron hinges, so designed as to securely clamp to the gate post and permit the gate to be swung back against the fence.

Semi-cantilever gates shall be provided with a combination steel or malleable iron catch and locking attachment of approved design, and shall be subject to approval of the Contracting Agency. Stops to hold gates open and a center rest with catch shall be provided on all double drive gates and on all other gates where required.

420.3.3 Repair of Damaged Coating: Welds made after galvanizing shall be ground smooth, then wire brushed to remove loose or burned zinc coating, after which the cleaned areas shall be repaired to the satisfaction of the Engineer in accordance with Section 771. Repairs to abraded or otherwise damaged zinc coating shall be made in a similar manner.

420.4 MEASUREMENT:

Chain link fence shall be measured on the fence line along the bottom strain wire from center to center of end posts, deducting the widths of gates and openings.

420.5 PAYMENTS:

The price bid and paid per linear foot for chain link fence shall include full compensation for furnishing all labor, materials, tools, and equipment, and doing all the work involved in constructing the fence complete in place as specified on the plans, and in the special provisions, except for furnishing and installing gates.

Gates will be paid for at the unit price bid for each size of gate required by the plans or special provisions, which price shall include full compensation for furnishing the gates, together with all necessary gate posts, fittings and hardware, and doing all the work involved in installing the gates complete in place as specified. If double gates are required, each double gate will be paid for at the unit price bid and such unit price shall include furnishing and installing both leaves.

Full compensation for clearing the line of the fence and disposing of the resulting material, excavating high points in the existing ground between posts, excavating and furnishing and placing concrete footings, connecting new fences to structures and existing fences, and any other related work shall be considered as included in the price bid per linear foot of fence and no additional allowance will be made therefore.

- End of Section -

SECTION 424

PARKWAY GRADING

424.1 DESCRIPTION:

This grading shall include all work necessary to bring the surface of the parkway, between the back of curbs and sidewalks and/or the parkway between sidewalks and the right-of-way line, to the grade and cross-section shown on the plans or as directed by the Engineer. It shall also include median islands between divided roadways.

424.2 ROUGH GRADING:

(A) Fill material shall contain no rocks over 3 inches in diameter, broken concrete, or debris of any nature.

(B) Backfill behind curbs and along the edges of the sidewalk shall be made immediately upon the completion of those items.

424.3 FINE GRADING:

(A) The finished surface shall be free from stone and all debris and be true to grade and cross-sections after compaction to not less than 80% of maximum density, as determined by test methods specified in Section 301.

(B) Where existing parkways are planted in grass, flowers, or shrubs and the level is somewhat above the top of the curb, or sidewalk, the parkway shall be graded back on a 4:1 slope from the edge of curb or sidewalk, with the least possible damage to the planted area.

424.4 PAYMENT:

Unless otherwise provided in the special provisions or proposal, no payment will be made for parkway grading as such; the cost thereof shall be included in the price bid for construction or installation of the items to which such grading is incidental or appurtenant.

- End of Section -

SECTION 425

TOPSOILS

425.1 DESCRIPTION:

This work shall consist of furnishing and hauling topsoil from an approved source and placing the topsoil as shown on the plans, in accordance with this specification and special provisions.

425.2 MATERIALS:

Topsoil shall conform to the requirements of Section 795.

425.3 CONSTRUCTION METHODS:

Prior to the excavation of topsoil, all grass, weeds, brush, stumps, loose rocks and other objectionable material shall be removed from the surface of the area from which the topsoil is to be removed.

The topsoil source shall be excavated in such a manner that all material excavated will be of the same composition and structure throughout.

Topsoil shall be spread over the areas and to the depths as specified, and shall be water settled.

After the topsoil has been spread, stumps, roots and other objectionable matter shall be removed from the surface of the area and disposed of in a manner satisfactory to the Engineer.

425.4 MEASUREMENT:

Unless otherwise specified, topsoil shall be measured by the cubic yard in place and loose after watering and settling.

425.5 PAYMENT:

The quantities measured as provided above, will be paid for at the contract price per cubic yard for furnishing and placing topsoil, which price shall be full compensation for the item complete, as described and specified.

- End of Section -

SECTION 430

LANDSCAPING AND PLANTING

430.1 DESCRIPTION:

This section shall govern the preparation and planting of landscape areas required in the Plans or Specifications. Materials will be in accordance with Section 795.

Existing utilities and improvements not designated for removal shall be protected in place. Any damages will be repaired by the Contractor at no additional cost to the Contracting Agency.

Unless otherwise provided, walls, curbs, planter boxes, irrigation systems, and other improvements shall be constructed after rough grading has been completed and prior to finish grading.

430.2 GENERAL:

Landscape or planting areas shall not be cultivated when they are so wet as to cause excessive compaction or so dry as to cause excessive dust or the formation of large clods.

Prior to any grading the areas shall be cleared and grubbed in accordance with Section 201, Clearing and Grubbing.

Finish grade for these areas shall not vary more than 1 inch from the specified grade and cross-section and shall be a smooth uniform surface, free of any abrupt grade changes or depressions. Unless otherwise specified, finish grade below adjacent paving, curbs, or headers shall be 1 inch for lawn and granite areas and 3 inches for planting areas.

Unless otherwise specified, in-place soil will be prepared and conditioned for utilization as topsoil. If imported topsoil is specified or has to be used, the existing soil, before subgrade, shall be scarified to a depth of 6 inches prior to placing the topsoil and the thickness of the topsoil layer shall be at least 6 inches.

All landscape and planting areas, except those intended for lawns, shall be treated with a pre-emergence control, such as “Surflan” or equal, applied in accordance with the manufacturer's recommendations.

430.3 LAWN AREAS:

430.3.1 Preparation of In-Place Soil: After clearing and grubbing has been completed, the existing surface shall be scarified and cultivated to a minimum depth of 8 inches; then brought to finish grade. During the operation, debris, including all stones over 1 inch in any dimensions, shall be removed and disposed of offsite.

After clearing and grubbing and initial cultivation has been completed, chemical fertilizer, 16-20-0 composition, shall be mechanically spread over the entire area at an average rate of 10 pounds per 1000 square feet. After spreading, the fertilizer shall be cultivated into the top six inches of soil using suitable equipment. The resulting soil shall be in a friable condition, suitable for planting.

The Engineer shall inspect and approve these areas prior to seeding.

430.3.2 Seeding: If a Bermuda summer lawn has not been established during its normal planting season, April through September, then rye grass (Solium Multi-folium) seed will be planted.

The rate of seeding shall be 3 1/2 pounds of Bermuda seed or 15 pounds of rye seed per 1000 square feet.

After seeding has been completed, the entire area shall be rolled with a lawn roller for leveling and seed retention. Immediately after rolling, the area shall be watered with a mist type spray until the soil is wet to a depth of 2 inches.

The Contractor shall provide the necessary safeguards to protect the planted areas from damage by erosion or trespass. Any damaged areas or any areas, greater than 6 inches in diameter, which fail to show a good stand shall be repaired and replanted until an acceptable stand of grass is obtained.

430.3.3 Maintenance: The Contractor shall be responsible for maintenance of the lawn areas until they are accepted by the Contracting Agency. This shall include watering, mowing, weeding and removal of all debris.

430.4 DECOMPOSED GRANITE AREA:

Decomposed granite shall be in accordance with Section 795. The Contractor shall confirm that a sufficient quantity is available so that the entire area will be of the same composition and appearance, and shall furnish a sample to the Engineer for approval as to color.

After preliminary grading is completed and the area has been cleared and grubbed, a pre-emergence control, such as Surflan, or equal, shall be applied over the entire area, in accordance with the manufacturer's recommendations. The decomposed granite shall be evenly distributed over the area with a minimum depth of 2 inches. Finish grading will be accomplished and the granite will be lightly watered and then compacted to an extent satisfactory to the Engineer. After compaction, a second treatment with the pre-emergence control will be accomplished.

430.5 TREE, SHRUB, AND GROUND COVER PLANTING:

The species, sizes, the manner in which to be furnished, and the approximate number are as shown in the plant list. The quantities, as listed, are approximate and the Contractor shall furnish and install all plant material necessary to complete the plantings as shown on the landscape plan. Change order adjustment will be made for unit price proposals, but not for lump sum proposals.

430.5.1 Substitutions: All requests for substitutions must be submitted in writing to the Contracting Agency prior to commencement of work on the project. The Contractor shall not take any further action concerning his request until a written approval or denial is received from the Contracting Agency. Plants of kinds other than those indicated on the plant list will be considered by the Contracting Agency only upon submission of proof that the specified plant is not reasonably procurable in the local region. Substitutions will resemble the specified plant in regards to appearance, ultimate height, shape, habit of growth, and general soil requirement.

Substitution of a larger size of the same species may be made by the Contractor without written approval. However, the Contracting Agency will not be responsible for any additional costs incurred by the Contractor, either for the additional cost of the plants or for any additional planting costs.

430.5.2 Plant Inspection Prior to Delivery to the Project Site: Prior to delivery of any species to the project site, the Contractor shall make the necessary arrangement with the Engineer for an inspection of the plant material at the offsite location. Any plants found to be unsuitable in growth or condition or which are not true to name shall be removed and replaced with acceptable plants.

430.5.3 Plant Protection after Delivery to the Project Site: Plants transported to the site shall be planted as soon as possible. During any interim storage period, they shall not be exposed to excessive sun or drying winds. Any stock, that in the opinion of the Engineer has deteriorated due to exposure or has been damaged during transporting, will be removed and replaced at the Contractor's expense.

430.5.4 Plant Location: The Contractor shall stake out the location of planting areas and plantings pit prior to any excavation. Subject to the Engineer's approval, minor relocations may be accomplished at this time to avoid unsuitable conditions, such as utilities, rocky areas, poor soil, etc. If major relocations are necessary, the Engineer will provide revised plans.

430.5.5 Ground Cover Areas: The planting beds shall be brought to finish grade before spreading the fertilizer or conditioning material specified. Fertilizing and conditioning material shall be mechanically spread at a uniform rate over the entire bed area. After spreading, this material shall be uniformly cultivated into the upper 6 inches of soil using suitable equipment. The resulting soil shall be in a friable condition suitable for planting. A pre-emergence control application is required prior to planting.

Ground cover shall be planted in moist soil with the spacing as indicated on the plans. Each plant shall be planted with its proportionate amount of soil so as to minimize root disturbance. After planting, the area shall be raked to restore a smooth finish grade and to provide drainage. Watering will begin immediately.

The Contractor is responsible for maintaining these areas until acceptance by the Contracting Agency. Maintenance will include protection from trespass or damage, weeding, watering, and removal of all debris. It may be necessary to install a protective fence or barrier around these areas until growth is assured.

430.5.6 Shrub and Tree Pits: Planting pits shall be approximately circular with a diameter and depth at least twice the size of the plant ball or container. It must be large enough to permit handling and planting without injury or breakage of the root ball or root system. Unless otherwise specified, the excavated soil will be conditioned and used as prepared soil mix for backfill. Plants will not be allowed to stand in these pits without watering.

Prepared soil mix shall consist of one part organic soil conditioner (Section 795), two parts excavated soil and one pound of gypsum and four ounces of soil sulphur per tree or one-half pound of gypsum and two ounces of soil sulphur per shrub. The backfill shall be produced by thoroughly combining these components into a homogeneous mixture. The Contractor shall notify the Engineer prior to mixing prepared soil so that he may observe the mixing process. In addition, during backfilling, slow release fertilizer tablets, Agriform 21 gram tablets with a 20-10-5 analysis, shall be added in the following quantities:

For one-gallon container ..... 1 tablet
For five-gallon container ..... 2 tablets
For fifteen-gallon container ..... 4 tablets
For twenty-four inches or larger box ..... 6 tablets

All containers shall be opened and removed in such a manner that the roots of the plant are not damaged. Balled plants wrapping shall be loosened or cut back after the plant is positioned in the pit.

A layer of prepared soil mix shall be placed in the pit and the plant shall be set approximately in the center of the hole with the root crown at its natural growing depth with respect to finish grade. The plant shall be faced so as to present the best appearance and relationship to adjacent plants or structures. It shall be rigidly constrained until backfilling with prepared soil mix and slow release fertilizer tablets is completed. The backfill will be thoroughly settled by tamping and watering so that all voids are filled.

Trees shall be supported by two tree stakes (Section 795) with a top tie placed for maximum support and a second tie placed midway between top tie and ground level.

After planting, the plants shall be pruned as directed by the Engineer.

430.6 HEADER INSTALLATION:

Headers shall be installed at the location and grades as shown on the plans prior to planting operations. Stakes shall be located at corners and at intervals not to exceed 5 feet and shall be driven to slightly below the top of the header. Headers shall be nailed to the stakes with two nails, clinched 1/2 inch. Splice plates shall be used at butt joint; centered on the joint and nailed with four nails.

430.7 CLEAN UP:

Any debris or other material dropped onto paved or graded area during excavation or hauling operation shall be promptly removed and these areas shall be kept neat and clean at all times. Upon completion of planting operation, all remaining soil, stones, and other debris shall be removed from the site and disposed of to the satisfaction of the Engineer.

430.8 PLANT GUARANTEE AND MAINTENANCE:

The Contractor shall insure that all plant materials are in a sound, healthy, vigorous condition free from insects, bark abrasions, or other objectionable disfigurements and shall immediately replace any plant which is unacceptable at any time up to and including final acceptance of the project or completion of the plant establishment period whichever occurs later. When the termination of the plant establishment period extends beyond the final acceptance date for the project, this additional period of

time for plant establishment may be considered as a special warranty period within the standard 1-year guarantee period and the Engineer may authorize final payment in accordance with Section 109. Unless otherwise authorized by the Engineer, the Contractor shall maintain all landscaped areas on a continuous basis as they are completed during the course of work and until final project acceptance or the termination of the plant establishment period, whichever occurs later.

Maintenance shall include keeping the landscape areas free of debris and weeding and cultivating the planted areas at intervals acceptable to the Engineer. The Contractor shall provide adequate personnel to accomplish the required maintenance. Pruning and restaking of plants shall be as directed by the Engineer.

430.9 PLANT ESTABLISHMENT PERIOD:

The Contractor shall request an inspection by the Engineer whenever substantial completion of the planting and related work has been accomplished. After this initial inspection, and subject to his approval of the work, the Engineer will issue a written field notification to the Contractor setting the effective, beginning date for plant establishment. The plant establishment period shall be for a period of 60 calendar days, but is subject to extension by the Engineer if the landscape areas are improperly maintained, appreciable plant replacement is required, or other corrective work becomes necessary.

At final project acceptance or at the end of the plan establishment period, a final acceptance inspection of the planted areas will be made by the Engineer.

430.10 MEASUREMENT AND PAYMENT:

Measurement and payment shall be in accordance with Section 109.

The lump sum or unit prices established on the proposal sheet shall be full compensation for furnishing all labor, material, tools, and equipment and for performing all work necessary to complete the landscaping operation to include planting of trees, shrubs, and ground cover.

- End of Section -

SECTION 440

SPRINKLER IRRIGATION SYSTEM INSTALLATION

440.1 DESCRIPTION:

The Contractor shall furnish all the necessary labor, materials, and equipment required to complete the installation of the automatic sprinkler irrigation system providing full coverage to all plants and shrubs.

440.2 GENERAL:

Unless otherwise specified, the automatic sprinkler irrigation system layout as shown on the plans shall be considered schematic. The Contractor shall lay out the entire system using stakes to indicate the location of the various components. Preliminary adjustments to conform to actual site condition shall be accomplished at this time and the approval of the Engineer obtained prior to any actual work being performed. Utility connections, both water and electrical, shall be as shown on the plans or as designated by the utility concerned. Unless specifically exempted in the plans or specifications, the Contractor shall pay all costs concerned in providing these services.

Prior to the acceptance of the project, the Contractor shall furnish the Engineer 4 copies of the manufacturer's instruction and maintenance manual for each component or group of components to include parts listings and source of supply.

Prior to final inspection, the Contractor shall submit one set of corrected, as-built drawings showing the location of all pipe, valves, wiring, and utility services.

All permits for installation or construction of any of the work included under this section, which are required by legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examinations required by these authorities.

440.3 MATERIALS:

Prior to the start of construction, the Contractor shall submit shop drawings per Section 105 on all material for approval of the Engineer. All materials shall conform to Section 757.

440.4 LANDSCAPE IRRIGATION SYSTEM REMOVAL AND RESTORATION

When construction encroaches into an existing landscaped irrigation system, the Contractor shall remove the conflicting portion of the system within the right-of-way and/or easements and any portion which may remain under the proposed improvements, whether shown or not shown on the plans. If the removals affect other areas of the system not in conflict with the construction, the Contractor shall permanently or temporarily restore or modify the existing system to provide water to the unaffected areas. The restoration or modifications shall be completed within 24 hours after the disruption occurs or notification by the Engineer.

The Contractor shall restore the affected landscape irrigation system to an operational condition equal to or better than the existing system. When necessary, bubbler and/or sprinkler heads shall be reinstalled at the edge of the new improvements. The reconstructed or modified system shall provide completed irrigation coverage without overspray onto walks, pavement, walls, buildings, etc.

The Contractor shall have the option to salvage and reuse existing materials. In the event that it is not feasible to reinstall the salvaged materials, new materials shall be installed.

To provide ample notification for owners who desire to remove and restore their own system, the Contractor shall notify the affected property owners at least fourteen (14) days prior to the scheduled removal of the irrigation system.

When determined by the Engineer that the existing sprinkler system cannot be practically restored, the existing system shall be plugged and removed as directed.

Unless specified by the agency and called out in the bid documents, this work shall be considered incidental to the contract and no separate payment shall be made to comply with these provisions.

440.5 TRENCH EXCAVATION AND BACKFILL:

Trenches and other excavations shall be sized to accommodate the irrigation system components, conduit, and other required facilities. Additional space shall be provided to assure proper installation and access for inspection. Unless otherwise specified, the minimum depth of cover over pipelines and conduits shall be as follows:

(A) Electrical conduit - 18 inches

(B) Waterlines continuously pressurized - 18 inches

(C) Lateral sprinkler lines - 12 inches

(D) Plastic lines under pavement - 24 inches

The bottom of trenches shall be true to grade and free of protruding stones, roots or other matter which would prevent proper bedding of pipe or other facilities.

Trenches and excavations shall be backfilled so that the specified thickness of topsoil is restored to the upper part of the trench. Compaction shall be in accordance with Section 301.

Water settling of trench backfill will not be permitted unless approved by the Engineer.

440.6 PIPE INSTALLATION:

(A) General**:** Pipe fittings shall be installed in accordance with the manufacturer's recommendations and these specifications. When requested by the Engineer, the Contractor shall furnish the manufacturer's printed installation instructions before pipe installation.

Pipe shall be bedded in at least 2 inches of finely graded native soil or sand to provide a firm, uniform bearing. After laying, the pipe shall be surrounded with additional finely graded native soil or sand to at least 2 inches over the top of the pipe. Trench backfill, sufficient to anchor the pipes, may be deposited before the pipeline pressure testing, except that joints shall remain exposed until satisfactory completion of testing.

When two or more pipelines are installed in the same trench, they shall be separated by a minimum horizontal clear distance of 6 inches and they shall be installed so that each pipeline, valve, or other pipeline component may be serviced or replaced without disturbing the other.

Piping under concrete or asphalt shall normally be installed by jacking, boring, or hydraulic driving. When any cutting or removal of asphalt and/or concrete work is necessary, it shall be saw cut in accordance with Section 601. Permission to cut asphalt and/or concrete shall be obtained from the Engineer. Where piping on the drawings is shown under paved areas, but running parallel and adjacent to planted areas, the intent of the drawings is to install the piping in the planted area.

When plastic to steel pipe connectors are required, these connections shall be accomplished first. A non-hardening, non-oil base pipe compound or liquid teflon shall be used on the male threads only. The joint shall be hand-tightened with final tightening as necessary to prevent leaks accomplished with a strap wrench.

Threads shall be cut with clean sharp dies and shall conform to American Standards Association Specification B2.

Joints shall be made with a non-toxic non-hardening joint compound applied to the male threads only.

(B) When wrapped pipe is specified, joints and connectors shall not be wrapped until completion of the pressure test.

(C) Plastic Pipe: Plastic pipe shall be cut square, externally chamfered approximately 10-15 degrees, and all burrs and fins removed. It shall be joined utilizing threaded fittings or socket type, solvent welded fittings. Schedule 80 pipe only will be used for threaded joints. Field threading will be accomplished in the same manner as specified for steel pipe, except that a plug will be installed in the bore of the pipe prior to threading to prevent distortion. Threaded pipe joints shall be made using teflon tape on the male threads. Solvent will not be used for threaded joints. Threaded joints shall be hand tightened with final tightening as necessary to prevent leaks with a strap wrench. Solvent welded joints shall be made in accordance with ASTM D2855, and the

type of solvent recommended by the pipe manufacturer shall be used. Solvent shall be applied to the pipe ends in such a manner that no material is deposited on the interior surface or forced into the interior of the pipe during insertion. Excess solvent on the exterior of the joint shall be wiped clean immediately after assembly.

The pipe shall be protected from damage during assembly. All vises shall have padded jaws and only strap wrenches shall be used. Any plastic pipe which has been nicked, scarred, or otherwise damaged shall be removed and replaced. Care shall be exercised so that stresses on the previously made joints are avoided. Movement of the pipe following assembly, such as lowering the pipe into the trench, shall not occur prior to the set time recommended by the manufacturer of the solvent cement used.

The plastic pipe will be snaked from side to side within the trench so as to provide approximately 1 foot of slack per each 100 feet of pipe.

The pipeline will not be exposed to water for at least 12 hours after the last solvent welded joint has been made.

440.7 VALVES, VALVE BOXES, AND SPECIAL EQUIPMENT INSTALLATION:

Valves, backflow preventers, pressure regulators and related accessories shall be furnished and installed as specified.

All valves and other equipment shall be installed in a normal upright position unless otherwise recommended by the manufacturer, and shall be readily accessible for operation, maintenance and replacement. Sectional control valves shall not be located within range of sprinklers they control.

Gate valves and sectional control valves shall be installed below ground. Gate valves shall be housed in a covered concrete or plastic box that will permit access for servicing. Sectional control valves shall be equipped with a sleeve and cap centered on the valve stem.

Quick-coupler valves and garden valves projecting above grade shall be installed a minimum of 3 feet from curbs, pavement and walks. In non-irrigated areas, quick-coupler valves shall be set flush with finish grade, and in irrigated areas at or just above water level. They shall be installed on a double swing joint riser assembly. Garden valves shall be set 12 inches above finish grade, and shall be installed on a galvanized riser. In non-irrigated areas all valve boxes, valve access sleeves, and caps shall be set to finish grade, and in irrigated areas set adjacent to curbs, sidewalks or pavement at or just above water level. Valves shall be set at sufficient depth to provide clearance between the cover and the cap, valve handle, or key when the valve is in the fully open position. Backflow preventers shall be provided with pipe supports and the accessories necessary to properly secure the assembly. All backflow preventers shall be assembled with pipe, fittings, and risers of an approved material by the contracting agency.

440.8 SPRINKLER HEAD INSTALLATION AND ADJUSTMENT:

In accordance with the requirements of Subsection 440.7 all mains and laterals, including risers, shall be flushed and pressure tested before installing sprinkler heads. A water coverage test shall be performed after the sprinkler heads are installed.

(A) Location, Elevation and Spacing: Sprinkler head spacing shall not exceed the maximum shown on the drawings or recommended by the manufacturer. They shall be installed with at least 4 inches clearance from adjacent vertical elements projecting above grade such as walls, planter boxes, curbs and fences. Bubbler heads shall be installed a minimum of 2 inches above finish grade. The Engineer will notify the Contractor in writing when the planted beds are sufficiently planted and settled to make the necessary adjustments to the bubbler heads. Any adjustments are to be made within sixty (60) calendar days after this notification is received and at no additional cost to the Contracting Agency.

(B) Riser Assembly: A top outlet riser assembly shall consist of a pipe riser threaded into a top outlet ell or tee installed in the lateral supply line. Double-swing joint and single-swing joint riser assemblies shall utilize a horizontal 6 inches pipe nipple threaded into a side outlet ell or tee installed in the lateral supply line. For a double-swing joint, 3 ells shall be used in the remaining assembly ahead of the vertical riser pipe. For a single-swing joint, one ell shall be used.

(C) Sprinkler Head Adjustment: After all sprinkler heads are installed and the irrigation system is operating, each section or unit shall be adjusted and balanced, with all section control valves fully open to obtain uniform and adequate coverage. Sprinkler heads having adjustable pin nozzles or orifices shall have the pins adjusted to provide adequate distribution of

water over the coverage pattern. The Contractor shall substitute larger or smaller nozzle cores in non-adjustable sprinkler heads as necessary.

440.9 AUTOMATIC CONTROL SYSTEM INSTALLATION:

The Contractor shall install a complete automatic irrigation control system including the automatic controller, remote control valves and wiring, and all necessary accessories and utility service connection including the junction box and any work required from the stubout provided by the power company.

The automatic controller shall be installed outside of the coverage pattern of the irrigation system at the location designated in the contract documents. The foundation for the controller shall be Class C concrete of the size shown on the plan or recommended by the manufacturer. The control components in the controller shall be fused and the chassis shall be grounded. The controller shall be installed in a steel security cabinet with metal hasp and padlocks unless the controller is to be placed with a building or walled enclosure.

Remote control valves shall be compatible with the automatic controller. The valve is to be housed in a plastic box with locking cover, and it shall be installed with at least a 6 inches clearance below the plastic cover. The box shall be set to finish grade in non-irrigated areas and adjacent to curbs, sidewalks or pavement at or just above high water elevation in irrigated areas.

All service wiring shall be installed in rigid conduit from the service point to the controller at the minimum depth specified in Subsection 440.2. A separate disconnect switch or combination meter socket, as required, shall be installed between the source of power and the controller. The minimum service wire shall be No. 12 AWG copper 600 volt type, TWH or larger as required by the contract documents or controller manufacturer. Wire splices shall be located only in specified pull boxes and shall be made with a packaged kit approved for underground use. Pull boxes shall be plastic with locking covers set to proper elevations on a 12 inches layer of crushed rock or washed gravel.

All wiring issuing from the controller shall be direct burial installed in main or lateral waterline trenches wherever practicable. The wiring shall be bundled and secured to the lower quadrant of the irrigation pipeline at 10 foot intervals with plastic electrical tape. Sufficient slack shall be left in the wiring or tubing to provide for expansion and contraction. When the control wiring or tubing cannot be installed in a pipe trench, it shall be installed a minimum of 18 inches below finish grade.
All pilot or “hot” wires are to be of one color and all common wires are to be of another color.

Unless otherwise required, all control wiring shall be direct burial Type UF, No. 14 AWG copper. Splices in control wire shall be made in accordance with the requirements for service wire. Sufficient slack shall be left at each splice and point of connection in pull boxes and valve boxes so that in case of repair the valve bonnet or splice may be brought to the surface without disconnecting the wire. No splices shall be permitted under pavement.

All wiring shall be tested for continuity, open circuits, and unintentional grounds prior to connecting the equipment.

Upon completion of the work the control system shall be in operating condition with an operational chart mounted within the controller cabinet.

440.10 FLUSHING AND TESTING:

After completion and prior to the installation of any terminal fittings, the entire pipeline system shall be thoroughly flushed to remove all foreign material. After flushing, the following tests shall be conducted in the sequence listed below. All equipment, materials, and labor necessary to perform the tests shall be furnished by the Contractor and all tests shall be conducted in the presence of the Engineer.

(A) Pipeline Pressure Test: A water pressure test shall be performed on all pressure mains and laterals before any couplings, fittings, valves, and the like are concealed. All open ends shall be capped after the water is turned into the lines in such a manner that all air will be expelled. Pressure mains shall be tested with all control valves to lateral lines closed. After the pressure main test, all valves shall be opened to test lateral lines. The constant test pressure and the duration of the test are as follows:

Mains	6 hours at 125 psi
Laterals	2 hours at 100 psi

(B) Sprinkler Coverage Test: The coverage test shall be performed after sprinkler heads have been installed and shall demonstrate that each section or unit in the irrigation system is balanced to provide uniform and adequate coverage of the areas serviced. The Contractor shall correct any deficiencies in the system.

(C) Operational Test: The performance of all components of the automatic control system shall be elevated for manual and automatic operation.

During the maintenance period specified and at least 9 days prior to final acceptance, the Contractor shall set the controller on automatic operation and the system shall operate satisfactorily during this period. All necessary repairs, replacement and adjustment shall be made until all equipment, electrical work, controls and instrumentation are functioning in accordance with the contract documents.

440.11 MEASUREMENT AND PAYMENT:

Measurement and payment shall be in accordance with Section 109. The lump sum or unit prices established in the proposal sheets shall be full compensation for furnishing all labor, materials, tools and equipment, and performing all work necessary to complete the sprinkler irrigation system described or specified in the contract documents.

- End of Section -

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PART 500

STRUCTURES

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SECTION 505

CONCRETE STRUCTURES

505.1 DESCRIPTION:

Concrete bridges, culverts, catch basins, manholes, retaining walls, abutments, piers, footings, foundations and similar structures shall be constructed in conformity with the plans and specifications. Concrete for use in work constructed under this specification and testing thereof shall conform to the requirements of Section 725. Reinforcing shall conform to the requirements of Section 727.

Safe and suitable ladders shall be provided to permit access to all portions of the work.

505.1.1 Minor Structures: Concrete structures such as cattle guards, catch basins, median barriers, headwalls, and other miscellaneous structures as defined by the Engineer are hereby defined as Minor Structures. Such Minor Structures, at the option of the Contractor, may be either constructed of cast-in-place concrete, or furnished as precast units. Precast units shall be fabricated in accordance with shop drawings submitted by the Contractor and approved by the Engineer, in accordance with the requirements of Section 105.2. All structures not defined as Minor Structures shall be classified as Major Structures.

505.2 SUBGRADE FOR CONCRETE STRUCTURES:

Each subgrade upon which concrete is placed shall be firm and free from water. Ground water shall be kept several inches below subgrade until the concrete has set. When the subgrade is in dry earth, it shall be moistened with water from a spray nozzle immediately before concrete is placed.

When the design details for the project provide for the construction of filter or drain material consisting of gravel or combination of gravel and sand, which material becomes subgrade for concrete, the placing of steel reinforcement and placement of concrete shall follow the placing of the filter or drain material as closely as practical. The filter or drain material shall be kept dewatered to the extent necessary to prevent any portion of concrete materials being carried away before the concrete has attained its final set. No payment will be made for the work required to keep such materials dewatered, other than such costs as may be included in the prices bid for various items of work or amount bid for dewatering when the schedule provides an item for same.

When concrete is to rest on rock, the rock shall be fully uncovered. The surface of the rock shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled off or cut to approximately horizontal and vertical steps. Seams in the rock shall be grouted as directed by the Engineer and the base for structures shall be slush grouted or otherwise treated as the Engineer may direct.

Precast Concrete Minor Structures shall be founded in accordance with the requirements of Section 206.4.5.

505.3 FORMS:

Forming plans for cast-in-place bridge decks and cast-in-place bridge superstructures shall be prepared in accordance with the requirements of Section 105.2.

Forms shall be of suitable material and of type, size, shape, quality, and strength to enable construction as designed. The forms shall be true to line and grade, mortar tight, and sufficiently rigid to resist any appreciable amount of springing out of shape during placing of the concrete. The responsibility for their adequacy shall rest with the Contractor. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited. The surfaces of forms shall be smooth and free from irregularities, dents, sags and holes that would appreciably deface the finished surface. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being reused, and the reuse of forms shall be subject to the approval of the Engineer. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent that will leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete.

Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber, or material which will provide a surface at least equally satisfactory. Any lumber or material which becomes badly checked or warped prior to placing concrete may be rejected.

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Forms for all exposed surfaces of bridges, viaducts, overcrossings and similar structures shall be constructed of plywood or an approved equal. Plywood for forms shall be exterior type, of the grade Concrete-Form Exterior, conforming to the specifications of the NBS, Commercial Standards latest edition. Plywood shall be furnished and placed in 48 inches widths and in uniform lengths of not less than 96 inches, except where the dimension of the member formed is less than the specified panel dimension. Plywood shall be placed with the grain of the outer plies in the direction of the span. Where plywood is attached directly to the studding or joints, the panels shall be not less than 5/8 inch thick, and the studdings or joints shall be spaced not more than 12 inches, center to center. Plywood less than 5/8 inch thick, otherwise conforming to the requirements specified, may be used with a continuous backing of 5/8 inch sheathing. All form panels shall be placed in a neat, symmetrical pattern with the horizontal joints level and continuous.

Wood forms for copings and curbs shall have a thickness of not less than 15/8 inches and a width of not less than the full depth of coping or curb.

Unless otherwise shown on the plans, all sharp edges shall be chamfered with 3/4 inch triangular fillets. Forms for curved surfaces shall be so constructed and placed that the finished surface will not deviate appreciably from the arc of the curve.

Forms shall be so constructed that portions, where finishing is required, may be removed without disturbing portion of forms to remain.

Forms for girders and slabs shall be cambered as may be required by the Engineer.

Forms shall, as far as practicable, be so constructed that the form marks will conform to the general lines of the structure.

Form clamps or bolts, approved by the Engineer, shall be used to fasten forms. The use of twisted wire loop ties to hold forms in position will not be permitted, nor shall wooden spreaders be used unless authorized by the Engineer. Clamps or bolts shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back 1 inch below the finished surface of the concrete. Forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and all form clamps shall extend through and fasten such wales, all based on the rate of concrete placement.

The Contractor may at his own option, place such portions of the concrete for the structure directly against the side of the excavation or sheathing without the use of outside forms, provided that the following conditions are met.

(A) If concrete is placed directly against the sides of the excavation, the faces of the excavation must be firm and compact, and be able to stand without sloughing off and be at all points outside the concrete lines shown on the plans.

(B) If concrete is placed against sheathing, such sheathing shall be closely fitted and shall be outside of the concrete lines shown on the plans. Those surfaces against which the concrete is to be placed shall be faced with building paper. Except as otherwise specified all sheathing shall be removed, but not until either at least 7 days after placing concrete or until the concrete has attained a strength in compression of not less than 2,000 psi. Care should be used in pulling sheathing so as to avoid damaging the concrete. Voids left by the removal of sheathing, piles and/or similar sheathing supports shall be backfilled with material having a sand equivalent of not less than 30 and consolidated by jetting as directed by the Engineer. When, in the opinion of the Engineer, field conditions or the type of sheathing or methods of construction used by the Contractor are such as to make the removal of sheathing impracticable, that portion of the sheathing against which concrete has been placed may be left in place.

Regardless of the method used in the placement of concrete without outside forms the following stipulations shall hold:

(A) The reinforcing steel shall be accurately set and held firmly in place, to the satisfaction of the Engineer.

(B) No direct payment will be made for building paper, sheeting, gunite or concrete placed outside of concrete lines shown on the plans. The cost thereof shall be absorbed in the prices bid for the various items of work.

(C) The Contractor shall assume all risks of damage to the work or to existing improvements due to any reason whatsoever that may be attributable to the method of construction outlined above.

505.3.1 Removal of Forms: The falsework supporting any span of a continuous or rigid frame structure subject to bending stress shall not be released until after the last concrete placed in the span and in the adjoining spans, excluding concrete above the deck slab, has attained a compressive strength of not less than twice the design unit stress, or 21 days after the concrete is placed, whichever occurs first.

Stairway riser forms shall be removed and the finish of the steps completed on the day the concrete is placed. Metal stairway treads, if required by the plans, shall be installed immediately after the steps have been placed.

Side forms for beams, girders, columns, railings, or other members wherein the forms do not resist dead load bending shall be removed not more than 24 hours after placing concrete, where finishing is required, unless otherwise directed by the Engineer, provided that satisfactory arrangements are made to cure and protect the concrete thus exposed.

Side forms for arch rings, columns, and piers shall be removed before the members of the structure which they support are placed so that the quality of the concrete may be inspected. Such forms shall be so constructed that they may be removed without disturbing other forms which resist direct load or bending stress.

Forms and shoring for box and arch sections of sewers and storm drains may be removed as follows:

(A) Forms for open channel walls — 16 hours.
(B) Outside forms of box sections and inside wall forms of box sections which do not support the slab forms — 16 hours.
(C) Arch sections in open cut — 12 hours.
(D) Slab forms for box sections:
    (1) Type II Cement — 48 hours or 6 hours per foot of span between supports, whichever is greater.
    (2) Type III Cement — 24 hours or 3 hours per foot of span between supports, whichever is greater.
    (3) Type V Cement — 56 hours or 7 hours per foot of span between supports, whichever is greater.

The periods of time at which the Contractor may remove forms, as set forth above, are permissive only and subject to the Contractor's assuming all risks that may be involved in such removals. At his option, except for surfaces to be finished, the Contractor may leave the forms in place for such longer periods as are, in his opinion, required.

505.4 FALSEWORK:

Falsework construction and erection shall not commence until the Contractor has received written approval of the sealed final falsework shop drawings.

All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure concrete were placed at one time.

All falsework, staging, walkways, forms, ladders, cofferdams, and similar accessories shall equal or exceed the minimum applicable safety requirements of Section 107. Compliance with such requirements shall not relieve the Contractor from full responsibility for the adequacy and safety of said items.

Falsework shall be founded upon a solid footing safe against undermining and protected from softening. When the falsework is supported on timber piles, the piles shall be driven to a bearing value as determined by the Contractor’s Engineer.

Falsework and forms shall be so constructed as to produce in the finished structure the lines and grades indicated on the plans. Suitable jacks or wedges shall be used in connection with the falsework to set the forms to grade or camber shown on the plans, or to take up any settlement in the form work either before or during the placement of concrete. Single wedges for this purpose will not be permitted; it being required that all such wedges be in pairs to insure uniform bearing. Dead load deflection in stringers and joints will be compensated for by varying depths of the joists or by using varying depth nailing strips.

Arch centering shall be removed uniformly and gradually, beginning at the crown and working toward the springing, to permit the arch to take its load slowly and evenly. Centering for adjacent arch spans shall be struck simultaneously.

Falsework under any continuous unit or rigid frame shall be struck simultaneously; the supporting supports being released gradually and uniformly, starting at the center and working both ways towards the supports.

505.4.1 Falsework Design: Falsework design shall be in accordance with the requirements of Section 105.2.

Falsework shall be designed by the Contractor to carry all loads and pressures which may be applied to it. The construction loads to be applied are as follows:

Tunnel centering – 100 percent of the concrete load where concrete is placed by pumping. Forms shall be so constructed to provide adequate relief for excessive pump pressure.

All other structures – a live load of 30 pounds per square foot of horizontal area.

Transverse and longitudinal bracing – a horizontal force equal to 2 percent of the vertical load.

The unit stresses for wood falsework shall be those recommended in the West Coast Lumbermen's Association's standard grading and dressing rules increased 25 percent for short time loading.

Falsework may be bolted or spiked at the option of the Contractor, but the use of bolts and spikes shall not be combined in the same connection. The allowable spacings and connection values of bolts and spikes shall be in accordance with the national design specifications for stress-grade lumber and its fastenings as recommended by National Lumber Manufacturers Association except that an additional allowance of 25 percent for temporary use shall be added to the connection values for bolts and spikes.

Ends of columns bearing on wedges shall be tied in both direction by girts.

Unit stresses for steel falsework shall be in accordance with the requirements of the specifications for design, fabrication and erection of structural steel for buildings of the AISC.

505.5 PLACING REINFORCEMENT:

Reinforcing bars shall be accurately placed as shown on the plans and shall be firmly and securely held in position by wiring at intersections with wire not smaller than No. 16 gage and by using concrete or metal chairs, spacers, metal hangers, supporting wires and other approved devices of sufficient strength to resist crushing under full load. Wooden supports shall not be used.

Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted. Before placing in the forms, all reinforcing steel shall be thoroughly cleaned of mortar, oil, dirt, loose mill scale, loose or thick rust and coatings of any character that would destroy or reduce the bond. No concrete shall be deposited until the placing of the reinforcing steel has been inspected and approved.

Bundle bars shall be tied together at not more than 6 foot centers.

The Contractor will be allowed the following tolerances when placing, tying and supporting reinforcing steel:

(1) In slabs and beams, horizontal bars shall be within ¼ inch measured vertically, of the position indicated on the plans.
(2) In vertical walls, columns, wings, and similar members, clearance from the forms shall be within ¼ inch of the clearance shown on the plans.
(3) In slabs or walls, long runs of bars may vary up to 2 inches in spacing; however, the specified number of bars shall be placed.

505.5.1 Splicing: Splices of bars shall be made only where shown on the plans or as approved by the Engineer. Where bars are spliced they shall be lapped at least 30 diameters, unless otherwise shown on the plans.

Welding of reinforcing steel will not be permitted unless specifically authorized by the Engineer.

505.5.2 Bending Reinforcement: Bending of reinforcing steel shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications Section 9.4.

Bars shall not be bent nor straightened in a manner that will injure the material. Bars with kinks or unspecified bends shall not be used.

505.5.3 Welded Wire Fabric: Welded wire fabric shall be held firmly in place and spliced not less than 2 meshes.

505.5.4 Dowels:

505.5.4.1 Dowel Placement: Dowel placement shall consist of drilling or coring dowel holes in concrete, furnishing and placing anchoring materials, and placing reinforcing steel dowels in accordance with the details shown on the Project Plans, and the requirements of the project Special provisions and these Specifications.

Dowel holes shall be cored where dowels are to be placed:

(A) in bridge decks and other thin concrete sections, and the depth of the dowel hole shown on the project plans projects to 3 inches or less from the opposite face of the concrete section, or

(B) within 4 inches from an existing concrete edge.

Cored holes shall be intentionally roughened after coring.

All holes shall be blown clean with compressed air, prior to applying the anchoring material.

The diameter of the holes for the dowels shall be 1/8“ larger than the diameter of the dowels to be placed. The depth of the holes for the dowels shall be as shown on the Project Plans.

The anchoring materials for the dowels shall be an epoxy adhesive conforming to the requirements of Section 505.5.4.2, unless otherwise specified on the Project Plans and/or the project Special Provisions, or as approved by the Engineer.

505.5.4.2 Anchoring Materials: Epoxy materials shall be used for anchoring dowels. The Contractor shall submit Certificates of Compliance or Analysis, complete with supporting documentation, to the Engineer for all epoxy materials to be used for anchoring dowels on a specific project, in accordance with the requirements of Section 106.2. The epoxy materials shall be provided by the Contractor in general conformance with the requirements of Section 1015 – General Requirements of Section 1015 – EPOXY MATERIALS of the current Arizona Department of Transportation (ADOT) Standard Specifications for Road and Bridge Construction, amended to date.

Epoxy resin base anchoring adhesive shall be used for anchoring dowels in concrete. High viscosity, or non-sag epoxies in the form of a gel, shall be used for horizontal or near-horizontal applications, where flow out of the anchoring hole is a problem. Low and medium viscosity epoxies may be used in vertical anchoring holes that open upward. The anchoring product shall specifically be designed for the designated application, according to the manufacturer’s product literature.

Epoxy resin base anchoring adhesive shall provide the specified minimum tensile pullout resistance, when tested in accordance with Arizona Test Method 725, as modified in accordance with Section 505.5.4.3 of these specifications. The pot life of the anchoring material shall be determined in accordance with AASHTO T-237, Part I. The determined pot life shall be within 25 percent or 10 minutes of the pot life specified by the manufacturer, whichever is greater.

505.5.4.3 Dowel Strength Requirements: The epoxy resin base anchoring adhesive shall provide the following minimum pullout resistances:

#4 dowels:	12.0 Kips
#5 dowels:	18.6 Kips
#6 dowels:	26.4 Kips
#7 dowels:	36.0 Kips

Arizona Test Method (ATM) 725 is a Tensile Proof Dowel Test, developed by ADOT to specifically test #6 reinforcing steel dowels anchored in Portland cement concrete with an epoxy adhesive. When testing reinforcing steel dowel sizes, the anchoring hole (ATM 725: PREPARATION – 4. (a)) shall be modified as follows; the rotary hammer drill bit size (ATM 725: APPARATUS – 2. (a)) shall be modified accordingly:

#4 dowels:	5/8” diameter x 8” long
#5 dowels:	3/4” diameter x 10” long
#6 dowels	7/8” diameter x 12” long
#7 dowels	1” diameter x 14” long

The Contractor may opt to conduct pullout tests with hole lengths other than those required above, based on the adhesive manufacturer’s product literature and recommendations; however, test results shall demonstrate that the tested system provides the required pullout resistances.

505.6 PLACING CONCRETE:

No concrete shall be placed in any forms supported by falsework until the Contractor’s Professional Engineer has inspected the completed falsework, and has issued a properly sealed and signed certificate that the falsework has been constructed according to the approved falsework drawings.

Where a schedule for placing concrete is shown on the plans, no deviation will be permitted therefrom unless approved in writing by the Engineer.

The placing of concrete for a given pour shall start at the low point and shall proceed upgrade, unless otherwise permitted by the Engineer.

With the exception of concrete placed in slope paving and aprons, and concrete placed under water, all concrete shall be compacted by means of high frequency internal vibrators of a type, size and number approved by the Engineer. The number of vibrators employed shall be ample to consolidate the incoming concrete to a proper degree within 15 minutes after it is deposited in the forms. In all cases, at least 2 vibrators shall be available at the site of the structure in which more than 25 cubic yards of concrete is to be placed. The vibrators shall not be attached to or held against the forms or the reinforcing steel. The locations, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without causing segregation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface. Fresh concrete shall be spread in horizontal layers insofar as practicable and the thickness of the layers shall not be greater than can be satisfactorily consolidated with the vibrators. If additional concrete is to be placed, care shall be taken to remove all laitance and to roughen the surfaces of the concrete to insure that fresh concrete is deposited upon sound concrete surfaces. Layers of concrete shall not be tapered off in wedge-shaped slopes, but shall be built with square ends and level tops.

Mixed concrete, after being deposited, shall be consolidated until all voids are filled and free mortar appears on the surface. The concrete shall be placed as nearly as possible in its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted.

Fresh concrete shall not be permitted to fall from a height greater than 6 feet without the use of adjustable length pipes or elephant trunks.

The use of approved external vibrators for compacting concrete will be permitted when the concrete is inaccessible for adequate compaction provided the forms are constructed sufficiently rigid to resist displacement or damage from external vibration.

During the placing of concrete, care shall be taken that methods of compaction used will result in a surface of even texture free from voids, water or air pockets, and that the coarse aggregate is forced away from the forms in order to leave a mortar surface. Spades or broad-tined forks shall be provided and used to produce the desired results if required by the Engineer.

The use of chutes in conveying or depositing concrete will be allowed only at the discretion of the Engineer, and wherever they are used they shall be laid at such inclination as will permit the flow of concrete of such consistency as is required. The use of additional water in mixing the concrete to promote free flow in chutes of low inclination will not be allowed. Where necessary in order to prevent segregation, chutes shall be provided with baffle boards or a reversed Section at the outlet.

Concrete for columns shall be placed using pipes of adjustable length and not less than 6 inches in diameter.

Horizontal members or sections shall not be placed until the concrete in the supporting vertical members or sections has been consolidated and a minimum 2 hour period has elapsed to permit shrinkage to occur.

Walkways shall be provided along each side and for the full length of bridge structures outside the deck area. These walkways shall be of sufficient width, and so constructed as to provide for the support of the bridges from which the longitudinal floats specified are to be operated. Inspection walkways and access thereto shall be provided under the deck forms between each pair of girders and outside of each outside girder for the full length of the bridge structure. The walkways shall be not more than 8 feet below the concrete to be inspected.

505.6.1 Construction Joints in Major Structures: The work shall be so prosecuted that construction joints will occur at designated places shown on plans unless specifically permitted otherwise by the Engineer. The Contractor shall complete, by continuous depositing of concrete, section for the work comprised between such joints. The joints shall be kept moist until adjacent concrete is placed.

All construction joints at the bottom of walls or arches, at the top of walls, and all longitudinal construction joints having a keyed, stepped or roughened surface shall be cleaned by sandblasting prior to placing the adjacent concrete. Any quality of sand may be used which will accomplish the desired results.

The sandblasting operations shall be continued until all unsatisfactory concrete, and all laitance, coatings, stains, debris, and other foreign materials are removed. The surface of the concrete shall be washed thoroughly to remove all loose material. The method used in disposing of waste water employed in washing the concrete surfaces shall be such that the waste water will not stain, discolor, or affect exposed surfaces of the structures. The method of disposal will be subject to the approval of the Engineer.

All horizontal construction joints or those on slight slopes, shall be covered with Class D mortar as specified in Section 776.

Expansion and contraction joints in the concrete structures shall be formed where shown on the plans and as directed. In general, such joints shall have smooth abutting surfaces, painted or separated and sealed as detailed on the plans. No reinforcement shall be extended through the joints, except where specifically noted or detailed on the plans. Concrete or mortar shall not be permitted to lap these joints in such a manner as to effect a tie or bond that would later promote spalling.

Asphalt paint or premolded asphalt filler used in joints shall be as specified in Section 729.

No direct payment will be made for furnishing and placing asphaltic paint, premolded asphaltic filler or other types of joint separators; their costs shall be included in the price bid for the item of work of which they are a part.

505.6.2 Adverse Weather Concreting:

(A) Hot Weather Concreting: Hot weather is defined as any combination of high ambient temperature, low relative humidity, and wind velocity which would tend to impair the quality of fresh concrete. These effects become more pronounced as wind velocity increases. Since last minute improvisations are rarely successful, preplanning and coordination of all phases of the work are required to minimize these adverse effects.

As an absolute minimum, the Contractor shall insure that the following measures are taken:

(1) An ample supply of water, hoses, and fog nozzles are available at the site. (2) Spare vibrators are on hand in the ratio of one spare vibrator for each three in use. (3) Preplanning has been accomplished to insure prompt placement, consolidation, finishing, and curing of the concrete. (4) Concrete temperature on arrival should be approximately 60°F. and in any event shall not exceed 90°F. The use of cold water and ice is recommended. (5) The subgrade is moist, but free of standing water. (6) Fog spray is utilized to cool the forms and steel. Under extreme conditions of high ambient temperature, exposure to the direct rays of the sun, low relative humidity, and wind, even strict adherence to these measures may not produce the quality desired and it may be necessary to restrict concrete placement to early morning only. If this decision is made, then particular attention must be directed to the curing process since the concrete will be exposed to severe thermal stresses due to temperature variation; heat of hydration plus midday sun radiation versus nighttime cooling.

(B) Cold Weather Concreting: Concrete shall not be placed on frozen ground, nor shall it be placed when the ambient temperature is below 40°F. unless adequate means are used to heat the aggregate and/or water and satisfactory means have been taken for protecting and heating the concrete during the curing period.

(C) Wet Weather Concreting: Placing of concrete shall be discontinued when the quantity of rainfall is such as to cause a flow or wash to the surface. Any concrete already placed and partially cured shall be covered to prevent dimpling. A construction joint will be installed prior to shut down.

(D) Replacement of Damaged or Defective Concrete: Upon written notice from the Engineer, all concrete which has been damaged or is defective, shall be replaced by the Contractor at no cost to the Contracting Agency.

(E) Recommended Reference:
(1) ACI-305 Hot Weather Concreting
(2) ACI-306 Cold Weather Concreting
(3) ACI-308 Recommended Practices for Curing Concrete

505.6.3 Bridge Deck Joint Assemblies:

505.6.3.1 Description: This work shall consist of furnishing and installing expansion devices including the seals, anchorage system, and hardware in accordance with the project plans and these specifications.

505.6.3.2 Materials: Elastomer Seals shall be of the Compression Seal or Strip Seal type, and shall conform to the requirements of the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction Section 1011-5.

Steel shapes and plates shall conform to the requirements of ASTM A36, or ASTM A588.

505.6.3.3 Construction Requirements:

(1) General: Deck joint assemblies shall consist of elastomer and steel assemblies which are anchored to the concrete at the deck joint. The seal armor shall be cast in the concrete. The completed assembly shall be properly installed in the planned position, shall satisfactorily resist the intrusion of foreign material and water, and shall provide bump-free passage of traffic. For each size of seal on a project, one piece of the seal material supplied shall be at least 18 inches longer than required by the project Plans. The additional length will be removed in the presence of the Engineer and used for materials testing. Certificates of Compliance conforming to the requirements of Section 106.2 shall also be submitted by the Contractor.

(2) Shop Drawings**:** Prior to fabrication, the Contractor shall submit shop drawings to the Engineer for approval, in accordance with the requirements of Section 105.2. The shop drawings shall show complete details of the method of installation to be followed, including a temperature correction chart for adjusting the dimensions of the joint according to the ambient temperature, and any additions or rearrangements of the reinforcing steel from that shown on the project plans.

(3) Elastomer Seals: Seals shall conform to the requirements specified.

(4) Armor: All steel for cast-in-place deck joint assemblies shall conform to the requirements specified.

(5) Galvanizing**:** All steel parts of strip seal assemblies shall be galvanized after fabrication, in accordance with the requirements of ASTM A123 and A153, unless ASTM A588 steel is used. Bolts shall be high strength, conforming to the requirements of ASTM A325M, with a protective coating of zinc, followed by a chromate and baked organic coating conforming to the requirements of ASTM F1135, Grade 3, 5, 6, 7, or 8 and Color Code A.

Steel parts of compression seal assemblies do not require galvanizing, plating, or painting.

(6) Joint Preparation and Installation: At all joint locations, the Contractor shall cast the bridge decks and abutment backwalls with a formed blockout, sized to accommodate the pre-assembled joint assembly. The joint assembly will be anchored in the concrete to be placed with the secondary pour in the blockout. Prior to the secondary pour, the surface of the existing concrete in the blockout shall be coated with an approved adhesive specifically formulated for bonding new concrete to old concrete.

(7) Welding: All welding and inspection of welding for structural steel shall be performed in accordance with the requirements of the latest revision of the AASHTO/AWS D1.5M/D1.5 Bridge Welding Code. The use of electro-slag welding process on structural steel will not be permitted.

Installed armor assemblies shall be covered or otherwise protected at all times prior to installing the elastomer portion of the joint assembly. The elastomer shall be installed at such time and in such manner that it will not be damaged by construction operations.

Immediately prior to the installation of the seal element, the steel contact surfaces of the joint armor shall be clean, dry, and free of oil, rust, paint, or foreign material. Any perforation or tearing of the seal element due to installation procedures or construction activities will be cause for rejection of the installed seal element.

During the installation of all proprietary deck joint assemblies, the manufacturer's representative shall be present. As a minimum, the representative shall be present during the placement of the joint assembly in the deck blockout, prior to the secondary concrete pour, and shall also be present during the installation of the seal element.

505.6.4 Water Stops: Water stops of rubber or plastic, shall be placed in accordance with the details shown on the project plans. Where movement at the joint is provided for, the water stops shall be of the type permitting such movement without damage. Water stops shall be mechanically spliced, vulcanized, or heat-sealed to form continuous watertight joints, in accordance with the manufacturer's recommendations, and as approved by the Engineer.

505.6.5 Longitudinal Joints between Precast Bridge Deck Units: After erection of the units and at the time requested by the Engineer, the longitudinal shear key joints between units shall be thoroughly packed with a pre-packaged non-shrink grout or a sand-cement grout with an expansion agent approved by the Engineer. The Contractor shall then transversely connect the deck units with the connection rods, stressing and anchoring them as shown on the project plans.

505.7 CONCRETE DEPOSITED UNDER WATER:

When conditions render it impossible or inadvisable in the opinion of the Engineer to dewater excavation before placing concrete, the Contractor shall deposit under water, by means of a tremie or underwater bottom dump bucket, a layer of concrete of sufficient thickness to thoroughly seal the cofferdam. To prevent segregation the concrete shall be carefully placed in a compact mass and shall not be disturbed after being deposited. Water shall be maintained in a still condition at the point of deposit.

A tremie shall consist of a water tight tube having a diameter of not less than 10 inches with a hopper at the top. The tube shall be equipped with a device that will close the discharge end and prevent water from entering the tube while charging the tube with concrete. The tremie shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering, when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work to prevent water entering the tube and shall be entirely sealed at all times, except when concrete is being placed. The tremie tube shall be kept full of concrete. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, always keeping it in the deposited concrete. The flow shall be continuous until the work is completed and the resulting concrete seal shall be monolithic and homogeneous.

The underwater bucket shall have an open top and the bottom doors shall open freely and outward when tripped. The bucket shall be completely filled and slowly lowered to avoid back wash and shall not be dumped until it rests on the surface upon which the concrete is to be deposited. After discharge, the bucket shall be raised slowly until well above the concrete.

Concrete deposited in water shall have 10 percent extra cement added.

505.8 CURING:

As soon after the completion of the specified finishing operations as the condition of the concrete will permit without danger of consequent damage thereto, all exposed surface shall either be sprinkled with water, covered with earth, sand or burlap; sprayed with a curing compound or sealed with a material conforming with Section 726. All concrete for bridge structures shall be water cured unless otherwise permitted by the Engineer. The Contractor shall use the wet burlap method for the water cure of all concrete in bridge decks and approach slabs, unless otherwise authorized by the Engineer.

Concrete that is water cured must be kept continuously wet for at least 10 days after being placed; preferably being covered, if possible, with at least 2 layers of not lighter than 7 ounce burlap, except that handrail, baserail, railing posts, tops of walls, and similar parts of the structure, if water cured, must be covered with burlap as above prescribed, immediately following the

finishing treatment specified therefore, and such covering shall not be removed in less than 4 days. Roadway areas, floors, slabs, curbs, walks, and the like, that are water cured may be covered with sand to a depth of at least 2 inches, in lieu of the burlap as specified above, as soon as the condition of the concrete will properly permit, and such covering must remain wet and in place until the concrete so covered is at least 10 days old unless otherwise directed by the Engineer or provided by special provisions.

When a sprayed impervious membrane is used, it shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely cover and seal all exposed surfaces of the concrete with a uniform film. To insure complete coverage, membrane shall be applied in two applications for a total coverage of 150 square feet per gallon. The membrane, however, shall not be applied to any surface until all of the finishing operations have been completed; such surfaces being kept damp, until the membrane is applied. All surfaces on which a bond is required, such as construction joints, shear planes, reinforcing steel, and the like, shall be adequately covered and protected before starting the application of the sealing medium in order to prevent any of the membrane from being deposited thereon; and any such surface with which the seal may have come in contact shall immediately thereafter be cleaned. Care shall be exercised to avoid and prevent any damage to the membrane seal during the curing period. Should the seal be broken or damaged before the expiration of 10 days after the placing of the concrete, the break shall be immediately repaired by the application of additional impervious membrane over the damaged area.

Should any forms be removed sooner than 10 days after the placing of the concrete, the surface so exposed shall either be immediately sprayed with a coating of the membrane seal, or kept continuously wet by the use of burlap or other suitable means until such concrete has cured for at least 10 days.

When tops of walls are cured by the membrane sealing method the side forms, except metal forms, must be kept continuously wet for the 10 days following the placing of the concrete.

If due to weather conditions, materials used, or for any other reason, there is any likelihood of the fresh concrete checking or cracking prior to the commencement of the curing operations, it shall be kept damp, but not wet, by means of an indirect fine spray of water until all danger of such checking or cracking is past, or until the curing operations are started in the particular area affected.

Since hot weather leads to more rapid drying of concrete, protection and curing are far more critical than in cool weather. Water curing shall be used wherever it is practical and shall be continuous to avoid volume changes due to alternation of wetting and drying. The need for adequate continuous curing is greatest during the first few hours after placement of concrete in hot weather.

505.9 FINISHING CONCRETE:

Immediately after the removal of forms as provided above, all concrete surfaces shall be finished in accordance with the requirements specified below.

All surfaces scheduled to be covered with backfill shall be finished so as to be free of open and rough spaces.

All surfaces that will remain exposed in the completed work shall be finished so as to be free of open and rough spaces, depressions or projections. All angles and fillets shall be sharp and true and the finished surface shall present a pleasing appearance of uniform color.

All top surfaces of walls, abutments, piers, etc., shall be finished to a smooth surface and shall be cured by an approved method.

If rock pockets or honeycomb are of such an extent and character as to affect materially the strength of the structure and to endanger the steel reinforcement the Engineer may declare the concrete defective and require the removal and replacement of that portion of the structure affected by the Contractor at no additional cost to the Contracting Agency.

If finishing operations are not carried out as set forth below, all placing of concrete shall stop until satisfactory arrangements are made by the Contractor to promptly correct defective finishing work and to carry out finishing operations as specified.

One of the classes of finish as specified shall be applied to the various surfaces as set forth under applicability of finishes.

No finishing or patching shall be permitted until the surface has been inspected by the Engineer.

505.9.1 Finishing Fresh Concrete in Bridge Decks: Upon placing the deck to a uniform and true surface, screed supports shall promptly be removed from the surface and any necessary hand finishing shall be promptly accomplished in the areas where the screed supports have been removed.

After final floating of the plastic concrete, bridge decks subject to vehicular traffic shall be textured transversely. Apparatus producing textured grooved shall be mechanically operated from an independent self-propelled bridge. Grooves shall be 1/16 to 1/8 inch in width and 3/32 to 6/32 in depth. Center to center spacing of the grooves shall be as follows: 7/8 inch, 3/4 inch, 1 inch, 3/4 inch, 1-1/8 inch and then repeated or other measurements as approved by the Engineer. Texturing shall be completed before surface of concrete is torn or unduly roughened by texturing operation. Grooves that close following texturing will not be permitted and will have to be retextured. Hand tine brooms shall be available on the job site, at all times during texturing operation, to repair faulty texturing grooves.

The finished surface will be tested with a 10 foot straightedge furnished by the Contractor. The testing will be accomplished by holding the straightedge in contact with the deck surface and parallel to the centerline. The surface shall not vary more than 1/8 inch from the lower edge of the straightedge. Areas showing high spots of more than 1/8 inch shall be corrected by cutting or planning. The cutting or planning machine shall be a rotary type, equipped with an adjustable cutter and having a minimum wheel base of 10 feet. Areas showing low spots of more than 1/8 inch shall be filled with an approved mixture of sand, cement and epoxy. The mixture shall firmly adhere to the surface and shall match the surrounding concrete. All areas corrected shall not show deviations in excess of 1/8 inch when tested with a 10 foot straightedge.

505.9.2 Finishing Fresh Concrete in Sidewalks and Bridge Sidewalks: After the concrete has been placed and spread between the forms, it shall be thoroughly worked until all the coarse aggregate is below the surface and the mortar comes to the top. Concrete may be consolidated by means of mechanical vibrators approved by the Engineer.

The surface shall then be struck off and worked to grade and cross-section with a wood float.

A mechanical finishing machine that will consolidate the concrete and strike off and finish the surface may be used if permitted by the Engineer, provided that the machine produces a sidewalk equal to or better in all respects than that produced by the methods specified herein.

The surface shall be sweat finished by means of a steel trowel followed by a light broom finish.

The sidewalks shall be marked and edged with the proper tools to form the joints, marking and edges shown on the plans.

505.9.3 Finishing Green Concrete: Class I Finish — All bolts, wires and rods shall be clipped and recessed. All holes, honeycomb, rock pockets and other surface imperfections shall be cleaned out, thoroughly moistened and carefully patched with mortar. Mortar shall be composed of 1 part of cement and 2 parts of fine sand. A portion of the required cement for mortar shall be white as required to match the color of the surrounding concrete.

Class II Finish — The surface shall be patched and pointed as specified above for Class I Finish and then promptly covered with polyethylene film, wet burlap or wet cotton mats. If polyethylene film is used, the film shall be held securely to the surface by means of weights, adhesive or other suitable means. Only white polyethylene film for covering will be acceptable.

When the mortar used in patching and pointing has set sufficiently, the surface shall be uncovered and thoroughly rubbed with either a float or a carborundum stone until the surface is covered with a lather. Cork, wood or rubber floats shall be used only on surfaces sufficiently green to work up such lather, otherwise a carborundum stone shall be used. During the rubbing process, a thin grout composed of 1 part cement and 1 part of fine sand may be used to facilitate producing a satisfactory lather; however, this grout shall not be used in quantities sufficient to cause a plaster coating to be left on the finished surface. A portion of the required cement for grout shall be white as required to match the color of the surrounding concrete. Rubbing shall continue until irregularities are removed and there is no excess material. At the time a light dust appears, the surface shall be brushed or sacked. Brushing or sacking shall be carried in one direction so as to produce a uniform texture.

Class III Finish — The surface shall be treated as specified above under Class II Finish except that after brushing, the surface shall again be securely covered with polyethylene film, wet burlap or wet cotton mats. In not less than 1 day nor more than 4 days, the surface shall be uncovered and rubbed with a carborundum stone. This rubbing shall continue until the entire surface

is of a smooth texture and uniform color. During the process, the use of a thin mixture of equal parts of sand and cement with water will be permitted. At the time a light dust appears, the surface shall be brushed or sacked, care being taken to carry this brushing in one direction so as to produce a uniform texture.

505.9.4 Finish Hardened Concrete: If for reasons either beyond the control of the Contractor or with the approval of the Engineer, more than 6 days have elapsed between the time of placing concrete and the time of the removal of forms, the concrete shall be considered as hardened. Prior to finishing hardened concrete, the surface shall be covered with burlap or cotton mats and kept thoroughly wet for a period of at least 1 hour. Finishing shall be identical to the respective requirements for Class I, Class II and Class III Finish for green concrete, except that the use of a mechanically operated carborundum stone will be required for Class II and Class III Finishes.

505.9.5 Applicability of Finishes: Surfaces requiring Class I Finish — All formed structures that are to be covered by backfill and those surfaces that are normally not in view of either vehicular or pedestrian traffic such as the surfaces on the inside of barrels of culverts, the under surfaces of decks, surfaces of concrete girders, piers and abutment walls.

Surfaces requiring Class II Finish — All exposed surfaces of headwalls, wingwalls, deck edges on culverts, end of piers on bridges and culverts, retaining walls and those vertical surfaces under highway grade separation structures that are exposed to view of the traveling public, including piers and pier caps, the outside face of outside girders, and other similar surfaces.

When surfaces of uniform texture and pleasing appearance are obtained through the use of first class metal forms, paper tubing or the use of special form coatings and the use of special care, such surfaces may, upon approval of the Engineer, be excluded from the surfaces requiring Class II Finish.

Surfaces requiring Class III Finish for bridge structures — All formed or finished surfaces above the surface of the deck on the roadway side of the handrail and the outside vertical surfaces from the top of handrail and dado to the lower edge of the chamfer at the bottom of the deck.

505.10 DIMENSIONAL TOLERANCES:

The maximum allowable tolerances or deviations from dimensions shown on the project plans or the approved shop drawings shall be as follows:

505.10.1 Cast-in-Place Concrete:

(A) Variation from plumb in the lines and surfaces of columns, piers, abutment and girder walls:
In any 10 foot or less length: 0.4 inches
Maximum for the entire length: 1 inch

(B) Variation in cross-sectional dimensions of columns, piers, girders, and in the thickness of slabs and walls:
+ 1/4 inch
- 1/8 inch

(C) Girders alignment (deviation from straight line parallel to center line of girder measured between diaphragms):
1/8 inch per every 10 feet in length

(D) Variation in footing cross-sectional dimensions in project plans:
+ 2 inches
- ½ inch

(E) Variation in footing thickness:
Greater than specified - No Limit
Less than specified - 5 percent of specified thickness up to a maximum of 1 inch

(F) Subgrade Tolerances:
Slab poured on subgrade excepting footing thickness:
+ 1/4 inch
- 3/4 inch

(G) Girder Bearing Seats:
Deviation from plane surface (flatness): ± 1/8 inch in 10 feet.
Deviation from required elevation:
+ 1/4 inch
- 1/8 inch

(H) Cast-in-Place concrete box girder superstructures:
Deviation in overall depth:
+ 1/4 inch
- 1/8 inch
Deviation in slab and wall thickness:
+ 1/4 inch
- 1/8 inch
Deviation of post-tensioning ducts:
± 1/4 inch

505.10.2 Minor Precast Concrete Structures: Precast units that do not comply with the dimensional tolerances specified herein will be rejected. Precast units that show evidence of cracks, pop outs, voids or other evidence of structural inadequacy, or imperfections that will reduce the aesthetics of the unit after final placement will be rejected. The maximum allowable tolerances or deviations from the dimensions shown on the drawings shall be as follows:

(A) Over-all dimensions of member: ± 1/4 inch per 10 feet, maximum of ± 3/4 inch.

(B) Cross-sectional dimensions: sections 6 inches or less ± 1/8 inch
Sections 18 inches or less and over 6 inches ± 1/4 inch
Sections 39 inches or less and over 18 inches ± 1/4 inch

(C) Deviations from straight line:
Not more than 1/4 inch per 10 feet
All exposed, sharp corners of the concrete shall be filleted ¾ inches with a maximum allowable deviation of ± 1/8 inch.

505.11 MEASUREMENT:

505.11.1 Reinforcing Steel: When reinforcing steel is scheduled for payment as a specific item, it will be measured in pounds, based on the total computed weight for the size and length of bars, or for the area of welded wire fabric, as shown on the Project Plans or as approved by the Engineer.

Unit bar weights for deformed and plain billet-steel bars will be the nominal unit weights specified in AASHTO M-31 (ASTM A615).

Area unit weights for steel welded wire fabric will be calculated based on specified wire spacing's and unit weights for specified wire types and sizes. Unit weights for plain wire shall be based on the nominal areas specified for Wire Size Numbers in AASHTO M-32 (ASTM A82). Unit weights for deformed wire shall be the nominal unit weights specified for Deformed Wire Size Numbers in AASHTO M-225 (ASTM A496).

If the area unit weights for steel welded wire fabric are specified on the Project Plans or in the Special Provisions, both the Contractor and the Engineer shall independently calculate the area unit weight, using specified wire spacing's, types and sizes, and the criteria in the preceding paragraph. Any apparent discrepancy between the specified and calculated area unit weights shall be resolved by the Engineer prior to the Contractor placing the order for the steel welded wire fabric.

Lap splices made for the convenience of the Contractor will not be included in the measurement for payment.

Reinforcing steel for Minor Structures, as defined in Section 505.1.1, will not be measured, but will be included in the items unit price or specified method of payment, unless otherwise called out on the Project Plans or in the Special Provisions.

Dowel Placement will be measured by the unit each.

505.11.2 Concrete: When concrete is scheduled for payment on the basis of cubic yards, the calculation of the quantity of concrete for payment will be made only to the neat lines of the structures as shown on the plans. The quantity will be based on the concrete having the specified plan lengths, widths/depths, and thicknesses. However, all concrete shall be placed to line and grade within the tolerances specified in Section 505.10, or as approved by the Engineer as being reasonable and acceptable for the type of work involved. No volumetric deductions will be made for rounded or beveled edges, space occupied by reinforcing steel, metal inserts, or openings 0.5 square yard or less in area.

The quantity of concrete will be calculated considering any mortar used to cover construction joints as being concrete. The cost of cement used in any mortar for covering construction joints, patching, or other uses in the structure being constructed, in excess of that required for the design mix of the adjacent concrete, shall be absorbed in the cost of the item of work of which said mortar is a part.

505.11.3 Deck Joint Assemblies: Deck joint assemblies will be measured to the nearest tenth of a foot. Measurement will be made along the centerline of the joint, at the surface of the roadway, from face-to-face of curb or barrier. No measurement will be made for that portion of the deck joint assembly required by plan details to extend through the barrier face or curb; that portion of the joint assembly will be considered incidental to the sealing of the joint.

505.11.4 Bridge Railing, Curbs, Barriers, and Approach Slabs:

Bridge Pedestrian Fence and Curb, Bridge Pedestrian Fence and Parapet, and Bridge Fence and Parapet will be measured to the nearest tenth of a foot, from end post to end post.

Bridge Traffic and Pedestrian Rail will be measured to the nearest foot, determined from the outside dimensions of the rail.

Bridge Concrete Barrier will be measured to the nearest tenth of a foot.

Barrier Concrete Barrier Transition will be measured as a unit for each constructed.

Reinforced Concrete Approach Slab will be measured to the nearest square yard.

505.12 PAYMENT:

Payment for Portland cement concrete structures will be made in conformity with the terms of the contract and will be based on unit prices and/or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, materials, tools and equipment, preparation of subgrade for placing of concrete and doing all work required to construct the structures in conformity with the plans and specifications.

505.12.1 Reinforcing Steel: The accepted quantities of reinforcing steel, of the type indicated on the Project Plans or specified in the Special Provisions, and measured in conformance with Section 505.11.1 will be paid for at the contract unit price per pound, complete in place.

The accepted quantity of dowels placed will be paid for at the contract unit price for Dowel Placement, which shall be full compensation for the work, complete in place. Steel reinforcement furnished for the dowels will be measured and paid for under the pay item Reinforcing Steel.

No measurement or direct payment will be made for dowels which are required to replace existing reinforcing steel that is damaged as a result of the Contractor's operations; the Contractor shall furnish and place such dowels at his own expense.

505.12.2 Concrete: Payment for Portland cement concrete structures will be made in conformity with the terms of the contract and will be based on unit prices and/or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, materials, tools and equipment, preparation of subgrade for placing of concrete, and doing all work required to construct the structures in conformity with the plans and specifications.

Where concrete is scheduled for payment on the basis of cubic yards, the calculation of the quantity of concrete for payment will be made only to the neat lines of the structures as shown on the plans and on the basis of the concrete having the specified lengths, breadths, and thicknesses. The quantity of such concrete will be calculated considering the mortar used to cover construction joints as being concrete and no deductions will be made for rounded or beveled edges, space occupied by

reinforcing steel, metal inserts, or openings 5 square feet or less in area. The cost of cement used in mortar for covering construction joints, patching, or other uses in the structure being constructed, in excess of that required for the design mix of the adjacent concrete, shall be absorbed in the item of work of which said mortar is a part.

An adjustment in the contract unit price, to the nearest cent, will be made for the quantity of concrete represented by the results of cylinder strength tests that are less than the specified 28-day compressive strength. Strength tests will be conducted in accordance with Section 725.8. The adjustment in contract unit price, if the concrete is accepted, will be based on Table 725-2 in Section 725.9.

The contract unit price for structural concrete shall include full compensation for all items incidental to providing a concrete structure complete in place, including waterstops, roadway drains, scuppers, metal inserts, and bearing pads.

505.12.3 Minor Concrete Structures and Accessories:

The accepted quantities of:

Minor Structures	Each
Deck Joint Assemblies	0.1 Foot
Bridge Pedestrian Fence and Curb	0.1 Foot
Bridge Pedestrian Fence and Parapet	0.1 Foot
Bridge Fence and Parapet	0.1 Foot
Bridge Traffic and Pedestrian Rail	Foot
Bridge Concrete Barrier	0.1 Foot
Bridge Concrete Barrier Transition	Each
Reinforced Concrete Approach Slab	Square Yard

will be paid for at the unit price and/or lump sums as set forth in the proposal. The contract unit price shall include full compensation for all labor, materials, tools and equipment necessary to provide the concrete structure or accessory complete in place, including all concrete, reinforcing steel, and items embedded in the concrete, such as anchor bolts, grates and frames, metal inserts, etc.

- End of Section -

SECTION 506

PRECAST PRESTRESSED CONCRETE MEMBERS

506.1 DESCRIPTION:

This work shall consist of furnishing and placing precast prestressed concrete members in accordance with the details shown on the plans, and as provided in these specifications and special provisions.

This work shall include the manufacture, transportation and storage of girders, slabs, and other structural members of precast prestressed concrete and shall also include the placing of all precast prestressed concrete members.

The members shall be furnished complete including all concrete, prestressing steel, bar reinforcing steel, and incidental materials in connection therewith.

Prestressing may be performed by either pretensioning or posttensioning methods. The method of prestressing to be used shall be optional with the Contractor, subject to the requirements provided in these specifications.

Prior to casting any members to be prestressed, the Contractor shall submit to the Engineer for review complete details of the method, materials and equipment he proposes to use in the prestressing operations, including any additions or rearrangement of reinforcing steel from that shown on the plans. Such details shall outline the method and sequence of stressing and shall include complete specifications and details of the prestressing steel and anchoring devices, anchoring stresses, type of enclosures, and all other data of the prestressing steel in the members, pressure grouting materials and equipment. For any rearrangement of prestressing tendons the stress calculations shall be submitted for approval by the Engineer.

506.2 CONCRETE:

Concrete construction shall conform to the provisions in Section 505.

The Contractor shall be responsible for furnishing concrete for prestressed members which contains not less than 611 nor more than 752 lbs., of cement per cubic yard of concrete, which is workable and which conforms to the strength requirements specified. Batch proportions shall be determined by the Contractor.

The compressive strength of the concrete will be determined from concrete test cylinders cured under conditions similar to those affecting the member.

The use of admixtures for the purpose of producing high strength at an early date shall be subject to the approval of the Engineer. In no case shall calcium chloride or any additive containing calcium chloride be used in concrete for prestressed construction.

Concrete shall not be deposited in the forms until the Engineer has inspected the placing of the reinforcement, enclosures, anchorages, and prestressing steel.

The concrete shall be vibrated internally or externally, or both, as required to consolidate the concrete. The vibrating shall be done with care and in such a manner that displacement of reinforcement, enclosures, and prestressing steel will be avoided.

Holes for anchor bars, and for diaphragm dowels which pass through the member, openings for connection rods, recesses for grout and holes for railing bolts shall be provided in the members in accordance with the details shown on the plans. Where diaphragm dowels do not pass through the member, the dowels may be anchored in the member by embedment in the concrete or by means of an approved threaded insert.

Forms for interior cells or voids in the members shall be constructed of a material that will resist breakage or deformation during the placing of concrete and will not materially increase the weight of the member.

Forms may be removed when permitted by the Engineer provided that the concrete is not damaged in so doing and that adequate curing is provided. The members shall be properly supported to prevent dead load bending at all times prior to initial tensioning. After prestressing, the members shall be handled or supported at or near the final bearing points for storage.

The members shall be supported in transporting in a manner that will allow reasonable conformity to the proper bearing points with consideration for limitations of adequate hauling equipment. At all times members shall be handled or supported securely in an upright position, avoiding tipping or racking.

Lifting devices shall not project above the surface of the member after erection unless they will be imbedded in a subsequent concrete pour, have a minimum concrete cover of 2 inches and do not interfere with the placement of reinforcing steel or concrete.

The steam curing method or other approved methods may be used for curing precast prestressed concrete members in lieu of water curing. Steam curing, if elected by the Contractor, shall conform to the following provisions:

(A) After placement of the concrete, members shall be held for a minimum 2-hour presteaming period. The initial application of the steam shall be from 2 to 4 hours after the final placement of concrete to allow the initial set of the concrete to take place.

(B) All exposed surfaces of the members shall be kept wet continuously during the holding and curing period.

(C) The steam shall be saturated below pressure and shall be distributed uniformly over all exposed surfaces of the member and shall not impinge on the exposed concrete surfaces.

(D) The steam hood shall be equipped with temperature recording devices that will furnish an accurate continuous permanent record of the temperatures under the hood during the curing period. The position of the temperature devices shall be approved by the Engineer.

(E) During application of the steam the ambient air temperature shall increase at a rate not to exceed 40°F. per hour until a maximum temperature of from 140°F. to 160°F. is reached. The maximum temperature shall be held until the concrete has reached the desired strength.

506.3 PRESTRESSING STEEL:

Prestressing steel shall be high-tensile wire conforming to ASTM A421, high-tensile wire strand confirming to ASTM A416, or high-tensile strength alloy bars conforming to the following requirements:

High-tensile strength alloy bars shall be thermal stress relieved to produce suitable metallurgical structure and shall be individually proof-tested during the process of manufacturing to a minimum of 90 percent of the manufacturer's minimum guaranteed ultimate strength. The mechanical properties of the completed bars shall be as follows:

	Regular Grade	Special Grade
Ultimate tensile strength psi. min.	145,000	160,000
Yield strength, measured by the 0.7 percent extension under load method, psi. min.	130,000	140.000
Elongation in 20 bar diameters after rupture, percent, minimum	4.0	4.0
Reduction of area, percent, min.	25.0	20.0
Modulus of elasticity at 70 percent of the manufacturer's minimum guaranteed ultimate strength psi.min.	25×10^6	25×10^6

Diameter tolerances shall conform to ASTM A29

Bars of different ultimate strength shall not be used interchangeably in the same member, unless otherwise permitted by the Engineer.

In handling and shipping bars, every care shall be taken to avoid bending, injury from deflection, scraping or overstressing of the bars. All damaged bars will be rejected.

All wire and strand to be post-tensioned shall be:

(A) Protected from corrosion during shipping by a factory treatment or processing.

(B) Protected against abrasion during shipment and handling.

Wires shall be arranged to produce equal stress in all wire of wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to insure proper positioning in the enclosures.

Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires, and shall develop the full strength of the wire. No cold forming process shall be used that causes indentations in the wire.

When the button-headed wire assembly is tested as a unit in tension at least 90 percent of the failures at or above the minimum guaranteed ultimate strength of the wire shall occur in the wire and not in the buttons.

All prestressing steel shall be protected against rust and other corrosion and damage and shall be free of all dirt, scale and pits due to rust, oil, grease and other deleterious substances when finally encased in concrete or grouted in the member.

506.4 ANCHORAGES AND DISTRIBUTION:

All post tensioned prestressing steel shall be secured at the ends by means of approved anchoring devices. The anchors shall be of such nature that they will not kink, neckdown or otherwise damage the prestressing steel.

The load from the anchoring device shall be distributed to the concrete by means of approved devices that will effectively distribute the load to the concrete.

Anchoring devices for all post-tensioned prestressing steel shall be of the permanent type.

Where the end of a post-tensioned assembly will not be covered by concrete, the anchoring devices shall be recessed so that the ends of the prestressing steel and all parts except tendons of the anchoring devices will be at least 2 inches inside of the end surface of the members, unless a greater embedment is shown on the plans. Following post-tensioning, the recesses shall be filled with grout, and finished flush.

When headed wires are used, the outside edge of any hold for prestressing wire through a stressing washer or through an unthreaded bearing ring or plate shall not be less than 1/4 inch from the root of the thread of the washer or from the edge of the ring or plate.

Distribution plates or assemblies shall conform to the following requirements:

(A) The final unit compressive stress on the concrete directly underneath the plate or assembly shall not exceed 3,000 psi, and a suitable grillage of reinforcing steel shall be used in the stressed area.

(B) Bending stresses in the plates or assemblies induced by the pull of the prestressing steel shall not exceed design working stress, as determined by the Engineer, in the anchorage plate when 100 percent of the ultimate load is applied.

(C) Materials and workmanship shall conform to the requirements in Section 515.

Should the Contractor elect to furnish anchoring devices of a type which are sufficiently large and which are used in conjunction with a steel grillage imbedded in the concrete that effectively distributes the compressive stresses to the concrete and steel distribution plates or assemblies may be omitted.

506.5 ENCLOSURES:

Enclosures for prestressing steel shall be metallic and mortar-tight and shall be accurately placed at the locations shown on the plans or approved by the Engineer.

In lieu of metallic enclosures, openings for prestressing steel may be formed by means of cores or ducts composed of rubber or other suitable materials that can be removed prior to installing prestressing steel.

All enclosures or openings or anchorage assemblies shall be provided with pipes or other suitable connections for the injection of grout after prestressing.

506.6 PRESTRESSING:

All prestressing tendons shall be tensioned by the use of equipment allowing actual elongation to be measured directly and using a hydraulic ram equipped with an accurate method of determining the tensioning force applied using one of the following methods; a gauge measuring the internal hydraulic pressure of the ram, or force exerted by the ram; a spring-type dynamometer used with the tensioning force applied directly; an electronic load cell used with the tensioning force applied directly. Readings taken from any one of these gauges shall be converted to actual tensioning forces through the use of calibrated values taken from a certified chart from a recent calibration. All gauges shall be of sufficient size and adequately made to allow accurate readings to be made of load increments of one percent of the total capacity of the ram used, not to exceed two percent of the tensioning force used.

The force in each tendon as obtained from the calibrated value shall be compared with the tensioning force obtained from calculation using the modulus of elasticity, cross-sectional area and length of tendon for the actual net elongation measured directly. When there is a difference between the values in excess of 5 percent final anchorage of the tendon shall be delayed until the reason for the discrepancy is found and appropriate correction is made to reduce the difference to five percent or less. Within the allowable difference, final anchorage shall be made when the required tensioning force is obtained according to the elongation used in pretensioning and according to the corrected gauge reading in post-tensioning.

The tensioning of prestressing steel in any post-tensioned member and the cutting or releasing of prestressing steel in any pretensioned member shall not be performed until tests on concrete cylinders indicate that the concrete in the member has attained a compressive strength of not less than the value shown on the plans for transfer strength.

Subject to prior approval by the Engineer, a portion of the total prestressing force may be applied to a member when the strength of the concrete in the member is less than the value shown on the plans and the member may then be moved. Approval by the Engineer of such partial prestressing and moving shall in no way relieve the Contractor of full responsibility for successfully constructing the members.

The cutting and releasing of prestressed steel in pretensioned members shall be performed in such an order that lateral eccentricity of prestress will be a minimum. The prestressing steel shall be cut off flush with the end of the member and the exposed ends of the prestressing steel shall be heavily coated with roofing asphalt or coal tar.

Post-tensioning will not be permitted until it is demonstrated to the satisfaction of the Engineer that the prestressing steel is free and unbonded in the enclosure.

The tensioning process as applied to post-tensioned members shall be so conducted that tension being applied and the elongation of the prestressing steel may be measured at all times. A record shall be kept of gauge pressures and elongations at all times and shall be submitted to the Engineer for approval.

Draped prestressing steel in post-tensioned members shall be tensioned by simultaneous jacking at each end of the assembly, except where low frictional forces permit tensioning from one and as determined by the Engineer.

Determination of the jacking stresses shall be supported by calculations, or both calculations and field tests when specified, prepared by the Contractor. The Contractor shall submit his calculations to the Engineer for approval, and prior to making field tests shall submit details of his proposed gauges and load devices for determining the jacking load at each end of the test prestressing unit to the Engineer for approval. The stress at the center will be calculated from the average of the end test loads, when tests are required. Jacking stresses within 2 percent of the specified values will be considered satisfactory.

The following friction coefficients shall be used in calculating friction losses. K represents the wobble of the ducts, and U represents the curvature in draped cables:

Type of Steel	Type of Duct	K	U
Bright metal wire or strand	Bright metal	0.002	0.30
	Galvanized	0.0015	0.25
Bright metal bars	Bright metal	0.0003	0.20
	Galvanized	0.0002	0.15

The maximum temporary tensile stress (jacking stress) in prestressing steel shall not exceed 75 percent of the ultimate tensile strength of the prestressing steel. The prestressing steel shall be anchored at stresses (initial stress) that will result in the ultimate retention of working forces of not less than those shown on the plans but in no case shall the initial stress exceed 70 percent of the ultimate tensile strength of the prestressing steel.

506.7 BONDING AND GROUTING:

Post-tensioned prestressing steel shall be bonded to the concrete by pressure grouting the enclosures or openings.

All prestressing steel to be bonded to the concrete shall be free of scale and pits due to rust, dirt, oil, grease and other deleterious substances.

Grouting equipment shall be capable of grouting to a pressure of at least 100 psi. The grouting shall consist of neat cement and water conforming to the provisions in Section 725. The grout shall completely fill the enclosure or opening.

All enclosures or openings shall be clean and free of all foreign materials that would impair bonding of the grout. Each enclosure or opening shall be thoroughly flushed out with water and blown out with air or cleaned by other approved methods immediately prior to grouting.

After post-tensioned prestressing steel has been pressure grouted, the member shall not be moved or otherwise disturbed until at least 24 hours have elapsed.

506.8 SAMPLES FOR TESTING:

Sampling and testing shall conform to the specifications or ASTM A416 and A421 as provided in this specification.

Samples from each size and each lot of prestressing steel wires and bars, from each manufactured reel of prestressing steel strand, and from each lot of anchorage assemblies and bar couplers to be used shall be furnished for testing.

All wire or bars of each size from each mill lot and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each such lot can be accurately identified at the job site. Each lot of anchorage assemblies and bar couplers to be installed at the site shall be likewise identified. All unidentified prestressing steel, anchorage assemblies or bar couplers received at the site will be rejected.

The following samples of material and tendons, selected by the Engineer from the prestressing steel at the plant or job site, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

(A) For wire or strand one 7 foot long sample shall be furnished for each heat or reel and for bars one 6 foot long sample shall be furnished for each heat.

(B) If the prestressing tendon is to be prefabricated, one completely fabricated prestressing tendon 5 feet in length for each size of tendon shall be furnished, including anchorage assemblies. If the prestressing tendon is to be assembled at the job site, sufficient wire or strand and end fittings to make up one complete prestressing tendon 5 feet in length for each size of tendon shall be furnished, including anchorage assemblies.

(C) If the prestressing tendon is a bar, one 6 foot length complete with one end anchorage shall be furnished and in addition if couplers are to be used with the bars two 3 foot lengths of bar equipped with one coupler and fabricated to fit the coupler shall be furnished. Prestressing systems previously tested and approved need not be furnished as complete tendon samples, provided there is no change whatsoever in the material, design or details previously approved. Shop drawings shall contain an identification of the project on which approval was obtained, otherwise sampling will be necessary.

For prefabricated tendons, the Contractor shall give the Engineer at least 10 days' notice before commencing the installation of end fittings or the heading of wires. The Engineer will inspect all end fitting installations and wire headings while such fabrication is in progress at the plant and will arrange for all required testing of the material to be shipped to the site.

No prefabrication tendon shall be shipped to the site without first having been released by the Engineer, and each tendon shall be tagged before shipment for identification purposes at the site. All unidentified tendons received at the site will be rejected.

Job site or site as referred to herein shall be considered to mean the location where the members are to be manufactured whether at the project site or a removed casting yard.

The release of any material by the engineer shall not preclude subsequent rejection if the material is damaged in transit or later damaged or found to be defective.

506.9 HANDLING:

Extreme care shall be exercised in handling, storing, moving and erecting precast prestressed concrete members to avoid twisting, racking or other distortion that would result in cracking or damage to the members. Precast prestressed members shall be handled, transported and erected in an upright position and the points of support and directions of the reactions with respect to the members shall be approximately the same during transportation and storage as when the member is in its final position.

Precast prestressed concrete members shall be placed in the structure in the conformity with the plans and special provisions for the structure to be constructed.

506.10 PAYMENT:

Precast prestressed concrete members, will be paid for at the contract price or prices for furnishing and erecting precast prestressed concrete members of the various types and lengths set forth in the proposal.

The contract price paid for furnishing the member shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing and furnishing the member at the site of the work complete in place as shown on the plans, and as specified.

Partial payment will be allowed for members which are in the stockpile at the manufacturer's plant.

- End of Section -

SECTION 510

CONCRETE BLOCK MASONRY

510.1 DESCRIPTION:

All materials for concrete block masonry shall conform to the requirements of Sections 775 and 776.

510.2 CONSTRUCTION:

Proper masonry units shall be used to provide for all windows, doors, bond beams, lintels, pilasters, etc. with a minimum of unit cutting. Where masonry unit cutting is necessary, all cuts shall be neat and regular and edges exposed in the finished work shall be cut with a power driven abrasive saw.

Where no bond pattern is shown, the wall shall be laid up in straight uniform course with regular running bond with alternate header joints in vertical alignment.

Intersecting masonry walls and partitions shall be bonded by staggering the joints to form a masonry bond and the use of 1/4 inch minimum diameter ties at 24 inches o.c. maximum.

Where stack bond is indicated on the plans, approved metal ties shall be provided horizontally at 24 inches o.c. maximum.

Where masonry facing is a part of wall construction metal, ties shall be furnished and installed as directed by the Engineer.

Mortar joints shall be straight, clean and uniform in thickness. Unless otherwise specified or detailed on the plans, horizontal and vertical joints shall be approximately 3/8 inch thick with full mortar coverage on the face shells; shall have vertical joints buttered well for a thickness equal to the face shell of the block and these joints shall be shoved tightly, so that the mortar bonds to both blocks. No slushing or grouting of a joint will be permitted, nor shall a joint be made by working in mortar after the units have been laid.

Exposed walls shall have joints tooled with a round bar or V-shaped bar to produce a dense, slightly concave surface well bonded to the block at the edges. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.

If it is necessary to move a block so as to open a joint the block shall be removed from the wall, cleaned and set in fresh mortar.

510.3 PLACING REINFORCING STEEL:

Reinforcing steel shall be placed as indicated on the plans. Splices shall be lapped a minimum of 40 diameters, except that dowels other than column dowels need to be lapped only 30 diameters. Column dowels shall lap 50 diameters.

Outside horizontal steel shall lap around corners 40 diameters, and be carried through columns unless otherwise shown on the plans. Inside horizontal steel shall extend as far as possible and bend into corner core. A dowel shall be provided in the foundation for each vertical bar. Bending of dowels to fit openings will not be permitted and, where required, new dowels shall be installed by drilling and grouting. All lap joints shall be wired.

Vertical cores containing steel shall be filled solid with grout, and thoroughly rodded.

Where knockout blocks are used, steel shall be erected and wired in place before 3 courses have been laid. Vertical cores at steel locations shall be filled as construction progresses.

Where knockout blocks are not used, vertical cores at steel locations shall be filled in lifts of not more than 4 feet. The maximum height of pour shall be 8 feet. Cores shall be cleaned of debris and mortar and shall have reinforcing steel held straight in place. If ordered by the Engineer, inspection and cleanout holes shall be provided at the bottom of each core to be filled.

Reinforcing steel shall be inspected prior to placing grout.

510.4 CURING:

Newly constructed masonry shall be kept damp for at least 5 days with a nozzle regulated fog spray sufficient only to moisten faces of the masonry but not of such quantity as to cause water to flow down over the masonry.

510.5 MORTAR AND GROUT:

Mortar and grout used for concrete block masonry shall conform to Section 776.

510.6 PAYMENT:

Payment for concrete block masonry will be included in the lump sum price for the structure of which the masonry is a part, unless another basis for payment is included in the proposal.

- End of Section -

SECTION 511

BRICK MASONRY

511.1 MATERIALS:

Unless otherwise specified, brick masonry shall be constructed of brick conforming to Section 775 and cement mortar as described in Section 776.

511.2 BRICKLAYING:

The amount of wetting will depend on the rate of absorption of the brick at the time of laying. When being laid, the brick shall have suction sufficient to hold the mortar and to delete the excess water from grout, and shall be sufficiently damp so that the mortar will remain plastic enough to permit the brick to be leveled and plumbed after being laid without breaking the mortar bond.

Brick work shall be plumb, level, straight and true to dimensions shown on the plans. Such work shall start, where feasible, at a least important corner of wall and the masonry contractor shall request an early inspection of the work by the Engineer. All pattern work, bonds or special details indicated on the plans shall be accurately and uniformly executed. Face bonding shall be as shown on the plans, but if not shown, shall be running bond for standard size brick and approximately ⅓ bond for oversize brick and approximately 1/4 bond for modular brick unless otherwise designated by the Engineer. All bed and head joints shall be solidly filled with mortar at the time of laying.

Unless otherwise shown or detailed on the plans the thickness of mortar joints shall be uniformly ½ inch.

Face bricks shown to be laid in stack bond shall have the center lines of vertical joints plumb and the brick laid equidistant from the center line with not more than 1/8 inch variation in the width of these joints. The brick in each separate stack shall not vary more than 1/8 inch in length, but the separate stacks may vary in width of stacks.

When mortar has slightly stiffened, solidly fill with mortar all interstices between bricks and between bricks and other materials and also fill all line pin holes. Jointing and tooling shall be done before mortar has stiffened.

Masonry to be plastered shall have all mortar joints trowel cut flush.

Masonry to be painted and not shown to be tooled or raked, shall have all joints carefully and evenly struck with a trowel.

Masonry to be left exposed without paint or plaster, shall have all mortar joints carefully and evenly tooled with a metal jointing tool of a type as approved by the Engineer. Masonry shown or indicated to have raked joints shall have the joints raked out 3/8 inch deep, then tooled with a flat jointing tool, then brushed with a stiff non-metallic brush. Sack-rubbing or wiping finished masonry with rags will not be permitted.

511.3 PROTECTION:

Protect all sills, ledges, offsets, other materials, etc., from droppings of mortar during construction. Protect the tops of all unfinished masonry from rain by using water-repellant covering such as roofing felt or tar paper.

Protect the surfaces of wall, piers, etc., from mortar droppings, or splashes at scaffold heights.

511.4 CURING:

Finished masonry shall not be wetted, except when exposed to extreme hot weather or hot wind, and then only by using a nozzle regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.

511.5 REINFORCED GROUTED BRICK MASONRY:

Mortar in all bed joints shall be held back 1/4 inch from edges of brick adjacent to grout space, or shall be beveled back and upward from grout space. The thickness of head and bed joints shall be as hereinbefore specified or shown. Head joints specified or shown to be less than 5/8 inch thick shall be solidly filled with mortar as brick are laid. Head joints 5/8 inch or more

in thickness may have mortar sufficient only to form dams to retain the grout. Bed joints shall not be deeply furrowed with the trowel. All brick shall be shoved at least ½ inch into place. One outer tier shall be not more than 12 inches before grouting, but the other tier shall be not more than 4 inches high before placing the grout. Grout shall be thoroughly agitated and mixed to eliminate segregation before being placed. All interior grout spaces shall be filled with grout and immediately puddled or swished with a stick or rod (not a trowel) sufficiently to cause the grout to flow into all interstices between the bricks and to fully encase the reinforcing steel. Wherever possible, grouting shall be done from the inside face of exterior masonry. If any grout contacts the finished masonry, it shall be immediately removed, and the surface cleaned.

In masonry which is more than 2 tiers in thickness, including pilasters and columns, the interior shall be of whole or half bricks placed into grout with not less than 3/4 inch of grout surrounding each brick or half brick. Except at the finish course, all grout shall be stopped 1 ½ inches below the top of both outer tiers. Where necessary to stop off a longitudinal run of masonry, it shall be done only by racking back ½ brick length in each course and stopping grout 2 inches back of the rack. Toothing will not be permitted unless special approval is given by the Engineer.

Reinforcing steel shall be accurately placed in strict accordance with the plans and notes thereon. Vertical steel shall be held firmly in proper position. Where necessary this shall be done by means of frames or other suitable devices. Horizontal steel may be placed as the work progresses.

511.6 PAYMENT:

Payment for brick masonry will be included in the lump sum price for the structure of which the masonry is a part unless another basis for payment is included in the proposal.

- ***End of Section*** -

SECTION 515

STEEL STRUCTURES

515.1 DESCRIPTION:

515.1.1 Shop Drawings: The Contractor shall prepare and submit to the Engineer for approval, complete shop drawings which shall show details, dimensions, sizes of materials, and all information and data necessary for the metal work, including full details of the match markings. Any materials fabricated by the Contractor prior to the approval of the drawings will be at his risk. The Contractor shall be responsible for the correctness of the drawings and for shop fits and field corrections, even though the drawings may have been approved by the Engineer.

515.1.2 False work: The Contractor shall be fully responsible for designing and providing false work capable of supporting all loads which are applied.

515.1.3 As Built Plans: When required by the special provisions, the Contractor shall furnish to the Engineer before formal acceptance of the work detailed plans of the structure as built. Inasmuch as the plans will be retained by the Contracting Agency as permanent records, they must be in the form of printable transparencies of quality satisfactory to the Engineer.

515.1.4 Methods and Equipment: When requested by the Engineer, before starting erection of any structural members, the Contractor shall inform the Engineer fully as to the methods he proposes to follow and the amount and character of equipment he proposes to use. The use of such methods and equipment shall be subject to the approval of the Engineer. Approval by the Engineer shall not be considered as relieving the Contractor of the responsibility for the safety of his methods or equipment or for carrying out the work in full accordance with the plans and specifications.

An inspector or other authorized representative of the Engineer may examine the metals and metal items to be fabricated before they are worked in the shop and may exercise constant surveillance over the work during its progress, with full power to reject materials or workmanship not conforming to the plans and specifications.

The Contractor shall give the Engineer sufficient advance notice to permit ample time for the inspection of materials before commencement of the fabricating operations.

The Engineer shall be furnished complete copies in triplicate of all mill reports. The Contractor shall furnish ample means and assistance for sampling all materials. Arrangements shall be made for the Engineer to have free access at all times to any portion of the shops where work is being done.

No fabricating, machining, cutting, welding, assembling, or painting shall be done except with the knowledge of the Engineer. Any work done otherwise will be subject to rejection.

The acceptance of any material or finished member by the Engineer shall not be a bar to subsequent rejection if it is later found to be defective. Rejected material and workmanship shall be promptly replaced.

Samples of materials, except castings, shall be cut from stock designated by the Engineer or will be selected from items furnished. Gray iron, steel, and bronze castings shall be cast with test coupons.

515.2 STEEL BUILDING AND MISCELLANEOUS STEEL STRUCTURES:

Details of design, fabrication and erection of such buildings and structures shall conform to the specifications for the design, fabrication and erection of structural steel for buildings of the AISC except as modified by the special provisions for any conflicts with the applicable building code which may exist.

The design, fabrication and erection of structural steel and all similar work incidental or appurtenant to steel construction for highway bridges shall be performed in accordance with the latest standard specifications for highway bridges adopted by AASHTO. The plans or special provisions will designate the members to be galvanized.

515.2.1 Miscellaneous Metal Fabrication: The provisions of this subsection shall apply to items not intended primarily for structural purposes and which are fabricated from metals.

If straightening of any materials is necessary, the straightening shall be done by methods which will restore the material to its original shape or surface without residual blemish. Sharp kinks or bends will be considered a cause for rejection of the materials.

The finish of miscellaneous metal items shall not be less in quality and workmanship than that standard considered to be the commercial standard for the kind of member being furnished. Punched and drilled holes shall be burred and, unless otherwise specified, sheared and machined edges shall be finished by grinding to an appropriate radius. Riser, sprue, or vent marks on castings shall be ground flush with the adjacent surface. Blow holes in castings shall not be repaired by any method except as authorized in advance by the Engineer. Exposed edges of sheet metal shall be dressed with a stone or file to remove the sharp edges or corners. Drilled or punched holes which are improperly located or misaligned shall be cause for rejection and may not be corrected without the prior approval of the Engineer. All parts of assemblies shall be fabricated so that they may be assembled without forcing or drifting.

Welders proposed to be used on miscellaneous metal fabrication will be subject to qualifications.

515.3 WORKMANSHIP:

Workmanship and finish shall be equal to the best general practice in modern bridge shops.

Rolled material before being laid off or worked shall be straight. If straightening is necessary, it shall be done by methods approved by the Engineer. Kinks and bends may be cause for rejection of the material.

If straightening is necessary in the field only methods approved by the Engineer shall be used.

Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture.

Portions of the work exposed to view shall be finished neatly. Shearing, flame cutting and chipping shall be done carefully and accurately. Undercut gusset plates will not be accepted. All sharp corners and edges, and edges that are marred, cut or roughened in handling or erection, shall be slightly rounded by grinding or other suitable means.

515.4 COMPUTED WEIGHT:

The computed weight shall be obtained by the use of the following rules and assumptions:

(A) The weight of structural and cast steel shall be assumed at 0.2833 pound per cubic inch. The weight of cast iron shall be assumed at 0.2604 pound per cubic inch. The weight of wrought iron shall be assumed at 0.2776 pound per cubic inch.

(B) The weights of rolled shapes and of structural plates, shall be computed on the basis of their nominal weights and dimensions, as shown on the shop drawings, deducting for copes, cuts, and open holes, exclusive of rivet or bolt holes.

(C) Rivets, bolts, and welds shall be considered as incidentals and their price shall be included in the price of steel shapes and plates.

(D) The weight of castings and fillets shall be computed from the dimensions shown on the shop drawings, deducting for all openings or cuts in the finished casting.

(E) The weight of pins and rollers shall be computed from the dimensions shown on the shop drawings, deducting for all holes, openings, pockets, and metal removed by machine finishing.

Pilot nuts and driving nuts for each size of pin shall be furnished for erection work and the weights of such nuts will not be included in the weight of structural steel to be paid for.

(F) If computed weights are used to determine the pay quantities of galvanized metal, the weight to be added to the calculated weight of base metal for the galvanizing shall be determined from the table of weights of zinc coatings specified by the ASTM A153.

515.5 PAINTING:

With the exception of items which are to be galvanized, structural steel members and miscellaneous metal items shall have a shop prime coat of approved rust-inhibitive paint. Application shall be as specified in Section 530. The thickness of the prime coat shall be not less than one mill.

After erection of structural steel uncoated surfaces at connections, surfaces where the shop coat has been abraded or otherwise damaged shall be touched up. Match marks and identification marks shall be properly cleaned off and painted over. The paint shall be identical to that used for the shop prime coat.

515.6 MEASUREMENT:

Steel structures will be paid for at a lump sum price or at a price per pound for structural steel, and at prices per pound for cast steel and cast iron. The pay quantities will be determined by computed weights or, by scale weights obtained as provided in this specification. Only material actually used in the completed structure will be paid for.

The pay quantities will be determined by computed weights for rolled sections and scaled weights for castings except as otherwise specified.

Computed weights will be used to determine pay quantities of alloy and carbon steel when members contain both alloy and carbon steel.

The weight of erection bolts, paint, boxes, crates, and other containers used for packing and the materials used for supporting members during transportation will not be included in the weights of material to be paid for.

The weight of structural steel to be paid for will not exceed the computed weight by more than 1 ½ percent. The weight of cast steel or cast iron to be paid for will not exceed the computed weights by more than 7 ½ percent. If the scale weight of any member is less than 99 ½ percent of the computed weight of that member, the member will be rejected and will not be paid for.

If computed weights are used, the weight to be paid for will be the calculated weight as established by the Engineer and no allowance will be made for weight in excess thereof.

515.7 PAYMENT:

Unless otherwise provided in the proposal, the basis of payment for steel structures shall be as follows:

The price paid per pound for structural steel including full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing, fabricating, delivering, erecting and prime coating the steel work, complete in place, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The prices paid per pound for cast steel, cast bronze and cast iron shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing the materials, complete in place, as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

Full compensation for furnishing and placing sheet packing, performed fabric pads, elastomeric or elastic bearing pads, and red lead paste, and for grouting masonry or bearing plates as shown on the plans shall be considered as included in the price paid for structural steel and no separate payment will be made therefore. Where the specifications or plans require metal to be galvanized, the price paid per pound for the metal, including the weight of zinc coating, shall be considered as full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing the galvanized metal complete in place, as shown on the plans, and as specified in the specifications and the special provisions, and as directed by the Engineer.

- End of Section -

SECTION 520

STEEL AND ALUMINUM HANDRAILS

520.1 DESCRIPTION:

Metal handrail shall consist of furnishing all materials and constructing handrail of steel or aluminum, including railing, posts, fittings and anchorages. Metal handrail shall be fabricated, installed and painted, when required, in accordance with the details shown on the plans and these specifications.

520.2 FABRICATION:

Prior to beginning any work on the fabrication of the railing, the Contractor shall submit shop drawings for approval, showing complete railing details.

Materials furnished for metal handrail shall conform to the requirements specified on the plans.

The Engineer shall be furnished complete, copies in triplicate of all mill reports on steel and aluminum materials furnished.

Railings shall be fabricated from welded or seamless members of the size and thickness shown on the plans. Steel members shall conform to the requirements of ASTM A53. Grade B structural steel conforming to ASTM A36, or tubular sections of hot rolled mild steel, as shown. Aluminum handrails shall conform to the requirements of either ASTM B429 for round extruded tube or ASTM B221 for semi-hollow extruded tube with rounded corners.

Welding shall be performed by the electric arc process and shall be done in conformance with AASHTO/AWS D1.5, Bridge Welding Code. All butt welds on exposed surfaces shall be ground flush with adjacent surfaces.

Railing panels shall be straight and true to dimensions.

For structures on curves, either horizontal or vertical, the railing shall conform closely to the curvature of the structure.

The completed steel railing units shall be galvanized in accordance with the requirements of Section 771 unless otherwise specified.

Provide Series 300 stainless steel fasteners for aluminum alloy handrails.

520.3 ERECTION:

The railing shall be carefully erected, true to line and grade. Posts and balusters shall be vertical and parallel with the deviation from the vertical for the full height of the panel not exceeding 5/8 inch. After erecting the railing, any abrasions or exposed steel shall be repaired in accordance with Section 771 or Section 530.

520.4 MEASUREMENT:

The various types of railing will be measured by the linear foot from end to end along the face of the railing including terminal sections.

520.5 PAYMENT:

The price paid per linear foot for handrailing shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all work involved in constructing the railing complete in place as shown on the plans and specified herein.

- End of Section -

SECTION 525

PNEUMATICALLY PLACED MORTAR

525.1 DESCRIPTION:

The work under this section shall consist of furnishing all material and pneumatically placing, by means of suitable equipment and competent operators, either premixed Portland cement and fine aggregate (dry mix process) or premixed concrete (wet mix process).

525.2 DRY MIX PROCESS:

The dry mix process shall consist of thoroughly mixing a proportional combination of fine aggregate and Portland cement and conveying this mixture through a delivery hose to a special nozzle where water is added and combined with the dry ingredients prior to discharge. The nozzle water ring shall be cleaned daily.

The fine aggregate shall be material sand, conforming to ASTM C33, with Gradation No. 1 as shown in Table 525-1 and with not less than 3 percent or more than 7 percent moisture by weight.

Portland cement and mixing water shall conform to the requirements of Section 725.

The dry mix shall consist of 1 part Portland cement and 4.5 parts of fine aggregate by weight. Machine mixing will be required. This operation of proportioning and mixing shall be subject to the approval of the Engineer.

525.3 WET PROCESS:

The wet process shall consist of premixing by mechanical methods a proportional combination of Portland cement, aggregate and water required to produce mortar or concrete and conveying this mortar or concrete through the delivery hose to the special nozzle where additional compressed air is added prior to discharge. The air ports in the nozzle shall be cleaned daily.

The Portland cement concrete used for the Wet Mix Process shall conform to Section 725 and shall be Class A (3000 psi) unless otherwise specified. In no event shall a slump greater than 4 inches be used. As the work approaches the vertical, the maximum slump shall not exceed 1 inch.

The fine and coarse aggregate shall conform to ASTM C33 using one of the three graduations shown in Table 525-1. Unless otherwise specified, Gradation No. 1 will be used.

TABLE 525-1

PNEUMATICALLY PLACED MORTAR GRADATION (A.C.I. TABLE 2.2.1)

Sieve size	Percent by weight passing individual sieves		
	Gradation No. 1	Gradation No. 2	Gradation No. 3*
3/4 in.	—	—	100
½ in.	—	100	80-95
3/8 in.	100	90-100	70-90
No. 4	95-100	70-85	50-70
No. 8	80-100	50-70	35-55
No. 16	50-85	35-55	20-40
No. 30	25-60	20-35	10-30
No. 50	10-30	8-20	5-17
No. 100	2-10	2-10	2-10

*Batch fine and coarse aggregates separately to avoid segregation.

525.4 REINFORCING STEEL:

Reinforcing steel bars or welded-wire fabric shall conform to Section 727 and shall be 6 x 6 - W 1.4 x 1.4 welded wire fabric unless otherwise specified. Reinforcement shall be placed as closely as possible to the center of the mortar.

525.5 EQUIPMENT:

Prior to the start of construction, the Contractor shall demonstrate that his equipment, materials and operators are capable of providing a finished structure in accordance with the specifications. For this demonstration, the Contractor shall provide test panels, 30 inches by 30 inches, with a depth the same as the structure, but not less than 4 inches. A separate panel shall be provided for each shooting position to be used (overhead, slope and/or slab) and one half of each panel shall contain reinforcement as used in the structure. Cores will be taken for visual inspection and compressive strength tests. The Engineer has the authority to accept or reject equipment, materials and/or operators based on his evaluation and his decision will be final.

If the Contractor can present valid, factual documentation to the satisfaction of the Engineer that his equipment, materials and operators have produced satisfactory results on similar work within the past six months, the Engineer may eliminate the test panel procedure.

525.6 SURFACE PREPARATION:

The surface on which the mortar is to be placed shall be compacted and true to line and grade as required by the plans and specifications. The surface shall be uniformly moistened so that water will not be drawn from the freshly-placed mortar. Placement of the mix shall not start until the temperature is 35° F and rising and shall stop when the temperature is 40°F and falling.

525.7 FORMS AND GROUND WIRES:

Forms shall be plywood or some other suitable material, true to line and grade, sufficiently rigid to resist deflection during mortar placement.

Ground or gauging wires shall be installed where necessary to establish the thickness and finish lines of the structure.

525.8 JOINTS:

Construction joints shall be tapered to a shallow edge from not more than one inch thick over a width of approximately one foot except where the joint will be subjected to compressive stress. In this case, square joints shall be constructed. Joints shall be thoroughly cleaned and wetted prior to any additional application.

Install control joints in accordance with the plans. Reinforcement will not extend across control joints.

525.9 FINISHING:

Unless otherwise specified, the natural gun finish will be provided.

525.10 CURING:

Curing shall be accomplished using Type 2 compound as specified in Section 726. Application rate shall be not less than one tenth of a gallon per square yard. Subsection 505.6.2 Adverse Weather Concreting is applicable.

525.11 TESTING:

Tests to determine the quality of the mortar will be performed by the Engineer periodically during the course of work. Test panels shall be prepared by the Contractor.

Test panels shall be at least 12 inches square and as deep as the structure, but not less than 4 inches. Cores shall be taken from the panel for visual and compressive strength tests. The minimum compressive strength at the end of 28 days shall be 3000 psi.

The Engineer may allow the use of 6 inches by 12 inches hardware cloth cylinders for testing in lieu of the test panels. These cylinders will be furnished by the Contractor.

All rebound pockets and any mortar, defective in the compressive strength test, shall be cut out and replaced.

525.12 PAYMENT:

Payment for pneumatically-placed mortar will be made at the unit price per square yard or the lump sum as set forth in the proposal. Such payment shall be full compensation for furnishing all labor, tools, equipment and accomplishing all work in conformity with the plans and specifications.

- End of Section -

SECTION 530

PAINTING

530.1 DESCRIPTION:

This work shall consist of furnishing paint and other necessary materials and painting metal, wood or other surfaces in accordance with the details shown on the plans and these specifications.

530.2 MATERIALS:

Materials used in paint for painting shall conform to the requirements of Section 790.

530.3 WEATHER CONDITIONS:

Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather. Except as provided below, painting will not be permitted when weather conditions during application are such that the atmospheric temperature will drop below 35°F. during the drying period. If fresh paint is damaged by the elements, it shall be replaced by the Contractor at no additional cost to the Contracting Agency.

Subject to the approval of the Engineer, the Contractor may provide suitable enclosures to permit painting during inclement weather. Provisions must be made to control atmospheric conditions artificially inside the enclosures within limits suitable for painting throughout the painting operation. The cost of providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work and no additional payment will be made therefore.

530.4 APPLICATION:

Painting shall be done in a neat and workmanlike manner. Unless otherwise specified paint shall be applied either by brush, roller, or spray methods.

If brushes are used, they shall have sufficient body and length of bristle to spread the paint in a uniform coat. In general, the primary movement of the brush shall be such as to fill thoroughly all irregularities in the surface, after which the coating shall be smoothed by a series of parallel strokes. Paint shall be evenly spread and thoroughly brushed out. If a considerable amount of brush marks appear, it will be considered that the paint has been improperly applied. If rollers are used, they shall be of a type that does not leave a stippled texture in the paint file.

On all surfaces which are inaccessible for brushing, the paint shall be applied by spray or by sheepskin daubers especially constructed for the purpose, or by other means approved by the Engineer.

If spray methods are used, the operator shall be thoroughly experienced. Runs, sags, thin areas in the paint coat, or skips and holidays shall be considered as evidence the work is unsatisfactory and the Contractor may be required to apply the remainder of the paint by brush.

A water trap acceptable to the Engineer shall be furnished and installed on all equipment used in spray painting.

Mechanical mixers shall be used to mix the paint. The paint shall be mixed a sufficient length of time, prior to use, to thoroughly mix the pigment and vehicle together. Paint shall be kept thoroughly mixed while being applied.

530.5 THINNING PAINT:

Paints specified are formulated ready for application and no thinning will be allowed. If the paint becomes thick in cool weather, it shall be heated in the container immersed in hot water.

530.6 PROTECTION OF WORK:

The Contractor shall protect all parts of the structure against disfigurement by spatters, splashes, and smirches of paint or of paint materials. The Contractor shall be responsible for any damage caused by his operations to vehicles, persons, or property, and shall provide protective means to guard against such damage at his expense.

Paint stains which might result in an unsightly appearance shall be removed or obliterated by the Contractor.

When ordered by the Engineer, if traffic causes an objectionable amount of dust, the Contractor shall sprinkle the adjacent roadbed and shoulders with water for a distance on each side of the location where painting is being done sufficient to abate the dust nuisance. The Contractor shall furnish and post at his own expense DRIVE SLOWLY signs and take other necessary precautions to prevent dust and dirt from accumulating on freshly painting surfaces.

530.7 SAFETY PRECAUTIONS:

The following safety precautions shall be observed in addition to those prescribed by law in Section 107.

The applicable sections of NACE, A Manual for Painter Safety.

530.8 SURFACE PREPARATION FOR PAINTING:

530.8.1 Steel: Surface preparation for painting of the steel shall conform to the surface preparation specifications of the Steel Structures Painting Council.

Unless otherwise specified, the commercial blast method shall be used.

After erection and riveting or welding, all surfaces of structural steel which will be exposed to air in the completed structure and the repainting of existing steel structures where partial painting is required, the method of cleaning will be as directed by the Engineer or as specified in the special provisions.

530.8.2 Galvanized Surfaces:

(A) Hand Cleaning: Concrete spatter, heavy grease, and other foreign matter shall be removed from galvanized surfaces by hand scraping or wire brushing.

(B) Solvent Cleaning: After hand cleaning, all galvanized surfaces shall be cleaned by the solvent cleaning procedures prescribed in Section 530.8.1 above to remove oil, grease and other detrimental foreign matter.

(C) Pretreatment: After hand and solvent cleaning, the cleaned areas shall then be painted by brushing on at least 1 full coat of paint No. 1. Unless otherwise directed by the Engineer, the second coat shall be applied within 24 hours after the primer is applied.

530.8.3 Wood Surface: Wood surfaces shall be prepared for painting by removing all cracked or peeled paint, loose chalky paint, dirt, and other foreign matter by wire brushing, scraping, sanding, or other approved means immediately prior to painting. All surfaces shall be wiped or dry brushed to remove any dust or chalky residue that may result from cleaning operations. All wood designated to be painted shall be thoroughly dry before paint is applied.

530.9 PAINTING:

530.9.1 Structural Steel:

(A) Paint: Unless otherwise required on the plans or in the special provisions, the paints to be applied to structural steel surfaces shall consist of a shop prime coat, as specified in Section 515, a second coat, and a finish coat. The total dry film thickness of the prime and second coat shall be not less than 3 mills. The dry thickness of the paint will be measured in place with a calibrated magnetic film thickness gauge.

Excessively thick coats of paint will not be permitted. The thickness of each coat shall be limited to that which will result in uniform drying throughout the paint film.

Unless specified otherwise on the plans or in the special provisions, the paint coats shall be as specified for general use on structural steel in Section 790. Succeeding coats of paint, not otherwise materially different in color, shall have carbon black mixed into the paint in accordance with Section 790 to produce a perceptible color difference between the paint coat being applied and the preceding coat.

Any damage to sound paint on areas not designated for treatment, resulting from the Contractor's operations, shall be repaired as directed by the Engineer.

Application of Paint: Painting of structural steel, except for shop applied prime coats and sections which will be inaccessible after erection as described below, shall be done after erection unless otherwise specified in the special provisions. Requests to do any additional painting prior to erection shall be submitted by the Contractor and approved by the Engineer in writing before such work is started. Painting prior to erection will be limited to a prime coat of paint, except that surfaces exposed to the atmosphere which would be inaccessible for painting after erection shall be painted the full number of coats prior to erection. Any deficiencies in the prime coat of paint, or any second coat shall be corrected to the satisfaction of the Engineer prior to the application of the finish coat of paint.

The surface of the paint coat being covered shall be free from moisture, dust, grease, or any other deleterious material which would prevent the bond of the succeeding coat. In spot painting, any old paint which lifts after application of the touch-up coat, shall be removed by scraping and the area repainted before application of the next coat.

The finish coat shall not be applied until the required total film thickness of the undercoats of paint, as described above is obtained.

Open seams at contact surfaces of built-up members which would retain moisture shall be caulked with red lead paste before applying the second coat of paint.

Except for anchor bolt assemblies, steel embedded in concrete need not be painted. Anchor bolt assemblies shall be painted or dipped with 1 coat of paint prior to installation.

With the exception of abutting chord and column splices and column and truss shoe bases, machine finished surfaces shall be coated with a rust inhibitor which can be easily removed. Surfaces of iron and steel castings which have been machine finished shall be painted with a coat of shop paint.

530.9.2 Machinery: Prior to installation, all surfaces of machinery exposed to the atmosphere which are subject to corrosion and are normally painted, shall be painted with 2 coats of paint. Unless otherwise specified, after installation of the machinery, such surfaces shall be painted with a finish coat. All coats shall be as specified for structural steel.

530.9.3 Galvanized Surfaces: Unless otherwise provided on the plans or in the special provisions, galvanized surfaces shall be left unpainted. Areas of galvanized coating damaged due to welding after fabrication or handling shall be prepared as specified above and then painted with 1 full coat of paint No. 15.

530.9.4 Metal Guard Rails: Metal guard rails when required to be painted shall be painted with 2 coats of paint No. 11.

530.9.5 Wood Surfaces:

(A) Paint: The surface shall be prepared as specified above and painted with paint No. 6 or 7. The number of coats of paint will be specified in the special provisions.

(B) Application of Paint: When permitted in writing by the Engineer, the prime coat of paint may be applied prior to erection. After the prime coat has dried and the timber is in place, all cracks, checks, nail holes, etc., shall be puttied flush with the surface and allowed to dry before the second coat is applied.
Skips, holidays, and thin areas or other deficiencies in any 1 coat of paint shall be corrected to the satisfaction of the Engineer before the succeeding coat is applied.

The surface of the paint coat being covered shall be free of any deleterious material before any additional paint is applied.

530.10 TESTING::

Paint and paint materials shall be sampled and tested prior to use. Tests shall be conducted in accordance with methods specified by ASTM or by methods set forth in Federal Standard 141. In the absence of any such methods, other suitable methods may be designed and utilized by the Engineer. Lots or batches of paint of proprietary brand, as defined in Section 790, which have been previously sampled and tested by the Contracting Agency, and approved, may be used without further testing, if permitted by the Engineer.

530.11 PAYMENT:

Payment for the preparation of surfaces, shop prime coat and field touch-up coats on structural steel and miscellaneous metal items shall be considered as included in the prices for the structural steel and miscellaneous metal items. Payment for second and finish coats on structural steel or miscellaneous metal items shall be considered as included in payments for the structures, except that payment for cleaning all painting on miscellaneous metal items shall be considered as included in the price for the item when a separate price therefore is included in the proposal.

Full compensation for preparing surfaces and for painting machinery, galvanized metal, guard rails and wood shall be considered as included in the various prices paid for the contract items or work and no separate payment for such work will be made.

- End of Section -

PART 600

WATER, SEWER, STORM DRAIN AND IRRIGATION

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SECTION 601

TRENCH EXCAVATION, BACKFILLING AND COMPACTION

601.1 DESCRIPTION:

The work covered by this specification consists of furnishing all labor, equipment, appliances, materials, and performing all operations in connection with the excavation, backfilling and compaction of trenches for pipe installations.

Excavation for appurtenance structures, such as manholes, inlets, transition structures, junction structures, vaults, valve boxes, catch basins, etc., shall be deemed to be in the category of trench excavation.

The Trench Cross-Section Detail shown on Detail 200-2 illustrates the terminology used in this specification.

See Section 620 for cast-in-place concrete pipe.

Pipe materials that are considered to be rigid include reinforced concrete pipe, non-reinforced concrete pipe, reinforced concrete cylinder pipe, vitrified clay pipe, steel casings, cast iron, and ductile iron pipe.

Pipe materials that are considered to be flexible include thermoplastic pipes (HDPE, SRPE, PP, PVC) and corrugated metal pipe.

601.2 EXCAVATION:

601.2.1 General: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the plans, and including excavation ordered by the Engineer of compacted backfill for the purpose of making density tests on any portion of the backfill.

601.2.2 Trench Widths: Trenches for a single pipe shall conform to the dimensions in Table 601-1. Multiple pipe installations in a single trench shall be installed in accordance with details on the plans or in the special provisions.

Table 601-1 TRENCH WIDTHS

Size of Pipe (Nom. Dia.)	Maximum Width At Top Of Pipe Greater Than O.D. Of Bell	Minimum Width At Springline Each Side of Pipe Barrel
Rigid Pipes:		
Less than 18 inches	16 inches	6 inches
18 inches to 24 inches inclusive	19 inches	7.5 inches
27 inches to 39 inches inclusive	22 inches	9 inches
42 inches to 60 inches inclusive	30 inches	12 inches
66 inches to 78 inches inclusive	42 inches	15 inches
84 inches to 96 inches inclusive	50 inches	19 inches
102 inches to 120 inches inclusive	60 inches	24 inches
Flexible Pipes:		
Less than 18 inches	20 inches	8 inches
18 inches to 24 inches inclusive	23 inches	9.5 inches
27 inches to 39 inches inclusive	28 inches	12 inches
42 inches to 60 inches inclusive	34 inches	14 inches
66 inches to 78 inches inclusive	44 inches	16 inches
84 inches to 96 inches inclusive	48 inches	18 inches
102 inches to 120 inches inclusive	54 inches	21 inches

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The width of the trench shall not be greater than the maximum indicated in Table 601-1, at and below the level of the top of the pipe. The width of the trench above that level may be made as wide as necessary for shoring, bracing, and for proper installation of the work.

If the maximum trench width as specified in Table 601-1 is exceeded at the top of the pipe, additional load bearing capacity to compensate for the increased pipe loading may be required by the Engineer. The Contractor shall provide, at no additional cost to the Contracting Agency, the additional load bearing capacity. This may require changing the material requirements of initial backfill, a higher strength pipe, a concrete cradle, cap or encasement, or other means approved in writing by the Engineer. Where safety or undermining situations occur, a controlled low strength material (CLSM) backfill as specified in Sections 604 and 728 may be used as needed.

601.2.3 Trench Grade: Alignment and elevation stakes shall be furnished by the Contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Contractor will also furnish the Engineer with cut sheets.

For all pipe 12 inches or greater in diameter, the Contractor shall excavate for and provide a bedding at least 4 inches thick or 1/12 the O.D. of the pipe barrel whichever is greater. This bedding material shall be placed at a uniform density with minimum compaction and fine graded as specified herein.

601.2.4 Fine Grading: The bedding or the bottom of the trench when bedding is not required shall be accurately graded to provide uniform bearing and support for each section of the pipe at every point along its entire length, except for portions of the pipe where it is necessary to excavate for bells or other joint types and for proper sealing of the pipe joints.

601.2.5 Over-excavation: Except at locations where excavation of rock from the bottom of the trench is required, care shall be taken not to excavate below the depth needed to accommodate the required bedding depth.

Unauthorized excavation below the specified trench grade line shall be refilled at the Contractor's expense with ABC material compacted to a uniform density of not less than 95 percent of the maximum density as determined by AASHTO T-99 and T-191 or ASTM D6938. When AASHTO T-99, method A or B, and T-191 are used for density determination, ARIZ 227c will be used for rock correction.

Whenever rock is encountered in the trench bottom, it shall be over-excavated to a minimum depth of six inches below the bottom of the pipe barrel. This over-excavation shall be filled with bedding material placed with the minimum possible compaction.

Whenever unsuitable soil incapable of supporting the pipe is encountered, the Contractor will notify the Engineer and a field determination will be made as to the depth of over-excavation and the granular fill required.

601.2.6 Excavation for Manholes, Valves, Inlets, Catch Basins and Other Accessories: The Contractor may place concrete directly against excavated surfaces for cast-in-place items, provided that the faces of the excavation are firm, unyielding, and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if precast structures are used, the Contractor shall excavate as needed to place bracing, shoring, and forms or to place the precast structure. The excavation shall be backfilled with the same material required for the adjoining pipe line trench and compacted per Table 601-2.

Any unnecessary excavation below the elevation indicated for the foundation of any structure shall be replaced with the same class of concrete specified for the structure or with 1½ sack controlled low strength material as specified in Section 728. When the replacement material is structural concrete, the material shall be placed at the same time as the structure. However, when using 1½ sack controlled low strength material, placement of the material shall be per Section 604 which requires a time lag between placement of the controlled low strength material and the structural concrete. The placement of the additional material shall be at no cost to the Agency.

601.2.7 Pavement and Concrete Cutting and Removal: Where trenches lie within the portland cement concrete section of streets, alleys, driveways, or sidewalks, etc., such concrete shall be sawcut to neat, vertical, true lines in such a manner that the adjoining surface will not be damaged. The minimum depth of cut shall be 1½ inches or 1/4 of the thickness, whichever is greater.

Asphalt pavement shall be clean-cut, with approved equipment and by approved methods in accordance with the requirements of Section 336.

No ripping or rooting will be permitted outside limits of cuts. Surfacing materials removed shall be hauled from the job site immediately, and will not be permitted in the backfill.

601.2.8 Grading and Stockpiling: All grading in the vicinity of trench excavation shall be controlled to prevent surface water from flowing into the trenches. Any water accumulated in the trenches shall be removed by pumping or by other approved methods.

During excavation, material suitable for backfilling shall be placed in an orderly manner, a sufficient distance back from the edges of trenches, to avoid overloading and to prevent slides or cave-ins. Material unsuitable for backfilling, or excess material, shall be hauled from the job site and disposed of by the Contractor.

The Contractor shall, prior to commencement of the work, submit a letter to the Contracting Agency stating the location of each disposal site for all excess or unsuitable material and certify that he has obtained the property owner's permission for the disposal of all such materials.

Where the plans and/or special provisions provide for segregation of topsoil from underlying material for purposes of backfill, the material shall not be mixed.

601.2.9 Shoring and Sheathing: The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to governing laws. The bracing, sheathing, or shoring shall not be removed in one operation but shall be done in successive stages to prevent overloading of the pipe during backfill operations. The cost of the bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price for the pipe or other item which necessitated the work.

All shoring and sheathing deemed necessary to protect the excavation and to safeguard employees, shall be installed. See Section 107.

601.2.10 Open Trench: Except where otherwise noted in the special provisions, or approved in writing by the Engineer, the maximum length of open trench, where the construction is in any stage of completion (excavation, pipe laying or backfilling), shall not exceed 1320 feet in the aggregate at any one location.

Any excavated area shall be considered open trench until all ABC for pavement replacement has been placed and compacted. With the approval of the Engineer, pipe laying may be carried on at more than one location, the restrictions on open trench applying to each location. Trenches across streets shall be completely backfilled as soon as possible after pipe laying.

Substantial steel plates with adequate trench bracing shall be used to bridge across trenches at street crossings where trench backfill and temporary patches have not been completed during regular work hours. Steel plates shall be installed in accordance with Detail 211. Safe and convenient passage for pedestrians shall be provided. The Engineer may designate a passage to be provided at any point he deems necessary. Access to hospitals, fire stations and fire hydrants must be maintained at all times.

601.3 PROTECTION OF EXISTING UTILITIES:

601.3.1 Utilities: Unless otherwise shown on the plans or stated in the specifications, all utilities, either underground or overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damages to or interruption of service caused by the construction.

If the Contractor desires to simplify his operation by temporarily or permanently relocating or shutting down any utility or appurtenance, he shall make the necessary arrangements and agreements with the owner and shall be completely responsible for all costs concerned with the relocation or shutdown and reconstruction. All property shall be reconstructed in its original or new location as soon as possible and to a condition at least as good as its previous condition. This cycle of relocation or shutdown and reconstruction shall be subject to inspection and approval by both the Engineer and the owner of the utility.

The Contractor shall be entirely responsible for safeguarding and maintaining all conflicting utilities that are shown on the plans (Sections 107 and 105 apply). This includes overhead wires and cables and their supporting poles whether they are inside or outside of the open trench. If, in the course of work, a conflicting utility line that was not shown on the plans is discovered, the Contracting Agency will either negotiate with the owner for relocation, relocate the utility, change the alignment and grade of the trench or as a last resort, declare the conflict as "extra work" to be accomplished by the Contractor in accordance with Section 104.

Backfill, around utilities that are exposed during trench excavation, shall be placed in accordance with the utility's haunching and initial backfill requirements.

601.3.2 Irrigation Ditches, Pipes and Structures: The Contractor shall contact the owners of all irrigation facilities, and make arrangements for necessary construction clearances and/or dry-up periods.

All irrigation ditches, dikes, headgates, pipe, valves, checks, etc., damaged or removed by the Contractor, shall be restored to their original condition or better, by the Contractor at no additional cost to the Contracting Agency.

601.3.3 Building Foundations and Structures: Where trenches are located adjacent to building foundations and structures, the Contractor shall take all necessary precaution against damage to them. The Contractor shall be liable for any damage caused by the construction.

Except where authorized in the special provisions or in writing by the Engineer, water settling of backfill material in trenches adjacent to structures will not be permitted.

601.3.4 Permanent Pipe Supports: Permanent pipe supports for the various types and sizes of sewer, water and utility lines shall conform to the Standard Details or the details shown on the plans. Such pipe supports shall be erected at the locations shown on the plans and/or at any other location as necessary as determined by the Engineer.

601.4 FOUNDATION, BEDDING, HAUNCHING, BACKFILLING AND COMPACTION:

601.4.1 Foundation: The bottom of an excavation upon which a structure is to be placed or the bottom of a trench where the elevation is set below the pipe elevation shown on the plans or as directed by the Engineer. The elevation of the trench foundation is determined from the desired pipe elevation by taking into account the bedding and pipe wall thicknesses. The foundation surface will consist of native material or replacement material required due to over-excavation.

601.4.2 Bedding: Bedding is the material upon which a pipe is to be placed.

The bedding material type shall be ABC per Section 702 unless otherwise specified.

601.4.3 Haunching: Haunching is the material placed between the bedding and springline. If placed in lifts, the lift thickness shall not exceed 2 feet (1 foot for flexible pipe) and shall be deposited and compacted to the specified density uniformly on each side of the pipe to prevent lateral displacement of the pipe.

The haunching material shall be ABC per Section 702. With Agency approval an alternative granular material or CLSM may be used.

601.4.4 Initial Backfill: The material placed between the springline to 12 inches above top of pipe. Initial backfill shall be placed in lifts that shall not exceed 2 feet (1 foot for flexible pipe) and which can be effectively compacted depending on the type of material, type of equipment, and methods used.

Initial backfill material shall be ABC per Section 702. With Agency approval an alternative granular material or CLSM may be used, and with agency approval native backfill with no piece larger than 1½ inches may be used for concrete pipe.

601.4.5 Final Backfill: Material placed above the initial backfill to the top of the trench or to the bottom of the road base material. Final backfill shall be placed in lifts that shall not exceed 2 feet and the lift height shall not be more than can be compacted to the required density with the equipment and methods being used.

Final backfill shall be ABC per Section 702 or sound earthen material with no piece larger than 4 inches and be free from broken concrete, broken pavement, wood or other deleterious material.

Backfill under street pavement shall be constructed per Detail 200-1 with the type of replacement noted on the plans or in the special provisions. Unless otherwise noted, backfill under single curb, curb and gutter, sidewalk, driveways, valley gutters, etc. shall be the same as the adjacent street pavement.

601.4.6 Compaction Densities: Trench backfill shall be thoroughly compacted to not less than the densities shown in Table 601-2 when tested and determined by AASHTO T-99 and T-191 or ASTM D6938. When AASHTO T-99, method A or B, and T-191 are used for density determination, ARIZ-227c shall be used for rock correction.

Backfill material shall be within 2 percentage points of its optimum moisture content while being compacted.

When backfill material is CLSM and it is placed in accordance with Section 604, no compaction testing is required, the compaction density shall be deemed acceptable.

TABLE 601-2
MINIMUM TRENCH COMPACTION DENSITIES

Backfill Type	Location	From Surface To 2 feet Below Surface	From 2 feet Below Surface To 1 foot Above Top of Pipe	From 1 foot Above Top of Pipe to Bottom of Pipe
I	Under any existing or proposed pavement, curb, gutter, attached sidewalk, roadway shoulders, and other areas within right-of-way subject to vehicular traffic, or when any part of the trench excavation is within 2-feet of the existing pavement, curb, or gutter.	100% for granular 95% for non-granular	95%	95%
II	On any utility easement or right-of-way outside limits of Type I backfill.	85%	85%	90%
III	Around any structures (manholes, etc.) or exposed utilities outside limits of Type I backfill.	95% in all cases		

601.4.7 Water Consolidation: Jetting is the only acceptable water consolidation method and its use is restricted. Jetting may only be used in Type I Backfill for the haunching and initial backfill zones and in Type II Backfill locations as defined in Table 601-2.

Water consolidation by jetting shall use a 1 ½ inch pipe of sufficient length to reach the bottom of the lift being settled and shall have a water pressure of not less than 30 psi. All jetting shall be accomplished transversely across the trench at intervals of not more than 6 feet with the jetting locations on one side of the trench offset to the jetting locations on the other side of the trench. The entire lift shall be leveled and completely saturated working from the top to the bottom.

When jetting is used within the haunching and initial backfill zones, the Contractor shall be responsible for establishing each lift depth so as to avoid floating the pipe being placed and shall make any needed repair or replacement at no cost to the Contracting Agency. For pipes larger than 24 inches I.D. the first lift shall not exceed the springline of the pipe and subsequent lifts shall not exceed 3 feet.

Where jetting is used and the surrounding material does not permit proper drainage, the Contractor shall provide, at his expense a sump and a pump at the downstream end to remove the accumulated water.

The use of water consolidation does not relieve the Contractor from the responsibility to make his own determination that such methods will not result in damage to existing improvements. The Contractor shall be responsible for any damage incurred.

If jetting does not obtain the required compaction density, mechanical compaction methods shall be used to meet the compaction requirements. Water consolidated backfill material may need to be removed and replaced.

Jetting within Type I backfill locations shall not be used unless the material in which the trench is located and the backfill are both granular material. No exception shall be made for construction within new developments.

601.4.8 Granular Material and Native Backfill Material: For purposes of this specification, granular material is material for which the sum of the plasticity index and the percent of the material passing a No. 200 sieve does not exceed 23. The plasticity index shall be tested in accordance with AASHTO T-146 Method A (Wet Preparation), T-89 and T-90.

Native material used for backfill shall be sound earthen material free from broken concrete, broken pavement, wood or other deleterious material with no piece larger than 4 inches.

601.4.9 Rights-Of-Way Belonging to Others: Backfill and compaction for irrigation lines of the Salt River Valley Water Users' Association and Roosevelt Irrigation Districts and for trenches in State of Arizona or another entity's right-of-way outside the limits of the Contracting Agency shall be accomplished in accordance with their permit and/or specifications.

601.4.10 Test Holes: Boring logs shown on the plans do not constitute a part of the contract and are included for the Contractor's convenience only. It is not intended to imply that the character of the material is the same as that shown on the logs at any point other than that where the boring was made. The Contractor shall satisfy himself regarding the character and amount of rock, gravel, sand, silt, clay and water to be encountered in the work to be performed.

601.4.11 Bedding and Backfilling for Electronic, Telephonic, Telegraphic, Electrical, Oil and Gas Lines: The bedding and backfill for these underground facilities shall be native material or sand which conforms to the grading requirement of ASTM C33 for fine aggregate. When backfill material consists of aggregate base course, crushed stone, or other material containing stones, only sand will be used within the bedding, haunching, and initial backfill zones. The bedding depth shall be six inches. Compaction shall be in accordance with Table 601-2.

601.5 CONTRACTOR CERTIFICATION OF INSTALLATION PROCEDURES:

When requested in the Special Provisions or by the Engineer prior to installation, the Contractor shall furnish to the Contracting Agency an affidavit (certification) from the pipe manufacturer (or his designee) stating that the Contractor is familiar with the manufacturer's suggested installation methods and procedures and the manufacturer's suggested installation methods and procedures are consistent with MAG requirements.

When required by the Special Provisions, the pipe manufacturer or his designee will review the Contractor's methods and procedures for pipe installation in the field. The Contractor will make any adjustments in the installation as recommended by the manufacturer or his representative. If necessary, the Contractor may be required to reinstall or provide corrections to pipe installed prior to the field review at no cost to the Agency. Once the manufacturer or his representative has reviewed the Contractor's installation methods and the Contractor has adjusted his installation methods as recommended by the same, the manufacturer or his representative shall furnish to the Contracting Agency an affidavit (certification) that the Contractor's installation methods and procedures, at the time of the review, complied with the manufacturer's installation practices. The affidavit must provide the name of the manufacturer's representative witnessing the pipe installation.

601.6 PAVEMENT REPLACEMENT AND SURFACE RESTORATION:

601.6.1 Grading: The Contractor shall do such grading in the area adjacent to backfilled trenches and structures as may be necessary to leave the area in a neat and satisfactory condition approved by the Engineer.

601.6.2 Restoring Surface: All streets, alleys, driveways, sidewalks, curbs, or other surfaces, in which the surface is broken into or damaged by the installation of the new work, shall be resurfaced in kind or as specified to the satisfaction of the Engineer in accordance with Section 336.

601.6.3 Cleanup: The job site shall be left in a neat and acceptable condition. Excess soil, concrete, etc., shall be removed from the premises.

601.6.4 Temporary Pavement: The Contractor shall install temporary asphalt pavement or the first course of permanent pavement replacement in accordance with Section 336 immediately following backfilling and compaction of trenches that have been cut through existing pavement. Except as otherwise provided in Section 336, this preliminary pavement shall be maintained in a safe and reasonably smooth condition until required backfill compaction is obtained and final pavement replacement is ordered by the Engineer. Temporary paving removed shall be hauled from the job site and disposed of by the Contractor at no additional cost to the Contracting Agency.

601.7 PAYMENT:

No pay item will be included in the proposal or direct payment made for trench excavation, backfilling, compaction, or placement of temporary pavement. The cost of these features of the work shall be included in the unit price per linear foot for furnishing and laying pipe.

- End of Section -

SECTION 602

TRENCHLESS INSTALLATION OF STEEL CASING

602.1 DESCRIPTION:

The Contractor shall furnish all labor, material and equipment as required for the trenchless operation to install steel casing using horizontal earth auger boring, hand tunneling or pipe ramming.

602.2 MATERIALS:

The steel casing shall consist of steel plates rolled and welded into a cylinder. Plate material shall meet the minimum requirements of ASTM A283. Shop and field joints shall be butt welded in accordance with the minimum requirements of American Welding Society (AWS) D1.1/D1.1M. Welding shall be performed by AWS D1.1 certified personnel.

The steel casing for pressurized carrier pipes shall be a minimum of 12-inches larger than the largest OD of the carrier line including pipe bells and flanges or the size indicated on the plans, whichever is greater.

The steel casing for gravity carrier pipes shall be a minimum of 18-inches larger than the largest OD of the carrier line including pipe bells and flanges or the size indicated on the plans, whichever is greater.

602.3 TRENCHLESS OPERATION:

Before starting operations, the Contractor shall submit in accordance with Section 105.2, detailed shop drawings of the bore pit and receiving pit shoring, the casing, bulkheads, carrier pipe installation method, and welder certifications.

The bore and reception pits for the trenchless operation shall be shored to safeguard existing sub-structures and surface improvements and to protect against ground movement.

On steel casing 37-inches (ID) or larger, grout connections shall be provided at a maximum spacing of every 20-feet located at 12 o'clock in the steel casing. Upon completion of the boring operation, the contractor shall inspect each grout hole to determine if grouting is required. Any void greater than 2 inches outside the casing will require the boring contractor to grout fill the void. After grouting, the grout holes shall be closed with a threaded plug.

Steel casing smaller than 36-inches (OD) installed by horizontal earth auger boring, hand tunneling or pipe ramming will not require outside grouting unless caving or earth movement occurs.

602.4 DEWATERING:

All water encountered during the trenchless operation shall be disposed of by the Contractor in a manner that will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering shall be considered incidental to the work and no additional payment shall be made.

602.5 CARRIER PIPE PLACEMENT:

The tolerances allowed for the alignment and grade of carrier pipe shall comply with requirements of Section 610, 615 or 618 as applicable. The Contractor shall be responsible to obtain the required line and grade for the carrier pipe. The carrier pipe shall not contact or rest on the casing.

Pressurized carrier pipes, (i.e. water, gas, force main) shall be placed using casing spacers, wood skids or steel pipes for rails. Casing spacers shall be installed 3 per joint minimum with 8-foot maximum spacing. The annular space between the casing and carrier line shall be left empty unless otherwise directed. When the annular space is to be filled, 3/8-inch pea gravel shall be used.

Gravity carrier pipes, (i.e. sewer, storm drain, irrigation) shall be placed using wood skids or steel pipes for rails. The annular space between the casing and carrier line shall be left empty unless otherwise directed. When the annular space is to be filled, 3/8-inch pea gravel shall be used.

Bulkheads consisting of brick and mortar or concrete shall be constructed on the ends of the casing; bulkheads shall be a minimum of 8-inches thick. Alternative casing end closures may be substituted for brick and mortar or concrete bulkheads if approved by the engineer.

PVC conduits for dry utilities, (i.e. communications, fiber, electric) shall be placed using non-metallic PVC casing spacers. The annular space between the casing and carrier line shall be filled as indicated in the contract documents.

After completing the carrier pipe installation, the Contractor shall remove all loose and disturbed material in the bore pits and backfill the pits in accordance with Sections 601 and 336.

602.6 MEASUREMENT AND PAYMENT:

Measurement for steel casing shall be the number of horizontal linear feet from the end of casing in the bore pit to the end of casing in the reception pit. Payment for steel casing shall be full compensation for furnishing all labor, material, tools, and equipment required for the trenchless installation of steel casing, complete in place including but not limited to carrier pipe and bulkhead placement and the excavation and backfilling of pits.

- End of Section -

SECTION 604

PLACEMENT OF CONTROLLED LOW STRENGTH MATERIAL

604.1 DESCRIPTION:

The work covered by this specification consists of furnishing all materials, labor and equipment for the placement of controlled low strength material (CLSM).

The type of backfill to be used shall be as specified in the special provisions, plans or by the Engineer.

The following is a brief description of the types of CLSM and their intended uses:

1/2 SACK: General trench backfill in areas where future excavation into the backfill with conventional hand tools is anticipated or in areas of low loading such as streets, parking areas, behind retaining walls, etc.

1 SACK: General trench backfill and backfill behind retaining walls where additional strength is required above that of 1/2 sack CLSM.

1-1/2 SACK: Structural backfill under foundations and as thermal fill and/or mechanical protection of duct banks and conduits.

604.2 MATERIALS:

CLSM shall conform to the requirements of Section 728. Ready-mixed concrete shall not be used in lieu of CLSM without prior approval from the Engineer and shall be subject to rejection.

604.3 PLACEMENT:

The controlled low strength material shall be placed directly into the excavation. The CLSM shall be placed in a uniform manner that will prevent voids in or segregation of the material. Foreign material which falls into the trench prior to and during placing of the CLSM shall be immediately removed. The CLSM shall have consistency, workability, plasticity, flow characteristics and pumpability (when required) such that the material when placed is self-compacting. Mechanical compaction or vibration may be used to consolidate around structures, pipes, multiple conduits, etc., otherwise no mechanical compaction or vibration shall be required. The total elapsed time between the initial addition of water to the CLSM and the completed placement shall not exceed 90 minutes.

When CLSM is used for backfill around pipes or conduits, the CLSM shall be placed equally on both sides of pipe or conduit to prevent lateral displacement. Also, the CLSM shall be placed in lifts. The height of each lift shall not exceed the depth that will cause floating of the pipe or conduit. When placing the CLSM in greater lift depths, sufficient anchorage shall be provided so the pipe or conduit will not float.

Where CLSM is used for backfill around pipes or conduits with a depth less than 20 feet, the width of the excavation shown on the plans or in Section 601 may be reduced so that the minimum clear distance between the outside of the pipe or conduit and the side of the excavation (each side) shall be 12 inches for pipes or conduits 42 inches and larger, 6 inches for pipes or conduits between 4 inches and 42 inches and 3 inches for pipes or conduits 4 inches and smaller.

When CLSM is used behind retaining walls, the depth of each lift shall be limited so it will not induce hydraulic loads greater than the design loads.

For long trenches or installations which require a large amount of CLSM, bulkheads of wood, dirt, sand bags, etc. can be used to control the material's flowability. The bulkhead shall be removed prior to the continuation of the backfilling.

CLSM shall NOT be permitted to come in contact with any aluminum, copper or brass materials, e.g., aluminum pipes or culverts, copper water pipe, saddles, fittings, etc. Protection shall be any combination of the following: place a layer of noncorrosive material around the pipe e.g., native material, import material, etc. or provide a protective covering or wrapping such as polyethylene wrap per Section 610.6. Pipes smaller than 4 inches can be completely wrapped with tape as per Section 610.6 or approved equal.

Generally, CLSM does not resist freezing and thawing and in some cases may propagate the condition. CLSM mixes must be modified where long term freeze-thaw durability is indicated as a concern. The mix design shall have an air content of no less than six percent by volume, when tested in accordance with ASTM C6023.

604.4 PERFORMANCE TESTING:

CLSM placed within the traveled way or otherwise to be covered by paving or embankment materials, shall not be covered until one of the following performance criteria have been met:

(A) When a person of average weight and shoe size can walk on the surface of the CLSM without creating greater than 1/8-inch indents in the material, or
(B) When the in-place CLSM has reached a strength of 30 psi, when tested in accordance with ASTM D4832, or
(C) When a ball drop indentation of 3-inches or less is obtained, when tested in accordance with ASTM D6024, or
(D) When a penetration resistance reading of 650 is achieved, when tested in accordance with ASTM C403.

Additionally, CLSM shall not be covered if proof rolling by pneumatic-tired or steel wheel vibratory roller results in the bringing of free water to the surface or results in surface undulation (pumping).

When CLSM is placed in foundation excavations, the material shall be protected from foundation loading and placement of foundation concrete prior to having reached initial set per ASTM C403, or allowed to set in place for 24 hours, whichever occurs first.

604.5 ACCEPTANCE:

CLSM shall be considered deficient and may be rejected at the discretion of the Engineer if:

(A) The CLSM is outside of the limits specified in Table 728-1 and/or
(B) The aggregate gradation is outside the limits specified in Section 728.2.

Rejected material not placed shall be immediately removed from the job site. Rejected material placed shall be removed and replaced with acceptable material. Removing and disposing of the rejected material shall be at no additional cost to the Contracting Agency.

604.6 PAYMENT:

No pay item will be included in the proposal nor direct payment made for CLSM unless specifically included in the Project Specifications and Fee Proposal. The cost for placing the material shall be included in the unit price for the specific work function (laying pipe, placing structure foundation, construction retaining wall, etc.).

- End of Section -

SECTION 605

SUBDRAINAGE

605.1 DESCRIPTION:

The subdrainage system shall be constructed in accordance with the notes and details shown on the plans and the applicable provisions of these specifications except as modified in the special provisions.

605.2 CONCRETE:

All concrete placed in drainage structures, subdrain outlets, pipe collars, and similar features of the subdrainage system shall conform to the applicable provisions of Section 725.

605.3 SUBDRAINAGE PIPE:

Subdrainage pipe, both perforated and non-perforated, shall be either bell and spigot concrete, bell and spigot vitrified clay, or corrugated metal pipe, as shown on the plans or specified in the special provisions. However, if the particular kind of pipe is not shown on the plans nor specified in the special provisions, subdrainage pipe shall be concrete pipe of at least standard strength quality and shall conform to the requirements of Section 736. Vitrified clay pipe shall conform to the requirements of Section 743. Corrugated metal pipe shall conform to the requirements of Section 760.

605.3.1 Pipe Joints: Unless the pipe joints are of a self-aligning type, have the bottom half of the bell joint filled with mortar to securely hold the pipe in alignment and to bring the inner surface of abutting pipes flush and even. Where a tight joint for non-perforated pipe is required, the bell joint shall be completely filled with mortar.

605.4 SUBDRAINAGE MANHOLES:

Subdrainage manholes, including inlets, outlets, flap gates, gate boxes, and drop steps, shall comply with the requirements of the plans and the special provisions.

605.5 FILTER MATERIALS:

The filter materials shall be placed within the limits shown on the plans. The compositions of the filter materials shall each conform to one of the grading requirements in Table 605-1; the particular requirement to be used will be specified in the special provision.

The materials used shall conform to requirements for concrete aggregates in Section 725.3; however, the requirements for grading, and reactivity, as stated therein, shall not apply. The minimum bulk specific gravity shall be 2.50, by ASTM C127.

TABLE 605-1

FILTER MATERIAL GRADING - % PASSING

Screen or Sieve Size	TYPE		
	F1	F2	F3
3/4”		100	100
3/8”	100	80 - 100	70 - 100
No. 4	90 – 100	60 – 85	45 - 75
No. 8	75 – 90	45 – 70	30 – 60
No. 16	55 – 80	30 – 55	20 – 45
No. 30	30 – 60	15 – 40	10 – 30
No. 50	10 – 40	5 – 20	0 - 15
No. 100	0 – 15	0 – 10	0 - 5
No. 200	0 - 5	0 - 5	

605.6 PLACEMENT:

605.6.1 General: The excavated subgrade shall be kept free of surface water. Mudholes, ruts, or soft spots due to the Contractor's operations shall be repaired at no additional cost to the Contracting Agency, as ordered by the Engineer.

Filter and drain material shall be placed around drainage pipe so as to provide even support throughout the entire length of the pipe and to permit the installed pipe to lie upon true alignment and grade. The minimum thickness of filter material surrounding the pipe shall be 6 inches.

Filter material shall be spread to such depth as to obtain the required thickness after compaction and shall be uniform and true to the line and grades indicated on the plans.

The surface under sloped bank lining or invert shall not show any variation or departure greater than ½ inch from the testing edge of a 10 foot straightedge. Ridges and humps shall be regarded depressions filled and compacted, and tested for straightness until grading is accomplished within the tolerance specified. No relative density will be required.

Pipe damage during placement or compaction shall be replaced by the Contractor at no additional cost to the Contracting Agency. The Contractor shall exercise due care to prevent water from surface drainage or other sources, mud, muck, or debris, from running into the filter material both during and after its placement, until the lining, backfill, or structure placed thereon is completed or set. The Contractor shall provide and operate drainage sumps and pumps, or equivalent means satisfactory to the Engineer, to prevent any such saturations of the filter materials.

605.6.2 Under Sloped Bank Lining: Those portions of filter materials which become subgrade for sloped bank lining shall be compacted by 4 passes of a small roller weighing not less than 600 pounds, and 20 pounds per inch of roller width, or by other means approved by the Engineer.

605.6.3 Under Invert: Those portions of filter materials which become subgrade for channel invert linings shall be compacted by 2 passes of a smooth-wheeled roller lapping 1 foot each pass, or by use of manually-operated hand tampers, or by other means as approved by the Engineer. The weight of the roller or the size of the tamper shall be approved by the Engineer.

605.6.4 In Trenches and Along Heels or Walls of Sides of Structures: The filter materials shall be placed in 1 foot lifts and compacted by hand-held tamping or vibrating equipment to the satisfaction of the Engineer.

605.7 TESTS OF THE SUBDRAINAGE SYSTEM:

Two separate tests shall be made on each subdrain line by the Contractor to assure the proper functioning of the subdrainage system.

Each test shall be conducted in the presence of the Engineer and shall consist of the flushing of the subdrain line with sufficient water to develop a flow of 5 cubic feet per minute out of the end of the line being tested, as measured by approved measuring equipment furnished by the Contractor.

When a channel invert slab is required, the first test of each completed section of the subdrain system shall be performed immediately prior to the placement of reinforcing steel for the channel invert slab and the second test shall be performed after completion of the channel invert work. Manholes shall be cleared of all debris prior to beginning the second test.

Final acceptance of the subdrainage system will be made only if the discharge is of uniform flow and of adequate quantity. Any necessary clearing of drain lines to meet the above requirements shall be performed by the Contractor at no additional cost to the Contracting Agency.

All costs involved in the performance of the tests, including the furnishing of all labor, equipment, and material required therefore, shall be included in the prices bid for the items under which the subdrainage system is to be constructed.

605.8 PAYMENT:

Payment for the work included in this specification will be made on the basis of the lump sum or unit prices stipulated in the proposal, unless the payment for subdrainage work is included in the cost for other improvements. Such payment shall include full compensation for furnishing all labor, tools, and equipment and incidentals for doing the work involved.

- End of Section -

SECTION 607

TRENCHLESS INSTALLATION OF SMOOTH WALL JACKING PIPE

607.1 DESCRIPTION:

The Contractor shall furnish all labor, material and equipment as required for the trenchless operation for the installation of thirty-inch inside diameter (30" ID) and larger, tongue and groove smooth wall jacking pipe installed by horizontal earth pipe jacking or hand tunneling.

607.2 MATERIALS:

The jacking pipe shall be tongue and groove smooth wall reinforced concrete pipe per ASTM C76 class V, unless vitrified clay pipe per ASTM C1208, or centrifugally cast fiberglass reinforced polymer mortar pipe per ASTM D3262, is approved by engineer.

607.3 TRENCHLESS OPERATION:

Before starting operations, the Contractor shall submit in accordance with Section 105.2, detailed shop drawing of the bore pit and receiving pit shoring, the jacking pipe, bulkheads, installation method, and the annular grouting mix design and grouting method. The proposed installation method and equipment shall be at the Contractor's option, no field construction shall commence until the proposed installation method is approved in writing by the Engineer. The Engineer's approval shall in no way relieve the Contractor of the responsibility for damages of any nature which might occur as a result of the methods used.

The bore and reception pits for the trenchless operation shall be shored to safeguard existing sub-structures and surface improvements against ground movement.

The leading section of jacking pipe shall be equipped with a tunnel shield. Excavation shall be carried out entirely within the tunnel shield and no excavation in advance thereof will be permitted. Every effort shall be made to avoid any loss of earth outside of the tunnel shield. Excavated material shall be removed from the jacking pipe as excavation progresses.

Upon completion of the jacking operation and if the grade of the jacking pipe is acceptable, all voids around the outside of the pipe shall be filled with grout.

607.4 DEWATERING:

All water encountered during the trenchless operation shall be disposed of by the Contractor in a manner that will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering shall be considered incidental to the work and no additional payment shall be made.

607.5 MEASUREMENT AND PAYMENT:

Measurement for jacking pipe shall be the number of horizontal linear feet from the end of jacking pipe in the bore pit to the end of jacking pipe in the reception pit.

Payment for jacking pipe shall be full compensation for furnishing all labor, material, tools, and equipment required for the trenchless installation of the jacking pipe, complete in place including but not limited to shop drawings, dewatering, jacking pipe, bulkhead placement, grouting, and the excavation and backfilling of pits.

When a Contractor has the option of jacking and/or boring or open cut construction, and elects to construct a pipeline by the jacking and/or boring method, he will be paid for the replacement of such items of work as pavements, curb and gutter, sidewalk, driveway and alley entrances, as allowed for by open cut construction.

- End of Section –

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SECTION 610

WATER LINE CONSTRUCTION

610.1 DESCRIPTION:

The construction of all water lines shall conform to applicable standard specifications and details, except as otherwise required on the plans or as modified in the special provisions.

610.2 GENERAL:

All pipes shall be delivered, handled and installed in accordance with the manufacturer's recommendations and/or applicable provisions of AWWA standards for installation of the various types of water mains specified, insofar as such recommendations and provisions are not in variance with the standard specifications and details.

Where water lines are to be constructed in new subdivisions or in conjunction with street repaving projects, the streets shall be pre-graded to within 6 inches of the new street subgrade prior to trenching or cut stakes shall be set for trenching.

610.3 MATERIALS:

All pipes for water lines shall be of the classes shown on the plans or as specified below.

(A) The 4-inch through 16-inch diameter pipe sizes may be PVC C900 or ductile iron, except where a particular material is specified by the agency or the contract documents. All pipes shall be minimum 150 psi design unless otherwise specified.

(B) Pipe 16 inches and larger may be either ductile iron, or concrete pressure pipe-steel cylinder type.

Ductile iron and cast iron water pipe and fittings per: Section 750. Concrete pressure pipe-steel cylinder type per: Section 758. C900 PVC per: AWWA C900-07.

Service material containing brass or bronze must comply with the current NSF 61-8 standards at the time the project begins.

All brass or bronze service material must meet the current AWWA C-800 standards.

Any product used in water line construction containing brass or bronze that comes in contact with potable water shall meet the current NSF standards and federal law.

Only such packing materials as are included in the list of acceptable materials in AWWA C-600 for installation of cast iron water main shall be used. The packing materials shall be handled in such a manner as to avoid contamination, and shall be dry when placed in the joints. All such materials shall be free of oil, tar, or greasy substances, except that treated paper packing material, jute, cement, or sulfur compound caulking will not be permitted.

610.4 CONSTRUCTION METHODS:

610.4.1 Trenching/Cover: All water mains in major streets shall have a minimum cover of 48 inches over the top of the pipe. Water mains in other locations shall have a minimum cover over the top of the pipe as follows:

(A) 36 inches for mains smaller than 12 inches.

(B) 48 inches for mains 12 inches and larger.

Cover for water mains will be measured from existing or proposed finished grade of pavement or from natural ground, whichever is deeper.

Except as otherwise required in this specification, the special provisions, or by the Engineer, trench excavation, backfilling and compaction shall be in accordance with the requirements of Section 601. Backfilling may be accomplished as soon as the pipe line has been installed to the satisfaction of the Engineer, subject to the requirements for testing per Section 611.

610.4.2 Laying Pipe: No water main shall be deflected, either vertically or horizontally, in excess of that recommended by the manufacturer of the pipe or coupling.

If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and rejoined as for a new pipe.

Curb stops with flushing pipes or fire hydrants shall be installed at the ends of dead-end mains according to standard details.

Thrust blocks shall be installed in accordance with this specification.

Valve boxes and covers shall be according to standard details.

Ductile iron pipe shall be installed in accordance with this specification and pipe and fittings shall be in accordance with Section 750.

PVC C-900 pipe shall be installed in accordance with AWWA C900 and Section 601.

610.4.3 Blocking and Restraints: All pipe lines, valves and fittings 16 inches and smaller in diameter shall be blocked with concrete thrust blocks in accordance with standard details. Thrust block areas for pipe, valves and fittings larger than 16 inches in diameter shall be installed per details shown on the plans. The areas stipulated in the standard details are minimums and shall not be decreased.

If irregular soil or pressure conditions are encountered, a thrust block design revision or an alternate joint restraint system may be required by the Engineer.

When restrained/welded joints are specified to resist thrust forces, blocking is not required.

With the Engineers approval, restrained/welded joints may be used in lieu of thrust blocks.

Where restrained joints are specified on mains sixteen (16) inches in diameter and smaller, ductile iron pipe shall be used with an approved joint restraint method.

On mains sixteen (16) inches in diameter and larger where plans specify welding joints and where ductile iron pipe is furnished, joints shall be restrained by an approved joint restraint method for the distance specified.

610.4.4 Maintain Pipe Cleanliness / Pipe Cleaning: The interior of all pipe and fittings shall be kept as free as possible of all dirt and foreign material at all times, until the pipe is placed in the new line.

Every precaution shall be taken to prevent foreign material from entering the pipe. When on the project site, the ends of the pipe section shall be plugged, wrapped or tarped at all times when pipe laying is not in progress, which includes storage and staging at the site. The pipe shall be stored on a pallet, blocking or other means to prevent foreign materials from entering the pipe. The pipe line shall be protected by a water-tight plug or other means approved by the Engineer when the pipe is in the trench if pipe laying is not in progress.

If in the opinion of the Engineer, the pipe contains dirt that will not be removed during the flushing operation; the interior of the pipe shall be cleaned and swabbed, as necessary, with a .005 to .010 percent chlorine solution.

If the Contractor or pipe-laying crew cannot install the pipe in the trench without getting earth into it, the Engineer may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end of the pipe and left there until the connection is to be made to the adjacent pipe.

At the close of each day's work, and at times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer. Joints of all pipe in the trench shall be completed before the work is stopped. If water is in the trench, the seal shall remain in place until the trench is pumped dry.

610.4.5 Testing: Hydrostatic testing shall be in accordance with Section 611. After pressure testing and before placing in service, all water lines shall be disinfected. Disinfection shall be accomplished in accordance with Section 611. All corporation stops used for testing and chlorination shall be left in the pipe line with the stop closed and all connecting pipe removed.

610.5 SEPARATION:

610.5.1 General: Water lines and sewer lines shall be separated to protect water lines from contamination by sewer lines.

The angle of a water line and sewer line crossing shall be limited to between (45) forty-five degrees and (90) ninety degrees. Intersection angles of less than (45) forty-five degrees shall not be allowed.

Separation distances are measured from the outside diameter of the water or sewer line, or the centerline of a manhole.

When water and sewer lines cannot meet separation requirements, extra protection is required as described in Subsection 610.5.5 and shown in Standard Details 404-1, 404-2 and 404-3.

Extra protection requirements for line crossings are measured from the closest outside surfaces of the sewer and water line.

Water line service connections to individual building supply and distribution plumbing shall not be placed below sewer lines, and shall otherwise comply with the separation requirements of the applicable plumbing code as applied by the Agency (Administrative Authority). Methods described for extra protection do not apply to these service lines.

Water and sewer lines shall not be constructed parallel within a common trench.

610.5.2 Water Line Separation from Gravity Sewer Lines: Water lines shall not be placed within two (2) feet horizontal and one (1) foot vertical above and two (2) feet vertical below gravity sewer lines.

Extra protection is required where a water line is placed within six (6) feet horizontal and two (2) feet vertical above a gravity sewer line.

Extra protection is required where a water line is placed within six (6) feet horizontal and any distance below a gravity sewer line.

610.5.3 Water Line Separation from Pressurized Sewer Lines: Water lines shall not be placed within six (6) feet horizontal and within two (2) feet vertical below or within two (2) vertical above a pressurized sewer line.

Extra protection is required where a water line is placed within six (6) feet horizontal and within six (6) feet vertical above a pressurized sewer line.

Extra protection is required where a water line is placed within (6) feet horizontal and any distance below a pressurized sewer line.

610.5.4 Water Line Separation from Manholes: Water lines shall not pass through or come into contact with any part of a sewer manhole and shall be separated six (6) feet horizontal from the center of a sewer manhole.

610.5.5 Extra Protection: New water lines that require extra protection from new sewer lines, shall have extra protection provided by using ductile iron pipe for both lines. Lines of standard pipe length shall be centered at the point of crossing so that no joints exist within six (feet) horizontal and only restrained or mechanical joints exist within ten (10) feet horizontal.

New water lines that require extra protection from sewer lines, shall have identification wrap and/or tape installed on the water and sewer lines for the length that requires extra protection for each line.

New water lines that require extra protection from existing sewer lines shall be constructed using the extra protection specified for new water lines, and the existing sewer line:

(1) shall be reconstructed using a standard length of ductile iron pipe centered at the point of crossing so that no joints exist within six (6) feet horizontal and only restrained or mechanical joints exist within ten (10) feet horizontal, or

(2) shall be encased in 6 inches of concrete for the horizontal distance of the line that requires extra protection but for a distance no less than ten (10) feet horizontal.

Existing water lines that require extra protection from new sewer lines shall provide for extra protection by:

(1) constructing the new sewer line and reconstructing the existing water line using ductile iron pipe for both lines with standard pipe lengths centered at the point of crossing so that no joints exist within six (feet) horizontal and restrained or mechanical joints exist within ten (10) feet horizontal, or

(2) encasement of both the existing water line and the new sewer line in six (6) inches of concrete for the horizontal distance of the lines that require extra protection but for a distance no less than ten (10) feet horizontal.

(3) Extra protection for existing ductile iron water lines can be met by the installation of restrained or mechanical joints on the existing water line within ten (10) feet horizontal of the crossing and either

(a) construction of new sewer line using a standard pipe length of ductile iron pipe centered at the point of crossing so that no joints exist within six (6) feet horizontal and restrained or mechanical joints exist within ten (10) feet horizontal, or

(b) encasement of the new sewer line in 6 inches of concrete for the horizontal distance of the line that requires extra protection but for a distance no less than ten (10) feet horizontal.

610.6 POLYETHYLENE CORROSION PROTECTION:

610.6.1 General: Where called for in the plans and specifications or directed by the Engineer, pipe, valves and fittings shall be protected from corrosion by encasement in a polyethylene protective wrapping referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

610.6.2 Materials: The polywrap shall be of virgin polyethylene, not less than 8 *mils* in thickness, formed into tubes or sheets as may be required. Naturally pigmented material may be used where exposure to ultraviolet light will be less than 48 hours.

Otherwise the material shall be pigmented with 2 to 2 1/2 percent of well dispersed carbon black with stabilizers.

The polywrap shall be secured as specified below with 2-inch wide pressure sensitive tape not less than 10 mils thick. This flexible tape shall consist of a polyethylene or polyvinyl chloride backing with a synthetic elastomeric adhesive film comprised of butyl rubber. Tape shall remain flexible over a wide range of temperatures, with tensile strength and elongation properties in conformance with ASTM D1000.

The minimum tube size for each pipe diameter shall be per Table 610-1.

TABLE 610-1 (from AWWA C105-05) POLYWRAP FLAT TUBE WIDTHS		
Nominal Pipe Diameter (Inches)	**Cast Iron Or Ductile Iron With Push-On Joints (inches)**	**Cast Iron or Ductile Iron With Mechanical Joints (inches)**
4	14	16
6	16	20
8	20	24
10	24	27
12	27	30
14	30	34
16	34	37
18	37	41
20	41	45
24	54	53
30	67	.
36	81	.
42	81	.
48	95	.
54	108	.
60	108	.
64	121	.

610.6.3 Installation: The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. With the pipe suspended from the center the tube shall be slipped over the spigot end and bunched up between the point of support and the spigot end. After the pipe is installed into the bell of the adjacent pipe the pipe shall be lowered to the trench bottom and the supporting sling removed from the center of the pipe. The pipe shall then be raised at the bell end enough to allow the tube to be slipped along the full length of the barrel with enough left at each end to overlap the adjoining pipe about 1 foot. A shallow bell hole must be made at each joint to facilitate installation of the polywrap.

Pull the bunched-up polywrap from the preceding length of pipe, slip it over the end of the new length of pipe, and secure in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. Then slip the end of the polywrap from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Tape it in place.

The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe, and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

Repair any rips, punctures or other damage to the tube with the adhesive tape or pieces of tube material secured with tape.

Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

610.6.4 Payment for Polywrap: Payment for this item shall be per the provisions of Subsections 109.4 and 109.5 of the specifications unless this item is specifically called for on the plans or in the supplemental specifications or special provisions as a specific component and pay item for a given project.

610.7 VALVES:

Valves shall be installed in accordance with AWWA C-600 or AWWA C-603 modified as follows:

All tapping sleeves, gate valves, butterfly valves, air release and vacuum valves and corporation stops shall be in accordance with Section 630.

Just before installation in the trench, valves shall be fully opened and closed to check the action, and a record made of the

number of turns required to fully open or close the valve. For valves 16 inches and larger, a member of the water utility shall be present to check the action and record the number of turns. The inside of all valves shall then be thoroughly cleaned and the valve installed.

Valves 12 inches and smaller in size shall be supported by concrete blocks, in accordance with the standard details.

Valves 16 inches and larger in size along with their bypass valves, shall be supported on concrete slabs, and/or concrete piers, as indicated on the plans.

Concrete supports shall be provided under valves in vaults and manholes, and shall be constructed an inch low, then grouted with non-shrink grout. Adjustable pipe supports shall be as indicated on the plans. Buried valves shall be supported on concrete blocks as detailed on the plans.

Valve boxes shall be installed over all buried valves in accordance with standard details.

Standard couplings or matching joints shall be used when more than one length of pipe is required, or when two or more pieces are joined, to form the valve box riser. Install extension stems on all valves where the operating nut is 5 feet or more below grade.

610.8 MANHOLES AND VAULTS:

Construction shall consist of furnishing all materials and constructing manholes or vaults complete in place, as detailed, including foundation walls, cast iron steps, frames, covers, and any incidentals thereto, at location shown on the plans.

Manholes shall be constructed to conform with the requirements of Section 625 and standard details, except the inside diameter shall be 60 inches.

Vaults shall be constructed of reinforced concrete conforming to Section 725 and of concrete pipe conforming to ASTM C76 Wall A or B. Vaults shall be kept moist for 7 days before backfilling.

610.9 FIRE HYDRANTS:

The Contractor shall furnish all labor, materials, and equipment necessary to install fire hydrants complete in place at locations shown on the plans in accordance with the standard details and special provisions. Fire hydrants furnished by the Contractor shall conform to the requirements of Section 756.

If paint is chipped, scuffed, or otherwise damaged during handling and installation, the Contractor shall touch up such spots as may be designated by the Engineer.

All hydrants must be flushed and left in good working condition with the control valve open.

610.10 COUPLINGS, JOINTS, GASKETS AND FLANGES:

(A) **Couplings:** The couplings used to join the pipe to flanged valve adapters shall have a minimum working pressure of 150 psi, and shall have a fusion-bonded epoxy finish. The coupling sleeves shall be carbon steel with a minimum yield of 30,000 psi. The flanges shall have a minimum yield of 30,000 psi and be ductile iron or carbon steel for sizes up to 12”, or high-strength, low-alloy steel for sizes 14” and larger.

(B) **Joints:** The joints and fitting shall conform to Sections 750 and 752.

Bolts and Nuts:

(1) Bolts, studs, and nuts used in underground field flanged connections or for connecting fittings shall be carbon steel compliant with ASTM A307, Grade A unless Grade B is specified. Bolts, studs, and nuts shall be in accordance with AWWA C111. Bolts and studs shall have Class 2A thread tolerance with the corresponding nuts having Class 2B

tolerance. Bolts, studs and nuts shall have a hot-dipped zinc coating in accordance with ASTM F2329. All bolt diameters shall normally be 1/8 inch smaller than the bolt hole diameter. If specified, allowable exceptions to zinc coating shall be bolts, studs, and nuts made from 316 stainless steel per ASTM F593 or cadmium plated per ASTM B766. All bolts shall be hexagonal heads.

(2) The minimum requirement for underground mechanical joint connections using T-head bolts shall meet the requirements of AWWA C111 using a high strength low alloy steel manufactured for atmospheric corrosion resistance per ASTM A242.

These bolted joints shall be protected as follows: Following installation and before backfilling, all couplings, steel flanges, bolts, nuts, anchor bolts and rods, bolting of all flanged valves, and all exposed steel shall be protected from corrosion by either of the two methods outlined below at the Contractor's option.

(A) Below ground installations shall be coated with NO-OX-ID "A" with a film of not less than 1/32 inch thick and then coated with cement mortar not less than 1 inch thickness before backfilling. Cement mortar shall be composed of 1 part cement, ASTM C150, Type II, low alkali, to 3 parts sand. Before application of the cement mortar coating the area to be protected shall be covered with a layer of 2 x 2 inch No. 14 gage welded wire fabric, firmly wired in place.

(B) Below ground installations shall be protected by the application of hot coal-tar enamel. The coal-tar enamel shall be in accordance with AWWA C-203 and shall be applied to the top part of the pipe or fittings by daubers for at least 2 coats for a total minimum thickness of 1/16 inch. The coal-tar for under side of the pipe flanges or fittings shall be applied by the pan or cocoon method as described below and in AWWA Manual M-11, Steel Pipe.

Pan Method: The coating pan is securely anchored in place on the underside of the pipe and straddling the connection to be coated. The pan shall be wide enough so that the entire connection will be coated.

Hot coal-tar enamel is poured into the pan, from one side only, until the pan is completely filled. The drain plug or valve, is then opened and the excess coal-tar drained out. The pan can then be removed. Details of the coating pan and corresponding dimensions are given in AWWA Manual M-11.

The upper portion of the connection, and all remaining exposed steel pipe, will then be coated by the use of a dauber. The coal-tar coating shall be applied in at least 2 coats for a minimum thickness of 1/16 inch. The daubers and method of application shall conform to AWWA C-203. No thinning will be allowed.

(C) ***Cocoon Method:*** The cocoon is formed by placing glass fiber cloth or roofing paper, of the proper width, around the underside of the connection and adjacent exposed steel pipe. The edges of the cocoon shall be securely fastened to the pipe. Backfill is lightly placed to the spring line, and the top of the cocoon is opened and layed back on the filled area and hot coal-tar enamel poured, from one side only, until the cocoon is completely filled. The loose backfill prevents rupture of the cocoon. The upper portion of the connection and remaining exposed steel pipe shall be coated as above.

(D) **Gaskets:** Except as otherwise provided, all gaskets for pipe lines shall be one piece full faced gaskets from one-ply cloth inserted SBR rubber material. Gaskets for flanges 20 inches and smaller shall be from 1/16 inch thick material. Gaskets for flanges 24 inches and larger shall be from 1/8 inch thick material. Gasket material shall be J-M 109 as manufactured by Johns-Manville Corporation or an approved equal. Physical characteristics of the rubber compound shall meet ASTM D2000, Class 4AA805A13.

(E) **Flanges:** Cast iron flanges shall conform to AWWA C-110 as to material, diameter, thickness, drilling, etc. Steel flanges shall be ring or hub type, and shall conform to AWWA C-207, Class D. All flanges shall be drilled and have flange diameters and bolt circles conforming to AWWA C-110, except bolt holes will be 1/8 inch larger than the bolts given for the various sizes. All bolts shall be as specified above and all flanges shall have a flat facing.

610.11 CONNECTION TO EXISTING MAINS:

Existing pipe to which connections are to be made shall be exposed by the Contractor as directed by the Engineer, to permit field changes in line, grade or fittings, if necessary.

All connections to existing mains shall be constructed according to the plans.

Valves connecting new work to the existing system shall be kept closed at all times.

Only Agency personnel shall operate existing valves. The Contractor shall not operate valves in the existing system.

After disinfected samples have been taken and the new work passes the bacteriological tests, the new line shall then be turned over to the Contracting Agency with all branch lines and tie-in valves closed.

When shutdown of an existing water main is necessary in order to connect to the new lines, the Contractor shall make application and pay the required charges to the Contracting Agency. A conference between the Contractor's representative, Engineering Inspection, and Water Distribution personnel shall establish the time and procedures to insure that the shutdown will be for the shortest possible time. If necessary to minimize inconvenience to customers, shutdowns may be scheduled during other than normal working hours. The water supply to some customers, such as hospitals, cannot be shut off at any time. Provisions to furnish a continuous supply of water to such establishments will be required. After the procedures and time for a shutdown are agreed upon, it shall be the Contractor's responsibility to notify all customers in advance that the water will be turned off. When possible, customers shall be notified 24 hours in advance and in no case, except in emergency, shall notification be less than 30 minutes. Notification shall be in writing, giving the reason for the shutdown and the time and duration the water service will be shut off.

The Contracting Agency will close existing valves, but will not guarantee a 100% complete shutdown.

610.12 FIRE LINE SERVICE CONNECTIONS:

Fire line service connections shall be installed in accordance with standard details.

The fire line from the control valves at the main to the detector check valve shall be constructed of ductile iron pipe per Section 750.

610.13 METER SERVICE CONNECTIONS:

All new meters must be installed by the Contracting Agency after the proper application as required by Code with fees paid at prevailing rates.

When plans call for connections from a new water main to an existing water meter, the work shall include new copper pipe and fittings except as follows:

(A) Wrapped galvanized pipe shall be used to connect or extend existing galvanized service pipe. Type K soft copper pipe or tubing shall be used to connect or extend existing copper service pipe except when otherwise called for in the plans.

(B) When the existing main is not abandoned, and the existing meter is to be connected to the new line, the corporation stop at the old main shall be closed and the abandoned service line cut 6 inches from the old main.

(C) Taps and service connections to the new main shall be made prior to testing and disinfection of the new line.

(D) Meter service piping may be installed by drilling in place of open cut construction when approved by the Engineer.

When called for on the plans, the meter and box shall be relocated by the Contractor as directed by the Engineer. Existing meters which are shown on the plans to be relocated shall be located and installed in accordance with standard details.

Water meter boxes which are broken during construction shall be replaced by the Contractor at no additional cost to the Contracting Agency. Existing meter boxes which are already broken prior to start of construction shall be replaced by the Contractor with boxes furnished by the Contracting Agency. Boxes may be picked up by the Contractor after written authorization is received from the Engineer. The written authorization shall include the street address of each broken meter box and the size of meter box required. All water meter boxes shall conform to the standard details.

610.14 CLEANUP:

When testing, chlorination, compaction, and cleanup do not follow pipe laying in an orderly manner, the Engineer reserves the right to close down trenching and pipe laying until these operations are adequately advanced.

610.15 PAVEMENT AND SURFACING REPLACEMENT:

Pavement and surfacing replacement shall be in accordance with the requirements of Section 336.

610.16 MEASUREMENT AND PAYMENT:

(A) **Pipe:**

(1) Measurement of all pipe shall be of the linear feet of pipe installed, measured along the centerline of the pipe, through all valves and fittings, from the centerline of the fittings or centerline of valves on ends of pipe to the centerline of fittings, centerline of valves on ends of pipe or to the end of pipe, as the case may be, for all through runs of pipe. Measurement of lateral line pipes shall start at the centerline of valve at connection to the main. Measurement of service lines shall be from the centerline of the new main to the connection at the meter. Measurement shall be to the nearest foot.

(2) Payment will be made at the contract unit price per linear foot of each type and size of pipe. Such payment shall be compensation in full for furnishing and installing the pipe and fittings, specials, adapters, etc., complete in place, as called for on the plans and/or on the standard details, and shall include all costs of excavation, removal of obstructions, shoring and bracing, bedding, backfilling, compaction, maintenance of traffic, testing, disinfecting, connections to existing lines or works, and all work not specifically covered in other pay items.

(B) **Service Line Connections:** Measurement shall be of the number of unit connections made for water services, if called for in the bid. Each bid item unit shall consist of the connection to the water main and to the meter, as may be required in the plan details. Payment will be made at the contract unit price for each water service connection and shall be compensation in full for labor materials (other than pipe) equipment, tapping, and all necessary incidentals. Payment for new service pipe required to make the connection will be made separately, as stipulated above. If no contract bid item exists for connections, then the cost for connections to meters and main lines shall be included in the corresponding pipe bid item unit price.

(C) **Relocation of Existing Meters and Boxes:** Measurement shall be of the number of meters and boxes moved and reinstalled. Payment will be made at the contract unit price for each meter and box relocated and installed.

(D) **Permanent Pipe Supports and Encasement of Existing Pipes:** Measurement shall be of each unit included in the bid, and payment shall be compensation in full for supporting or encasing existing pipe, as required on the plans, including excavation, form work, reinforcing, concrete, handling and controlling flows in the existing pipe, removing and replacing existing pipe where necessary, supporting, backfilling and compaction, and pavement and/or surfacing replacement required in excess of pay width(s) allowed in Section 336.

(E) **Concrete Thrust Blocks:** Concrete thrust blocks and anchors for all pipe 16 inches and larger shall be measured by the cubic yard(s) of concrete placed, as required on the plans and/or as directed by the Engineer. Payment will be made at the contract unit price per cubic yard, and shall be compensation in full for excavation, formwork, placing and finishing concrete, reinforcing, backfilling and compaction, and pavement and/or surfacing replacement required in excess of pay width(s) allowed in Section 336. All thrust blocks and anchors for 12 inches and smaller pipe shall be included in the linear foot cost of the pipe.

(F) **Valves:** Measurement of and payment for valves, tapping sleeves and valves, and valve boxes shall be for each item furnished and installed, as designated in Section 630.

(G) **Fire Hydrants:** Measurement shall be the number of fire hydrants installed. Payment will be at the contract unit price for the installation of each fire hydrant complete in place and in operating condition. The 6 inch ductile iron pipe and fittings, required for making the connection from the main to the hydrant, shall be a separate pay item in the proposal as described above.

(H) **Pavement and/or Surfacing Replacement:** Payment for pavement and/or surfacing replacement will be made as stipulated in Section 336, except as otherwise established in this specification. The cost of pavement and/or surface replacement required for service line installations shall be included in the contract unit price for service line pipe.

- End of Section -

SECTION 611

WATER, SEWER AND STORM DRAIN TESTING

611.1 HYDROSTATIC TESTING:

Water lines, including all fittings and connections to the water mains shall be tested for water-tightness by subjecting each section to hydrostatic testing in accordance with applicable provisions of AWWA C-600, except as modified below, and shall consist of pressure testing and allowance testing.

The test section shall be slowly filled with potable water and all air shall be vented from the line. The rate of filling shall be as determined by the Superintendent of Water Distribution, with at least 24 hour notice required before tests are scheduled.

The Contractor shall provide all vents, piping, plugs, bulkheads, valves, bracing, blocking, pumps, and measuring devices and all other equipment necessary for making the tests, including pressure gages, and shall pay the Contracting Agency for water used in the tests.

Hydrostatic Testing: Pressure testing may be made before or after backfilling, but backfilling must be completed before allowance testing. If the pipe is center-loaded, a visual inspection for leaks may be made along the pipe line while the test section is under test pressure, and all visible leaks repaired. However, if mechanical compaction is to be used in the backfilling operations as spelled out in AWWA C-600, the tests shall not be made until the backfilling is completed and compacted. Backfill and compaction for the full distance encompassed by restrained/welded joints shall be completed prior to testing. All connections, blowoffs, hydrants and valves shall be tested with the main as far as is practicable. Hydrostatic testing shall not begin until the pipe has been filled with water for at least 24 hours to allow for air venting.

(A) **Pressure Testing:** Unless otherwise noted in the contract documents, the minimum prescribed test pressure shall be at least 200 psi for lines smaller than 16 inches and 150 psi for lines 16 inches or larger, not to exceed 5 psi over the minimum prescribed test pressure, as measured at the lowest end of the section under test. The duration of each pressure test shall be at least 2 hours, during which time the test section shall not drop below the minimum prescribed test pressure. If the pressure in the pipe test section has not stabilized by the end of the testing period, a hydrostatic retest will be required.

Each section of a new line between sectionalizing valves or between the last sectionalizing valve and the end of the project shall be tested separately as required in AWWA C-600, and/or as modified in these specifications, except that any such section less than 500 feet in length may be tested with the adjacent section, if both sections of line have the same pipe class rating. No section greater than 1/2 mile in total pipe length shall be tested without special written permission of the Engineer.

(B) **Testing Allowance/Makeup Water:** Makeup water volume shall be determined after the pressure test has been satisfactorily completed and all backfilling and compaction has been completed to top of trench. Testing allowance shall be defined as the maximum quantity of makeup water necessary to be supplied into the pipe line section under test to restore the ending test pressure to the beginning test pressure, after the pipe line has been filled with water and all air expelled. The Contractor shall furnish the necessary apparatus and assistance to conduct the test.

The duration of each makeup water test shall be at least 2 hours. To pass the allowance testing, the quantity of makeup water from the pipe line shall not exceed the makeup water quantity allowed by the following formula, from AWWA C-600:

$$M = \frac{SD\sqrt{P}}{148{,}000}$$

in which

M = testing Allowance (makeup water), in gallons per hour.

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches.

P = test pressure of the pipe being tested, per 610.15 (A)

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Should the test on any section of the pipe line require more makeup water than allowed by the above formula, the Contractor shall locate and repair the defective pipe, fittings, or joint until the makeup water volume is within the specified allowance. All repairs and retests, if required, shall be made at the Contractor's expense.

Connections to the existing pipelines or existing valves shall not be made until after that section of new construction has satisfactorily passed the hydrostatic tests.

Ductile iron pipe used in conjunction with ACP will be tested to the ACP standards, unless otherwise directed by the Engineer. High pressure systems of all ductile iron pipe will be tested in accordance with AWWA C-600, Section 4.1.

611.2 DISINFECTING WATER MAINS

611.2.1 Flushing Completed Pipe Lines:

(A) **Preliminary Flushing:** All mains 12 inches and smaller shall be flushed, prior to chlorination, as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test has been made. It must be understood that flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the main during laying. It is difficult to flush mains over 12 inches in diameter, so in such instances the requirements above, must be rigidly adhered to.

Heavy duty, factory bushed, tapped couplings, with corporation stops shall be located at all high points in the lines to allow the air to be removed prior to testing the water lines and at disinfection points as may be required. Field taps will not be permitted.

The couplings, at high points and disinfection points, shall be left exposed during backfilling until the testing is complete. Couplings and corporation stops shall be left on the mains upon completion of water mains.

(B) **Valve Damage by Foreign Material:** Unless proper care and thorough inspection are practiced during the laying of water mains, small stones, pieces of concrete, particles of metal, or other foreign material may gain access to mains newly laid or repaired. If it is believed that such foreign material(s) may be in the main, all hydrants on the line shall be thoroughly flushed and carefully inspected after flushing to see that the entire valve operating mechanism of each hydrant is in good condition.

611.2.2 Chlorine Residual: Before being placed in service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that a chlorine residual of not less than 10 ppm remains in the water after 24 hours standing in the pipe.

611.2.3 Methods of Applying Chlorine: Any of the following methods of application of chlorine (arranged in order of preference) may be used, subject to the approval of the Engineer.

- Liquid chlorine gas-water mixture.
- Direct chlorine feed.
- Calcium or sodium hypochlorite and water mixture.

611.2.4 Application of Liquid Chlorine: A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device or, if approved by the Engineer, the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas or of the gas itself must provide means for preventing the backflow of water into the cylinder.

611.2.5 Chlorine-Bearing Compounds in Water: On approval of the Engineer, a mixture of water and a chlorine-bearing compound of known chlorine content may be substituted for liquid chlorine.

(A) Compounds to be used: The chlorine-bearing compounds that may be used are: calcium hypochlorite*, and sodium hypochlorite**.

(B) Preparation of mixture: High-test calcium hypochlorite must be prepared as a water mixture for introduction into the water mains. The powder should first be made into a paste and then thinned to approximately a 1 percent chlorine solution (10,000 ppm). The preparation of a 1 percent chlorine solution requires the following proportions of powder to water:

Product	Amount of Compound	Quantity of Water (Gallons)
High-test calcium hypochlorite (65—70% Cl)	1 lb.	7.50
Liquid laundry bleach (5.25% Cl)	1—2 pts.	12.6

611.2.6 Point of Application: The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valved section of it and through a corporation stop inserted in the top of the newly laid pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipe line extension.

611.2.7 Rate of Application: Water from the existing distribution system or other source of supply shall be controlled so the rate of flow shall not exceed 500 gpm, unless approved by the Superintendent of Water Distribution, through a suitable measuring device into the newly laid pipe line during the application of chlorine. The rate of chlorine solution flow shall be in such proportion to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall produce at least 10 ppm of residual chlorine after 24 hours standing in the pipe. This may be expected with an application of 50 ppm, although some conditions may require more

On lines 12 inches in diameter or less, determination of the rate of flow of water into the line to be treated may be made by starting with the line full of water and measuring the rate of discharge at a hydrant located at the end of the pipe farthest away from the point of chlorine application.

For lines larger than 12 inches in diameter, the disinfection operation is generally started with the line empty.

Measurement of the flow of water into and out of all lines shall be made by means of a pitot gage, current type meter, or other approved device.

611.2.8 Preventing Reverse Flow: Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves shall be used to accomplish this.

611.2.9 Retention Period: Treated water shall be retained in the pipe long enough to destroy all nonspore-forming bacteria. This period should be at least 24 hours and should produce no less than 10 ppm residual chlorine at the extreme end of the line at the end of the retention period.

NOTE: If the circumstances are such that less than a 24 hour retention period must be used, the chlorine concentration shall be increased to 100 ppm. Under these conditions, special care should be taken to avoid attack on pipes, valves, hydrants and other appurtenances.

611.2.10 Chlorinating Valves and Hydrants: In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent. All valves in lines being disinfected shall be opened and closed several times during the 24 hour period of disinfection.

611.2.11 Final Flushing, Sampling and Testing: Following chlorination, all treated water in the newly laid pipeline shall be thoroughly flushed until the replacement water throughout the new pipeline can be proved, by laboratory testing, comparable in quality to the water served to the public from the existing water system. Prior to sampling for laboratory testing, the residual chlorine throughout the length of the pipeline shall be reduced to 1.0 ppm or less. Once the required residual chlorine level in the pipeline is achieved, samples shall be taken as outlined below.

*Comparable to commercial products known as HTH, Perchloron, and Pittchlor.
** Known commercially as liguid laundry bleach.

The Contracting Agency or its authorized representative will collect all samples for testing of the new water mains. To initiate the sampling and testing, the Contractor will present to the Contracting Agency a written request for such work no later than 24 hours prior to the time when samples are to be taken.

Samples shall be taken from a tap and riser located and installed in such a way as to prevent outside contamination. Samples shall never be taken from an unsterilized hose or fire hydrant, because such samples will seldom meet bacteriological standards. The number of sampling locations shall be as follows: Waterlines up to but less than 150 feet in length require one sampling riser installed as near the end as possible; lines 150 feet to 300 feet in length, two sampling risers, one near each end of the line; lines 300 to 3,000 feet in length, a minimum of three sampling risers. In addition, dead ends on main lines should be represented with a sampling riser.

The number of samples taken at each sampling location shall be determined by the Contracting Agency based on one of the following methods.

(A) One sample from each sampling location which is examined and analyzed in the laboratory over a three day (72 hour) period.

(B) Two samples taken on separate days from each sampling location. Satisfactory water quality of the new main shall continue for a period of at least two days (48 hours) as demonstrated by laboratory examination of these samples.

Upon completion of laboratory testing, results of all tests shall be sent by the laboratory to the Contracting Agency. Results of laboratory analysis will be interpreted by the Contracting Agency, and reported to the Contractor. Under no circumstance shall the Contractor contact the laboratory. If there is need for test results before written reports are submitted, such information shall be obtained only from the Contracting Agency or its authorized representative.

611.2.12 Repetition of Chlorination Procedure: Should the initial treatment fail to result in the conditions specified above, the original chlorination procedure shall be repeated until satisfactory results are obtained.

611.3 SEWER LINE TESTING:

Pressure testing of force mains shall be done in accordance with Section 611.1

Sewers and pipe lines shall be subject to acceptance testing after backfilling has been completed but prior to the placement of the finished surface material.

The Contracting Agency reserves the right to require testing of the entire installation. Cost of repairs or corrections necessary to conform to the following testing requirements will be borne by the Contractor at no additional cost to the Contracting Agency.

(A) **Low Pressure Air Test:**

Testing will be accomplished by the means of "Low Pressure Air Testing." Tests may be conducted by the Contractor or an independent testing firm. However, acceptance tests shall be made only in the presence of the Engineer.

Test Procedure:

(1) Before testing, the pipe shall be thoroughly cleaned.
(2) The Contractor shall seal off the section of pipe to be tested at each manhole connection. Test plugs must be securely braced within the manholes.
(3) A minimum of two connecting hoses to link the air inlet test plug with an above ground test monitoring panel must be provided.
    (a) One hose is to induce air through the test plug and into the test chamber.
    (b) The second hose is for the purpose of monitoring the test pressure from within the enclosed pipe.
(4) UNDER NO CIRCUMSTANCES ARE WORKERS TO BE ALLOWED IN THE CONNECTING MANHOLES WHILE A PRESSURE TEST IS BEING CONDUCTED.

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(5) Add air slowly into the test section. After an internal pressure of 4.0 psi is obtained, allow internal air temperature to stabilize.
(6) After stabilization period, adjust the internal air pressure to 3.5 psi, disconnect the air supply and begin timing the test.
(7) Refer to Table 611-1 to determine the length of time (minutes) the section under test must sustain while not losing in excess of 1 psi as monitored by the test gauge. If the section of line to be tested includes more than one pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.
(8) Sections so determined to have lost 1 psi or less during the test period will have passed the leakage test. Those sections losing in excess of 1 psi during the test period will have failed the leakage test.
(9) Appropriate repairs must then be completed and the line retested for acceptance.

TABLE 611-1
SANITARY SEWER AIR TEST
Minimum Test Time for Various Pipe Sizes*

Nominal Pipe Size, in.	T (time), min/100 ft	Nominal Pipe Size, in.	T (time), min/100 ft.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

* The time has been established using the formulas contained in ASTM C828, Appendix.

(B) **Hydrostatic Test:**

Exfiltration Testing (water):

Sanitary sewer testing by means of exfiltration should only be considered when low pressure air testing cannot be used and only with the approval of the Engineer.

Testing Procedure:
(1) The Contractor shall furnish all equipment for testing.
(2) Seal off the downstream end of the line and fill with water to a minimum head of 4 feet in a stand pipe at the high end.
(3) A period of at least one hour will be allowed for absorption time before making the test.
(4) A suitable meter or method of measuring the quantity of water used is necessary.
(5) The allowable water loss for sanitary sewers shall not exceed 0.158 gallons per hour per 100 feet of pipe per inch of diameter of pipe under a minimum test head of 4 feet above the top of the pipe at the upper end.

(C) **Deflection Test for HDPE and PVC Pipe:**

In addition to the tests prescribed above, the Contractor shall perform a deflection test on the system as directed by the Engineer. Any part of the installation which shows deflection in excess of 5% of the nominal inside diameter per Section 738 for HDPE pipe or in excess of 5% of the average inside diameter per ASTM D3034 for PVC pipe, shall be evaluated and appropriate remedy, if any, shall be performed.

After acceptance but prior to the termination of the warranty period, the Contracting Agency may test the long term deflection of the sewer. If the Contracting Agency determines that the deflection has exceeded 7 ½% of the average inside diameter, that portion of the installation shall be corrected by the Contractor at no cost to the Contracting Agency.

(D) **Closed Circuit T.V. Inspection:**

The Contracting Agency reserves the right to visually inspect the interior of the sewer line using a television camera. Any defects in the pipe or construction methods revealed shall be corrected by the Contractor at no additional cost to the Contracting Agency.

611.4 POST INSTALLATION INSPECTION OF NEW MAINLINE STORM DRAINS:

(A) **Video Inspection:**

The Contractor shall provide the Engineer with an annotated video inspection record (either VHS or DVD format) of the new mainline storm drain pipeline. The video shall clearly show all joints, seals, connecting pipes, and manholes. This video shall be provided to the Engineer, and reviewed and approved by the Engineer prior to the Contractor being allowed to place the final pavement over the storm drain line.

(B) **Deflection Test for HDPE and PVC Pipe:**

In addition to the tests prescribed above, the Contractor shall perform a deflection test on the system as directed by the Engineer. Any part of the installation which shows deflection in excess of 5% of the nominal inside diameter per Section 738 for HDPE pipe or in excess of 5% of the average inside diameter per ASTM D3034 for PVC pipe, shall be evaluated and appropriate remedy, if any, shall be performed.

After acceptance but prior to the termination of the warranty period, the Contracting Agency may test the long term deflection of the storm drain. If the Contracting Agency determines that the deflection has exceeded 7 ½% of the average inside diameter, that portion of the installation shall be corrected by the Contractor at no cost to the Contracting Agency.

611.5 PAYMENT:

No separate pay item shall be contained in the proposal for disinfecting water mains. This operation shall be included in the price bid for the water mains, installed complete in place, as specified in the proposal

The Contracting Agency will pay for the initial Sewer C.C.T.V. inspection. Any additional inspection(s) required, due to the failure of the initial inspection, shall be paid for by the Contractor.

No separate payment will be made for this Storm Drain Video or Deflection Testing; the cost of the video and deflection testing shall be included in the cost of the pipe.

- End of Section -

SECTION 615

SANITARY SEWER LINE CONSTRUCTION

615.1 DESCRIPTION:

The construction or extension of sanitary sewer lines shall conform to the applicable standard specifications and details, except as otherwise required on the plans or as modified in the special provisions.

615.2 MATERIALS:

Pipe used for sewer line construction, including specials, joints, and gaskets, shall be according to the following Sections, or as modified by the special provisions.

- Reinforced Concrete Pipe (RCP), see Section 735
- High Density Polyethylene (HDPE) Pipe, see Section 738
- Steel Reinforced Polyethylene (SRPE) Pipe, see Section 739
- Polypropylene Pipe (PP), see Section 740
- Vitrified Clay Pipe (VCP), see Section 743
- Polyvinylchloride Pipe (PVC), see Section 745
- Ductile Iron Pipe (DIP), see Section 750

615.3 TRENCHING:

Trench excavation shall be accomplished in accordance with Section 601, except as specified below, or as modified by special provisions.

The Engineer shall furnish the Contractor alignment and elevation stakes at agreed-upon intervals and offset together with cut sheets showing the difference in elevation from the top of the stakes to the flow line of the pipe.

The trench shall be dry when the fine grading of the trench bedding is accomplished. Before placement of pipe the fine grade shall be carefully checked by use of a string line, laser beam, or other means so that when in final position the pipe will be true to line and grade, ±0.05 feet for 12 inch and smaller diameter pipe and ±0.10 feet for 15 inch and larger diameter pipe.

615.4 SEPARATION:

To protect water lines from contamination by sewer lines, separation and extra protection shall be in accordance with Section 610.

Sewer lines that are constructed of ductile iron pipe for extra protection shall be internally lined for sewer service.

615.5 PIPE INSTALLATION:

Pipe shall be of the type, class, and size called for on the plans. All pipe shall be protected during handling against impact shocks and free falls. No damaged or defective pipe shall be installed in the work. Pipe shall be kept clean at all times, and as the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.

The laying of the pipe shall be in trenches free from water or debris, and shall commence at the lowest point, with the spigot ends pointing in the direction of the flow. Each pipe shall be laid firmly and true to line and grade, in such manner as to form a closed concentric joint with the adjoining pipe and to prevent sudden offsets of the flowline. Any adjustment to line and grade shall be made by scraping away or filling in under the body of the pipe, never by wedging or blocking under the pipe ends.

The alignment and grade of each length of pipe shall be checked after setting by measurement from the string line, laser beam target or other means approved by the Engineer.

At all times when work is not in progress, open ends of the pipe and fittings shall be securely closed to the satisfaction of the Engineer, so that no water, earth or other substance will enter the pipe or fittings.

615.6 FITTINGS:

All fittings shall conform to the requirements of the pipe specifications and shall be located as shown on the plans, or as directed by the Engineer, in accordance with the standard details.

615.7 JOINTING:

615.7.1 Gasket Joints: Prior to joining pipes, all surfaces of the portions of the pipes to be joined shall be cleaned, dried, and prepared in accordance with the manufacturer's recommendations. The joints shall then be carefully centered and completed.

Trenches shall be kept water-free during the installation of joints and couplings.

The joint and coupling materials shall be as specified in the appropriate pipe sections and shall be installed in accordance with the manufacturer's recommendations. Cement mortar joints will NOT be permitted in sanitary sewer construction.

615.7.2 Water Stops: Water stops will be required when connecting pipes other than VCP or RCP to concrete structures, manholes, etc. The water stop shall comply with Section 738 and shall be installed per manufacturer recommendations.

615.8 SANITARY SEWER SERVICE TAPS:

Sanitary sewer service taps shall be constructed in accordance with standard details.

To maintain structural integrity of the pipe, service tap connections into an existing flexible pipe shall be made in accordance with the pipe manufacturer's recommendations.

When any damage occurs to the pipe, the Contractor shall perform repairs, as recommended by the manufacturer at no cost to the Contracting Agency. Damage to the pipe will include but not be limited to gouging, marring, and scratching forming a clear depression in the pipe.

The locations of the service tap for each property shall be in the downstream ⅓ of the lot, or as requested by the property owner. Sewer service taps shall not be covered until they have been plugged and marked in accordance with standard details and their location has been recorded by the Engineer. Electronic markers shall be placed at no greater depth than electronic locating devices can locate them (typically 2'-4').

615.9 SANITARY SEWER CLEANOUTS:

Cleanouts shall be constructed at locations shown on the plans, in accordance with the standard details.

615.10 MANHOLES:

Manholes shall be constructed to conform with the requirements of Section 625 and standard details.

615.11 BACKFILLING:

Backfilling and compaction shall be accomplished in accordance with Section 601 except as modified by special provisions.

615.12 TRENCHLESS INSTALLATIONS:

Trenchless installation of pipe shall be in accordance with Section 602 or Section 607.

615.13 INSPECTION AND TESTING

Testing and inspection shall be in accordance with Section 611.

615.14 PAVEMENT AND SURFACING REPLACEMENT:

Pavement and surfacing replacement shall be in accordance with Section 336.

615.15 CLEANUP:

The Engineer has the right to close down forward trenching and pipe laying where testing, backfill, compaction and cleanup does not follow in an orderly manner.

615.16 MEASUREMENT AND PAYMENT:

(A) Sanitary Sewer Pipe and Fittings:

Measurement will be made horizontally through manholes and fittings and from centerline to centerline of structures, for the various types and sizes of pipe called for on the plans and in the proposal.

Payment for the various sizes and types of pipe will be made at the contract unit price per linear foot, and shall be compensation in full for furnishing and installing the pipe and fittings complete in place, as specified, including excavation, removal of obstructions, backfilling, compaction, sheeting and bracing, testing, and all incidental work not specifically covered in other pay items.

(B) Sanitary Sewer Service Lines and Taps:

Measurement of the number of taps installed will only be made when pay items for sanitary sewer taps are contained in the contract.

When pay items for sanitary sewer taps are contained in the contract, payment for sanitary sewer service taps will be made at the contract unit price and shall be compensation in full for furnishing and installing pipe and fittings needed to connect to the main, complete in place, as specified and called for on the plans and standard details, including all cost for furnishing and installing electronic markers, and all cost of excavation, removal of obstructions, shoring and bracing, backfilling, compaction, pavement replacement, maintenance of traffic, and all work incidental thereto.

The length of pipe required for the service lines shall be measured and payment made as Sanitary Sewer Pipe and Fittings. If no pay item is provided for the sanitary sewer taps, the connection cost including all costs for furnishing and installing electronic markers shall be included in the unit cost of the sanitary sewer pipe.

(C) Sanitary Sewer Cleanouts:

Measurement will be the number and type of cleanout installed.

Payment will be made at the contract unit price and shall be compensation in full for furnishing and installing pipe, fittings, and frame and cover as called for on the plans and in accordance with the standard details.

- End of Section -

SECTION 616

RECLAIMED WATER LINE CONSTRUCTION

616.1 GENERAL:

This specification prescribes standards for utility water mains for the purpose of conveying, under pressure, reclaimed water for permitted reuse. Installation of reclaimed water mains shall be constructed in accordance with these specifications for materials, installation, and identification.

616.2 MATERIALS:

Pipe materials shall be in accordance with Section 610.

Valves shall be in accordance with Sections 610 and 630.

Valve boxes shall be in accordance with Section 345, this Section and Detail 391-1 and 391-2. Manholes shall be in accordance with Section 625, 787 and this Section, and applicable Details.

616.3 INSTALLATION:

Pipe shall be installed in accordance with Sections 601, 610, and this Section.

Valves and risers shall be installed in accordance with this section.

Valve box debris caps shall be installed in accordance with this Section and Detail 392.

When a reclaimed water main is adjacent to or crosses a potable water main, the reclaimed water main shall be considered a pressure or force sanitary sewer and comply with Details 404-1, 404-2 and 404-3 for separation and/or protection. When reclaimed water main is adjacent to or crosses a gravity, pressure or force sanitary sewer, the reclaimed water main shall be considered a potable water main and comply to Detail 404-1, 404-2 and 404-3 for separation and/or protection.

616.4 IDENTIFICATION:

The color purple shall be used for identifying all pipes, valves, and other equipment used for conveying reclaimed water.

Reclaimed water identification tape shall be an inert polyethylene plastic impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The tape shall be a minimum of 4.0 mils thick and no less than 3 inches wide. The tape shall be purple and shall have the words, “CAUTION: RECLAIMED WATER LINE” or similar wording printed in black lettering continuously along the entire length. Lettering shall be a minimum 1 ½ inches high. Spacing between the individual words of the message shall not exceed three inches.

Reclaimed water identification sleeving (pipe socks) shall be an inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The sleeving shall be a minimum of 4.0 mils thick. The sleeving shall be purple and shall have the words, “CAUTION: RECLAIMED WATER LINE” or similar wording printed in black lettering continuously along the entire length. Lettering shall be a minimum 1 ½ inches high. Spacing between the individual words of the message shall not exceed three inches.

Reclaimed water identification decals shall be made of inert material resistant to cracking, peeling, and fading due to sunlight and heat. Decals shall have an aggressive adhesive to ensure permanent bonding to the surface that is being identified. The decals shall have the words, “CAUTION: RECLAIMED WATER - DO NOT DRINK” or similar wording printed in black lettering on a purple background. Lettering shall be a minimum 1 inch high. Spacing between the individual words of the message shall not exceed three inches.

Reclaimed water pipe identified by stenciling shall use paint or ink resistive to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. Stenciled pipe shall have the words, “CAUTION: RECLAIMED WATER - DO NOT DRINK” or similar wording printed in black or white lettering on a purple background continuously along the entire length.

Lettering shall be a minimum of 1 ½ inches high lettering shall be placed on a painted purple band a minimum of 3 inches wide that runs the entire length of the pipe.

Reclaimed water locating tape shall be an inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The tape shall be a minimum of 4.0 mils thick, 3 inch wide and contain a minimum thickness of 1/3 mil metallic foil or two embedded copper wires. The tape shall be purple and printed with the words, "CAUTION: RECLAIMED WATER LINE BELOW" or similar wordings printed in black lettering continuously along the entire length. Lettering shall be a minimum 1 ½ inches high. Spacing between the individual words of the message shall not exceed three inches.

Integral colored reclaimed water pipe shall be purple in color and shall have the words, "CAUTION: RECLAIMED WATER-DO NOT DRINK" or similar wording printed in black lettering at intervals no greater than 3 feet. Lettering shall be a minimum 1 ½ inches high. Spacing between the individual words of the message shall not exceed three inches.

Reclaimed water valve tags shall be inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The tags shall be purple and shall have the words, "CAUTION: RECLAIMED WATER-DO NOT DRINK" or similar wording printed in black lettering. The lettering shall be a minimum of ½ inch high.

616.4.1 Below- Ground Pipe:

(A) All below-ground reclaimed water pipelines shall be marked by identification tape, or sleeving, or integral coloring, or stenciling in conformance with this section.

Identification tape shall be installed parallel to the centerline and on top of the pipe. The identification tape shall be installed continuously for the entire length of the pipe and shall be securely fastened with plastic adhesive tape banded around both the pipe and identification tape at no more than 4-foot intervals.

Identification sleeving shall be installed so the wording runs along the top of the pipe. Care shall be exercised to avoid displacement of sock and to ensure its integrity.

Stenciled pipe shall be installed so the wording is parallel to the centerline and on top of the pipe.

(B) The Agency will need to maintain adequate records, install locating devices, conduct surveys, etc. to be capable of locating all below-ground reclaimed water mains as required by Arizona Revised Statutes 40-360. The means for locating the mains shall be at the discretion of the Agency. When locating tape is used, the tape shall be installed with the printed side up, directly above the pipe, parallel to the centerline, and buried 24 inches below the finished surface grade. The backfill shall be sufficiently leveled so that the tape is installed on a flat surface. Care shall be exercised to avoid displacement of the tape and to ensure its integrity.

In lieu of locating tape, a locating wire can be fastened by plastic adhesive tape to the top center of the pipe. The adhesive tape shall be banded around both the pipe and wire at no more than 4 foot intervals. The wire shall be continuous for the entire length of the pipe, without gaps, breaks, etc. The wire shall terminate above ground in a valve riser housing.

616.4.2 Above-Ground Pipe: All above ground pipe shall be identified by stenciling or decals in conformance to this section.

Stenciled pipe shall be installed so that the wording runs along both sides of the pipe.

Identification decals shall be placed on both sides of the pipe at intervals no greater than 3 feet. Surfaces shall be prepared to ensure proper adhesion of the decals.

616.4.3 Valves and Risers: Valve handles shall be affixed with tags in accordance with this section. Tags shall be securely fastened in a manner that ensures their visibility.

Riser pipes shall be painted purple both inside and out from the top of the pipe to at least one foot below the finished grade.

Debris caps shall be required in all valve housings per Detail 392 and shall be colored purple and affixed with tags in accordance with this section. Tags shall be securely fastened in a manner that ensures their visibility.

616.4.4 Valve and Manhole Covers: Valve and manhole covers shall be stamped with the words or shall have raised lettering with the words "RECLAIMED WATER". Reclaimed water valve covers shall be of a shape that is not interchangeable with potable water valve covers.

- End of Section -

SECTION 618

STORM DRAIN CONSTRUCTION

618.1 DESCRIPTION:

This section covers pipe line construction used for the conveyance of irrigation water and storm drainage in streets, easements, and alley right of ways, under low hydrostatic heads.

Installation of pipe in laterals of Salt River Valley Water Users' Association or other irrigation districts shall conform to the specifications and permit of the respective irrigation district.

Installation of pipe in State Highways shall conform to the specifications and permit of the Arizona Department of Transportation.

Installation of pipe under railways shall conform to the specifications and permit of the respective railway agency.

618.2 MATERIALS:

Pipe used for storm drain construction, including specials, joints, and gaskets, shall be according to the following Sections, or as modified by special provisions.

- Cast-in-Place Concrete Pipe (CIPP), see Section 620.
- Reinforced Concrete Pipe (RCP), see Section 735. For permitted construction reinforced concrete pipe strength shall be equal to or higher than Class III, A-III, HE-III, or VE-III.
- Non-Reinforced Concrete Pipe, see Section 736.
- High Density Polyethylene (HDPE), see Section 738.
- Steel Reinforced Polyethylene (SRPE) Pipe, see Section 739.
- Polypropylene Pipe, see Section 740.
- Corrugated Metal Pipe, see Section 760.

The size, type, and minimum strength of pipe shall be as shown on the plans, or as specified. Pipe stronger than that specified may be furnished at the Contractor's option and at no additional cost to the Contracting Agency.

When specified in the special provisions pipe line layout drawings shall be furnished to the Engineer prior to the manufacture of the concrete pipe. Catch basin connector pipe need not be included in the pipe line layout; however, special prefabricated pipe connections to the main line shall be included. In lieu of including catch basin connector pipe in the pipe layout, a list of catch basin connector pipes shall accompany the layout. The connector pipe list shall contain the following information.

(A) Size and Class of pipe.

(B) Station at which pipe joins main line.

(C) Number of section of pipe, length of section, type of sections (straight, horizontal bevel, vertical bevel, etc.).

The pipe layouts will be used by the Contracting Agency for reference only, but their use shall in no way relieve the Contractor of the responsibility for the correctness of the layout.

618.3 CONSTRUCTION METHODS:

Trench excavation, backfilling, and compaction shall be accomplished in accordance with Section 601, except as specified below, or as modified by special provisions.

The laying of the pipe shall be in finished trenches free from water or debris, and shall be commenced at the lowest point, with the spigot ends pointing in the direction of the flow. Each pipe shall be laid firmly and true to line and grade, in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden off-sets of the flow line. Any adjustment to line and grade shall be made by scraping away or filling in under the body of the pipe, never by wedging or blocking under the pipe ends.

Trenchless installation of pipe shall be in accordance with Section 602 or Section 607.

Variation from prescribed alignment and grade shall not exceed 0.10 foot and the rate of departure from or return to established grade or alignment shall be no more than 1 inch in 10 feet of pipe line unless otherwise approved by the Engineer. For closures and deflection angles greater than 10 degrees, joints shall be made by use of a bend, specially manufactured fitting, or by a concrete collar, per standard details.

618.4 POST INSTILLATION INSPECTION AND TESTING:

Post instillation inspection and testing shall be in accordance with Section 611.4.

618.5 MEASUREMENT:

(A) Main Line Pipe: Shall be the number of linear feet of pipe laid as measured along the pipe axis.

Unless hereinafter modified, measurement shall extend through manholes when no change in pipe size occurs. When a change in pipe size occurs within a manhole, unless hereinafter modified, measurement for each size will be taken to the centerline of the manhole.

(B) Connecting Pipe: Shall be the number of linear feet of pipe installed, as measured along the pipe axis from a main line pipe, or a manhole, or a catch basin to a catch basin, or a plugged end, and shall include the portions of the connecting pipe embedded in the above structures.

618.6 PAYMENT:

(A) Main Line Pipe: Will be paid at the contract unit price per linear foot, to the nearest foot, for each size and type of pipe and shall be compensation in full for furnishing and installing the type of pipe as specified and as shown on the plans including removal of obstructions, excavation, bedding, backfilling, compacting, testing, joint materials, joining, collars, and field closures.

(B) Connecting Pipe: Will be paid at the contract unit price per linear foot, to the nearest foot for each type and size of pipe and shall be compensation in full for furnishing and installing complete in place as shown on the plans and as specified, the connecting pipe and specials including spur connections, removal of obstructions, excavation, bedding, backfilling, compacting, joint materials, joining, collars, field closures, and testing.

End of Section

SECTION 620

CAST-IN-PLACE CONCRETE PIPE

620.1 GENERAL:

This specification covers cast-in-place non-reinforced concrete pipe intended for use as storm sewers or irrigation lines. The abbreviated title is CIPP. CIPP is conduit made of Portland cement concrete cast monolithically in a properly prepared trench, using equipment specifically designed for this purpose. The type of equipment to be used by the Contractor must be approved by the Engineer and the Contractor may be required to furnish evidence of the successful use of this equipment on prior work. CIPP will be placed only:

(A) By experienced operators. The Engineer will be the sole judge as to experience level.
(B) In the presence of the Engineer.
(C) In ground capable of standing unsupported from the bottom of the trench to the top of the pipe without sloughing.
(D) In fill when it can be demonstrated to the satisfaction of the Engineer that the fill will adequately support the pipe.

620.2 MATERIALS:

620.2.1 Cement shall be ASTM C150, Type II, and low alkali as per Section 725.

620.2.2 Sand aggregate used for concrete and mortar shall conform to Section 725.3. Maximum size of the aggregate shall not be greater than ⅓ of the minimum wall thickness up to and including a wall thickness of 4 ½ inches. The maximum aggregate size is 1 ½ inches.

620.2.3 Water used for concrete and for curing the pipe shall be as per Section 725.

620.2.4 Concrete shall be Class A in accordance with Section 725. Slump shall be the minimum required for satisfactory placement of the concrete by the equipment used by the Contractor. The slump shall not exceed 3 inches.

620.2.5 Bonding mortar shall consist of two (2) or more parts of cement to three (3) parts of sand by volume.

620.3 CONSTRUCTION METHODS:

620.3.1 Excavation: The trench will be neatly excavated with vertical sides and semi-circular bottom. The trench shall be shaped to form the bottom outside of the pipe on the alignment and to the grades specified in the plans. Departure from and return to established grade shall not exceed 1 inch per 10 linear feet with a maximum allowable departure of 1 ½ inches. Departure from and return to specified alignment shall not exceed 2 inches per 10 linear feet with a maximum allowable alignment departure of 4 inches. The bottom of the trench, hereinafter known as the trench form, will be shaped to provide full, firm, and uniform support by undisturbed earth or compacted fill for at least the bottom 210 degrees of the pipe. Density of the fill shall be at least five percent (5%) greater than the natural inplace soil, but in no case less than 85 percent (85%) when tested in accordance with AASHTO T-99, Method A and T-191 or ASTM D6938.

When it is necessary to install the pipe in rocky areas, the rock will be removed and replaced with suitable fill material compacted to proper density. The rock will be over-excavated to leave 6 inches minimum compacted soil cushion between the rock and the pipe. For construction accuracy, areas left void by rock removal will be completely filled with compacted material, then trenched for the pipe as though natural ground. If the rock below the pipe subgrade is fractured or fragmented or if it consists of large cobblestones or boulders, the replacement fill material will be carefully selected to insure that it is of such gradation that it will not be removed downward by fluctuation of the water table. In no case will expansive soils be used for fill. A similar procedure of over-excavation, backfill, compaction, and retrenching will be used where sloughing sand or where soft or spongy soil conditions are encountered. When expansive clays are encountered, they will be thoroughly moistened by ponding, to completely expand the soil, and the moisture maintained until the concrete is placed.

Where the pipe is to be constructed through fill materials, such fill shall have stability in the zone of the trench form equal to firm undisturbed earth, in the area adjacent to the fill.

Upon direction of the Engineer, the Contractor shall substitute RCP or an acceptable alternate at locations where the conditions are unsuitable for CIPP. All cost for this substitution shall be borne by the Contractor.

620.3.2 Placement: At the time of concrete placement, all soil in the trench will be adequately moistened so that water is not drawn from the freshly placed concrete. However, the trench form will be completely free of water, mud, and debris. All forming devices, including the slipforms and hopper of the placement device, shall be thoroughly moistened.

Concrete shall not be placed when temperature of the concrete exceeds 90 degrees Fahrenheit or is less than 50 degrees Fahrenheit. The soil adjacent to the trench shall be at a temperature above freezing.

The pipe shall be constructed in one placement, the entire cross-section being placed monolithically. Inside forms shall be sufficiently rigid to withstand consolidation of the fresh concrete. Placement shall be such as to produce a thoroughly consolidated homogeneous concrete mixture conforming to the test requirements of this specification. Effective consolidation means shall be applied to the fresh concrete over the entire circumference and from within the pipe shell. Consolidation means shall be capable of effectively placing and consolidating fresh concrete at production speeds. Methods of consolidating shall be capable of building up sufficient pressure to effectively bond the concrete to the surrounding earth and to keep loose sand, mud, and water out of the pipe shell.

(A) Construction Joints:

When work is stopped at the end of a placement or for any period that would permit initial set to take place, a construction joint shall be formed. The ends of the pipe that are to be in butt contact shall be left in rough condition with a slope of approximately 45 degrees. Before resuming, if the pipe diameter is 60 inches or less, an excavation shall be made along the sides and bottom of the joint to permit casting of a concrete collar around the outside of the joint. This collar shall have a minimum thickness of 11/4 times the wall thickness of the pipe and shall lap the entire joint by at least two (2) times the wall thickness. Immediately before resuming concrete placement the surfaces to be bonded shall be cleaned of all laitance, coatings, foreign materials, and loose or defective concrete, thoroughly wetted and coated with a layer of bonding mortar (Subsection 620.2.5) approximately 1/4 inch thick. In lieu of the bonding mortar, neat cement paste may be thoroughly scrubbed onto the wet surface of the previously placed concrete.

For a joint that may be used for connections to another pipe or structure, a joint shall be made by squaring off the end of the pipe. An excavation shall be made along the sides and bottom of the cast-in-place pipe, for any diameter, to permit casting of a concrete collar as described above.

The outside top of all joints shall be capped for the entire width of the pipe that is exposed, that is, between the earth walls of the excavated trench. This cap shall have a minimum thickness equal to the wall thickness of the pipe and shall lap the joint, both upstream and downstream from the joint by at least twice the wall thickness of the pipe. A cap as described is required regardless of pipe size.

(B) Pipe Dimensions and Tolerances:

(1) The internal diameter of the pipe at any point shall not be less than 95 percent of the nominal diameter, and the average of any four (4) measurements of the internal diameter made at 45 degree intervals shall not be less than the nominal diameter.
(2) For pipe less than 15 inches inside diameter, the minimum wall thickness shall be 2 inches.
For pipe with an inside diameter of 15 inches to 24 inches the minimum wall thickness shall be 2 ½ inches. For pipe exceeding 24 inches inside diameter, the minimum wall thickness shall be 1/12 of the inside diameter, plus ½ inch.
(3) Offsets at form laps and horizontal edges shall not exceed ½ inch for pipe having inside diameter not greater than 42 inches; 3/4 inch for pipe having inside diameter greater than 42 inches, but not greater than 72 inches; and 1 inch for pipe having inside diameter greater than 72 inches.

620.3.3 Curing and Backfilling: The Contractor shall be responsible for proper curing of the concrete and backfilling the trench to an even grade. Final backfill and compaction shall not be started until concrete has developed a compressive strength of at least 2,000 psi. Curing shall be performed in such a manner as to prevent the premature drying of the concrete. The Contractor shall use one of the four methods described below.

(A) A 3 inch layer of moist loose soil or sand shall be carefully placed over the top of the pipe immediately after the pipe is cast. The backfill shall be material free of clods and rocks having a diameter greater than 2 inches and any other deleterious foreign materials. The backfill shall be carefully placed over the top of the pipe to prevent damage to the wet concrete. The thickness of

the backfill shall be increased by 9 inches after initial set of the concrete has occurred. The backfill shall be kept moist at all times until the pipe has been covered to a depth of 12 inches or more

(B) The exposed top portion of the pipe may be covered with wet burlap or other material of high moisture retentive properties immediately after the pipe is cast. The covering material shall be kept continuously moist until the placement of final backfill as described above. Moisture retentive material may be removed or left in place at the option of the Contractor.

(C) A pigmented membrane-curing compound conforming to ASTM C309 may be applied to the exposed surface immediately after the pipe is cast. The compound shall be applied at the rate of not less than one (1) gallon for each 150 square of exposed concrete. The pipe shall then be covered with a minimum of 3 inches of moist loose soil when the curing compound is sufficiently hard to resist damage from the fill. Final backfill shall be placed when the pipe attains suitable strength.

(D) Polyethylene film complying with ASTM C171, nominal thickness 0.0015 inches may be placed on the exposed top surface of the pipe immediately after the pipe is cast. The film shall be anchored in place with loose soil to assure continuous, adequate curing. The trench shall be completely backfilled as soon as the pipe attains suitable strength.

A humid atmosphere within the pipe, as evidenced by condensation on the interior surface, shall be maintained for at least seven (7) days following placement, except for a maximum period of 48-hours allowed for removing forms and making repairs. To prevent air drafts which may dry the pipe and to maintain a humid atmosphere inside the pipe, all openings into the pipe line shall be kept closed or covered, except when and where work is actually in progress on the inside of the pipe. If necessary to promote high humidity, the pipe line will be partially filled with ponded water during the curing period.

620.3.4 Repair: Care shall be taken when removing the forms that the pipe is not damaged. Immediately after the removal of the forms, the inside of the pipe shall be inspected and all required repairs made before final backfilling begins. All spalls, cracks or indentations not satisfying Subsection 620.3.2(A) shall be filled with mortar per Subsection 620.2.5. Cracks may be repaired with epoxy materials.

Longitudinal cracks exceeding 0.01 inches in width and 12 inches in length shall be cause for rejection of the pipe. The pipe section or reach in question shall either be removed or replaced or shall be repaired in a manner approved by the Engineer.

620.3.5 Finish: Except for the form offsets the interior surface of the pipe shall be equivalent to or better than a wood float finish. All extraneous concrete shall be removed from the interior surface.

620.4 METHODS OF TESTS:

Wall thickness shall be checked at the top, sides and bottom, every 100 feet. Where thickness is not determined by probes through the fresh concrete, small holes shall be drilled a day or so after placement. The holes shall be properly and permanently closed and sealed, flush with the inside surface of the pipe, after measurements are made.

Test cylinders shall be prepared and tested as per Section 725. If the cylinder tests indicate that the concrete does not meet the specified strength requirements, cores shall be taken from the same section of concrete represented by the faulty test cylinder under the supervision of the Engineer. The concrete should be at least 14 days old before the core specimens are taken. The diameter of the core specimens for the determination of compressive strength should be at least three (3) times the maximum nominal size of the coarse aggregate used and must be at least twice the maximum nominal size of coarse aggregate.

The length of the specimen, when capped, should be twice the core diameter. A core having a maximum height of less than 95 percent of its diameter before capping or a height less than its diameter after capping shall not be tested.

If cores are taken, the Contractor shall patch all core holes in such a manner that the patch will be permanent, will not leak, and will have a smooth interior finish flush with the interior surface of the pipe.

Procedures and payment for coring shall be in accordance with applicable portions of Section 725.

The Engineer will evaluate the test results and his decision as to required corrective action will be final.

620.5 MEASUREMENT:

Measurement of cast-in-place concrete pipe will be the number of linear feet of pipe measured horizontally along the pipe axis from end to end of the pipe. At changes in diameter, the measurement shall be to center of manhole or transition.

620.6 PAYMENT:

Payment will be made at the contract unit price bid per linear foot to the nearest foot for each size of pipe and shall be compensation in full for furnishing and installing the cast-in-place concrete pipe as specified, including removal of obstructions, excavation, backfilling, compacting, testing, and all incidental costs not specifically covered in other items in the proposal.

- ***End of Section*** -

SECTION 621

CORRUGATED METAL PIPE AND ARCHES

621.1 DESCRIPTION:

These specifications cover plain galvanized, bituminous coated, and bituminous coated and paved galvanized corrugated metal pipe for use in storm sewers. The pipe shall be of the types, constructed as specified, and shall be manufactured in accordance with the requirements of the stated specifications. Except as otherwise required, corrugated metal pipe shall conform to AASHTO M-36 for Type I, Type IA, II and Type IIA. The external coating and internal lining shall be in accordance with AASHTO M-190 and Section 760.

621.2 MATERIALS:

The types of pipe and fabrication shall be in accordance with Section 760.

All helically-wound corrugated metal pipe shall have a marking system which shall provide a quick external visual check of diameter variations during and after the manufacturing process.

621.3 INSTALLATION:

Excavation, bedding and backfill shall be in accordance with Section 601, except as modified by standard details.

No pipe shall be laid except in the presence of an inspector. Each pipe shall be carefully inspected immediately before it is laid and defective pipe will be rejected. Pipe lines shall be laid to the grades and alignment indicated on the drawings. Variation from prescribed grade and alignment shall not exceed 0.10 foot, and the rate of departure from, or return to established grade or alignment shall be no more than 1 inch in 10 feet, unless otherwise approved by the Engineer. Proper facilities shall be provided for lowering sections of pipe into trenches. All pipes, elliptical or round, as well as pipe arches requiring external coating or internal lining shall be equipped with lifting lugs as required and shall have connecting bands designed to provide positive connection without damaging the coating on the pipe or pipe arch.

All field repairs to the bituminous coating or paving shall be made with approved fiber reinforced bituminous mastic.

Corrugated metal pipe and/or pipe arches shall be laid with separate section joined together in such a manner that the joint space shall not exceed ½ inch, with the outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Elliptical pipe shall be installed so that the major or minor axis, whichever the case may be, and which should be indicated by suitable markings on the top of each end of the pipe sections, coincides with the survey alignment of the trench excavation. Any metal in the joints which is not thoroughly protected shall be coated with bituminous mastic. During the installation, the pipe shall be handled with care so as not to damage the external coating or internal lining. Coupling band bolts and damaged areas of the coupling bands and pipe shall be given a coating of bituminous mastic as specified above prior to placing the backfill. As determined by the Engineer, pipe that is damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced at no additional cost to the Contracting Agency.

621.3.1 Joints: Before the connecting band is placed around the pipe, the ends of the pipe that will be beneath the band, shall be coated with bituminous mastic or, if of suitable design, fitted with circular rubber gaskets to provide a watertight joint. The band shall be tightened evenly, keeping equal tension on the bolts. If mastic is used, tension shall be maintained over an interval of time until the flow of mastic terminates. The joint shall remain uncovered over a period designated by the Engineer, and before covering the joint the nuts shall be tested for tightness. If the nut has a tendency to loosen its grip on the bolt, it shall be tightened again and remain uncovered until a tight, permanent joint can be obtained. Prior to backfilling around the joint, the bolts, lugs, and nuts shall be given a coating of bituminous mastic. The annular space between abutting pipe sections shall be filled with bituminous mastic after jointing.

621.3.2 Pipe Elongation: Except as otherwise specified, the standard details shall control as to conditions under which pipe must be elongated. Pipe shall be elongated 5 ± ½ percent of the nominal diameter to take advantage of the buildup of side support as it settles back toward a full round shape under the backfill load. The method or technique for obtaining and releasing the elongation shall be optional to the Contractor. Under no circumstances shall the vertical diameter of the pipe at any point along the pipe section, after backfill and compaction is completed, be less than the nominal diameter of the pipe, or more than 5 percent greater than the nominal diameter of the pipe as shown on the plans or specified elsewhere in this specification. Any

damage done as a result of strutting shall be repaired as directed by the Engineer at no additional cost to the Contracting Agency. Strutting of pipe shall be approved by the Engineer.

621.3.3 Cutting: The Contractor will be prohibited from using conventional welding torches in cutting full lined CMP due to fire hazard. Pipe will either be sawcut or cut with special cutting tools which will not expose the pipe to the fire hazard of a normal acetylene torch. Whenever possible, connections shall be shop fabricated to prevent any exposure to fire hazard.

621.3.4 Repair of Damage to Coatings: Corrugated metal pipe shall be carefully handled at all times to prevent damage to the external coating, spelter coating, or internal lining. Each length of pipe shall be carefully inspected immediately prior to placing in the trench to ascertain that no damage has been done to the exterior coating that will be concealed when the pipe is placed. Any damage to the spelter coating shall be repaired to the satisfaction of the Engineer in accordance with Section 771. Any damage to the external coating or internal lining shall be repaired to the satisfaction of the Engineer with bituminous mastic as specified above.

621.4 TEST SPECIMENS:

All tests on the bituminous coating shall be made on samples secured from pipe delivered to or about to be delivered to the Contractor, or from the coating and lining facility of the pipe fabricator at the time the pipe is being coated.

Compliance with these specifications as set forth, shall be the responsibility of the Contractor. Three certified copies of test results indicating compliance shall be furnished for each lot or shipment prior to delivery of the material to the Contractor.

621.5 MEASUREMENT:

Measurement of corrugated metal pipe will be the number of linear feet of pipe, measured horizontally, from end to end of the pipe through manholes and specials. At changes in diameter the measurement will be to center of manhole or special.

621.6 PAYMENT:

Payment will be made at the contract unit price bid per linear foot, to the nearest foot, for each size and type of pipe and shall be compensation in full for furnishing and installing the corrugated metal pipe as specified, including removal of obstructions, excavation, backfilling, compacting, testing, and all incidental costs not specifically covered in other items in the proposal.

- End of Section -

SECTION 625

MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS

625.1 DESCRIPTION:

625.1.1 Manholes: Construction shall consist of furnishing all materials and constructing manholes complete in place, as detailed, including foundation walls, manhole frames, covers, and any incidentals thereto, at locations shown on the plans.

625.1.2 Sanitary Drop Sewer Connections: Construction shall consist of furnishing all materials and constructing drop sewer connections complete in place as detailed, including foundation materials, pipe, and any incidentals thereto, at locations shown on the plans.

625.2 MATERIALS:

Unless otherwise shown on the plans or specified in the special provisions, materials to be used shall conform with the following:

If allowed by the contracting agency, brick may be used for maintenance and adjustment of the existing sanitary sewer manhole or ring and cover. For the use of bricks in manholes see Section 775.

Cement mortar for manholes Class D, per Section 776.

Concrete for cast in place sanitary sewer manhole bases shall be Class A, for drop sewer connection shall be Class C, per Section 725.

Pipe used in sanitary sewer manholes or drop sewer connections shall comply with pipe requirements of Section 615.

Manhole frame and cover per Section 787 and cast in accordance with standard details.

Manhole steps shall not be used.

625.3 CONSTRUCTION METHODS:

625.3.1 Manholes: Manholes shall be constructed of precast concrete sections, or cast in place concrete. The invert channels shall be smooth and semi-circular in shape, conforming to the inside of the adjacent sewer sections. Changes in direction of flow shall be made with a smooth curve, having a consistent radius as large as the manhole will permit with no angle points. Changes in size and grade of the channels shall be made gradually, evenly, and uniformly throughout the manhole base.

Invert channels may be formed of concrete, half tile laid in concrete, or be constructed by laying full section of sewer pipe through the manhole and breaking out the top half after the surrounding concrete has hardened. The bench of the manhole outside the channels shall be smoothed and shall slope towards the channels.

The excavation shall be in such a manor, access is maintained around the manhole base before, during, and after placement of the manhole.

For cast-in-place manhole bases, a foundation of Class A concrete shall be constructed in accordance with the standard details and Section 505.

No brickwork shall be laid in water, nor, except as prescribed for curing, shall water be allowed to stand or run on any brickwork until the mortar has thoroughly set. Where new work is joined to existing unfinished work, the contact surfaces of the latter shall be thoroughly cleaned and moistened.

Bricks shall be thoroughly moistened prior to placing, and shall be laid in full cement mortar beds. Every course may be a header course, but at least every fourth course shall be a header course. The horizontal cross-section of the manhole shall be circular unless otherwise called for on the plans or standard details. An oval or egg-shaped section will not be permitted. The brick manholes shall be mortared outside with ½ inch of cement mortar as shown. Inside of the brick wall shall be neatly pointed. The mortar coat shall be cured with a liquid membrane-forming compound conforming with Section 726 immediately after mortar has been placed and finished.

All machined surfaces on the frame and cover shall be such that the cover will lie flat in any position in the frame and have a uniform bearing through its entire circumference. Any frame and cover which creates any noise when passed over by automobiles shall be replaced. Frames shall be set firmly in a bed of mortar true to line and grade, all as shown on the plans and as called for in these specifications.

Backfilling shall be done in accordance with the requirements for trench backfilling as stated in Section 601.

625.3.2 Sanitary Sewer Drop Connections: Drop sewer connections shall be constructed in conformance with standard details.

Backfilling shall be done in accordance with the requirements for trench backfilling as stated in Section 601.

625.4 MEASUREMENT:

Each type of manhole installed, shall be measured as a complete unit, no distinction shall be made based on manhole depth.

625.5 PAYMENT:

Payment will be made at the contract unit price for each accepted manhole, and shall be compensation in full for furnishing and installing the manhole, complete in place, with formed or pre-cast inverts, concrete foundation, sanitary sewer drop connections sheeting and bracing, removal of obstructions cast iron frame and cover, excavation and backfill, paving cut replacement in excess of the applicable pay widths authorized in Section 336, and any incidentals thereto, in conformance with the plans and specifications.

- End of Section -

SECTION 630

TAPPING SLEEVES, VALVES AND VALVE BOXES ON WATER LINES

630.1 DESCRIPTION:

The installation of all tapping sleeves, valves and valve boxes shall conform to this specification and standard details, except as otherwise required on the plans or as modified in the special provisions.

630.2 GENERAL:

For valves 12 inches and smaller, the Contractor shall furnish the manufacturer's standard data and catalogues for gate valves, tapping valves, tapping sleeves, curb stop valves, butterfly valves and any castings.

For valves larger than 12 inches, the Contractor shall furnish shop drawings and technical data required for evaluating and approval of each type of valve, tapping sleeve and valve and butterfly valve. This information shall include complete details, dimensions, weights, diameter of stems, alloy for all valve parts, and any information that may be required to assemble, install, operate and maintain the valve.

The name of the manufacturer, the year of manufacture, the size of the valve, model number and rated working pressure, shall be cast on the body of each valve.

The Contracting Agency may test 10 percent of each type and size of valve furnished. Failure of any of the valves tested to meet these specifications shall be deemed sufficient cause to reject the entire lot delivered.

The internal working parts of valves of the same make, type, and size, shall be interchangeable.

630.3 GATE VALVES:

630.3.1 General: All valves shall conform to the latest revisions of AWWA standards supplemented as follows:

Valves shall be of the non-rising stem type and shall be counter-clockwise opening (left-hand).

The valve may be furnished with valve stems made from 300 or 400 series stainless steel.

Unless otherwise noted, valves shall have a 2 inch square operating nut.

All valves shall be class 150 or higher as necessary to withstand the requirements of the pressure and leakage test.

Bronze for all interior parts of valves shall contain no more than 6 percent zinc if made from cast bronze, or must conform to Copper Development Association #67600 if made from bar stock material.

All interior ferrous surfaces exposed to fluid flow shall be epoxy coated to a minimum dry film thickness of 6 mils. Epoxy coatings shall be factory applied by a electrostatic or thermosetting process in accordance with the manufacturer’s printed instructions. The epoxy materials used shall be 100% powder epoxy or liquid epoxy that conforms to the requirements of AWWA C-550, and to the prevailing requirements of the Food and Drug Administration and of the Environmental Protection Agency.

All exterior ferrous surfaces, except finished or bearing surfaces, shall be factory coated with two coats of asphaltic varnish conforming to Federal Specifications TT-V-51c, or shall be epoxy coated as required above for interior surfaces.

By-pass valves, valves attached to side outlets and valves in blow-off lines shall be flanged.

Valves in air release and vacuum relief lines shall be flanged or screwed as shown on the plans.

Valves in fire hydrant lines shall have a flanged joint end on the side towards the main and a restraint or mechanical joint end on the side towards the hydrant.

Valves larger than 20 inches shall have flanged ends, unless otherwise noted.

Valves 20 inches and smaller may be furnished with flanged ends, mechanical joint ends, or push-on joint ends compatible with the type of pipe used, unless otherwise noted.

630.3.2 Supplements Specifically Relating to Valve Sizes:

(A) Valves smaller than 3 inches:

Valves shall be threaded, all bronze, standard double disc, non-rising stem with wheel handles or brass ball style.

Service Material containing Brass or Bronze must comply with the current NSF 61-8 Standards at the time the Project begins.

All Brass or Bronze service material must meet the current AWWA C-800 Standards.

(B) Valves 3 inches through 12 inches:

Valves shall be iron body resilient-seated gate valves in accordance with the latest revision of AWWA C-509 or AWWA C-515.

The valve shall be designed to work equally well with pressure on either side of the gate.

The valve shall be equipped with o-ring packing.

(C) Valves. 14 inches through 20 inches:

Valves shall be iron body resilient-seated gate valves in accordance with the latest revision of AWWA C-509 or AWWA C-515, or shall be double-disc gate in accordance with AWWA C-500.

Valves designed in accordance with AWWA C-509 shall be designed to work equally well with pressure on either side of the gate

Valves designed in accordance with AWWA C-500 shall be equipped with bronze tracks, rollers and scrapers. The bolts, nuts, studs, etc., used with the gear case shall conform the requirements for Bonnet Bolting in AWWA C-500.

Valves shall be for operation in a horizontal position. The valve shall have bevel gears. The gears and stuffing box shall be enclosed in a watertight iron case, for operation in a buried location. The case shall be filled with grease at the factory.

By-pass valves shall be furnished and installed on each valve unless otherwise indicated on the approved plans. See Table 630-1 for by-pass valve sizes.

(D) Valves 24 inches and larger:

Valves shall be double-disc gate in accordance with AWWA C-500.

Valves shall be for operation in the horizontal position and equipped with bronze tracks, rollers and scrapers. Valves shall have bevel gears. The gears and stuffing box shall be enclosed in a watertight iron case, for operation in a buried location. Bolts, nuts, studs, etc., used with the gear case shall conform to the requirements for Bonnet Bolting in AWWA C-500. The case shall be filled with grease to the factory.

By-pass valves shall be furnished and installed on each valve unless otherwise indicated on the approved plans. See Table 630-1 for by-pass valve sizes.

630.4 TAPPING SLEEVES AND VALVES:

630.4.1 Tapping Valves: Tapping valves shall be identical in construction with the above specifications for gate valves. Tapping sleeves are considered an integral part of a tapping sleeve and valve assembly, with openings the same as the valve. Tapping valves shall have ends and seat rings of sufficient size to permit the use of full size cutters of either the Mueller or

Smith type tapping machines. Tapping sleeve valves shall be flanged on one end to fit the tapping sleeve and a flange hub-end or mechanical joint on the other.

The tapping valve shall have the discs and seat ring so constructed that the inside diameter of the rings shall be at least 3/16 inch larger than the nominal size of the valve. The seat rings shall be bronze and shall have a minimum seating surface area equal to that of a standard gate valve, and the discs shall be proportionately larger to match.

Once the tap has been completed, the Contractor shall not operate the valve unless under direct supervision of the inspector.

TABLE 630-1

BY-PASS VALVE SIZES

Gate Valve Diameter in Inches	By-Pass Valve Diameter in Inches
16 to 20	3
24 to 30	4
36 to 42	6
48	8

630.4.2 Tapping Sleeves: Tapping sleeves shall be of extra heavy construction to provide resistance to line pressures. They shall be built in two halves for assembly around the main to be tapped.

The branch outlet shall have a flanged face for bolting to the tapping valve.

The inside diameter of the outlet branch shall be sufficiently larger than the nominal size to provide clearance for the full size cutters of the tapping machine.

Tapping sleeves shall be of the following types:

(A) Tapping sleeves for pipelines constructed of cast iron, ductile iron or asbestos cement:

Unless otherwise noted, the tapping sleeve assembly shall be pressure tested to 200 psi for a minimum of 30 minutes. The pressure test shall occur prior to tapping the main.

(1) Tapping sleeves in which the water is allowed to circulate between the sleeve and the outside surface shall comply to the following:

Gaskets of approved material shall be provided to form watertight joints along the entire length of the sleeve. The circumferential joints at the ends of the run of these sleeves shall be sealed by mechanical joints. Mechanical joints shall conform to the requirements set forth in AWWA C-111 as to dimensions, clearance, materials, etc. except the gaskets and glands for mechanical joints shall be in two pieces.

The longitudinal gaskets shall be totally confined or compressed between ridges and/or grooves extending continuously for the full length of both halves of the sleeve casting. Bolts shall be located close to the outside of the gaskets and closely spaced so as to exert sufficient pressure to form a watertight joint and to amply take care of any design stresses.

(2) Tapping sleeves in which the water is confined to the immediate area of the tap opening may be either of the following:

(a) Cast Iron - The outlet half of each sleeve shall be fitted with a continuous gasket of approximately circular cross-section permanently cemented into a groove surrounding the outlet opening. The back half of each sleeve shall be fitted with elastomeric pads, a metal shoe, or other device for developing adequate pressure on the gasket to prevent leakage at any pressure within the design capacity of the pipe. The sleeve shall be similar in construction to the Kennedy Square Seal or Rich-Corey improved sleeve.

(b) Stainless Steel, Type 304 - All integral metal parts of the sleeve shall be stainless steel, type 304. All welds shall be chemically treated and the residue removed so as to return the welded stainless steel to its original corrosion resistant state. The sleeve shall be capable of withstanding 125 ft.-lbs. of bolting torque without deformation of any

sleeve components. Actual bolting torque during installation shall be as specified by the manufacturer.

All gaskets shall be of virgin styrene butadiene rubber (SBR), or equal, compound for water services. The complete circle gasket shall be 0.25 inch ±0.03 thick and permanently attached to the sleeve. A dielectric insulating flange insulation kit shall be installed between the stainless steel flange and the cast iron valve. The kit shall contain full faced gaskets, full length sleeves, and single insulating washers. Insulation gasket material shall be neoprene-faced phenolic, insulation sleeves shall be mylar or minlon and full length, insulation washers shall be phenolic, or approved equal. All insulation material shall be of a type designated by the manufacturer as suitable for service at the operation temperatures and pressure specified.

(B) Tapping sleeves for concrete pressure pipes shall be fabricated tapping sleeves and comply to the following:

The sleeves shall be installed in accordance with AWWA Manual M-9. They shall also meet AWWA C-301, and AWWA C-303 standards pertaining to design, manufacturing, testing and welder qualifications. When tapping AWWA C-301 pipe, additional considerations pertaining to installation, testing and tapping shall be noted in the special prevision and/or the plans.

The tapping sleeve assembly shall be designed to meet or exceed the pressure rating of the pipe using the same safety factors.

The tapping sleeve assembly shall be pressure tested to at least 5 percent over the actual working pressure in the pipeline. The main shall be pressurized to full working pressure during the test of the sleeve. The test shall occur prior to tapping of the main.

The sleeve shall be a three part design, back half, front half with draw flange and a gland as shown in Detail 342. The sleeve shall be designed to permit the cutting of the rods or prestressing wires of the pipe after installation of the two sleeve halves. The gland shall have a sealing gasket set in a retaining groove on the pressure plate. The sealing portion of the gasket shall be square or rectangular in shape and have minimum dimensions of 1/2 inch x 1/2 inch. The pressure plate on the gland shall be stabilized to eliminate flexing. The gland shall be equipped with load bearing set screws to protect the pipe cylinder from any excess loading caused by the valve, tapping machine, etc. The annular space between the sleeve and the gland shall be grouted through an opening in the sleeve.

Both halves of the sleeve shall be the same thickness and width. With approval from the Engineer, stainless steel strapped back sleeves will be permitted when the outside pipe diameter is irregular and cannot accommodate a full back sleeve.

The sleeves shall be furnished with grout horns/openings through which the annular space between the outside pipe surface and the sleeve shall be grouted.

All interior and exterior ferrous surfaces shall be epoxy coated to a minimum dry film thickness of 12 mils. Epoxy coating shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturer's instructions. The epoxy materials used shall be 100% powder epoxy or liquid epoxy that conforms to the requirements of AWWA C-550 for use in a potable water system.

All bolts shall be 304 stainless steel.

No weld-on sleeves or nozzles will be permitted.

Tapping sleeves shall be JCM #415 Type 2 ESS or approved equal.

All external surfaces of the tapping sleeve shall be covered with a minimum of two inches of mortar. The mortar shall be Type "M" per Section 776 using Type II low alkali cement. The mortar shall be held in place by use of wire mesh.

The Contractor shall obtain the necessary dimensions for ordering the sleeve from direct field measurements. Excavation may be required to obtain the measurements. If an excavation is required, the Engineer may require the Contractor to return the land to its original use until the materials are delivered.

The contractor shall provide, for approval of the Engineer, the manufacture, shop drawings, calculations, and any other technical data as required by the Engineer for the tapping sleeve. Also, the contractor shall submit the manufacture history of

6 successful production of the sleeves over the last year. The submittal shall include but not limited to the number, size, location, agency and contact person, etc.

The Contractor shall also provide, for approval by the Engineer, the name of the company/contractor/subcontractor to install the sleeve and perform the tap. The submittal shall include a history of 5 successful sleeve installations and taps per year over the last 3 years. The submittal shall include but not limited to the sizes and locations of the taps, the agencies and contact persons, the addresses and telephone numbers, etc.

630.4.3 Tapping and Associated Fees: Except for meter service connections, taps shall be made by the Agency at prevailing rates or by approved Contractors when allowed or requested by the Contracting Agency. After installation of the tapping sleeve and valve, the Contractor shall provide an excavation sufficient in size to accommodate the tapping operation.

The Contractor shall pay the established shutdown charge to the Contracting Agency every time it is necessary to shut off valves and take a section of a water main out of services.

The above charges, as well as charges for tap connections to steel cylinder and reinforced concrete pipe, are subject to change, as established by the Contracting Agency.

630.5 BUTTERFLY VALVES:

(A) 16 inches and larger:

Valves shall be in accordance with AWWA C-504 latest revision as modified herein:

(1) Valve body shall be of cast iron or ductile iron with connecting ends one of or a combination of Flanged (Short Body), mechanical joint or ACP Hub End.

(2) Valves shall be Class 150-B unless otherwise specified.

(3) When requested the manufacturer shall furnish records of tests specified in AWWA C-504.

(4) Shaft seal may be O-ring seal, V-type packing or pull down packing.

(5) The valve disc may be either cast iron or ductile iron.

(6) Valves and operators shall be for direct burial installation.

(7) Valves to be furnished with manual operators and 2 inch square operating nut. Operator torque rating shall be calculated in accordance with AWWA C-504.

(8) Valves shall open when turning the operating nut counter-clockwise.

(9) Valves shall be installed with valve shaft in a horizontal position and the operating shaft vertical.

(10) All interior ferrous surfaces exposed to fluid flow shall be epoxy coated to a minimum dry film thickness of 6 mils. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturer's printed instructions. The epoxy materials used shall be 100% powder epoxy or liquid epoxy that conforms to the requirements of AWWA C-550, and to the prevailing requirements of the Food and Drug Administration and of the Environmental Protection Agency.

(11) All exterior ferrous surfaces, except finished or bearing surfaces, shall be factory coated with two coats of asphaltic varnish conforming to Federal Specification TT-V-51c, or shall be epoxy coated as required above for interior surfaces.

(12) A manufacturer's affidavit of compliance shall be furnished.

(13) Shop drawings shall be furnished.

(B) 3 inches through 12 inches:

This specification generally describes valves and operator assemblies designed for underground service, as manufactured by Dresser Industries, B-I-F Industries Incorporated, Henry Pratt Company, Allis Chalmers Manufacturing Company, or approved equal.

Where material or equipment is designated on the plans or in this specification by a trade or manufacturer's name, it is so designated primarily to establish standards of quality, finish, appearance and performance.

All specific requirements of this specification must be adhered to, and all necessary modifications shall be made in the article specified by the trade name, type or model or manufacturer's equipment to make it conform to all specific requirements of this specification.

The valves shall be in accordance with AWWA C-504, Class 150-B, except as modified herein:

(1) Valve ends may be the thin type or wafer type to be installed between flanges drilled in conformance with ASA B 16.1-125 or may be flanged both ends or the valves may have bell ends with rubber gaskets, forecast iron pipe or asbestos cement pipe conforming to the kind of pipe being used.

(2) Valves shall be designed for buried service with the valve shaft in a horizontal position and the operating shaft vertical.

(3) Valves shall be left-hand opening, counter-clockwise unless shown otherwise on the plans.

(4) Discs shall be Ni-Resist, ASTM A436, Type 1, or cast iron, ASTM A48, Class 40, in accordance with the following variations:

(a) Cast iron disc may be used providing the rubber seat ring is contained on the disc with the rubber ring closing against a Type 304 stainless steel ring or a bronze ring contained in the body of the valve.

(b) Ni-Resist disc may be used where rubber seat is contained in the valve body.

(c) Valves with rubber seats in the valve body may have cast iron discs with a Type 304 stainless steel or bronze edge seating surface retained on the edge of the disc.

Shafts and disc shaft fasteners shall be constructed of Type 304, stainless steel, unless the shaft is completely sealed from the line fluid. Valve shafts completely sealed from the line fluid may be of high strength steel with all other metal parts in contact with the line fluid to be Type 304 stainless steel.

Valves with rubber seat mounted in the body shall have the rubber either bonded or mechanically retained in its final position. Rubber seats which are on the disc edge shall be retained by a clamping ring and screws. Clamping ring and screws shall be made of 18-8 stainless steel, Type 304, or bronze conforming to ASTM B61 or ASTM B584.

Manual operators shall have AWWA 2 inch square operating nuts and shall require at least 2 turns per inch diameter to rotate the disc 90 degrees. Operators must accept a minimum of 300 ft. lbs. input torque on stops at ends of travel without damage to valve or operator. The operator torque rating shall equal, or exceed, the valves shown in Table I of AWWA C-504 for valve class specified above.

All interior ferrous surfaces exposed to fluid flow shall be epoxy coated to a minimum dry film thickness of 6 mils.

Epoxy coatings shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturer's printed instructions.

The epoxy materials used shall be 100% powder epoxy or liquid epoxy that conforms to the requirements AWWA C550-81, and to the prevailing requirements of the Food and Drug Administration and of the Environmental Protection Agency.

All exterior ferrous surfaces, except finished or bearing surfaces, shall be factory coated with 2 coats of asphaltic varnish conforming to Federal Specification TT-V-51c, or shall be epoxy coated as required above for interior surfaces.

630.6 AIR RELEASE AND VACUUM VALVES

Valve assemblies shall be furnished and installed where shown and as detailed on the drawings.

(A) Air release on water mains shall be controlled by the use of an air release valve assembly, of size and type as shown on the plans. Air release valves shall be of the flanged or screwed type as designated on the Agency's approved products list or in the special provisions.

(B) Vacuum and Air Relief when called for on the plans shall be controlled by a vacuum relief valve on the air release valve noted above. The valves shall be of the same manufacture or may be a combination air and vacuum valve assembly designated on the Agency's approved products list or in the special provisions.

630.7 CONSTRUCTION METHODS:

All valves, their supports, manholes, vaults, and valve boxes shall be installed in accordance with Section 610.

Valves 16 inches and larger, before being shipped from the factory, shall have the flanged ends completely covered with plywood. Plywood shall be left on the valve until just before installation in the line.

630.8 MEASUREMENT:

Measurement will be by the unit each of the various kinds and sizes of valves, manholes, vaults, or tapping sleeves and valves, including valve boxes and covers.

630.9 PAYMENT:

Payment will be made at the contract unit price and shall be compensation in full for the complete installation in place including all labor, materials, equipment, and all incidentals necessary to complete the installation. The compensation will also include the cost of necessary pavement replacement in excess of the pay widths allowed in Section 336 for pavement replacement over pipe trenches.

- End of Section -

SECTION 631

WATER TAPS AND METER SERVICE CONNECTIONS

631.1 DESCRIPTION:

This specification covers work by Contractors installing water services in new subdivisions by Permit and in projects under Contract. All the materials used shall comply with applicable standard specifications and the work performed in accordance with these specifications and standard details. The service connections shall be complete and all material shall be furnished by the Contractor except for the water meter.

All water service connections shall be constructed of Type K copper tubing or ultra high molecular weight polyethylene pipe of nominal iron pipe outside diameter.

All new subdivision water lines shall be staked for line and grade at 100 foot intervals by the Developer's Engineer prior to construction. All meter locations shall be staked by setting two stakes for line and marking one of the stakes for grade.

631.2 MATERIALS:

Copper pipe, tubing and fittings shall conform with Section 754. Polyethylene pipe shall conform with Section 755.

All fittings, pipe and tubing for polyethylene and copper pipe shall be as noted on standard details and as indicated in Section 610.3 Materials.

631.3 INSTALLATIONS:

631.3.1 General: Installation of copper tubing for meter service connections shall be in accordance with Section 754.

Meter service connection with copper tubing shall be in accordance with standard details.

The water service connection shall include the tap on the main, the corporation stop, the saddle if applicable, service pipe, appurtenant fittings, the curb stop, meter box and meter box cover, in accordance with standard details. Water meter boxes shall be installed in accordance with standard details to line and grade set by the Developer's Engineer. Upon acceptance, the Developer shall be responsible for damage to water meter boxes and covers until such time as the meters are installed by the Contracting Agency.

After the installation and acceptance of the water main and meter service pipe connections the water meter will be installed by the Contracting Agency upon proper application and payment of prevailing fees.

631.3.2 Standards: Except as otherwise specified all work shall be done in accordance with Sections 601 and 610.

631.3.3 Excavation and Backfill: The backfilling and compaction may be done as soon as the service line is installed, except backfilling and compaction shall not be completed around the corporation stop at the main water line until after inspection and recording of all tap locations. Trench bottom must be smooth and free of sharp objects. The minimum width of trench for water service pipe shall be 3 inches. The minimum depth of service pipe shall be 30 inches below the finished paving grade.

631.3.4 Polyethylene Pipe: Polyethylene pipe shall not be kinked, gouged or damaged during installation and backfilling operations. The pipe shall be placed in the trench allowing at least 12 inches per 100 feet for thermal contraction and expansion. Polyethylene pipe has a high thermal expansion and should never be confined under tension. The pipe should not be stored in the sun or left in the trench under abnormal high temperature. The pipe shall be carefully snaked in the trench bottom and covered up with uniform slack throughout its length. In trenches less than 8 inches in width, the expansion shall be obtained by making the tap on the opposite side of the main from the water meter and providing a loop of slack service pipe back over the top of the water main. Before installing, inspect pipe to detect any damage that may be caused by shipping, storage or handling. Damage spots can be cut out and pipe recoupled with Ford C-66-33, C-66-44, or approved equal brass compression fitting to form a continuous length. Damaged pipe shall not be used. Polyethylene pipe shall be cut only with a tubing cutter with rollers properly designated for the size of pipe being cut. When polyethylene pipe is used, the meter box setting must be placed parallel to the back of the sidewalk in accordance with standard details. Polyethylene pipe shall be installed with large sweeping bends

with radius of not less than 18 inches. Polyethylene pipe has a cold flow characteristic and must not be installed under a stressed condition. Compression fittings only may be used with the plastic being held securely between metal to metal. Stainless steel or brass inserts shall be placed in the proper position in each compression fitting with care taken to assure that the insert remains in place when the fitting is tightened. All meter service lines shall extend at right angles from the main to the curb lines.

631.3.5 Service Taps: One inch and 3/4 inch service taps to new meter mains may be made with a saddle, tapped coupling or direct tap in accordance with the following provisions:

The Developer may use heavy tapped couplings for meter service connections on all sizes of pipe including the 3 inch pipe in cul-de-sac streets. Bronze corporation stops must be installed in the tapped couplings prior to pressure testing or disinfection of the water main. Normally in subdivisions no saddles are required for 6 inch pipe and larger. At the Contractor's option, saddles may be used on all 6 inch pipe and larger. All service connections on major and collector streets shall be made with saddles or heavy duty tapped couplings regardless of the water main size or service pipe size. All taps on pipe smaller than 6 inches must be made by either a saddle or heavy tapped coupling with bronze insert. Direct taps must be made by the use of a corporation stop with tapered AWWA machine thread. All wet taps must be made by the Mueller Type B-100 tapping machine or approved equal. A sharp tapping bit must be used in order to obtain clean sharp threads. In general, each tapping tool should be resharpened or discarded after making 6 taps. The minimum distance between taps, saddles, and tapped couplings shall be 3 feet.

631.4 TESTING:

All services, service taps and fittings shall be tested along with the water main in accordance with Subsection 610.14.

631.5 CLEANUP AND COMPLETION:

Upon completion and acceptance of all phases of the water main and meter service lines the Developer shall release the new subdivision water system to the Contracting Agency for final operation and maintenance with all interior valves and corporation stops in open position and with all meter curb stops and valves at the connections to existing mains closed.

631.6 INSPECTION:

The Developer's Engineer shall make an as-built plan and make a record of the locations of all water service connections prior to the connections being covered up. This as-built plan shall give the stationing of each service tap. The stationing to be continuous for each street, and shall begin at the street intersection or property line at the end of the block.

631.7 SERVICE OVER 2 INCHES:

All service taps larger than 2 inches shall be made by the Agency after an application and payment of prevailing fees, unless otherwise required by the Agency.

631.8 SERVICE ON EXISTING MAINS:

Where all or part of a new subdivision is served by existing water mains, only authorized personnel of the Contracting Agency shall install the service connections upon proper application and payment of prevailing fees.

- End of Section -

PART 700

MATERIALS

SECTION 701

AGGREGATE

701.1 GENERAL:

Coarse and fine aggregates are defined in accordance with ASTM D2487. Material property requirements for specific uses are provided in applicable MAG sections.

Apparent specific gravity shall be at least 2.50, when tested in accordance with ASTM C-127.

701.2 COARSE AGGREGATE:

Rock and gravel shall be clean, hard, sound, durable, uniform in quality, and free of any detrimental quantity of soft, friable, thin elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance. Aggregate sources shall include, but not be limited to alluvial deposits, terrace aggregates, quarry stone, or other suitable sources including recycled products that meet all material test requirements as approved by the Engineer. Aggregate classification shall be made by size as noted herein.

701.2.1 Boulders: Particles of rock that will not pass a 12-inch square opening.

701.2.2 Cobbles: Particles of rock that will pass a 12-inch square opening, but are retained on a 3-inch square opening.

701.2.3 Coarse Gravel: Particles of rock that will pass a 3-inch U.S. standard sieve, but are retained on a 3/4-inch U.S. standard sieve.

701.2.4 Fine Gravel: Particles of rock that will pass a 3/4-inch U.S. standard sieve, but are retained on a No. 4 U.S. standard sieve

701.3 FINE AGGREGATE (SAND):

Fine aggregate (sand) shall be fine granular material produced by the crushing of rock or gravel or naturally produced by disintegration of rock and shall be sufficiently free of organic material, mica, loam, clay, and other deleterious substances to be thoroughly suitable for the purpose for which it is intended. Fine aggregates particles shall pass a No. 4 U.S. standard sieve, but are retained on a No. 200 U.S. standard sieve.

701.4 RECLAIMED CONCRETE MATERIAL (RCM)

Reclaimed concrete material (RCM) is defined as an aggregate material that is derived from the crushing, processing and classification of Portland cement concrete construction materials recovered, salvaged, or recycled from roadways, sidewalks, buildings, bridges, and other sources.

In accordance with Section 7 of AASHTO M319, RCM shall not contain more than five percent by mass of brick or concrete block and shall be substantially free of wood, metal, plaster, and gypsum board, RCM shall be free of all materials that fall under the category of solid waste or hazardous materials as defined by the state or local jurisdiction. With the approval of the Engineer, these respective quantities may be adjusted if the performance of the RCM is not adversely impacted. RCM may be used alone or uniformly blended with other approved aggregate materials to obtain the applicable performance criteria. RCM shall not be used in Portland Cement Concrete without the prior approval of the Engineer.

701.5 RECLAIMED ASPHALT PAVEMENT (RAP):

Reclaimed asphalt pavement (RAP) is defined as all recovered, salvaged or recycled asphalt road waste, large particles or milled material that has been size-reduced, crushed and or screened appropriately, making it reusable. This material shall be of a consistent and relatively clean manner as to not adversely affect the final material usage. RAP may be used alone or uniformly blended with other approved aggregate materials to obtain the applicable performance criteria. RAP shall not be used in Portland Cement Concrete without the prior approval of the Engineer.

701.6 SAMPLING:

Sampling of aggregates shall be performed in accordance with ASTM D-75.

- End of Section -

SECTION 702

BASE MATERIALS

702.1 GENERAL:

Base materials shall be as defined in Section 701, consisting of appropriately sized coarse and fine aggregates, Reclaimed Concrete Material (RCM) or Reclaimed Asphalt Pavement (RAP), other inert materials, and/or aggregates that have been treated for plasticity index mitigation, as approved by the Engineer. These materials, whether virgin or reclaimed or a uniform blend of both, shall conform to the end result quality requirements of this section.

When base material without further qualification is specified, the Contractor shall supply materials that meet the gradation and other quality requirements for Aggregate Base Course as defined in Table 702-1. When a particular classification of base material is specified, the Contractor may substitute materials meeting the gradation and other quality requirements for Aggregate Base Course for Select material, when approved by the Engineer.

The Contractor shall provide the Engineer laboratory testing documentation on the source of the base material showing compliance to Table 702-1 at least 10 business days prior to placement except where the base materials are being obtained from a currently approved source from a list maintained by the appropriate Agency or as determined by the Engineer. Included in the documentation shall be the percentage of RCM or RAP, if applicable.

RCM meeting the requirements of Section 701.4 can be utilized in base material at a maximum quantity of 50% and may be used in roadway applications or where otherwise specified by project plans or special provisions.

RAP meeting the requirements of Section 701.5 can be utilized in base material up to 100% and may be used in roadway applications or where otherwise specified by Project plans or special provisions.

702.1.1 Aggregate Base Course is primarily used in roadway applications or where otherwise specified by project plans or special provisions.

702.1.2 Select Material is primarily used, as a sub base in roadways, fill and embankment applications or where otherwise specified by project special provisions.

702.2 PHYSICAL PROPERTIES:

702.2.1 Base material shall meet the physical properties listed in Table 702-1.

Table 702-1			
Sieve Analysis Test Methods AASHTO T-27, T-11			
Sieve Size	Accumulative Percentage Passing Sieve, by Weight		
	Select Material		Aggregate Base Course
	Type A	Type B	
3 in.	100	- -	- -
1-1/2 in.	- -	100	100
1 in.	- -	- -	90 – 100
No. 4	30 - 75	30 - 70	38 - 65
No. 8	20 - 60	20 - 60	25 – 60
No. 30	10 - 40	10 - 40	10 – 40
No. 200	0 - 12	0 - 12	3 – 12
Plasticity Index Test Methods AASHTO T-89 Method A, T-90, T146 Method A			
Maximum allowable value	5	5	5
Fractured Face, One Face Test Method ARIZ 212, Percent by Weight of the Material Retained on a #4 Sieve			
Minimum required value	50	50	50
Resistance to Degradation and Abrasion by the Los Angeles Abrasion Machine Test Method AASHTO T-96, Percent Loss by Weight			
Maximum allowable value at 100 revolutions	10	10	10
Maximum allowable value at 500 revolutions	40	40	40

702.2.2: When tested for acceptance, Base material that does not meet Table 702-1 properties for gradation or PI may be approved at the Engineer's discretion if the R-Value is at least 70, when determined by test method AASHTO T-190 (see Table 310-1).

- End of Section -

SECTION 703

RIPRAP

703.1 GENERAL:

Aggregate for grouted and ungrouted riprap shall meet the requirements of Sections 701.2 and 703.2 unless otherwise stated in the project specifications.

Aggregate shall be color-matched with adjacent landscape aggregate if specified on the plans or in the special provisions.

The Contractor shall provide the Engineer, in writing, material information and the source location at least 10 days prior to use of the material unless the material is currently acceptable for use as determined by the Engineer.

703.2 PHYSICAL PROPERTIES:

Riprap shall have the following physical properties:

(A) The maximum aggregate size shall be 150% of the indicated D_{50} size and the minimum aggregate size shall be 50% of the indicated D_{50} size.

(B) Aggregate shall be angular and shall not exceed 3:1 ratio for flat and/or elongated pieces when determined by ASTM D4791. Rounded aggregate shall only be allowed when specified or approved by the Engineer.

(C) The loss by abrasion in the Los Angeles Abrasion Machine, determined as prescribed in ASTM C535, shall not exceed 40 percent (by weight) after 1000 revolutions.

- End of Section -

SECTION 705

PORTLAND CEMENT TREATED BASE:

705.1 GENERAL:

The cement treated base shall consist of aggregate, cement, and water. Use of other types of materials must be approved by the Engineer. The compressive strength requirement shall be determined by the project specifications. The amount of cement used in the mix design shall be determined by the project specifications.

705.2 AGGREGATE FOR CEMENT TREATED BASE:

The aggregate for cement treated base shall conform to the requirements of Section 702.2 Aggregate Base Course.

705.3 PORTLAND CEMENT AND WATER:

Portland cement and water shall conform to the requirements of Section 725.

705.4 CEMENT TREATED BASE MIX DESIGN:

A cement-treated base mix design incorporating the proposed materials shall be completed prior to the start of work. The mix design shall be performed in accordance with Arizona Department of Transportation test methods ARIZ-220, ARIZ-221, and ARIZ-222. Compressive strength specimens shall be tested in accordance with ARIZ-241.

The final report shall include the following elements:

(1) The source and supplier of the aggregate including gradation and plasticity index testing.
(2) The source, supplier, and type of cement.
(3) The cement content required to meet the project specifications. Cement content shall be calculated by the dry weight of the combined aggregate-cement mixture.
(4) The optimum moisture and maximum dry density of the proposed blend at the target cement content as determined by ARIZ-221.
(5) The rock corrected optimum moisture and maximum dry density of the proposed blend at the target cement content as determined by ARIZ-222.
(6) A summary of design compressive strength testing including a graph plotting cement content as the x-axis and compressive strength as the y-axis.

- End of Section -

SECTION 708

ASPHALT PAVEMENT CORE BONDING MATERIALS

708.1 GENERAL:

This specification covers the materials required to bond asphalt pavement cores to the asphalt concrete pavement from which it was originally removed.

708.2 MATERIALS:

Bonding material shall be a single component cementitious, rapid hardening, high strength, waterproof bonding agent conforming to the physical properties shown in Table 708-1.

TABLE 708-1

Bond Material Properties

Property	ASTM Test Method	Requirements
Bond Strength, psi	C882	20 min.
Compressive Strength, psi, (70 degrees F., 30 minute cure)	C109	200 min.

Bonding material shall be impervious to water penetration at the joint after curing.

Bonding material shall, within 30 minutes at minimum ambient temperature of 70 degrees F., allow an 18" diameter core to support a traffic load equivalent to at least three (3) times the AASHTO H-25 standard wheel load.

The bonding material is required to securely bond the asphalt concrete core to asphalt concrete pavement and to fill all voids between the core and pavement and within the core.

708.3 TEST REPORT:

Specifications and test results for the bonding material shall be submitted to the Agency for review and approval before use.

- End of Section -

SECTION 710

ASPHALT CONCRETE

710.1 GENERAL:

Asphalt concrete shall be a mixture of asphalt cement and mineral aggregates. Mineral admixture shall be included in the mixture when required by the mix design or by the Engineer. Asphalt concrete shall be produced in accordance with Section 321.

The designation for asphalt concrete mixes shall be based on the nominal maximum aggregate size of the mix. The applicable mix designations are 3/8 inch, 1/2 inch, 3/4 inch and Base (1") mix.

Each mix shall be designed using Marshall or Gyratory compaction methods. Either Gyratory or Marshall Mixes may be used for low or high traffic conditions, as determined by the agency. Low traffic conditions are conditions where the asphalt mix will be subject to low volume and low weight vehicle usage. Examples of this condition are residential streets, most parking lots and residential minor collector streets. High traffic conditions are conditions where the asphalt mix will be subject to high volume and/or heavy weight vehicle usage as found on major collector, arterial and commercial streets. Street classifications (i.e. minor collector and major collector) shall be determined by the specifying agency.

The following table (Table 710-1) displays the recommended lift thickness for various asphalt concrete mix designations found within Section 710. Please note that these recommended lift thicknesses are minimums based on each mix designation's "Nominal Aggregate Size" and the relative coarseness of its gradation. The compacted thickness of layers placed shall not exceed 150% of the Minimum Lift Thickness of Table 710-1 except as otherwise provided in the plans and specifications, or if approved in writing by the Engineer.

TABLE 710-1

RECOMMENDED MINIMUM LIFT THICKNESS FOR ASPHALT CONCRETE MIXES

Asphalt Concrete Mix Designation (inches)	Minimum Lift Thickness Marshall Mixes	Minimum Lift Thickness Gyratory Mixes
3/8"	1.0 inches	1.5 inches
1/2"	1.5 inches	2.0 inches
3/4"	2.5 inches	3.0 inches
Base	3.0 inches	n/a

710.2 MATERIAL:

710.2.1 Asphalt Binder: The asphalt binder specified in this section has been developed for use in desert climate conditions. When used in other climates, consideration should be given to adjustments in the asphalt binder selection. The asphalt binder shall be Performance Grade Asphalt conforming to the requirements of Section 711 for PG 70-10, unless otherwise approved by the Engineer or specified differently in the plans or special provisions.

710.2.2 Aggregate: Coarse and Fine aggregates shall conform to the applicable requirements of this section. Coarse mineral aggregate shall consist of crushed gravel, crushed rock, or other approved inert material with similar characteristics, or a combination thereof, conforming to the requirements of these specifications.

Coarse aggregate for hot mix asphalt is material retained on or above the No. 4 sieve and Fine aggregate is material passing the No. 4 sieve. Aggregates shall be relatively free of deleterious materials, clay balls, and adhering films or other material that prevent coating with the asphalt binder. Coarse and Fine aggregates shall conform to the following requirements when tested in accordance with the applicable test methods.

TABLE 710-2 COARSE/FINE AGGREGATE REQUIREMENTS			
Characteristics	Test Method	Low Traffic	High Traffic
Fractured Faces, % (Coarse Aggregate Only)	Arizona 212	75, 1 or more	85, 1 or more 80, 2 or more
Uncompacted Voids, % Min.	AASHTO T-304, Method A	42	45
Flat & Elongated Pieces, % 5:1 Ratio	ASTM D4791	10.0 Max.	10.0 Max.
Sand Equivalent, %	AASHTO T-176	50 Min.	50 Min.
Plasticity Index	AASHTO T-90	Non-plastic	Non-plastic
L.A. Abrasion, %Loss	AASHTO T-96	9 max. @ 100 Rev. 40 max. @ 500 Rev.	9 max. @ 100 Rev. 40 max. @ 500 Rev.
Combined Bulk Specific Gravity	AI MS-2/SP-2	2.35 – 2.85	2.35 – 2.85
Combined Water Absorption	AI MS-2/SP-2	0 – 2.5%	0 – 2.5%

Tests on aggregates used in asphalt concrete outlined above, shall be performed on materials furnished for mix design purposes and composited to the mix design gradation.

Blend sand (naturally occurring or crushed fines) shall be clean, hard and sound material which will readily accept asphalt binder coating. The blend sand grading shall be such that, when it is mixed with the other mineral aggregates, the combined product shall meet the requirements of Table 710-2.

The natural sand shall not exceed 20 percent for the Marshall mixes and 15 percent for the Gyratory mixes by weight of the total aggregate for a mix.

710.2.3 Reclaimed Asphalt Pavement (RAP): When allowed by the Engineer, Reclaimed Asphalt Pavement (RAP), as defined in Section 701.5, may be used in asphalt concrete provided all requirements of Section 710 are met. References to use of RAP in Section 710 apply only if RAP is used as part of the mixture.

When RAP is used in asphalt concrete, it shall be of a consistent gradation, asphalt content, and properties. When RAP is fed into the plant, the maximum RAP particle size shall not exceed 1 1/2 in. The percentage of asphalt in the RAP shall be established in the mix design. The percentage of RAP binder shall be established in the mix design.

When RAP is used in base and intermediate courses, the amount of RAP aggregate and RAP binder should not exceed 30% contribution; Surface courses should be limited to 20% RAP aggregate and RAP binder contribution.

In addition to the requirements of Section 710.3.1, the job mix formula shall indicate the percent of asphalt RAP and the percent and performance grade of virgin (added) asphalt binder.

When less than or equal to 15% RAP binder is used by weight of total binder in the mix, the added virgin binder shall meet the requirements for PG 70-10 as shown in Section 711. When greater than 15% RAP is used by weight of the total binder in the mix, the added virgin binder will be dropped one grade for low and high temperature properties to a PG 64-16, unless testing indicates that the blend of the recovered RAP binder and virgin binder meets the requirements for PG 70-10 as shown in Section 711. The virgin asphalt binder shall not be more than one standard asphalt material grades different than the specified mix design binder grade.

710.2.4 Mineral Admixture: Mineral admixture when used as an anti-stripping agent in asphalt concrete shall conform to the requirements of AASHTO M-17. Mineral admixture used in asphalt concrete shall be dry hydrated lime, conforming to the requirements of ASTM C1097 or Portland cement conforming to ASTM C150 Type II or ASTM C595 Type IP. The amount of hydrated lime or Portland cement used shall be determined by the mix design. The minimum Mineral admixture content within a mix will be 1.00 percent, by weight of total aggregate.

710.3 MIX DESIGN REQUIREMENTS:

710.3.1 General: The mix design for asphalt concrete shall be prepared by a laboratory that is accredited through the AASHTO Accreditation Program (AAP) in Hot Mix Asphalt Aggregates and Hot Mix Asphalt. The laboratory shall be under the direct supervision of a Civil Engineer, registered by the State of Arizona, and who is listed by ADOT as a "Qualified Asphaltic Concrete Mix Design Engineer" within ADOT's latest list of approved laboratories. The latest list of approved laboratories is available on ADOT's web page www.azdot.gov. The date of the design shall not be older than one year from the date of submittal, unless supportive documentation is provided and approved by the Engineer.

The mix design report shall include the following elements as a minimum.

(1) The name and address of the testing organization and the person responsible for the mix design report.

(2) The mix plant identification and/or location, as well as the supplier or producer name.

(3) A description of all products that are incorporated in the asphalt concrete along with the sources of all products, including admixtures and asphalt binder, and their method of introduction.

(4) The supplier and grade of asphalt binder, the source and type of mineral aggregate, and the percentage of asphalt binder and mineral admixture used.

(5) The percentage of RAP and RAP Binder being contributed to the total mix shall be included in the mix design report.

(6) The mix design report whether Gyratory or Marshall shall state the traffic condition (low or high traffic) and size designation.

(7) The results of all testing, determinations, etc., such as: specific gravity and gradation of each component, water absorption, sand equivalent, loss on abrasion, fractured coarse aggregate particles, Tensile Strength Ratio (ASTM D 4867), Marshall stability and flow, asphalt absorption, percent air voids, voids in mineral aggregate, and bulk density. Historical abrasion values may be supplied on existing sources. The submittal should include a plot of the gradation on the Federal Highway Administration's 0.45 Power Gradation Chart, plots of the compaction curves and the results of moisture sensitivity testing.

(8) The laboratory mixing and compaction temperature ranges for the supplier and grade of asphalt binder used within the mix design.

(9) A specific recommendation for design asphalt binder content and any limiting conditions that may be associated with the use of the design, such as minimum percentages of crushed or washed fine aggregate.

(10) The supplier's product code, the laboratory Engineer's seal (signed and dated), and the date the design was performed.

(11) If a Warm Mix Technology or additive is used; the following shall be included:

- Technology type and supporting manufacturer information; including instructions pertaining to laboratory mixture temperatures and curing.
- Amount (%) of additive (technology) used in the mixture.
- Attached copy of the ADOT approved product list, showing additive/technology
- Minimum plant production temperature shall not fall below manufacturer's recommendation.
- Minimum field compaction temperature shall be identified.
- Identify any special mixing or compaction temperatures or special methods to be used when conducting OA or OC testing of field collected samples. Example: if the field collected samples of warm mix asphalt can be treated as conventional hot asphalt mix, provide the equivalent conventional hot asphalt mix compaction temperature.

The mix design shall be submitted to the Agency or Engineer by the Contractor/Supplier for which it was developed as part of his project submittals. Once the mix design has been approved by the agency or Engineer, the Contractor and/or his supplier shall not change plants nor use additional mixing plants without prior approval of the Engineer. Any changes in the plant operation, the producer's pit, the asphalt binder, including modifiers in the asphalt binder, or any other item that will cause an adjustment in the mix, shall be justification for a new mix design to be submitted.

710.3.2 Mix Design Criteria: The mix design shall be performed by one of two methods, Marshall Mix Design or Gyratory Mix Design. The method shall be specified on the plans, special provisions, or by the Engineer. A minimum of 4 points will be used to establish the mix design results. The oven aging period for both Marshall and Gyratory mix design samples shall be 2 hours.

710.3.2.1 Marshall Mix Design: The Marshall Mix Design shall be performed in accordance with the requirements of the latest edition of the Asphalt Institute's Manual, MS-2 "Mix Design Methods for Asphalt Concrete." The mix shall use the compactive effort of 75 blows per side of specimen. The mix shall comply with the criteria in Table 710-3.

TABLE 710-3

MARSHALL MIX DESIGN CRITERIA

Criteria	Requirements				Designated Test Method
	3/8" Mix	1/2" Mix	3/4" Mix	Base Mix	
1. Voids in Mineral Aggregate: %, min	15.0	14.0	13.0	12.0	AI MS-2
2. Effective Voids: %, Range	4.0±0.2	4.0 ±0.2	4.0 ±0.2	4.0 ±0.2	AI MS-2
3. Absorbed asphalt: %, Range*	0-1.0	0-1.0	0-1.0	0-1.0	AI MS-2
4. Dust to Eff. Asphalt Ratio, Range **	0.6-1.4	0.6-1.4	0.6-1.4	0.6-1.4	AI MS-2
5. Tensile Strength Ratio: % Min.	65	65	65	65	ASTM D 4867
6. Dry Tensile Strength: psi, Min.	100	100	100	100	ASTM D 4867
7. Stability: pounds, Minimum	2,000	2,500	2,500	3,000	AASHTO T-245
8. Flow: 0.01-inch, Range	8-16	8-16	8-16	8-16	AASHTO T-245
9. Mineral Aggregate Grading Limits					AASHTO T-27
	Percent Passing with Admix				
Sieve Size	3/8 inch Mix		1/2 inch Mix	3/4 inch Mix	Base Mix
1-1/4 inch					100
1 inch				100	90-100
3/4 inch			100	90 – 100	85-95
1/2 inch	100		85 – 100	---	---
3/8 inch	90-100		62 – 85	62 – 77	57-72
No. 8	45-60		40 – 50	35 – 47	33-43
No. 40	10-22		10 – 20	10 – 20	9-18
No. 200	2.0 – 10.0		2.0 – 10.0	2.0 – 8.0	1.0 – 7.0

* Unless otherwise approved by the Engineer.

** The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the indicated range.

710.3.2.2 Gyratory Mix Design: Gyratory Mix Designs shall be performed in accordance with the requirements of latest edition of the Asphalt Institute's SP-2 manual. Mix design laboratory compacted specimens shall be prepared using a gyratory compactor in accordance with AASHTO T-312.

The mix design shall be formulated in a manner described for volumetric mix designs in the current edition of the Asphalt Institute Manual SP-2, except the number of trial blend gradations necessary will be determined by the mix design laboratory. Duplicate gyratory samples shall be prepared at a minimum of four (4) binder contents to select the recommended binder content. The gyratory specimens shall be compacted to 160 gyrations. Volumetric data for the design number of gyrations, N_{des}, and the initial number of gyrations, N_{ini}, are then back calculated based on the bulk specific gravity, G_{mb}, of the N_{max} specimens and the height data generated during the compaction process of those same specimens.

For Low traffic designs, volumetric data for 115 gyrations, N_{max} for Low Traffic designs, is also back calculated from the specimens compacted to 160 gyrations.

The corrected density of the specimens shall be less than 89.0 percent of maximum theoretical density at N_{ini}. The corrected density of the specimens shall be less than 98.0 percent of maximum theoretical density at N_{max}. The Gyratory mix shall comply with the criteria in Table 710-4.

TABLE 710-4

GYRATORY MIX DESIGN CRITERIA

Criteria	**Requirements**			**Designated Test**
	3/8" Mix	**1/2" Mix**	**3/4" Mix**	**Method**
1. Voids in Mineral Aggregate: %, Min.	15.0	14.0	13.0	AI SP-2
2. Effective Voids: %, Range	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	AI SP-2
3. Absorbed Asphalt: %, Range *	0 - 1.0	0 - 1.0	0 - 1.0	AI SP-2
4. Dust to Eff. Asphalt Ratio, Range **	0.6 – 1.4	0.6 – 1.4	0.6 – 1.4	AI SP-2
5. Tensile Strength Ratio: %, Min.	75	75	75	ASTM D 4867
6. Dry Tensile Strength: psi, Min.	75	75	75	ASTM D 4867
7. Mineral Aggregate Grading Limits				AASHTO T-27
	Percent Passing with Admix			
Sieve Size	**3/8 inch Mix**	**1/2 inch Mix**	**3/4 inch Mix**	
1 inch			100	
3/4 inch		100	90-100	
1/2 inch	100	90-100	43-89	
3/8 inch	90-100	53-89	-	
No. 8	32-47	29-40	24-36	
No. 40	2-24	3-20	3-18	
No. 200	2.0-8.0	2.0-7.5	2.0-6.5	
8. Number of Gyrations	**Low Traffic**		**High Traffic**	
N_{ini}	7		8	
N_{des}	75		100	
N_{max}	115		160	

* Unless otherwise approved by the Engineer.

** The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the indicated range.

710.3.2.3 Moisture Sensitivity Testing: Moisture sensitivity testing will be performed in accordance with ASTM D4867 for both Marshall and Gyratory mix designs, without the freeze/thaw cycles. The minimum required Tensile Strength Ratio is indicated in the tables above.

- End of Section -

SECTION 711

PAVING ASPHALT

711.1 GENERAL:

The asphalt shall be produced from crude asphalt petroleum or a mixture of refined liquid asphalt and refined solid asphalt. It shall be free from admixture with any residues obtained by the artificial distillation of coal, coal tar, or paraffin oil and shall be homogeneous and free from water.

Polymer modified asphalt cement shall be produced from crude asphalt petroleum and a polymer or blend of polymers mixed to produce a homogeneous material free from water.

Asphalt shall not be heated during the process of its manufacture, storage, or during construction so as to cause injury as evidence by the formation of carbonized particles.

711.2 TESTING REQUIREMENTS:

Paving asphalt shall be classified by the Performance Grading System and shall conform to the requirements set forth in Table 711-1 and AASHTO M-320 with the PAV temperature changes noted in the table. On all Grades Flash Point Temperature AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent.

TABLE 711-1
PERFORMANCE GRADING SYSTEM

	PG 58-22	PG 64-16	PG 70-10	PG 76-16
Original Asphalt				
Viscosity, AASHTO T-316 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear AASHTO T-315 (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Tests Using Rolling Thin Film Oven Residue (AASHTO T-240)				
Mass Loss, Maximum %	1.0	1.0	1.0	1.0
Dynamic Shear AASHTO T-315 G*/Sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	58	64	70	76
Tests Using Pressure Aging Vessel Residue (AASHTO R-28)				
PAV Aging Temperature, °C (AASHTO R-28)	100	100	110	110
Dynamic Shear AASHTO T-315 G*·Sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	28	34	34
Creep Stiffness, AASHTO T-313 (Note 3) S, Maximum, 300.0 Mpa *m*-value, Minimum, 0.300 Test Temp. @ 60s, °C	-12	-6	0	-6
Direct Tension, AASHTO T-314 (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-12	-6	0	-6

NOTES:

(1) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(2) For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of G*/sin (d) at test temperatures when the asphalt is a

Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer (AASHTO T-210 or AASHTO T-202).

(3) If the Creep Stiffness is below 300 MPa, the direct tension test is not required. If the Creep Stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the Creep Stiffness requirement. Direct tension test is recommended for polymer modified asphalt binders. The m-value requirement must be satisfied in all cases.

Polymer modified paving asphalt shall be classified by the Performance Grading System and shall conform to the requirements set forth in Table 711-2 and AASHTO M320 with the PAV temperature changes noted in the table. On all Grades Flash Point Temperature AASHTO T48: Minimum 230 °C and Mass Loss, Maximum 1.00 percent. P is for Polymer and TR is for Tire Rubber.

TABLE 711-2

PERFORMANCE GRADING SYSTEM

	PG 64-28P	**PG-76-22P**	**PG76-22TR Type 1 (Note 4)**	**PG76-22TR Type 2 (Note 4)**
Viscosity, AASHTO T-316 (Note 1) Max. 3 Pa-s, Test Temp, °C	135	135	135	135
Dynamic Shear, AASHTO T-315 (Note 2) G*/Sin δ, Min., 1.0 kPa Test Temp. @ 10 rad/s, °C	64	76	76	76
Elastic recovery, ASTM D6084 Procedure "B" @ 10°C	65	65	65	55
Phase Angle, Max	75	75	75	75
Separation test, Texas 540 % Max	4	4	4	4
Solubility in Trichloroethylene, ASTM 2042 or n-propyl bromide, ASTM D7553 % Minimum	–	–	97.5	–
Tests Using Rolling Thin Film Oven Residue (AASHTO T-240)				
Mass Loss, Maximum %	1.0	1.0	1.0	1.0
Dynamic Shear, AASHTO T-315 G*/sin δ, Min., 2.20 kPa Test Temp. @ 10 rad/s, °C	64	76	76	76
Tests Using Pressure Aging Vessel Residue (AASHTO R-28)				
PAV Aging Temperature, °C (AASHTO R-28)	100	110	110	110
Dynamic Shear, AASHTO T-315 G*sin δ, Max., 5000 kPa Test Temp. @ 10 rad/s, °C	22	31	31	31
Mass Loss, AASHTO T-240 Weight % Max	1.0	1.0	1.0	1.0
Creep Stiffness, AASHTO T-313 S, Maximum, 300 Mpa *m*-value, Minimum, 0.300 Test Temp. @ 60s, °C	-18	-12	-12	-12
Direct Tension, AASHTO T-314 (Note 3) Failure Strain, Minimum 1.0% Test Temp. @ 1.0 mm/min. °C	-18	-12	-12	-12

NOTES:

(1) This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

(2) For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of G*/Sin δ, at test temperatures when the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer (AASHTO T-210 or AASHTO T-202).

(3) If the Creep Stiffness is below 300 MPa, the direct tension test is not required. If the Creep Stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the Creep Stiffness requirement. Direct tension test is recommended for polymer modified asphalt binders. The m-value requirement must be satisfied in all cases.

(4) "TR" binders shall have 9% to 11% reclaimed tire rubber and enough virgin polymer to meet all performance grade criteria specified. The blend percentages shall be listed on the Certificate of Compliance by the manufacturer. Type 1 shall meet solubility limits.

711.3 TEST REPORT AND CERTIFICATION:

At the time of delivery of each shipment of asphalt, the supplier supplying the material shall deliver to the purchaser 3 certified copies of the test report which shall indicate the name of the refinery and supplier, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and results of the above specified tests. The test report shall be signed by an authorized representative of the supplier certifying that the product delivered conforms to the specifications for the type and grade indicated.

Until the certified test reports and samples of the material have been checked by the Engineer, that material will be only tentatively accepted by the Contracting Agency. Final acceptance will be dependent upon the determination of the Engineer that the material involved fulfills the requirements prescribed. The certified test reports and the testing required in connection with the reports shall be at no additional cost to the Contracting Agency.

711.4 TEMPERATURES:

Paving asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the paving asphalt during heating.

711.5 CONVERSION OF QUANTITIES:

When pay quantities of paving asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM D1250. In converting volume to weight, the computations shall be based on Table 711-3.

TABLE 711-3
ASPHALT CEMENT QUANTITY CONVERSION

Grade of Material	Gals. Per Ton of 60 °F.	Lbs. Per Gal at 60 °F.
PG 58-22	236	8.47
PG 64-16	235	8.51
PG 70-10	235	8.51
PG 64-28P	236	8.47
PG 76-22P,TR	236	8.47
PG 76-16	233	8.58

- End of Section -

SECTION 712

LIQUID ASPHALT

712.1 GENERAL:

Liquid asphalt shall consist essentially of either natural crude or refined asphalt petroleum, or a residual product thereof.

The liquid asphalt shall be medium curing product designed by the letters MC, and shall consist of a paving asphalt conforming to the provisions in Section 711, fluxed or blended with a kerosene type solvent.

The asphalt shall not be heated during the process of its manufacture or during construction so as to cause injury as evidence by the formation of carbonized particles.

712.2 TEST REQUIREMENTS:

The liquid asphalt shall consist of materials specified above and shall conform to the requirements set forth in Table 712-1.

712.3 TEST REPORTS AND CERTIFICATIONS:

Test reports and certifications will be furnished in accordance with Section 711.

712.4 CONVERSION OF QUANTITIES:

When pay quantities of liquid asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM D1250. In converting volume to weight, the computations shall be based on the data contained in Table 712-2

TABLE 712-1

AASHTO M-82 TABLE 1

	MC-30		MC-70		MC-250		MC-800		MC-3000	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Kinematic Viscosity at 60°C (140°F) centistokes	30	60	70	140	250	500	800	1600	3000	6000
Flash point (Tab. open-cup), degrees C° (F)	38 (100)	. . .	38 (100)	. . .	66 (150)	. . .	66 (150)	. . .	66 (150)	. . .
Water percent	. . .	0.2	. . .	0.2	. . .	0.2	. . .	0.2	. . .	0.2
Distillation test: Distillate percentage by volume of total distillate to 360°C (680°F)										
to 225°C (437°F)	. . .	25	0	20	0	10	. . .	. . .	. . .	. . .
to 260°C (500°F)	40	70	20	60	15	55	0	35	0	15
to 315°C (600°F)	75	93	65	90	60	87	45	80	15	75
Residue from distillation to 360°C (680°F) Volume percentage of sample by difference	50	. . .	55	. . .	67	. . .	75	. . .	80	. . .
Tests on residue from distillation:										
Absolute viscosity at 60°C (140°F) poises	300	1200	300	1200	300	1200	300	1200	300	1200
Ductility, 5 cm/min, cm.	100	. . .	100	. . .	100	. . .	100	. . .	100	. . .
Solubility in Trichloroethylene, percent	99	. . .	99	. . .	99	. . .	99	. . .	99	

TABLE 712-2		
LIQUID ASPHALT QUANTITY CONVERSION		
Grade of Materials	**Gals. Per Ton at 60 Degrees F.**	**Lbs. Per Gals. at 60 Degrees F.**
70	253	7.90
250	249	8.03
800	245	8.16
2000	241	8.30

- ***End of Section*** -

SECTION 713

EMULSIFIED ASPHALTS MATERIALS

713.1 GENERAL:

Emulsified asphalts shall be composed of a paving asphalt base uniformly emulsified with water and an emulsifying or stabilizing agent. It shall be homogeneous throughout and if stored, shall show no separation of ingredients within 30 days after delivery. Emulsified asphalt shall be classified as quick setting, rapid setting, medium setting or slow setting type in either anionic or cationic emulsions.

Emulsified asphalt shall be specified as follows:

(A) Penetration type and high viscosity type emulsion shall be designated by the letters RS-Rapid Setting.

(B) Mixing type emulsion shall be designated by the letters SS-Slow Setting, MS-Medium Setting and QS-Quick Setting.

713.2 TESTING REQUIREMENTS:

The emulsified asphalt shall conform to the requirements set forth in Table 713-1.

713.3 TESTS REPORT AND CERTIFICATION:

Test reports and certifications shall be made in accordance with Section 711.

TABLE 713-1

REQUIREMENTS FOR ANIONIC EMULSIFIED ASPHALT (Specification Designation)

Type	Rapid-Setting				Medium-Setting						Slow-Setting			
Grade	RS-1		RS-2h		MS-1		MS-2		MS-2h		SS-1		SS-1h	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Tests on emulsions Viscosity, Saybolt Furol at 77°F (25°C.), sec	20	100			20	100	100		100		20	100	20	100
Viscosity, Saybolt Furol at 122°F (50°C.), sec			75	400										
Demulsibility, 35 ml. 0.02 N. $CaCl_2$, percent	60		60											
Coating ability and water resistance														
Coating, dry and aggregate					good		good		good					
Coating, after spraying					fair		fair		fair					
Coating, wet aggregate					fair		fair		fair					
Coating, after spraying					fair		fair		fair					
Cement mixing test, percent												2		2
Sieve test, percent		0.1		0.1		0.1		0.1		0.1		0.1		0.1
Residue by distillation, percent	55		63		55		65		65		57		57	
Tests on Residue from Distillation Test: Penetration 77°F (25°C), 100g, 5 s	100	200	40	90	100	200	100	200	40	90	100	200	40	90
Ductility, 77°F (25°C), 5 cm/min. cm.	40		40		40		40		40		40		40	
Solubility in trichloroethylene, %	97.5		97.5		97.5		97.5		97.5		97.5		97.5	

TABLE 713-1 (continued)																				
REQUIREMENTS FOR ANIONIC/CATIONIC EMULSIFIED ASPHALT (Specification Designation)																				
Type	Quick Setting				Rapid Setting				Medium Setting				Slow Setting				Quick Setting	
Grade	QSH		CQSH		CRS-1		CRS-2h		CMS-2		CMS-2h		CSS-1		CSS-1h		PMCQS-1h	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Tests on emulsions:																		
Visc., Saybolt Furol at 77°F., sec.	20	100	20	100									20	100	20	100	20	100
Visc., Saybolt Furol at 122°F., sec					20	100	100	400	50	450	50	450						
Storage Stability Test, 1 day, %	1		1		1		1		1		1		1		1		1	
Demulsibility, 35 ml 0.8% sodium dioctyl sulfosucinate, %					40		40											
Coating ability and water resistance:																		
Dry aggregate									Good		Good							
after spraying									Fair		Fair							
wet aggregate									Fair		Fair							
after spraying									Fair		Fair							
Particle charge test			Positive		Positive		Positive		Positive		Positive		Positive		Positive		Positive	
Sieve Test, %	0.10		0.10		0.10		0.10		0.10		0.10		0.10		0.10			
Cement Mixing test, %														2.0		2.0		
Distillation:																		
Oil distillate, by volume of emulsion, %						3		3		12		12						
Residue, %	57		57		60		65		65		65		57		57		60	
Test on residue from distillation test:																		
Penetration, 25°C (77°F), 100 g. 5 sec.	40	110	40	110	100	250	40	90	100	250	40	90	100	250	40	90	55	75
Ductility, 25°C (77°F.) 5 cm per min, cm.	40		40		40		40		40		40		40		40		40	
Ring and Ball Softening Point, AASHTO T-53																	130	
Elastic Recovery, % AASTHO T30																	55	
Solubility in trichloroethylene, %	98		98		98		98		98		98		97.5		97.5		97.5	

* If the Particle Charge Test result is inconclusive for CSS-1 or CSS-1h, material having a maximum ph value of 6.7 will be accepted.
* If using PMCQS-1h the Residue from distillation shall be obtained from ARIZ-504.

713.4 TEMPERATURES:

Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table 713-2 the exact temperature to be determined by the Engineer. Emulsified asphalt shall be reheated if necessary. But at no time, after loading into a tank car or truck for transportation to the work site, shall the temperature of the emulsion be raised above the maximum temperature shown in Table 713-2. During all reheating operations, the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 degrees F.

TABLE 713-2		
APPLICATION TEMPERATURE OF EMULSIFIED ASPHALT		
Grade of Emulsified Asphalt	**Minimum °F.**	**Maximum °F.**
RS-1, MS-1, SS-1, SS-Ih, CSS-1, CSS-1h	70°F.	140°F.
RS-2, MS-2, MS-2h, CRS-1, PMCQS-1h CRS-1h, CRS-2h, CMS-2, CMS-2h, QSH, CQSH	125°F.	185°F.

Emulsified asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating.

713.5 CONVERSION OF QUANTITIES:

When pay quantities of emulsified asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F. in accordance with ASTM D1250. In converting volume to weight, the computations shall be based on Table 713-3.

TABLE 713-3		
EMULSIFIED ASPHALTS QUANTITY CONVERSION		
Grade of Material	**Gals Per Ton at 60°F.**	**Lbs Per Gal. at 60°F.**
All grades	240	8.33

- End of Section -

SECTION 714

MICROSURFACING MATERIALS

714.1 GENERAL:

Microsurfacing materials shall consist of a properly proportioned mixture of cationic polymer modified asphalt emulsion, mineral aggregates, mineral filler, water, and other additives.

714.2 AGGREGATE:

714.2.1 Mineral Filler: Mineral filler, as required by the mix design, shall be any recognized brand of non-air-entrained Type I/II normal Portland cement that is free of lumps and clods, with a minimum of 85% passing the #200 sieve, added by weight of aggregate as specified by the mix design.

714.2.2 Mineral Aggregate: Coarse and fine aggregates or approved mineral filler shall be per Section 701. Aggregates shall be 100% crushed with no rounded particles. No natural sand will be allowed. The mineral aggregate shall conform to Table 715-1 for gradation only. Application rates shall be 18-24 pounds of aggregate/square yard for Type II, and 24-35 pounds/square yard for Type III.

The mineral aggregate and mineral filler shall have a sand equivalency value not less than 50 (ASTM D2419) and be non-plastic.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate needed to produce the required gradation shall be proportioned separately in a manner that will result in a uniform and homogeneous blend. The final blended aggregate shall meet the above requirements for grading, sand equivalency, and plasticity.

714.3 BITUMINOUS MATERIAL:

The Polymerized Emulsion is a slow-setting, cationic type emulsion for mixing applications and seal coats. A minimum of 4% saturated polymer shall be high sheared into the asphalt prior to the emulsification process. The Agency may choose to sample the polymerized asphalt for testing. The amount of polymer will be based on weight of polymer and asphalt (total weight) and be certified by the supplier. The polymerized emulsion will meet the following specifications listed in Table 714-1.

Table 714-1		
Polymerized Emulsion		
Test	**AASHTO Method**	**Specification Limits**
Tests on Emulsion		
Viscosity, SSF, @ 77°F. sec.	T59	15-100
Sieve Test, %	T59	0.30 Maximum
Particle Charge	T59	Positive
Storage Stability, 24 hr. %	T59	1.0 Maximum
Evaporation Residue, %	Arizona 512	60 Minimum
Tests on Evaporation Residue	Arizona 504	
Kinematic Viscosity 275°F.cst	T201	650 Minimum
Penetration, 77°F 100g @ 5 sec	T49	40-90
Softening Point, degrees F.	T53	140 Minimum
Ductility, 77%, 5 cm/min.	T51	60 Minimum
Tests on Evaporation Residue after RTFO		
Kinematic Viscosity, 275°F. aging ratio, cst	T201	2.5 Maximum
Softening Point, degrees F.	T53	140 Minimum
The emulsion, upon standing undisturbed for a period of twenty-four (24) hours, shall show no white or milky colored substance on its surface, and shall be a homogeneous brown color throughout.		

714.4 MODIFIER TYPE AND CONTENT:

The modifier shall be saturated. The use of latex type modifier will be allowed only if both the test results and field performance are accepted by the Engineer. The asphalt cement shall contain a minimum of 4% solid polymer by weight of asphalt residue, sheared into the asphalt prior to emulsification. Plant verification by the Agency, and certification of the polymer content and type by the supplier, will be required throughout the duration of the contract. Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall be provided to the Agency.

714.5 WATER:

Water shall be potable water, free of any injurious impurities. The Contractor shall identify the water source to the Agency.

714.6 ADDITIVES:

Additives may be used to accelerate or retard the breaking point and set times of the mix, or to improve the resulting finished surface.

The use of additives in the mix shall be supplied in quantities predetermined by the laboratory mix design.

714.7 TEST CERTIFICATES AND REPORTS:

Test certificates and reports for the bituminous material shall be furnished in accordance with Section 711.3.

- End of Section -

SECTION 715

SLURRY SEAL MATERIALS

715.1 GENERAL:

Slurry seal shall consist of a properly proportioned mixture of emulsified asphalt, mineral aggregate, mineral fillers, additives (if necessary), and water.

All material sources must be approved prior to their use. The Contractor will submit a job mix formula and if requested prequalifications for materials at least seven days prior to start of construction. When requested, additional samples will be furnished during the construction period at no cost to the Contracting Agency. This is a non-pay item.

715.2 AGGREGATE:

715.2.1 Mineral Filler: Mineral filler shall consist of finely divided matter, such as hydrated lime, Portland cement, limestone dust or fly ash, conforming to the requirements of ASTM D4318. Mineral filler shall be used only when needed to reduce the setting time, to improve the workability or to reduce the stripping characteristics of the aggregate emulsion mixture. The minimum amount of the required filler will be used and it will be considered as part of the blended aggregate. The expected range shall be between .25% and 2.0% by weight of aggregate.

715.2.2 Mineral Aggregate: Coarse and fine aggregates or approved mineral filler shall be per Section 701. The mineral filler will be considered as part of the blended aggregate. The material shall be non-plastic (ASTM D4318) with a sand equivalent (ASTM D2419) of at least 50. The abrasion loss (ASTM C131) shall not exceed 35 percent. Historical test data from source aggregate may be used that was run within the past two years. Mineral aggregates used shall be 100% crushed. No natural sand shall be allowed. The gradation of mineral aggregate without mineral filler shall conform to Table 715-1.

TABLE 715-1

SLURRY SEAL AGGREGATE

SIEVE SIZE	Type I % PASSING	Type II % PASSING	Type III % PASSING
3/8	100	100	100
No. 4	100	85/100	70/90
No. 8	90/100	65/90	45/70
No. 16	65/90	45/70	28/50
No. 30	40/60	30/50	19/34
No. 50	25/42	18/30	12/25
No. 100	15/30	10/21	7/18
No. 200	10/20	5/15	5/15
Emulsified Asphalt content as a % of Dry Wt. Of Aggregate (approx.) ASTM D3910 (W.T.A.T. TEST)	18	16	14
Residual Asphalt Range requirements % of Dry Wt. of Aggregate ASTM D3910 (W.T.A.T. TEST)	10-16	7.5-13	6.5-12
Pounds of Aggregate per Square Yard (approx.)	8-10	12-18	18-25

715.3 BITUMINOUS MATERIAL:

The emulsified asphalt used for seal coating shall be quick setting or slow setting as per Section 713.

Polymer modified cationic quick setting emulsion (PMCQS-1h) may be used when approved by the Engineer.

The quick setting emulsified asphalt shall be of the anionic or cationic quick set type such as QSH, CQSH, or PMCQS-1h that will react to chemically active mineral fillers such as Portland cement in such a way that the applied slurry mixture can support controlled traffic in 45-60 minutes after application. The amount of chemically active filler shall be determined by job mix formula and field performance.

Polymer modified cationic quick setting emulsion (PMCQS1-h) shall be homogeneous and the polymer used shall consist of either a solid polymer milled / blended into the asphalt or latex blended into the emulsifier solution prior to the emulsification process. The PMCQS-1h shall contain a minimum of three percent polymer and shall conform to Section 713.

Slow setting emulsion may be used when traffic control is not a critical item.

Quick Set Emulsion Mix Properties	
Slurry Seal Mixing, 70-85 degree F., Sec.	120 Sec. Min.
Slurry Seal Setting text, 70-85 degree F., 1 hour cure	No Brown Stain
Slurry Seal Water Resistance Test, 70-85 degree F., 30 minute cure	No More Than Slight Discoloration

Placement of slurry seal is temperature dependent and should be tested under field conditions.

715.4 WATER:

Water shall be potable and be compatible with the slurry ingredients used.

715.5 DETERMINATION OF JOB MIX FORMULA:

The job mixture shall be designed to provide a suitable surface for traffic conditions, climate and curing. All materials shall be pre-tested in a qualified laboratory to determine their suitability for use in the slurry seal. The Wet Track Abrasion Test (W.T.A.T.) will be used for design purposes to establish the mix design to be used in the specified slurry seal.

The test will show a maximum wear loss of 75 grams per square foot. Samples of materials to be used on the job shall be used to run the W.T.A.T. The test will be performed in accordance with ASTM D3910 Design Testing and Construction of Slurry Seal.

715.5.1 Composition of Slurry Seal Mixtures: The job mixture shall conform to the requirements of the contract documents. The mixture shall attain an initial set in not less than 5 minutes not more than one hour. In cases where the surface is not critical to be open to traffic, a longer set time may be allowed, however not to exceed 12 hours. The setting time may be adjusted by the addition or removal of approved mineral fillers or chemical agents. The mixture shall be one of three types whose combined aggregates conform to the graduation requirements of Table 715-1. The mixture shall be sufficiently free flowing to fill cracks in the pavement. The mixture shall not segregate during or after laydown. The mixture shall produce a skid-resistant surface.

715.5.2 Trial Applications: The Contractor shall place a test strip of 60 square yards in the area designated by the Engineer. The test section shall be placed using the same equipment and methods as will be used on the job. The slurry mixture placed in a test strip shall conform to the design mix as determined by the W.T.A.T. with minor variations to obtain crack filling, set time, pavement bond and a skid resistant texture. If the materials do not meet the requirements for fluidity, non-segregation, or surface texture, a new job mix shall be formulated and tested. Work shall not proceed before approval of design mix and acceptance following the placing of a test strip.

715.6 TEST CERTIFICATES & REPORTS:

Test certificates and reports for the bituminous material shall be furnished in accordance with Section 711.

715.7 CONVERSION OF QUANTITIES:

Volumetric conversions shall be accomplished in accordance with Section 713.

- End of Section -

SECTION 716

COVER MATERIAL

716.1 GENERAL:

Cover material "chips" shall consist of precoated or uncoated aggregate spread in conjunction with a bituminous or asphalt-rubber seal coat.

716.2 COVER MATERIAL AGGREGATE:

716.2.1 Properties:

(1) When tested in accordance with AASHTO T-96, the loss shall not exceed 40 percent at 500 revolutions.
(2) When tested in accordance with AASHTO T-104 (Sodium Sulfate Soundness), the loss shall not exceed 12 percent.
(3) When tested in accordance with ARIZ-212, a minimum of 75 percent, by weight, of the material retained on the No. 8 sieve, shall have at least one fractured face.

716.2.3 Gradation: When tested in accordance with AASHTO T-27 and T-11, the gradation shall comply with Table 716-1 and/or Table 716-2.

TABLE 716-1

COVER MATERIAL (CHIPS) GRADATION
For Low Volume Traffic Only

Sieve Size	Percent Passing
½ inch	100
3/8 inch	97/100
1/4 inch	70/100
#8	0-5
#200	0-2

TABLE 716-2

COVER MATERIAL (CHIPS) GRADATION
For High Volume Traffic

Sieve Size	Percent Passing
3/4 inch	100
½ inch	97/100
3/8 inch	70/100
1/4 inch	0-10
#8	0-5
#200	0-2

716.3 PRECOATED CHIPS:

When specified, the aggregate shall be heated and precoated with asphalt cement as specified in Section 711. The quantity of bituminous material used shall not be less than 0.30 percent or greater than 0.70 percent of the combined weight of the bituminous material and the aggregate to achieve a "salt and pepper" appearance.

The final percentage of asphalt used for coating shall be as directed by the Engineer. The precoating shall be done in a drum mix hot plant. With approval of the Engineer a pug mill mixing facility may be used.

716.4 UNCOATED CHIPS:

When liquid or paving grade asphalt is used as the bituminous binder, the uncoated chips shall not contain moisture in excess of a saturated surface dry condition.

When emulsified asphalt is used as the bituminous binder, the uncoated chips shall be surface wet but free from running water.

- End of Section -

SECTION 717

ASPHALT-RUBBER ASPHALT CONCRETE

717.1 DESCRIPTION:

The work under this section shall consist of furnishing, proportioning and mixing all the ingredients necessary to produce an asphalt-rubber Asphalt Concrete (ARAC) material. ARAC mixes may be used for low or high traffic conditions, as determined by the agency. Low traffic conditions are conditions where the asphalt mix will be subject to low volume and low weight vehicle usage. Examples of this condition are residential streets, most parking lots and residential minor collector streets. High traffic conditions are conditions where the asphalt mix will be subject to high volume and/or heavy weight vehicle usage as found on major collector, arterial and commercial streets. Street classifications (i.e. minor collector and major collector) shall be determined by the specifying agency.

717.2 MATERIALS:

717.2.1 Asphalt-Rubber Binder (ARB): The blended ARB shall meet the criteria list below. The ARB may be blended in a dedicated blending and storage unit connected to the hot plant or at the asphalt binder supplier's facility.

717.2.1.1 Asphalt Cement: Asphalt cement shall conform to the requirements of Section 711.

717.2.1.2 Crumb Rubber: Crumb Rubber shall meet the gradation requirements as shown in Table 717-1 below when tested in accordance with Arizona Test Method 714.

TABLE 717-1
GRADATION REQUIREMENTS OF CRUMB RUBBER

Sieve Size	Percent Passing Type B
2.36 mm (#8)	
2.00 mm (#10)	100
1.18 mm (#16)	65 - 100
600 μm (#30)	20 - 100
300 μm (#50)	0 - 45
75 μm (#200)	0 - 5

The crumb rubber shall have a specific gravity of 1.15 ± 0.05 and shall be free of wire or other contaminating materials, and shall contain not more than 0.5 percent fabric. Calcium carbonate, up to four percent by weight of the crumb rubber, may be added to prevent the particles from sticking together.

Certificates of Compliance conforming to Arizona State Department of Transportation Standard Specifications for Road and Bridge Construction Section 106.05 shall be submitted. In addition, the Certificates shall confirm that the rubber is a crumb rubber, derived from processing at ambient temperature, whole scrap tires or shredded tire materials; and the tires from which the crumb rubber is produced is taken from automobiles, trucks, or other equipment owned and operated in the United States. The Certificates shall also verify that the processing does not produce, as a waste product, casings or other round tire material that can hold water when stored or disposed of above the ground. The crumb rubber to be used in ARB shall be the type produced through a process of mechanical grinding at ambient temperature. Use of crumb rubber granules produced from a cryogenic process is prohibited.

717.2.1.3 ARB Proportions and Properties: Ground crumb rubber in ARB shall be a minimum of 18 percent by weight of total binder,

ARB shall be Type 1 unless otherwise specified and conform to the requirements of Table 717-2 below:

TABLE 717-2			
PHYSICAL PROPERTIES OF ARB			
Property	**Requirement**		
	Type I	**Type 2**	**Type 3**
Grade of base asphalt cement	**PG 64-16**	**PG 58-22**	**PG 52-28**
Rotational Viscosity*; 350° F, Pascal seconds	1.5-4.0	1.5-4.0	1.5-4.0
Penetration; 39° F (4° C), 200g, 60 sec. (ASTM D5); dmm, min	10	15	25
Softening Point; (ASTM D36); °F, min.	135	130	125
Resilience; 77°F (ASTM D3407); %,min	25	20	15
* The Viscometer used must be a hand held rotational viscometer, such as a Rion (formerly Haake) Model VT – 04, or an equivalent, using Rotor No. 1. The rotor, while in the off position, shall be completely immersed in the binder at a temperature from 350° to 355° F for a minimum heat equilibrium period of 60 seconds, and an average viscosity determined from three separate constant readings (± 0.5 pascal-seconds) taken within a 30 second time frame with the viscotester level during testing and turned off between readings. Continuous rotation of the rotor may cause thinning of the material immediately in contact with the rotor, resulting in erroneous results.			

717.2.1.4 ARB Design: At least two weeks prior to paving, the Contractor shall submit an ARB design prepared by an ADOT approved laboratory. Such design shall meet the requirements specified herein. The design shall show the values obtained from the required tests, along with the following information: percent, grade and source of the asphalt cement used; and percent, gradation and source(s) of the crumb rubber used, as well as the ARB blending location: on-site or at the asphalt binder supplier's facility.

717.2.2 Aggregate: Coarse and fine aggregates shall conform to the applicable requirements of Tables 717-3 and 717-4 below. Coarse mineral aggregate shall consist of crushed gravel, crushed rock, or other approved inert material with similar characteristics, or a combination thereof, conforming to the requirements of these specifications.

Coarse aggregate is material retained above the Number 8 sieve and fine aggregate is material passing the Number 8 sieve. Aggregates shall be free of deleterious materials, clay balls, and adhering films or other material that prevent thorough coating with the asphalt cement. Mineral aggregate shall conform to the following requirements when tested in accordance with the applicable test methods.

TABLE 717-3		
MIX DESIGN GRADATION REQUIREMENTS		
Overlay Thickness	**1" & 1- ½"**	**2"**
Sieve Size	**Percent Passing**	**Percent Passing**
1" (25 mm)	100	100
¾" (19 mm)	100	95-100
½" (12.5 mm)	95-100	78-92
⅜" (9.5 mm)	78-92	61-75
No. 4 (4.75 mm)	28-45	30-40
No. 8 (2.36 mm)	15-25	15-25
No. 30 (600 µm)	5-15	5-15
No. 200 (75 µm)	3.0-7.0	2.0-6.0

The combined aggregate properties shall conform to the requirements of Table 717-4 below.

TABLE 717-4		
COARSE/FINE AGGREGATE REQUIREMENTS		
Characteristics	**Test Method**	**Requirements**
Fractured Faces, % (Plus No. 8)	ARIZ-212	85, 1 fracture 80, 2 or more
Uncompacted Voids, %	ARIZ-247	45.0 (High Traffic Volume) 42.0 (Low Traffic Volume)
Sand Equivalent (Minus No. 4)	AASHTO T-176	65 minimum
Plasticity Index	AASHTO T-89 & T-90	Non Plastic
L.A. Abrasion, % Loss	AASHTO T-96	9 max. @ 100 Rev. 40 max. @ 500 Rev.
Combined Bulk Specific Gravity	AI MS-2	2.35-2.85
Combined Water Absorption, %	AI MS-2	0-2.5

717.2.3 Mineral Admixture: Mineral admixture used in ARAC shall be dry hydrated lime conforming to the requirements of ASTM C1097 or Portland cement conforming to ASTM C150 for Type II, or ASTM C595 for Type IP. The minimum mineral admixture content will be 1.0percent, by weight of total aggregate.

717.3 MIX DESIGN REQUIREMENT:

717.3.1 General: The mix design for ARAC shall be prepared by a laboratory that is accredited through the AASHTO Accreditation Program (AAP) in Hot Mix Asphalt Aggregates and Hot Mix Asphalt. The laboratory shall be under the direct supervision of a Civil Engineer, registered by the State of Arizona, and who is listed by ADOT as a "Qualified Asphalt Concrete Mix Design Engineer" within ADOT's latest list of approved laboratories. The latest list of approved laboratories is available on ADOT's web page: http://www.azdot.gov/highways/materials/quality_assurance.asp.

The date of the design shall not be older than two years from the date of submittal, unless supportive documentation is provided and approved by the Engineer.

The mix design method used shall be in accordance with the Marshall Mix procedure, 75 blows, as described in Arizona Test Method 832 "Marshall Mix Design Method for Asphaltic Concrete (Asphalt Rubber) [AR-AC]". Mix designs are subject to approval by the Engineer.

717.3.2 Mix Design Criteria: The mix shall comply with the criteria in Table 717-5 below.

TABLE 717-5		
MARSHALL MIX DESIGN CRITERIA		
Criteria	Low Volume Traffic	High Volume Traffic
ARB Content 1" and 1-1/2" Overlay Thickness 2" Overlay Thickness	 8.4% minimum N/A	 8.0% minimum 7.0% minimum
Mixture Air Voids, %	3.5-4.5	4.5-5.5
Voids in Mineral Aggregate, %	19.0 min	19.0 min
Tensile Strength Ratio, AASHTO T-283	65% minimum	65% minimum
Marshall Stability, pounds minimum	800	800
Marshall Flow, 0.01 inch minimum	16	16

The mix design report shall include the following elements as a minimum.

(1) The name and address of the testing organization and the person responsible for the mix design report.

(2) The mix plant identification and/or location, as well as the supplier or producer name.

(3) The traffic condition (low or high traffic) and lift thickness.

(4) A description of all products that are incorporated in the ARAC along with the sources of all products, including the base asphalt cement, crumb rubber, mineral aggregate, and admixtures.

(5) The results of all testing, determinations, etc., such as: specific gravity and gradation, water absorption, sand equivalent, loss on abrasion, fractured coarse aggregate particles, Tensile Strength Ratio (AASHTO T-283), Marshall bulk density, stability and flow, asphalt absorption, percent air voids, voids in mineral aggregate. Historical abrasion values may be supplied on existing sources. The submittal should include a plot of the gradation on the Federal Highway Administration's 0.45 Power Gradation Chart and plots of the compaction curves.

(6) The laboratory mixing and compaction temperature ranges for the ARB used within the mix design.

(7) A specific recommendation for design ARB content and any limiting conditions that may be associated with the use of the design, such as minimum percentages of crushed or washed fine aggregate.

(8) The supplier's product code, the laboratory Engineer's seal (signed and dated), and the date the design was completed.

(9) The ARB design.

The mix design shall be submitted to the Agency or Engineer by the Contractor/Supplier for which it was developed as part of his project submittals. Once the mix design has been approved by the agency or Engineer, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer. Any changes in the plant operation, the producer's pit, the ARB, or any other item that will cause an adjustment in the mix, shall be justification for a new mix design to be submitted.

- End of Section -

SECTION 718

PRESERVATIVE SEAL FOR ASPHALT CONCRETE

718.1 GENERAL

Asphalt Concrete preservative seal shall be one of the following types or equal, with typical application rates.

TYPE A - Asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each supplier must submit a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements. They also must provide documentation of tests that determine the acceptable range of application of the product. Typical application rates are .07 to .18 gallons per square yard.

TYPE B - Petroleum Hydrocarbon emulsion. Applied at .05 to .20 gallons per square yard, diluted.

TYPE C - Tire modified surface sealer (TRMSS) or equal not diluted, and applied at a rate of .10 to .20 gallons per square yard.

TYPE D - Acrylic polymer, modified emulsion. Diluted to the manufacture's recommendation and applied at a rate of .08 to .20 gallons per square yard.

718.2 TEST METHODS AND REQUIREMENTS

Preservative seal for asphalt concrete material, shall meet type A, B, or C on Table 718-1 by certification from the manufacturer.

All tests shall be performed by AMRL accredited laboratory, accredited in the specified test being performed.

TABLE 718-1

PRESERVATIVE SEAL SPECIFICATIONS

Properties * (note 2)		Type-A	Type-B	Type -C	Type-D
Saybolt Viscosity @77°F (sfs)	ASTM D7496-09	45-55 (KU)* (note 1)	15-40	15-40	15-40
Residue by evaporation 138°C	ASTM D6934-08	30-40	.10 Max	53 min.	60-65
Sieve test %	ASTM D6933-08	N/A		.10 max.	0.1
5 day settlement test	ASTM D6930-10		2.0% max	N/A	N/A
Test on residue from evaporation ASTM D6934-08					
Flash point °F	ASTM D92	450°F	450°F	450°F	385°F
Softening point	ASTM D36M-09	130°F min	N/A	130°F min.	N/A
Accelerated weathering test	ASTM D4799-03	Report * (note 3)	N/A	Report (note 3)	Plant certification within 6 months
Ductility (@77°F) 100g 5 sec.	ASTM D113-07	N/A	N/A	20 min.	N/A
Storage stability, test 1 day%	ASTM 6930-10	N/A	N/A	N/A	N/A
Viscosity @ 140°F, cSt	D-445	N/A	1,000-9,500	N/A	210-390

Asphaltenes, % w (max)	D-2006-70	N/A	10.0 Max.	N/A	1.00
Maltene Dist. Ratio	D-2006-70	N/A	0.2-1.4	N/A	0.3-0.6
PC/S Ratio[45] (Min) (Note 4)	D-2006-70	N/A	0.5 Min.	N/A	0.5
Saturated Hydrocarbons,S[5] (note 4)	D-2006-70	N/A	28 Max.	N/A	21-28

Notes:
1. Kreb units (ASTM D562)
2. A full set of tests shall be performed by as specified by the special provisions in the undiluted condition. These tests and any other specified will be performed at the contractor's expense.
3. The Ultraviolet resistance testing results will be provided at no cost to the engineer.
4. Only residue by evaporation shall be run on diluted samples. Specification limits should be diluted rate times minimum residual value of concentrate.
5. PC/S ratio: $\frac{PC + A_1}{S + A_2}^{5}$

- ***End of Section*** -

SECTION 725

PORTLAND CEMENT CONCRETE

725.1 GENERAL:

Portland cement concrete shall be composed of cementitious materials, fine and coarse aggregates, water, and, if specified or allowed, certain chemical admixtures and additives.

TABLE 725-1
CONCRETE CLASSES - MINIMUM REQUIREMENTS

Class of Concrete	Minimum Cementitious Materials Content (lbs. per cubic yard)	Minimum Compressive Strength (1) at 28 Days (psi)
AA	600	4000
A	520	3000
B	470	2500
C	420	2000

(1) In accordance with section 725.8.

725.2 CEMENTITIOUS MATERIALS:

Cementitious materials to be used or furnished under this specification shall be:

Portland cement, meeting the requirements of ASTM C150
Type II, low alkali, when no other specific type is specified
Type III, low alkali, for high early strength, when applicable or specified
Type V, low alkali, when specified in the special provisions for applications requiring high sulfate resistance

Portland Pozzolan Cement ASTM C595
Type IP (MS), when no other specific type is specified

Supplementary Cementitious Materials (SCM) shall not be used as an additional cementitious materials replacement in concrete in combination with Portland Pozzolan Cement.

Cementitious materials shall be sampled and tested as prescribed in the applicable ASTM specifications. The Contractor shall obtain and deliver to the Engineer a certification of compliance signed by the material manufacturer, identifying the cementitious material and stating that the cementitious material delivered to the batching site complies with the appropriate specifications. When requested by the Engineer, the Contractor shall furnish three copies of the cementitious materials certification. The cost of furnishing tested cementitious materials shall be considered as included in the contract bid price and no additional allowance will be made therefore.

When suitable facilities, as recommended by the Concrete Plant Manufacturer's Bureau, and approved by the Engineer, are available for handling and weighing bulk cementitious materials, such facilities shall be used. Otherwise the cementitious material shall be delivered in original unopened sacks that bear the name or brand of the manufacturer. The type of cementitious material, and the weight contained in each sack shall be plainly marked thereon.

Cementitious materials shall be stored in such manner as to permit ready access for the purpose of inspection and identification, and so as to be suitably protected against damage by contamination or moisture. Should any lot of bulk cementitious material be delivered to the site show evidence of contamination, the Engineer may require that such lot be removed from the site.

725.2.1 Supplementary Cementitious Materials (Pozzolans): Supplementary Cementitious Materials to be used in concrete or furnished under this specification shall conform to the appropriate ASTM requirements as follows:

Fly ash or natural pozzolan	ASTM C618 and C311
Silica Fume	ASTM C1240

Up to 25 percent by weight of the Table 725-1 minimum cementitious materials requirements may be an approved fly ash or natural pozzolan. Additional pozzolanic material in excess of the minimum Table 725-1 requirements may be incorporated into a concrete mix design to achieve enhanced performance, upon approval of the Engineer.

The Contractor shall obtain and deliver to the Engineer a certification of compliance signed by the pozzolan supplier identifying the pozzolanic material and stating the pozzolan delivered to the batching site complies with the appropriate specifications. The cost of furnishing tested pozzolan shall be considered as included in the contract bid price and no additional allowance will be made therefore.

Pozzolanic materials shall be handled and stored in the same manner as other cementitious materials. When facilities for handling a bulk pozzolan are not available, the pozzolan shall be delivered in original unopened sacks bearing the name and brand of the supplier, the type and source of the pozzolan, and the weight contained in each sack plainly marked thereon.

725.3 AGGREGATES:

Coarse and fine aggregate shall conform to the applicable requirements of ASTM C33. Coarse aggregate grading requirements shall conform to the appropriate rock size designation in the Grading Requirements for Coarse Aggregate, Table 2. Fine aggregate grading requirements shall conform to the Fine Aggregate Grading section.

The average value of 3 successive sand equivalent samples shall not be less than 70 when tested in accordance with ASTM D2419. No individual sample shall have a sand equivalent less than 65.

The loss by abrasion in the Los Angeles Abrasion Machine, determined as prescribed in ASTM C131, shall not exceed 10 percent, by weight, after 100 revolutions nor 40 percent after 500 revolutions.

Prior to the delivery of the aggregates and whenever required during concrete production, the Contractor shall make stockpiles available to the Engineer for testing. All required samples shall be furnished at the expense of the Contractor, and the cost of sampling and testing shall be at the expense of the Contracting Agency.

Reclaimed Concrete Materials (RCM) and Reclaimed Asphalt Pavement (RAP) as defined in Section 701 shall not be used in Portland Cement Concrete without the prior approval of the Engineer.

725.4 WATER:

The water used for mixing concrete shall be potable or shall meet the requirements of ASTM C1602, when tested by a qualified independent testing laboratory.

725.5 ADMIXTURES AND ADDITIVES:

Admixtures or additives of any type, except as otherwise specified, shall not be used unless identified in the approved mix design or authorized by the Engineer.

Water reducing admixtures incorporated into the approved concrete mix design shall meet the requirements of ASTM C494 for the appropriate type.

Air entraining admixtures incorporated into the approved concrete mix design shall meet the requirements of ASTM C260.

Pigments incorporated into the approved concrete mix design for integrally colored concrete shall meet the requirements of ASTM C979.

Fibers incorporated into the approved concrete mix shall meet the requirements of ASTM C1116.

Any admixtures used shall be included in the price for that item.

725.6 MIX DESIGN PROPORTIONING:

A concrete mix design carrying the producer's designated mix number for each type of concrete being furnished under these specifications shall be submitted to the Engineer at least once each year for approval. Each design shall utilize the proper proportioning of ingredients to produce a concrete mix that is homogeneous and sufficiently workable to provide a consistent and durable concrete product that meets the specified compressive strength and other properties as required by the application.

In the event there is a modification to the mix design proportions:

(A) Modifications that do not require a new mix design submittal/approval:

(1) Modifications which do not result in batch target weights for the fine aggregate or combined coarse aggregates changing by more than 5 percent from the original approved mix design.

(2) Modifications to the percentage of coarse aggregate fractions that do not change the total coarse aggregate volume.

(3) Modifications to dosages of chemical or air-entraining admixtures, within the manufacturer’s recommendations.

(4) The incorporation or elimination of chemical admixtures which are listed on the mix design to effect a change in the time-of-set (retarders or accelerators).

(B) Modifications that require a new mix design submittal/approval and may require performance verification:

(1) Modification to the class of concrete per Table 725-1.

(2) Modification to the type/class/source of cement, fly ash, natural pozzolan, or silica fume.

(3) Modification to the percentage of fly ash, natural pozzolan, or silica fume.

(4) Modification to a coarse aggregate size designation.

(5) Modification of the type of chemical admixture, or the incorporation or elimination, of an air-entraining admixture.

(6) Modification of coarse or fine aggregate source.

725.7 MIXING:

All proportioning/batching/mixing equipment shall comply with the standards of the Concrete Plant Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or National Ready Mixed Concrete Association. The proportioning shall consist of combining the specified sizes of aggregates with cementitious materials, admixtures/additives, and water as herein provided. No method which may cause the segregation or degradation of materials shall be used.

Weighing and metering devices used for the purpose of proportioning materials shall fulfill requirements as to accuracy and tolerance prescribed by the Weights and Measures Division of the State of Arizona and shall be sealed and certified in accordance with the procedures established by this agency. This certification shall not be over 12 months old and shall be renewed whenever required by the Engineer. When portable plants are set up at a new or temporary location, the scales and scale assembly shall be inspected and certificate issued regardless of the date when the scales were last tested. The Engineer may require the Contractor to run a quick scale check at any time with certified weights furnished by the Contractor and order the scale recertified if necessary.

Any admixture/additive shall be measured accurately by mechanical means into each batch by equipment or in a method pre-approved by the Engineer.

The equipment for measuring and supplying the water in the mixer shall be so constructed and arranged that the amount of water to be added to the mixture can be measured, in gallons or by weight. The amount of water shall be varied in accordance with the percentage of free moisture in the material and the requirements of the workability of the aggregate.

Machine mixing will be required in all cases unless pre-approved by the Engineer. Regardless of the method employed, mixing shall be commenced as soon as possible after the cementitious material is placed in contact with the aggregates or water. All concrete mixers shall be of such design and construction, and so operated, as to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed.

725.7.1 Paving and Stationary Mixers: Paving and stationary mixers shall comply with the standards of the Concrete Plant Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or the National Ready Mixed Concrete Association.

Mixers shall be maintained in proper and serviceable working condition, and any part or portion thereof that is out of order, or becomes worn to such extent as to detrimentally affect the quality of mixing, shall be promptly repaired or replaced.

The proper proportions of aggregate, cementitious materials, admixtures/additives and water for each batch of concrete shall be placed in the mixer, and shall be mixed for a period of not less than 50 seconds after all such materials are in the drum.

The rotating speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

The total volume of materials mixed in any one batch shall neither exceed the water level capacity of the mixer nor the manufacturer's catalog rated capacity of the mixer.

725.7.2 Transit Mixers: Transit mixers shall meet the requirements of the Truck Mixer Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or the National Ready Mixed Concrete Association. Ready mix concrete and shall comply with ASTM C94 except as herein specified.

Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates, installed by the manufacturer, on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer for mixing purposes shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this section, the amount of materials charged into the mixer shall be reduced.

The rotation speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

Each batch of concrete placed in the mixer shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades, at the speed designated by the manufacturer of the equipment as mixing speed. Additional mixing shall be at the agitating speed designated by the manufacturer of the equipment. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum. Before any portion of the materials for any batch of concrete is placed therein, the drum of the mixer shall be completely emptied of the previously mixed batch.

At the time of delivery to the job site, the Engineer shall be provided with a legible delivery ticket which shall contain the following information:

Date and Truck Number.

Name of the Supplier.

Name of the Contractor.

Specific designation of job (name and location).

Number of cubic yards in the batch.

Time the transit mixer is loaded.

Amount of water added at the job site at request of receiver, and his signature or initials.

Suppliers' mix design code number.

Type and amount of admixture or additive that is not already included in the approved mix design, if any.

Serial number of the ticket.

Additional water may be added on the jobsite in accordance with ASTM C94 Tolerances in Slump section to adjust slump providing the slump after such water addition does not exceed the maximum allowed by these specifications in Section 725.9 (A) (1) and that water so added is mixed into the batch for a minimum of 30 additional revolutions at mixing speed. Loss of cement mortar during discharge which in the opinion of the Engineer would be of sufficient amount to affect the homogeneity of the concrete shall be cause for rejection of the load. The Contractor shall be responsible for all concrete to which water is added at the job site.

725.7.3 Job Mixed Concrete: All job mixed materials and procedures shall be pre-approved by the Engineer. A prepackaged commercial product shall be used for job mixed concrete placement in accordance with the manufacturer's recommended procedure.

In lieu of the use of a prepackaged commercial product, individual ingredients for concrete placement shall be prepared in a watertight container of suitable volume in batches not to exceed 1/3 cubic yard each. Proportioning of batches shall be in accordance with the applicable required mix design in Table 725-1 and Section 725.6. All mixing shall be done prior to placement in the forms and in accordance with the following procedure:

(A) Mixing shall be done in a mechanical batch mixer of approved type.
(B) The mixer shall be rotated at a speed recommended by the manufacturer.
(C) Mixing shall continue for at least 1-1/2 minutes after all materials are in the mixer, unless a shorter time is shown to be satisfactory by the mixing uniformity tests of ASTM C94.
(D) Materials handling, batching, and mixing shall conform to the applicable provisions of ASTM C94.
(E) Suitable records shall be kept to indentify the number of batches, proportions of materials used, and time and date of mixing and placement along with the approximate location in the structure.

725.7.4 Dry Batched Unmixed Concrete: All dry batched unmixed concrete materials and procedures shall be pre-approved by the Engineer. An accurate batch weight shall be provided to record the quantities of cementitious materials, aggregate, admixtures/additives, and water batched into the containers. The date of batching, the container number and the batching certificate number shall be recorded at the time of batching. Copies of the batch weight records shall be submitted to the Engineer upon request.

All dry batched unmixed concrete delivered to the job site shall be stored in containers so constructed that the cement cannot comingle with the water and aggregate within the container. Any admixture/additive added in powder form shall be added to the cement; if added in liquid form, it shall be added to the water.

The contents of the container shall be discharged into a mixer at the job site. Following discharge of the first container into the mixer, the mixer shall be operated at mixing speeds during the discharge of the remaining containers. After the contents of the last container have been discharged into the mixer, the concrete shall be mixed as specified in this specification for transit mixers, and drum or turbine type mixers.

Any spillage of cementitious materials, aggregate, water or admixtures/additives during the filling, transporting, or the discharging of the container, shall be cause for rejection of the container or the contents of the mixer if any portion of the rejected container is discharged into the mixer.

725.7.5 Volumetric Batching and Continuous Mixing Concrete and Equipment: Volumetric-batching and continuous-mixing concrete and equipment may be utilized upon approval of the Engineer for job site concreting applications. Material handling, procedures, and operations shall be in accordance with ACI 304.6R, Guide for the use of Volumetric-Measuring and Continuous-Mixing Concrete Equipment and all concrete produced and all test performed shall be in accordance with ASTM C685, Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing. All equipment shall meet the requirements of the Volumetric Mixer Standards of the Volumetric Mixer Manufacturers Bureau

and shall have a suitable copyrighted rating plate furnished by the Bureau and attached to the volumetric mixing equipment.

725.8 TESTS AND TEST METHODS:

725.8.1 Field Sampling and Tests: Concrete shall be sampled in accordance with ASTM C172 for determination of temperature, slump, unit weight and yield (when required) and air content (when required) as well as for fabrication of test cylinders for compressive strength determination at 28 days. Samples shall be of sufficient size to perform all the required tests and fabricate the necessary test cylinders but in no case less than 1 cubic foot. Concrete shall be sampled during discharge of the middle portion of the batch. At the discretion of the Engineer, a sample may be obtained at the beginning of the discharge if the properties of the concrete do not appear to be within the specification limits for slump or temperature.

All sampling and testing shall be done by a certified technician meeting the requirements of the ACI Concrete Field Testing Technician, Grade I or equivalent.

Temperature of the concrete mixture shall be determined in accordance with ASTM C1064.

Slump of the concrete mixture shall be determined in accordance with ASTM C143.

Air content of the concrete mixture (when required) shall be determined in accordance with ASTM C231 or C173, whichever is applicable.

Unit weight and yield of the concrete mixture (when required) shall be determined in accordance with ASTM C138.

All compressive strength test specimens shall be made, cured, handled, protected, and transported in accordance with the requirements of ASTM C31. The contractor shall provide and maintain for the sole use of the testing laboratory/technician adequate facilities for safe storage and proper curing of concrete test cylinders on the project site including sufficient access on weekends and holidays to allow the timely pick-up of cylinders specimens. Any and all deviations from the standard procedure of any test method shall be promptly identified and corrected. Any deviations shall be clearly noted by the testing laboratory on all written reports. Testing results obtained from non-standard testing procedures shall be considered invalid and discarded by Engineer.

Sampling and testing performed for concrete acceptance will be at the expense of the Contracting Agency. Sampling and testing for the Contractor's purposes of quality control or other needs shall be at the Contractor's expense.

725.8.2 Concrete Cylinder Test: A cylinder strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least two 4 inch by 8 inch cylinders made from the same sample of concrete and tested at 28 days. An adequate number of cylinder specimens shall be made for each 50 cubic yards or not less than each half-day's placement of each class of concrete. All specimens will be tested in a laboratory approved by the Engineer in accordance with ASTM C39 for concrete acceptance. Should an individual cylinder show evidence of improper sampling, molding, curing, or testing, the results shall be discarded and the compressive strength shall be the result of the average of the remaining cylinder(s). Additional cylinder specimens may be made and tested at other ages to obtain additional compressive strength information and shall not be considered as acceptance tests. Cylinder testing performed for concrete acceptance will be at the expense of the Contracting Agency. Cylinder testing for the Contractor's purposes of quality control or other needs shall be at the Contractor's expense.

725.8.3 Additional Concrete Testing: If the 28-day strength test does not meet the compressive strength requirements, additional concrete testing may be performed to further evaluate the concrete in question for purposes of acceptability or payment. This may involve testing of additional cylinders at later ages, (for example - hold cylinders at 56 days or more), or core testing to determine in-place concrete strengths. This additional testing and all coring repairs shall be pre-approved by the Engineer and at the expense of the Contractor. If core testing is performed, at least three representative cores shall be obtained, conditioned and tested in accordance with ASTM C42 from each concrete member or area of concrete to be tested at locations designated by the Engineer. Cores damaged subsequent to or during removal shall be rejected and additional core samples taken. Cores shall be obtained and delivered to a laboratory acceptable to the Engineer in time to allow complete strength testing within 48 days of original concrete placement. The Contractor may elect to have a representative present during sampling and testing. A core strength test shall be the average of the results of the three cores. Should an individual core show evidence of improper sampling, curing, or testing, the results shall be discarded and the compressive strength shall be the result of the average of the remaining core(s). Results of the core strength testing shall replace the results of the cylinder strength test for that sample.

725.9 ACCEPTANCE:

(A) **Plastic Concrete Properties**

(1) The slump of the concrete shall meet the requirements of ASTM C94 Tolerances in Slump section. When the approved mix design or project specification requirements for slump are a "maximum" or "not to exceed", the following tolerances apply:

Specified slump:	If 3" or less	If more than 3"
Plus tolerance	0 inch	0 inch
Minus tolerance	1 1/2 inch	2 1/2 inch

When the approved mix design or project specification requirements for slump are not written as a "maximum" or "not to exceed", the following tolerances apply:

For design slump of:	Tolerance
2 inch and less	+/- 1/2 inch
More than 2 through 4 inch	+/- 1 inch
More than 4 inch	+/- 1 1/2 inch

(2) Limit the maximum allowable temperature of the concrete mixture immediately before placement to 90 degrees F unless otherwise specified or unless a higher allowable temperature is pre-approved by the Engineer. At the discretion of the Engineer, recommended practices in ACI 305, Specification for Hot Weather Concreting, can provide good reference information and may be used to modify maximum allowable concrete temperature and acceptance.

Per ACI 306, Specification for Cold Weather Concreting, when the atmospheric temperature at the time of placing concrete is above 30°F the temperature of the concrete, as placed, shall not be less than 60°F. When the atmospheric temperature at the time of placing concrete is between 0°F and 30°F the temperature of the concrete, as placed, shall not be less than 65°F.

(3) Air entrained concrete shall meet the requirements of ASTM C94 Air-Entrained Concrete section. The air content of air-entrained concrete when sampled from the transportation unit at the point of discharge shall be within the approved mix design tolerance or +/- 1.5 % of the specified value. When a representative sample taken prior to discharge shows an air content below the specified level by more than the allowable tolerance, additional air entraining admixture shall be added to the concrete mix to achieve the desired air content level, followed by a minimum of 30 revolutions at mixing speed.

(4) Per ASTM C94 Mixing and Delivery section, discharge of the concrete shall be completed within 1 1/2 hour after the introduction of the mixing water to the cementitious materials or the introduction of the cementitious materials to the aggregates. The Engineer may allow the continuation of concrete placement after the 1 1/2 hour time limit has been reached if the concrete is of such slump or workability that it can be placed without the addition of water to the batch.

Any concrete failing to meet the tolerances for plastic concrete properties in 725.9 (A) (1) through (4) shall be reviewed by the Engineer and is subject to rejection.

(B) **Hardened Concrete Properties – Compressive Strength**

Compressive strength of concrete shall be determined on the basis of cylinder strength tests obtained in accordance with section 725.8.2 and shall be acceptable if the tests meet or exceed the minimum specified strength. When the validity of cylinder strength tests are suspect, the strength of concrete in question shall be determined in accordance with Section 725.8.3.

When compressive strength test results are less than the specified minimum, an Engineering Analysis to determine the impact of the strength reduction may be required by the Engineer prior to the decision to accept or reject the concrete. The Engineering Analysis will be at the Contractor's expense. Any concrete that is rejected by the Engineer shall be removed and replaced by the Contractor at the Contractor's expense.

When concrete is accepted by the Engineer on the basis of test results of less than 100% of the required minimum compressive strength, an adjustment in the concrete unit price may be made for the quantity of concrete represented by such strength tests in accordance with Table 725-2.

TABLE 725-2

Adjustment in Concrete Unit Price Based on Strength Deficiency

Class AA and Class A		Class B and Class C	
Percent of Specified Minimum 28-day Compressive Strength Attained (Nearest 1%)	Percent of Concrete Unit Price Allowed	Percent of Specified Minimum 28-day Compressive Strength Attained (Nearest 1%)	Percent of Concrete Unit Price Allowed
100 % or greater	100	100 % or greater	100
98-99	90	95-99	95
96-97	85	90-94	90
95	80	85-89	85

- ***End of Section*** -

SECTION 726

CONCRETE CURING MATERIALS

726.1 GENERAL:

Curing materials shall consist of waterproof paper, polyethylene film or liquid membrane-forming compounds which, when applied to fresh concrete, will inhibit moisture loss and reduce temperature rise during the curing period. All curing materials and methods shall be approved by the Engineer prior to use. Wet coverings such as burlap, cotton mats, or other moisture-retaining fabrics also may be used, or may be required by special provisions.

726.2 MATERIALS:

(A) Waterproof paper, or polyethylene film, shall conform ASTM C171.

(B) Liquid membrane-forming compounds shall conform ASTM C309. Type 1 compound with either a Class A or Class B vehicle shall be used for concrete structures, except bridge decks, approach slabs, and portland cement concrete pavement. Type 2 white pigmented compound, with either a Class A or Class B vehicle shall be used for portland cement concrete pavement, bridge decks and approach slabs.

(C) Burlap cloth made from jute or kenaf shall conform to AASHTO M-182.

- End of Section -

SECTION 727

STEEL REINFORCEMENT

727.1 GENERAL:

The following specifications set forth the requirements for bar reinforcement, wire reinforcement, and wire mesh reinforcement. The reinforcement shall conform accurately to the dimensions and details indicated on the plans or otherwise prescribed and before being placed in any concrete work, shall be thoroughly cleaned of all loose rust, mill scale, mortar, oil, dirt, or coating of any character, which would be likely to destroy, reduce, or impair its proper binding with the concrete.

No reinforcing steel will be accepted under this specification until it has been approved by the Engineer. When required by the Engineer, the Contractor or supplier shall furnish a spot sample taken on the project and notify the Engineer as to when and where they will be available. Such samples shall be furnished at the expense of the Contractor or supplier, but the cost of any testing that may be required will be borne by the Contracting Agency. Samples shall only be taken in the presence of the Engineer. The Contractor shall furnish 3 certified mill test reports or certificates of compliance for each heat or size of steel which can be clearly identified with the lot. When such information has been furnished, placing of the steel will not be held up until results of spot samples have been received. Unless otherwise specified, all reinforcing steel bars shall be deformed intermediate grade 40 billet steel conforming with ASTM A615 and the shapes shall conform with ASTM B670.

In testing bar reinforcement, only the theoretical cross-sectional area will be used in all computations.

Bending of steel shall conform to the requirements of Section 505.5.2.

The various grades of steel shall not be used interchangeably in structures.

727.2 WIRE REINFORCEMENT:

Wire reinforcement shall in all respects fulfill requirements prescribed in ASTM A82.

727.3 WIRE MESH REINFORCEMENT:

Mesh reinforcements shall conform to ASTM A185. The gage of the wire and the dimension of the mesh will be specified in the special provisions or shown on the plans. The wire mesh reinforcement shall be so constructed as to retain its original shape and form during necessary handling. The effective cross-sectional area of the metal shall be equal to that specified or indicated on the plans.

727.4 WIRE TIES:

Wire for ties shall be black, annealed, not lighter than 16 gage.

- End of Section -

SECTION 728

CONTROLLED LOW STRENGTH MATERIAL

728.1 GENERAL:

Controlled Low Strength Material (CLSM) is a mixture of cementitious materials, aggregates, admixtures\additives, and water that, as the cementitious materials hydrate, forms a soil replacement. CLSM is a self-compacting, flowable, cementitious material primarily used as a backfill, structural fill, or a replacement for compacted fill or unsuitable native material. Placement and usage of each type of CLSM is described in Section 604.

728.2 MATERIALS:

Cementitious materials shall conform to Section 725.2.

Coarse aggregate shall conform to ASTM C-33 grading size No. 57. The size and gradation of fine aggregates (sand) shall conform to ASTM C-33. Alternate materials meeting the applicable requirements of Section 701 or 702 such as combinations of other aggregates, Aggregate Base Course (ABC) or Reclaimed Concrete Material (RCM) may be used to replace the required coarse and fine aggregate as long as the approved mix design meets the requirements of Table 728-1 and is approved by the Engineer.

Water shall conform to Section 725.4.

728.3 PROPORTIONING OF MIXTURES AND PRODUCTION TOLERANCES:

Proportioning of the mixture shall comply with Section 725.6 and Table 728-1. The CLSM shall have consistency, workability, plasticity, and flow characteristics such that the material when placed is self-compacting. A minimum of 40% coarse aggregate shall be used. A mix design shall be submitted for the Engineer's approval prior to the excavation for which the material is intended for use. Sampling shall be in accordance with ASTM D5971. The flow consistency shall be tested in accordance with ASTM D6103. Unit weight (when applicable) shall be obtained by ASTM D6023. Compressive strength shall be tested in accordance with ASTM D4832.

TABLE 728-1

CONTROLLED LOW STRENGTH MATERIAL REQUIREMENTS

Portland Cement Content, Sack/cu yd	Flow, inches
1/2 Sack	9±2
1 Sack	9±2
1 1/2 Sack	9±2

Note for Table 728-1:
(1) CLSM mixes meeting the table requirements will not generally be placeable by means of a concrete pump or may not provide the needed workability for certain conditions. When pumpable mixes or increased workability are required, the addition of fly ash or a natural pozzolan in excess of the required Portland Cement Content may be used.
(2) Ready-mixed structural concrete or grout shall not be used in lieu of CLSM without prior approval from the Engineer and shall be subject to rejection.

728.4 MIXING:

CLSM mixing shall comply with Section 725.7 Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Mixes shall be homogenous, readily placeable and uniformly workable.

- End of Section -

SECTION 729

EXPANSION JOINT FILLER

729.1 PREMOLDED JOINT FILLER:

Expansion joint filler materials shall consist of preformed strips of a durable resilient compound and comply with ASTM D1751, D1752, or D2628, as specified by the Contracting Agency or as approved by the Engineer.

729.2 POUR TYPE JOINT FILLERS FOR PORTLAND CEMENT CONCRETE PAVING (PCCP):

Pour type joint fillers shall comply with ASTM D3406 or as approved by the Engineer. Joint sealant shall not contain any coal tar materials. The following requirement shall be added to paragraphs 7.1 of ASTM D3406:

The minimum ambient temperature during application and ambient temperatures under various storage conditions shall be clearly marked on the container.

729.3 TEST REPORT AND SHIPMENT CERTIFICATE:

Each shipment shall be accompanied by a certificate from the supplier that the material will comply with the above specifications and such certificate shall be delivered to the Engineer.

- End of Section -

SECTION 735

REINFORCED CONCRETE PIPE

735.1 GENERAL:

These specifications cover reinforced concrete pipe and related structures intended to be used for conveyance of sewage, industrial waste, and storm and irrigation water.

Except as modified herein reinforced concrete pipe shall be manufactured and tested in conformance with the requirements of ASTM C76 for circular pipe, ASTM C506 for elliptical pipe.

Whatever struts or other protective methods proved necessary to furnish and install the pipe to meet the limitation of cracks as specified herein, shall be provided and maintained throughout pipe handling and transportation.

735.2 JOINTS:

Bell Reinforcement: All reinforced concrete pipes less than 36 inch inside diameter and the same approximate equivalent size shall include an area of reinforcing steel in the bell not less than the area required for the circumferential reinforcement in the wall of the pipe.

Rubber gaskets shall be in accordance with ASTM C443.

Cement Mortar Joints for RCP will be in accordance with Subsection 736.3

735.3 FABRICATED SPECIALS – WYES, TEES, CURVES, BENDS AND CLOSURES :

Fabricated pipe specials shall be made equal in strength, diameter, and other physical characteristics to the standard straight pipe lengths by the use of extra concrete, extra reinforcing or steel items.

Horizontal and vertical long-radius curves shall be formed by bevel adapters or by beveling the straight pipe joint. The bevel of the pipe shall not exceed 5 degrees and the total angular deflection, for beveled pipe, shall not exceed 10 degrees. Small angular changes may be made with straight pipe provided that the joint opening does not exceed 3/4 inch. Short radius curves and closures shall be formed with fabricated specials; however, the angular deflection of any segment of the fabricated section shall not exceed 10 degrees.

735.4 MATERIALS:

Except when otherwise permitted by the Engineer, no materials other than water, Portland cement, Pozzolanic materials, mineral aggregates and steel shall be used in the manufacturing of the pipe, with the following exceptions:

(A) Portland Cement: Portland cement shall comply with ASTM C150, Type II, and low alkali. The pipe manufacturer shall supply a cement mill certificate in triplicate for each load of cement delivered, showing the specification, type, chemical analysis, and quantity. In lieu of the above, on stockpiled pipe the manufacturer shall certify that the type of cement used meets this specification. The pipe manufacturer shall also certify in writing that the cement content of the concrete complies with the specifications as to yield per cubic yard of concrete poured.

(B) Concrete Admixtures: The pipe manufacturer shall certify in writing that no calcium chloride or admixture containing calcium chloride has been used in the manufacture of the pipe. Other admixtures may be used if approved by the Engineer. The pipe manufacturer shall certify to the brand and chemical content of such admixtures used.

(C) Steel Reinforcement: The pipe manufacturer shall supply three copies of mill certificates showing heat numbers, chemical analysis, and physical tests on reinforcing steel. In lieu of the above, on stockpiled pipe the manufacturer shall certify that the type of steel used meets this specification.

735.5 MANUFACTURER'S QUALIFICATIONS AND EQUIPMENT REQUIREMENTS:

The manufacturer shall be competent to manufacture the type, size and quality of pipe; in addition, the manufacturer shall have satisfactory curing and storage facilities, and satisfactory financial resources.

Calibration of Cement and Aggregate Scales: The pipe manufacturer shall make whatever alterations are necessary to his equipment to enable the Contracting Agency's Sealer or State Inspector of Weights and Measures to check, calibrate, and seal the aggregate and cement scales used in the pipe production.

735.6 CURING OF PIPE:

(A) Steam Curing: The manufacturer shall provide adequate steam plant, piping, enclosures, and other facilities for curing the pipe. The enclosures shall be such that the temperature is maintained continuously between 110 and 150°F.

(B) Curing of the pipe shall not commence until the concrete has attained its initial set, but in any event not sooner than 1 hour and no later than 8 hours after placing of the concrete. Rate of rise of temperature shall not exceed 30°F per hour.

(C) Water Curing: The pipe shall be kept moist during daylight hours. The pipe, including the ends, shall be covered with burlap for the first 3 days, except that, if the pipe is kept constantly and completely wet with fog sprays during the daylight hours, the burlap covering may be omitted. If the manufacturer fails to proceed immediately with the required water curing the surfaces of the concrete, except joint surfaces that are to be grouted shall be sealed with an approved white pigmented sealing compound in accordance with Section 726.

735.7 TESTS AND ACCEPTANCE:

(A) Basis of Acceptance: The basis of acceptance for the reinforced concrete pipe shall be in accordance with ASTM C76, ASTM C506, or ASTM C507, as applicable, including the method stated in the special provision and as amended herein. However, the purchaser may, at his option, make concrete cylinder tests for the purpose of determining release dates for shipment of the pipe and for his information in regard to general quality of the concrete.

(B) Segregation of Material: The slump of the concrete mix shall not exceed 4 inches so as to preclude excessive segregation of the materials used and shall be proportioned so that the result shall be a homogeneous concrete mixture of such quality that the pipe will conform to the tests and design requirements of these specifications.

(C) A pipe has failed the D-load test when the opening crack exceeds .01 inch for a distance of 1 foot when measured at close intervals. These measurements are taken within the 1 foot measured span only when the crack line is more or less parallel to the axis of the pipe, as it is obvious that where the crack deviates substantially from parallel, and approaches a direction normal to the axis, that the edges of the crack tend to slip past each other, instead of opening up under load. The intent of the test is to measure the crack opening under stress.

(D) Porous or honeycomb concrete areas 6 inches or less in diameter may be removed and repaired. Pipe having defects or repairs greater than 6 inches in diameter will not be accepted.

(E) Any crack exceeding 1 foot in length that goes completely through the pipe, is not considered acceptable whether repaired or not, except that a single end crack that does not exceed the depth of the joint as measured from the end to the inside shoulder is acceptable.

(F) Any crack that is .01 inch in width for one-sixteenth inch in depth or deeper, for a length of 1 foot or more and continues as a hairline crack down to the reinforcing steel for over 1/2 the length of the pipe is not considered acceptable whether repaired or not.

(G) A single continuous hairline crack which does not extend to the reinforcing steel and not in excess of .01 inch in width for a distance of 1 foot is acceptable without repair. This type of crack, longer than 1 foot shall be repaired.

(H) Repairs shall be made by filling the defect with epoxy under pressure or by chipping out a V-Section to the full depth of the defect and repairing with an approved patching compound. The composition of the patching compound shall be furnished to the Engineer for approval.

(I) The words regarding acceptability and repair ability in the above paragraphs shall also apply when the crack occurs after loading of the pipe in the trench with backfill. Cracks wider than .01 inch shall be assumed to indicate overstress of the steel. In

such case, the defective portion of the installation shall be replaced or repaired in a manner acceptable to the Engineer. After structural repairs are completed, the remaining cracks shall be filled as required above. All corrective measures shall be at the expense of the Contractor.

(J) Blisters: All pipe joints having blisters involving less than 1/4 the interior surface area shall be repaired by removing all loose material and exposing all hollow area and replacing with fresh concrete properly bonded, with an acceptable bonding agent, and curing the repair with membrane coating. Blisters with larger areas are not considered to be repairable or acceptable.

(K) Painting of pipe, or portion of pipe, with grout to cover defects, minor or major, will not be permitted until approved by the Engineer.

(L) Where the modified or special design method, under the ASTM Standard is elected, acceptance on the basis of material tests and inspection of manufactured pipe for defects and imperfections shall be as stated in the ASTM Standard, and as amended herein. However, one joint of each size and D-load shall be selected by the Engineer for test purposes, and shall be tested for strength by the 3 edge bearing method, ASTM C497, with the results being used for confirmation of the submitted design for this D-load. If the pipe section tested fails in compression or shear before reaching the D-load specified, the test shall be considered a failure. Additional sections of the same diameter size and class shall be tested as specified above until the load requirements are met for the D-load strength. This test procedure shall be accomplished only once per manufacture regardless of the number of contractors he supplies. Placing of reinforcing steel in the test section of pipe to control shear cracks will not be permitted.

Requirements regarding defects shall be the same as stated above for standard pipe.

Concrete test requirements specified under compression tests of the ASTM Standard shall be amended in part to read as follows: “The average of any 5 consecutive strength tests of the laboratory-cured specimens shall be equal to or greater than the specified strength set forth in the design strength requirements table for the type and class of pipe being produced, and not more than 20 percent of the strength tests shall have values less than the specified strength. If more than 20 percent have values less than the specified strength, the lot represented shall be considered to be defective and not acceptable. In no case shall any cylinder tested fall below 80 percent of the specified design strength. If anyone cylinder falls below 80 percent of the specified design strength, then the entire production represented by that cylinder will not be accepted for purchase by the Contracting Agency unless the Contractor can demonstrate by coring to the satisfaction of the Engineer, that the cylinder in question is not representative of the entire production, or is representative of only a portion of the entire production.”

During the fabrication of the pipe, concrete cylinders shall be made from a representative sample of the concrete. Concrete cylinders and slump tests shall be made by the Engineer or under his direct supervision. A set of cylinders shall consist of five. A minimum of one set shall be made for each day's production.

In vibrated and spun pipe, where the slump of the concrete approaches 0, the cylinders shall be made as follows:

Fill the cylinder can in 3 equal layers. Each layer shall be vibrated and assisted by rodding or other mechanical contrivance simultaneously until the moisture comes to the surface. Care shall be taken that the material is not over-vibrated which will cause segregation. When the moisture rises to the surface of the third layer, it is struck off and leveled. The cap is put on the cylinder and it is marked for identification. It shall then be steam cured in the same manner as the pipe, at the conclusion of which, the cylinders shall be brought into the laboratory for standard moist curing until the prescribed time for the compressive test.

The cylinders shall be made according to ASTM C31 where the pipe is manufactured with concrete that has enough slump for the material to be hand rodded. For reinforced concrete pipe made by the centrifugal method, the manufacturer may substitute centrifugally cast test cylinders for standard test cylinders. Centrifugally cast cylinders shall be made in accordance with AWWA C302 and cured in the same manner as normal test cylinders, except that the net area of the hollow cylinder will be used to determine the compressive strength.

735.8 SANITARY SEWER PIPE:

In addition to the above, sewer pipe shall meet the requirements of ASTM C76, reinforced concrete pipe having O-ring Rubber Gasket Joints with an interior lining of plastic liner plate in accordance with Section 741.

(A) Pipe Design: The wall thickness and the amount of circumferential reinforcement shall not be less than that required for the D-load indicated on the plans and required by the specifications. The calculations for wall thickness and amount of steel area

per foot of pipe, having concrete lining, shall be for a pipe 2 inches larger in internal diameter than that specified on the plans. The additional concrete lining shall not be considered in the calculation for the area of steel required, nor in any of the load calculations.

D-load class of pipe and the date poured shall be plainly marked inside each pipe section. Specific approval must be obtained, prior to submitting a bid; to decrease the cover over the reinforcing steel at the joint should the steel interfere with the rubber gasket in the groove at the spigot end.

(B) Pipe Construction: Tamped or packer head pipe will not be allowed. Pipe having concrete lining shall have the internal diameters indicated on the plans, measured to the inside of the additional 1 inch of covering. The various sizes of pipe shall be centrifugally spun. Pipe having plastic liner plate shall be vibrocast to 1/2 inch tolerance to match the unlined pipe of the D-load indicated on the plans.

(C) Test and Acceptance: In addition to the statements above, any crack that goes completely through the pipe, regardless of length of crack is not considered acceptable whether repaired or not, except that a single end crack that does not exceed the depth of the joint as measured from the end to the inside shoulder is acceptable.

735.9 ACCEPTANCE MARK:

The Engineer may, at the place of manufacturer, indicate his acceptance of the pipe for delivery to the job by marking the pipe with the Contracting Agency's mark. Such acceptance, however, shall not be considered a final acceptance.

If the pipe is subsequently rejected, the mark placed thereon by the Engineer shall be defaced.

- End of Section -

SECTION 736

NON-REINFORCED CONCRETE PIPE

736.1 GENERAL:

The size and classes of the non-reinforced concrete pipe to be furnished shall be as shown on the plans, or as specified under the item of work for the project of which the concrete pipe is a part.

Strength classes of non-reinforced concrete shall be as identified in ASTM C14, Class 1 non-reinforced concrete pipe. Class 2 non-reinforced concrete pipe or Class 3 non-reinforced concrete pipe.

Unless otherwise specified, Class 3 non-reinforced concrete pipe will be used.

736.2 MATERIALS:

Materials used in manufacturing the pipe shall be as specified in ASTM C14, with the following exception:

Cement shall conform to ASTM C150, Type II, and low alkali. Samples and testing shall conform to the methods designated therein. The pipe manufacturer shall supply a cement mill certificate, in triplicate, for each load of cement delivered, showing the specification, type, chemical analysis, and quantity. On stockpiled pipe in lieu of the above, the manufacturer shall certify that the type of cement used meets this specification. Satisfactory facilities shall be provided for identifying, inspecting, and sampling cement at the mill, the warehouse, and the site of the work. The Contracting Agency shall have the right to inspect the cement and obtain samples for testing at any of these points. The cement shall be stored in a weathertight, dry, well ventilated structure approved by the Engineer. Cement salvaged by cleaning cement sacks, mechanically or otherwise, shall not be used in the work. Cement containing lumps will be rejected and shall immediately be removed from the site of the work. If the temperature of the cement exceeds 150°F., it shall be stored until cooled to that temperature.

736.3 PIPE JOINTS:

The joints may be tongue and groove mortared joints, or rubber gaskets joints. With rubber gasket joints, inside mortaring and outside grouting is not required. Tongue and groove joints shall be mortared inside and grouted outside. Grouting of outside joints shall be by the diapering method.

736.3.1 Cement Mortar Joints:

(A) The mortar or grout shall consist of 1 part Portland cement and 2 parts sand, by volume. The quantity of water in the mixture shall be sufficient to produce a soft workable mortar, but shall in no case exceed a water-cement weight ratio of 0.53. Where outside joints are made by the diaper method, the grout shall be composed of 1 part cement to 3 parts sand, and shall be mixed to the consistency of thick cream. The sand shall conform to Section 776.3, and the cement shall conform to Section 725.

(B) The pipe ends shall be thoroughly cleaned and wetted with water before the mortar or grout is placed. No backfilling around the joints shall be done until the joints have been fully inspected and approved.

(C) Mortar joints shall be cured by keeping them wet for three days or by using a curing compound.

736.3.2 Rubber Gasket Joints: Rubber gaskets shall be in accordance with ASTM C443 or AASHTO M-315.

736.4 CURVES, BENDS AND CLOSURES:

Horizontal and vertical long-radius curves shall be formed by slight deflection at the joints, provided that the maximum joint opening caused by such deflection shall not exceed 3/4 inch. Short radius curves shall be formed by straight pipe in which the joints are beveled. The bevel of the pipe shall not exceed 5 degrees, and the total angular deflection for beveled pipe shall not exceed 10 degrees at any joint.

736.5 CARE OF PIPE AND MATERIALS:

All pipe and materials shall be manufactured, handled, loaded, shipped and unloaded in such manner as to be undamaged and in sound condition, in the completed work. Particular effort shall be exercised to protect the ends of pipe. Repairs on damaged pipe shall be made to the satisfaction of the Engineer otherwise they shall not be used in the work and shall be replaced with an equal pipe or special in an acceptable condition. At all times rubber gaskets shall be stored in a cool, dark place until ready for use.

736.6 TESTS:

Before pipe is delivered to the job site for use in any work under the contract, test pipes shall meet the requirements of the hydrostatic pressure test and the loading test described in ASTM C14. The test shall be made at the point of manufacturer and shall be made under the presence of the Engineer.

- End of Section -

SECTION 738

HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR STORM DRAIN AND SANITARY SEWER

738.1 GENERAL:

This specification covers the requirements of profile-reinforced and corrugated (Type S or Type D) high density polyethylene (HDPE) pipe manufactured per ASTM F894, AASHTO M-252 or AASHTO M-294 for gravity flow, low pressure storm drain and sanitary sewer systems. When noted on the plans or in the special provisions, gravity flow, low pressure storm drains and sanitary sewers may be constructed using HDPE pipe. The HDPE pipe will be of the sizes 8 inch diameter through 120 inch diameter. For the purpose of this specification, low pressure is defined as the test pressures of 3.5 psi of air or 4 feet of water as specified in Section 615.11.

All pipe joints shall conform to the controlled pressure test of 10.8 psi of air or 25 feet of water as stipulated in ASTM D3212.

The size and class of the HDPE pipe to be furnished shall be designed by the Engineer and shown on the plans or in the project specifications. At no time will the class designed be less than RSC-63 for profile pipe, or minimum equivalent Pipe Stiffness (PS) for corrugated pipe per the requirements of AASHTO M-252 or AASHTO M-294.

738.2 MATERIALS:

738.2.1 Base Material Composition: Profile pipe base material and fittings shall, in accordance with ASTM F894, be made from a PE plastic compound meeting the requirements of Type III, Class C, Category 5, Grade P34 as defined in ASTM D1248 and with established hydrostatic design basis (HDB) of not less than 1250 psi for water at 73.4 degrees F^{o} as determined in accordance with Method ASTM D2837. Materials meeting the requirements of cell classification PE 334433 C or higher cell classification, in accordance with ASTM D3350 are also suitable. Corrugated pipe base material shall comply with the requirements of AASHTO M-252 (Type S) or AASHTO M-294 (Type S or D) and have a minimum cell classification PE 335420C.

738.2.2 Other Pipe Materials: Materials other than those specified under Base Materials shall comply with ASTM F894, AASHTO M-252 or AASHTO M-294.

738.2.3 Gaskets: Rubber gaskets shall be manufactured from a natural rubber, synthetic elastomer or a blend of both and shall comply in all respects with the physical requirements in ASTM F477.

738.2.4 Water Stops: Water stops shall be manufactured from a natural or synthetic rubber and shall conform to the requirements of ASTM C923. The water stop shall have expansion rings, a tension band, or a take-up device used for mechanically compressing the water stop against the pipe.

738.2.5 Thermal Welding Material: The material used for thermally welding the pipe material shall be compatible with the base material.

738.2.6 Lubricant: The lubricant used for assembly shall comply to manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

738.3 JOINING SYSTEMS:

738.3.1 Gasket Type: Joints for the piping system and fittings shall consist of an integrally formed bell and spigot gasketed joint. The joint shall be designed so that when assembled, the elastomeric gasket located on the spigot is compressed radially on the pipe or fitting bell to form a water tight seal. The joint shall be designed so to prevent displacement of the gasket from the joint during assembly and when in service. The elastomeric gasket shall meet the provision of ASTM F477.

All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The bell and spigot configurations for the fittings shall be compatible to those used for the pipe.

Joints shall provide a seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear, shall be smooth and free of any imperfections, which would adversely affect sealability. The assembly of the gasketed joints shall be in accordance with the pipe manufacturer's recommendations.

738.3.2 Thermal Weld Type: The pipe ends shall consist of an integrally formed bell and spigot, with or without the elastomeric centering gasket, which join together to form an interface between bell and spigot, such that it is suitable to seal by thermal weld using the extrusion welding process, in accordance with the manufacturer's recommended procedure.

Thermal welded joints may be effected by welding from inside the pipe or outside, or both.

The assembly of the welded joints shall be in accordance with the manufacturer's recommendations.

Thermal welded joints shall be used only when specified on plans or in specifications.

738.4 FITTINGS:

Fittings for HDPE profile wall or corrugated pipe may include tees, elbows, manhole adapter rings, plugs, caps, adapters and increasers. Fittings shall be joined by gasket type or thermal weld type joints in accordance with Subsection 738.3.

A clamp gasket or approved method shall be provided at manhole entry or connection to reduce infiltration and exfiltration. Where precast manholes are used, entrance holes must be large enough to allow for proper grouting around the manhole gasket. A non-shrink grout shall be used for grouting.

738.5 CERTIFICATION:

The manufacturer shall furnish an affidavit (certification) that all materials delivered shall comply with the requirements of ASTM F894 or AASHTO M-252.

Pipe and resin producers that manufacture according to AASHTO M-294 shall be certified according to the Plastic Pipe Institute protocol for their Third Party Certification Program.

738.6 DIMENSIONS AND TOLERANCES:

Profile wall HDPE pipe dimensions shall comply with dimensions given in Table 1 of ASTM F894. The “average or nominal inside diameter” of profile wall HDPE pipe shall not deviate from its normal pipe size by more than as specified in Table 1 of ASTM F894. Corrugated HDPE pipe dimensions shall be “nominal inside diameter” dimensions and shall not deviate from its nominal pipe size by more than the minimum and maximum tolerances as described in AASHTO M-252 or AASHTO M-294, Section 7.2.3.

Profile pipe shall have a Ring Stiffness Constant (RSC) or Pipe Stiffness (PS) as shown on the plans. The minimum RSC for profile HDPE pipe shall be RSC-63. The minimum PS for corrugated pipe shall be as shown in AASHTO M-252 (Section 7.5) or AASHTO M-294 (Section 7.4), and tested per ASTM D2412. In no case shall the minimum PS be less than the equivalent PS value for RSC-63.

738.7 CLASSIFICATIONS:

HDPE profile-reinforced pipe products shall be made in four standard Ring Stiffness Constant (RSC) classifications, 40, 63, 100 and 160. These are referred to as RSC-40, RSC-63, RSC-100 and RSC-160. The RSC test shall be conducted in accordance with ASTM D2412 with the exceptions listed in accordance with ASTM F894. HDPE corrugated pipe (Type S or Type D) shall meet the minimum Pipe Stiffness (PS) requirements of AASHTO M-252 or AASHTO M-294. The PS test shall be conducted in accordance with ASTM D2412 with the exceptions listed in accordance with AASHTO M-252 or AASHTO M-294.

738.8 MARKINGS:

Markings on pipe shall be per ASTM F894, AASHTO M-252 or AASHTO M-294. These markings shall be clearly shown on the pipe at intervals of approximately 12 feet and include but not limited to the following: the manufacturer's name or trademark, nominal size, the specification designation, plant designation code, date of manufacture or an appropriate code. All fittings shall be marked with the designation number of the specification and with the manufacturer's identification symbol. In addition, manufacturers of corrugated HDPE, AASHTO M-294, shall print on or affix the appropriate Plastic Pipe Institute Program Mark on each length of pipe produced that meets the requirements of the program.

738.9 CARE OF PIPE AND MATERIALS:

Care of pipe materials shall comply with Subsection 736.5.

HDPE profile reinforced RSC type pipe in shipping or storage shall not be stacked higher than three rows for pipes 21 inches in diameter or less, nor higher than two rows for pipes 24 to 36 inches in diameter inclusive. Pipe shall not be stacked, shipped, or stored with weight on the bells of the pipe.

Corrugated HDPE pipe in shipping and storage shall be stacked per manufacturer's recommendation, but in no case higher than 5 rows for pipe 24 inches or less in diameter, or 3 rows for pipe greater than 24 inches in diameter.

Pipe that is gouged marred or scratched forming a clear depression shall not be installed and shall be removed if damaged in the installation.

- End of Section –

SECTION 739

STEEL REINFORCED POLYETHYLENE PIPE AND FITTINGS FOR STORM DRAIN, IRRIGATION AND SANITARY SEWER

739.1 GENERAL:

This specification covers the requirements of Steel Reinforced Polyethylene (SRPE) pipe manufactured per ASTM F2562 for storm drains, irrigation and sanitary sewer systems. When noted on the plans or in the special provisions, storm drains, irrigation and sanitary sewers may be constructed using SRPE pipe. SRPE pipe shall be designed in accordance with AASHTO LRFD Bridge Design. Specifications, Section 12. Trench excavation, backfilling and compaction for this flexible pipe shall be in accordance with Section 601. Construction and installation shall be in accordance with Section 618 for storm drain and irrigation water or Section 615 for sanitary sewers.

The pipe stiffness class shall be Class 1, per Table 1 of ASTM F2562, unless otherwise specified.

739.2 MATERIALS:

739.2.1 Base Steel Materials: Continuous high strength galvanized ribs shall be cold rolled steel meeting the requirements of either ASTM A1008 or ASTM A1011 with minimum yield strength of 80,000 psi. The steel shall have a galvanized coating meeting the requirements of ASTM A653 with a G60 minimum coating weight. Steel ribs shall be completely encased within the HDPE profile.

739.2.2 HDPE Material Composition: SRPE pipe HDPE material and fittings shall, in accordance with ASTM F2562, be made from HDPE plastic compound meeting the minimum requirements of cell classification 335464C or higher cell classification, in accordance with ASTM D3350.

739.2.3 Gaskets: Elastomeric gaskets shall comply with the requirements in ASTM F477 and be as recommended by the pipe manufacturer.

739.2.4 Water Stops: Elastomeric Water stop gaskets shall conform to the requirements of ASTM C923.

739.2.5 Thermal Welding Material: The material used for thermal welding of the pipe shall be compatible with the pipe's base material.

739.2.6 Lubricant: The lubricant used for assembly shall comply with manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

739.3 JOINING SYSTEMS:

739.3.1 Gasket Type: Steel reinforced bell and spigot joints for the piping system and fittings shall consist of an integrally formed bell and spigot gasketed joint. The joint shall be designed so that when assembled, the elastomeric gasket located on the spigot is compressed radially on the pipe or fitting bell to form a water tight seal. The joint shall be designed so to prevent displacement of the gasket from the joint during assembly and when in service. The elastomeric gasket shall meet the provision of ASTM F477. Gasketed watertight pipe joints shall meet a minimum laboratory test pressure of 10.8 psi when tested in accordance with ASTM D3212.

All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made. The bell and spigot configurations for fittings shall be compatible to those used for the pipe.

Joints shall provide a seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear, shall be smooth and free of any imperfections, which would adversely affect the seal. The assembly of the gasketed joints shall be in accordance with the pipe manufacturer's recommendations.

739.3.2 Thermal Weld Type: Thermal weld joints, when specified, shall utilize plain ended pipe welded together by internal pressure testable couplers. The internal couplers shall have a minimum wall thickness equal to or greater than the pipe wall thickness as defined in ASTM F2562. The assembly of the welded joints shall be in accordance with the manufacturer's recommendations. Thermal welded pipe joints shall meet a minimum laboratory test pressure of 10.8 psi when tested in accordance with ASTM D3212.

739.3.3 Pipe to Concrete Structure Connections: An approved flexible connector, mechanical seal or water stop shall be provided at manhole entry or concrete structure connection to reduce infiltration and exfiltration. When grouting is necessary at a water stop connection, non-shrink grout shall be used.

739.4 FITTINGS:

Fittings for SRPE pipe may include tees, elbows, manhole adapter rings, plugs, caps, adapters and increasers. Fittings shall be joined by gasket type or thermal weld type joints in accordance with Subsection 739.3.

739.5 CERTIFICATION:

The manufacturer shall furnish a certification that all delivered materials comply with the requirements of ASTM F2562. The certification shall also identify the steel as galvanized with a G60 minimum coating weight, 80,000 psi yield strength and the cell classification of the HDPE material as 335464C minimum.

739.6MARKINGS:

Markings on pipe and fittings shall be per ASTM F2562. The markings shall be clearly shown on the pipe, at least, at the end of each length of pipe and spaced at intervals of not more than 10 feet. Markings shall include the following information: ASTM F2562, the nominal pipe size in inches, the pipe stiffness class, the manufacturer's name, trade name or trademark, the manufacturer's production code: identifying plant location, machine, and date of manufacture.

739.7 CARE OF PIPE AND MATERIALS:

All pipe, fittings, gaskets and water stop materials shall be manufactured, handled, loaded, shipped, unloaded, and installed in such a manner as to be undamaged and in sound condition, in the completed work. Particular effort shall be exercised to protect the ends of the pipe. Repairs on damaged pipe shall be made to the satisfaction of the Engineer or removed from the project site. Rubber Elastomeric gaskets shall be covered in a factory applied protective wrap.

- End of Section -

SECTION 740

POLYPROPYLENE PIPE AND FITTINGS FOR STORM DRAIN, IRRIGATION AND SANITARY SEWER

740.1 GENERAL:

This specification covers the requirements of profile wall (both dual wall - Type S and triple wall - Type D) polypropylene (PP) pipe manufactured per ASTM F2736 and AASHTO M330 for storm drain, or ASTM F2736 or ASTM F2764 for sanitary sewer systems. When noted on the plans or in the special provisions, storm drains, irrigation and sanitary sewers may be constructed using PP pipe. PP pipe approved sizes are 12 inch diameter through 60 inch diameter. Trench excavation, backfilling and compaction for flexible pipe shall be in accordance with Section 601 and manufacturer's installation recommendations. Construction and installation shall be in accordance with Section 618 for storm drain and irrigation water or Section 615 for sanitary sewers.

740.2 MATERIALS:

740.2.1 Base Material Composition: Profile pipe base material and fittings shall meet polypropylene materials requirements as stated in Section 4, Table 1 of ASTM F2736, Section 5, Table 1 of ASTM F2764 or Section 6, Table 1 of AASHTO M330.

740.2.2 Gaskets: Elastomeric gaskets shall comply with the requirements in ASTM F477 and be as recommended by the pipe manufacturer.

740.2.3 Water Stops: Elastomeric **w**ater stop gaskets shall conform to the requirements of ASTM C923.

740.2.4 Lubricant: The lubricant used for assembly shall comply with manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

740.3 JOINING SYSTEMS:

740.3.1 Gasket Type: Joints for the piping system and fittings shall consist of an integrally formed bell and spigot gasketed joint. The joint shall be designed so that when assembled, the elastomeric gasket located on the spigot is compressed radially on the pipe or fitting bell to form a water tight seal. The joint shall be designed so to prevent displacement of the gasket from the joint during assembly and when in service. The elastomeric gasket shall meet the provision of ASTM F477. Gasketed watertight joints shall meet laboratory test pressure of 10.8 psi when tested in accordance with ASTM D3212.

All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The bell and spigot configurations for fittings shall be compatible to those used for the pipe.

Joints shall provide a seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear, shall be smooth and free of any imperfections, which would adversely affect the seal. The assembly of the gasketed joints shall be in accordance with the pipe manufacturer's recommendations.

740.3.2 Pipe to Concrete Structure Connections: An approved flexible connection, mechanical seal, or water stop shall be provided at manhole entry or concrete structure connections to reduce infiltration and exfiltration. When grouting is necessary at a water stop connection, non-shrink grout shall be used.

740.4 FITTINGS:

Fittings for PP pipe may include tees, elbows, manhole adapter rings, plugs, caps, adapters and increasers. Fittings shall be joined by gasket type joints in accordance with Subsection 740.3.

The material used for thermally welding the fitting shall be compatible with the base pipe material.

740.5 CERTIFICATION:

The manufacturer shall furnish a certification that all delivered materials comply with the requirements of ASTM F2736, ASTM F2764, or AASHTO M330.

740.6 MARKINGS:

Markings on pipe and fittings shall be per ASTM F2736, ASTM F2764 or AASHTO M330. The markings shall be clearly shown on the pipe, at least, at each end of each length of pipe and spaced at intervals of not more than 10 feet. Markings shall include the following information: the manufacturer's name or trademark, nominal size, the specification designation, plant designation code, date of manufacture or an appropriate code. All fittings shall be marked with the designation number of the specification and with the manufacturer's identification symbol.

740.7 CARE OF PIPE AND MATERIALS:

All pipe, fittings, gaskets, and water stop materials shall be manufactured, handled, loaded, shipped, unloaded, and installed in such manner as to be undamaged and in sound condition, in the completed work. Particular effort shall be exercised to protect the ends of pipe. Repairs on damaged pipe shall be made to the satisfaction of the Engineer or removed from the project site. At all times elastomeric gaskets shall be covered in a factory applied protective wrap until ready for use.

- End of Section

SECTION 741

LINING FOR REINFORCED CONCRETE SANITARY SEWER PIPE

741.1 GENERAL:

The interior area of the reinforced concrete pipe as indicated on the plans, shall be sealed and protected with lining, as specified below.

The installation and application of the pipe lining shall be accomplished by the supplier of the reinforced concrete pipe.

All work for and in connection with the installation of lining in concrete pipe and the field sealing of joints shall be done in strict conformance with all applicable published specifications, instructions and recommendations of the approved lining manufacturer. The pipe supplier shall furnish all labor, material and equipment to successfully accomplish the lining.

741.2 MATERIALS:

741.2.1 Material Composition: The material shall be a liner plate which is a combination of inert, synthetic resins, pigments, and plasticizers, compounded to make permanently flexible sheets.

The liner plate shall be resistant to the following: Oxidizing agents, sulfuric, phosphoric, nitric, chromic, oleic, and stearic acids; sodium and calcium hydroxides; ammonia, sodium, calcium, magnesium, and ferric chlorides; ferric sulfate, petroleum oils and greases; vegetable and animal oils, fats, greases and soaps.

Liner plate shall be impermeable to sewage gasses and liquids and shall be non-conducive to bacterial or fungus growth. All liner plates shall be factory checked electrically to insure freedom from any porosity with a high voltage holiday detector set at a minimum of 20,000 volts.

Joint strips and welding strips shall have the same composition and corrosion resistance as liner plate, but shall not have locking extensions.

The lining shall have good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to 1/4 inch setting crack which may take place in the pipe or in the joint after installation, without damage to the lining.

Once cast into the pipe, the lining shall be permanently and physically attached to the concrete by a locking extension and shall not rely on an adhesive bond.

741.2.2 Material Details and Dimensions: The liner plate shall not be less than 0.065 inches in thickness. Locking extension shall be of the same material as the liner and shall be integrally extruded with the sheets. If steel bands are used to secure the liner plate to the forms transversely, strap channels shall be integrally molded into the sheet.

Liner plate shall be supplied as pipe size sheets fabricated by shop welding together the basic size sheets.

Joint straps shall be 4 inches ± 0.25 inches in width and shall have each edge beveled prior to application.

Welding strips shall be 1 inch ± 0.125 inch in width and shall have the edges beveled at time of manufacture.

The Contractor shall submit a shop drawing showing liner plate details for approval by the Engineer, prior to fabrication of the pipe.

741.3 INSTALLATION OF LINER PLATE:

The installation of liner plate, including the welding of all joints, shall be done in accordance with the manufacturer's recommendations. Nailing through the plate will not be tolerated. Liner plate shall be installed with locking extensions parallel with the longitudinal axis of the sewer, unless otherwise shown on the plans. All joints between individual sheets or sections of liner plates shall be continuously heat-welded by the use of welding strips of the same kind and equivalent thickness of material as the liner plates (with the exception of the integral extension ribs).

Liner plate shall be held snugly in place against inner forms by means of light gage steel wire, light steel banding straps or other suitable means. If steel banding straps are used, they shall be applied in strap channels provided for this purpose.

Locking extensions (T-shaped) shall be integrally extruded to all lower, terminal or longitudinal edges of liner plate as applied to concrete pipe. If banding straps are used, a steel rod 1/4 inch in diameter may be inserted in each locking extension along the longitudinal edges of each sheet of liner plate for concrete pipe or some other approved method for holding the lower edge of the liner plate snugly against the form shall be provided.

Concrete poured against liner plate shall be compacted in a careful manner so as to protect the liner plate and to produce a dense, homogeneous concrete securely anchoring the lock extensions into the concrete.

In removing forms, care shall be taken to protect liner plate from damage. Sharp instruments shall not be used to pry forms from lined surfaces. All holes and cut, torn or seriously abraded areas in the liner plate shall be patched. Patches made entirely with welding strip shall be fused to the liner plate over the entire patch. Larger patches may consist of smooth liner plate applied over the damaged area with adhesive. All edges must be covered with welding strip fused to the patch and the sound liner plate adjoining the damaged area.

The Contractor shall take all necessary measures to prevent damage to installed liner plate from equipment and materials used in or taken through the work.

The applied lining shall be free from bubbles due to poor workmanship, and the Contractor shall cut out said bubbles and weld a similar sheet in place of the bubble, unless otherwise directed by the Engineer.

Application on Concrete Pipe-Special Requirements: Liner plate shall be set flush with the inner edge of the bell or groove end of a pipe section and shall extend to the spigot or tongue end or to approximately 3 inches beyond the tongue end, depending upon the type of liner plate to be made with the adjoining concrete pipe.

Wherever concrete pipe, which are protected with liner plate, join structures not so lined, such as brick structures, concrete pipe, cast-in-place structures or clay pipe, the liner plate shall be extended over and around the end of the pipe and back into the structure for not less than 4 inches.

Where a pipe spur, not of plastic lined concrete, is installed through lined concrete pipe, the liner plate shall be returned 4 inches at the surface of contact. The seal between the liner plate and the spur shall be made using an approved adhesive material and strapped in place.

If the joint space is too wide or the joint space surface too rough to allow satisfactory sealing with this adhesive, the joint space shall be filled with 2 inches of densely caulked lead wool or other approved caulking material.

Lined concrete pipe may be cured by standard curing methods. Care shall be exercised, in handling, transporting and placing lined pipe to prevent damage to the liner plate. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or with a suitable fork lift.

No pipe with damaged lining will be accepted until and unless the damage has been repaired to the satisfaction of the Engineer.

741.4 FIELD JOINTS:

The Contractor shall obtain the services of qualified personnel to weld the liner plate field joints. Pipe joints must be dry before the liner plate joints are made. All mortar and other foreign material shall be removed from liner plate surfaces adjacent to the pipe joint, leaving them clean and dry.

No liner plate joints shall be made until the trench has been backfilled.

Field joints in the liner plate at pipe joints may be either of the following described types:

Type P-1- The joint shall be made with a separate 4 inch joint strip and 2 welding strips. The 4 inch strip shall be centered over the joint, secured to the liner plate with an approved adhesive, or other approved means, and welded along each edge to adjacent liner plate with a 1 inch weld strip. The width of the space between adjacent liner plate sheets shall not exceed 2 inches. The

4 inch joint strip shall lap over each liner plate a maximum of 1 inch. Type P-2 - The joint shall be made with a plastic strip, without locking extensions integrally extruded with the liner plate and extending approximately 3 inches beyond the spigot end. A 1 inch welding strip is required. The joint strip shall overlay the liner plate a minimum of 1 inch on the downstream side of the pipe joint. An approved adhesive, or other approved means, shall be used to hold the lap in place during the welding. The joint strip on beveled pipe shall be trimmed to a width, measured from the end of the spigot, of approximately 3 inches for the entire circumferential length of the liner. Distortion in bending back the strip to expose the pipe joint during the laying and joint mortaring shall be avoided. All welding of joints is to be in strict conformance with liner plate manufacturer's specifications.

Type P-4 - The joint shall be made with a 4 inch weld strip. The 4 inch weld strip shall be centered over the joint and welded in place to the lining in adjacent joints of pipe. The weld strip shall lap over each liner plate in minimum of 1 inch.

741.5 TESTING AND REPAIRING DAMAGED LINER SURFACES: :

After the pipe is installed in the trench, all surfaces covered with liner plate shall be tested with an approved electrical holiday or flaw detector set at a minimum of 20,000 volts. All welds shall be physically tested by a non-destructive probing method. All patches over nail and form tie holes, or repairs to the liner plate wherever damage has occurred, shall be done in conformance with the instructions and recommendations of the liner plate manufacturer.

Each transverse welding strip which extends to a lower edge of the liner plate shall be tested. The welding strips shall extend below the liner plate, providing a tab. A 10-pound pull will be applied normal to the face of the pipe by means of a spring balance. Liner plate adjoining the welding strip will be held against the concrete during application of the force. The 10-pound pull will be maintained if a weld failure develops, until no further separation occurs. Defective welds will be re-tested after repairs have been made. Tabs shall be trimmed away neatly after the weld strip has passed inspection. The Contractor shall provide all equipment required to test liner plate in the manner recommended by the manufacturer and as described above. The Contractor shall also provide personnel qualified to perform the testing. Testing shall be performed in the presence of a representative of the Contracting Agency.

- End of Section -

SECTION 742

PRECAST MANHOLE

742.1 GENERAL:

This specification covers requirements for precast manhole sections. All precast manhole manufacturers shall be NPCA (National Precast Association) certified and shall provide all NPCA certifications upon request. Loading criteria for the precast manholes shall meet or exceed the AASHTO H20 loading requirements. All precast manhole risers shall be monolithically cast to ensure water tightness and have a certified structural design and the manhole shall be cast in a fashion to achieve water tightness. This shall include a monolithic cast manhole or a multi section cast manhole which also shall have a certified structural design.

742.2 MATERIALS:

742.2.1 Concrete Materials: Concrete materials shall conform to the requirements of Section 725 and Table 725-1 for Class AA.

742.2.2 Precast Sections: Precast sections shall conform to ASTM C478, AASHTO M199. The design shall be in accordance with ACI 318 and ASTM C890 using traffic load A-16 (HS20-44).

742.2.3 Joints and Connections: Details of proposed joints and connections shall be submitted to the engineer for approval and shall conform to ASTM C990, C993, or C425 as applicable.

742.3 MANHOLE PENETRATIONS:

The location of penetrations shall be determined by the plans and specifications. Manhole penetrations may be formed or cut out. Cut outs of the precast base shall be done using a mechanical hole saw. After the core is removed from the casting, the precaster shall coat all exposed reinforcing with a corrosion inhibiting epoxy suitable for end use application. The thickness of the epoxy shall be per the epoxy manufacturer's recommendation. Knock outs shall be formed in the location noted on the plans or specifications.

742.4 REINFORCING:

Reinforcing steel shall meet the following specifications:

- Bars ASTM A615 or A706
- Wire and wire fabric ASTM A1064

Design of the reinforcing shall be in accordance with ACI 318 and ASTM C890

742.5 GASKETS:

A flexible pipe to manhole connector shall be used whenever a pipe penetrates into a precast concrete manhole or structure. The design of the connector shall provide a flexible, watertight seal between the pipe and the concrete. The connector shall assure that a seal is made between the structure wall and the pipe by:

- Casting the connector integrally with the structure wall during the manufacturing process in a manner that will not pull out during pipe coupling.
- Compressing the connector against the inside circumference of the structure by means of wedge or toggle style connection, expansion ring or other means approved by the engineer.

The connector shall be made from materials that conform to the physical and chemical requirements in ASTM C923 or C425 as applicable. The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer.

The connection hardware shall be constructed of type 316 stainless steel meeting ASTM A480. The hardware shall ensure a water tight connection between the concrete and the pipe material and shall provide an adequate seal enough to withstand the negative air pressure test per ASTM C-1244.

742.6 LIFTING POINTS:

Lifting points shall be designed and evaluated by a registered professional engineer and have a minimum safety factor of four. There shall be a minimum of two lifting points on every precast manhole base. After base installation, the lifting holes shall be thoroughly packed with a pre-packaged non-shrink grout. Bent reinforcing steel bars shall not be used as lifting devices. Through lifting holes will not be allowed.

742.7 IMPERFECTIONS:

Any imperfections which in the opinion of the engineer may adversely affect the performance of the precast section shall be cause for rejection.

– End of Section –

SECTION 743

VITRIFIED CLAY PIPE

743.1 GENERAL:

Vitrified clay pipe, 30 inch diameter or less, shall be extra strength in accordance with the requirements set forth in ASTM C700, except as modified herein. Pipe larger than 30 inches shall be of the type specified in the Special Provisions.

743.2 MANUFACTURING REQUIREMENTS:

743.2.1 Shape: Pipe ends shall be square with the longitudinal axis, and sockets shall be true, circular, and concentric with the barrel of the pipe.

The ends of the pipe shall be so formed that when the pipes are laid together and the joints made, they shall constitute a continuous and uniform line of pipe and shall have a smooth and regular interior surface.

743.2.2 Stoppers, Branches, Ends: Stoppers shall be used with all branch pipes that are to be left unconnected. Stoppers for branch pipes having flexible compression joints may be either clay discs with flexible compression joints, factory applied, that will mate with the branch joint; or, a resilient material of controlled design and dimensions for mating with the branch pipe to which it is to be applied; or, of other material approved by the Engineer. Wooden stoppers will not be accepted.

Branches shall be furnished with connections of the sizes specified, securely and completely fastened to the barrel of the pipe in the process of manufacture.

"T" branches shall have their axis perpendicular to the longitudinal axis of the pipe. "Y" branches shall have their axis 45 degrees (unless otherwise specified) from the longitudinal axis of the pipe, measured from the socket end.

All branches shall terminate in sockets. Barrel of the branch shall be of sufficient length to permit making proper joint when the connecting pipe is inserted in the branch socket.

743.2.3 Imperfections: The following additional imperfections in a pipe or fittings will be considered injurious and cause for rejection:

(A) Any surface fire crack in the ends of the spigot or bell which exceeds 1 inch in length.

(B) Any piece broken from the bell end of the pipe or fittings when it adversely affects the performance of the joint or connection.

743.2.4 Certification: A certificate from the manufacturer shall be furnished attesting that the pipe meets the requirements of this specification, including test reports for the hydrostatic pressure test and the loading test herein specified.

743.3 TESTS:

In addition to the required tests at the manufacturer's plant, the Engineer's representative may select specimens at random at the point of delivery or at the job site. Tests on these specimens shall be performed at a local testing facility under the supervision of the Engineer's representative. The cost of such supervision will be borne by the Contracting Agency and all other costs shall be borne by the Contractor.

When the pipe is subjected to an internal hydrostatic pressure of 10 psi for the time shown in Table 743-1, the accumulated moisture on the exterior surface shall not run down the sides in such quantity that will exceed 10 milliliters.

TABLE 743-1	
TABLE OF TESTING TIME FOR PIPES	
Thickness of Wall Inches	**Test Time Minutes**
Up to and including 1	7
Over 1 and including 1 1/2	9
Over 1 1/2 and including 2	12
Over 2 and including 2 1/2	15
Over 2 1/2 and including 3	18
Over 3	21

The loading test shall conform in manner to that specified in ASTM C301 for 3-edge bearing and shall be applied to all specimens selected for testing.

743.4 IDENTIFICATION MARKS:

Pipe and fittings shall be clearly marked with the name or trademark of the manufacturer, a code number identifying production control and plant location, and extra strength designation.

743.5 JOINTS:

Acceptable joints shall be flexible compression type for bell and spigot pipe or flexible compression couplings for plain-end pipe.

Compression joints and couplings shall conform to the requirements of ASTM C425.

- End of Section -

SECTION 744

ABS TRUSS PIPE AND FITTINGS

744.1 GENERAL:

Truss pipe is defined as an internally-braced double-walled ABS composite pipe conforming to ASTM D2680. When noted on the plans or in the special provisions, gravity sanitary sewer system may be constructed using truss pipe for diameters not exceeding 15 inches.

Truss pipe shall have both ends of each pipe length sealed at the factory such that the inert filler material between the two concentric thermoplastic tubes is impervious. All field cuts shall be sealed according to the manufacturer's recommendations.

744.2 COUPLINGS AND FITTINGS:

Fittings for truss pipe may include couplings, wyes, tees, elbows, caps, plugs adapters, manhole water stops and clamps. All couplings and fittings shall be assembled by a chemically welded method. Solvent shall be of the type recommended by the pipe manufacturer. Each solvent weld type coupling or fitting shall be accurately formed and entirely compatible in jointing the pipe to assure a leak-proof joint. Couplings and fittings shall be manufactured from the same material as the pipe except that caps, plugs and adapters may be fabricated or molded from rubber, polyurethane or other suitable compounds. The couplings and fittings shall have chemical and physical properties equal or superior to the pipe itself.

744.3 SOLID WALL PIPE AND FITTINGS:

744.3.1 General: When noted on the plans or in the special provisions, Sewer and Drain Solid Wall Pipe and Fittings may be used for 4 inch and 6 inch service lines, risers and fittings.

744.3.2 Material: Sewer and Drain Solid Wall Pipe shall be manufactured of virgin ABS compound as specified in ASTM D1788, Types I and IV, excepting that the minimum heat deflection temperature (ASTM D648) shall be 180°F.

744.3.3 Strength: Test samples of pipe, 6 inches long, shall be cut from full length sections and tested by the method outlined in ASTM D2412. The pipe shall be deflected at least 35 percent without failure and the stiffness at 5 percent deflection shall equal or exceed the value listed in Table 744-1 below after the test samples have been immersed in a 5 percent solution by weight of sulfuric acid and n-Heptain for a period of 24 hours prior to testing. Failure is defined as rupture of the pipe wall.

Stiffness factor may be computed by the method outlined in ASTM D2412 or by dividing the load in lbs/linear inch by the deflection in inches and 5 percent deflection (F/ΔY in Table 744-1).

TABLE 744-1

MINIMUM STIFFNESS REQUIREMENTS

Nominal Size	F/ΔY 2.5% min
4 inches	55 lb./in.
6 inches	55 lb./in.

744.3.4 Couplings and Fittings: All couplings and fittings shall be assembled by a chemically welded method. Each solvent weld type coupling or fitting shall be accurately formed and entirely compactable with the Sewer and Drain Solid Wall Pipe to assure a leak proof joint. Couplings and Fittings shall be manufactured from the same material as the pipe except that caps, pugs and adapters may be fabricated or molded from rubber, polyurethane or other suitable compounds. The couplings and fittings shall have chemical and physical properties equal or superior to the pipe itself.

744.4 MANHOLE CONNECTIONS:

A clamp gasket or approved equivalent method shall be provided at manhole entry or connection to reduce infiltration and exfiltration. Where precast manholes are used, entrance holes must be large enough to allow for proper grouting around the manhole gasket.

744.5 CERTIFICATION:

A certificate from the manufacturer shall be furnished attesting that the pipe meets the requirements of ASTM D2680.

744.6 IMPERFECTIONS:

Any imperfections which in the opinion of the Engineer may adversely affect the performance of the pipe or joints shall be cause for rejection.

744.7 INSTALLATION AND TESTING:

Truss pipe shall be installed in accordance with applicable provisions of Section 615. In addition to the tests prescribed in Section 615, the Engineer may, at his option, require a deflection test on all or any part of the line. Any pipe which shows deflection in excess of 5% shall be removed and replaced at no cost to the Contracting Agency.

- ***End of Section*** -

SECTION 745

PVC SEWER PIPE AND FITTINGS

745.1 GENERAL:

This specification covers the requirements of polyvinyl chloride (PVC) plastic sewer pipe and fittings for gravity flow sewers and building connections. When noted on the plans or in the special provisions, gravity sanitary sewers may be constructed using PVC pipe for diameters not exceeding 15 inches. Pipe, fittings, couplings and joints shall be in conformance with the requirements of ASTM D3034, SDR-35, except as modified herein.

745.2 MATERIALS:

745.2.1 Caps and Plugs: Caps and plugs for building connections may be molded or fabricated from rubber, polyurethane or other suitable compound.

745.2.2 Gaskets: Rubber gaskets shall be manufactured from a synthetic elastomer and shall comply in all respects with the physical requirements specified in ASTM F477.

745.2.3 Lubricant: The lubricant used for assembly shall have no detrimental effect on the gasket or on the pipe.

745.3 JOINING SYSTEMS:

Joints for the piping system and fittings shall consist of an integral bell gasketed joint designed so that when assembled, the elastomeric gasket located within the bell is compressed radially on the pipe or fitting spigot to form a positive seal. The joint shall be designed so to prevent displacement of the gasket from the joint during assembly and when in service.

All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

The bell and spigot configurations for the fittings shall be compatible to those used for the pipe.

Joints shall provide a permanent seal against exfiltration and infiltration. All surfaces of the joint upon which the gasket may bear shall be smooth and free of any imperfections which could adversely affect sealability.

The assembly of the joints shall be in accordance with the pipe manufacturer's recommendations.

745.4 FITTINGS:

Fittings for PVC pipe may include elbows, wyes, tee wyes, double bell couplings, manhole couplings, manhole adapter rings, plugs, caps, adapters and increasers.

Manholes couplings shall be manufactured from asbestos cement and incorporate an elastomeric gasket moisture barrier.

745.4.1 Manhole Connections: A manhole adapter gasket or approved equivalent method shall be provided at manhole entry or connection to prevent infiltration and exfiltration. Where precast manholes are used, entrance holes shall be large enough to allow for proper grouting around the manhole ring.

745.5 CERTIFICATION:

A certificate from the manufacturer shall be furnished certifying that the pipe and fittings meet the requirements of ASTM D3034, SDR-35, F/ΔY 2.5% min. Y = 46 psi at 5% deflection.

745.6 IMPERFECTIONS:

Any imperfections which in the opinion of the Engineer may adversely affect the performance of the pipe or joints shall be cause for rejection.

- ***End of Section*** -

SECTION 750

IRON WATER PIPE AND FITTINGS

750.1 CAST IRON WATER PIPE:

All cast iron water pipe shall be designed in accordance with AWWA C-101.

Cast iron water pipe may be designed for either 18/40 or 21/45 physicals and shall conform to AWWA C-106 or AWWA C-108.

Except as otherwise provided cast iron or water pipe shall be designed to meet internal pressure of 150 psi, external cover of 5 feet, and standard Laying Condition B.

Cast iron pipe shall be nominal 18 foot lengths.

Pipe shall be cement mortar lined and seal coated in accordance with AWWA C-104.

750.2 DUCTILE IRON WATER PIPE:

All ductile iron water pipe shall be designed in accordance with AWWA C-150 and shall be manufactured in accordance with AWWA C-151. The class shall be as designated in the plans or special provisions.

Pipe shall be cement mortar lined and seal coated in accordance with AWWA C-104.

750.3 JOINT REQUIREMENTS:

Push-on joints for cast iron or ductile iron water pipe shall conform to AWWA C-111 and shall include synthetic rubber gaskets and lubricant.

Mechanical joints for cast iron or ductile iron water pipe shall conform to AWWA C-111 and shall include cast iron glands, synthetic rubber gaskets, and T-head bolts and nuts.

Flanged joints for cast iron or ductile iron water pipe shall be as detailed on the plans or as designated in the special provisions.

Restrained Joints:

When noted on plans or approved by the Engineer, joints for push-on or mechanical jointed ductile pipe may be modified to provide a fully restrained joint. These modifications to push-on and mechanical joints, including but not limited to segmented or special glands and split sleeves, shall conform to AWWA C-111. The Engineer shall review and/or approve each manufacturer's modifications to the joint. Upon request of the Engineer, the manufacturer of the modified joint shall provide test data showing compliance with AWWA C-111.

750.4 FITTINGS:

Iron fittings shall be either Gray-Iron or Ductile Iron conforming to AWWA C-110 or AWWA C-153 with a minimum pressure rating of 250 psi. Flanged ends shall conform to AWWA C-110. Push-on and mechanical joints ends shall conform to AWWA C-111.

Fittings shall be cement mortar lined and coal-tar coated in accordance with AWWA C-104.

- End of Section -

SECTION 752

ASBESTOS-CEMENT WATER PIPE AND FITTINGS

752.1 GENERAL:

These specifications cover asbestos-cement pressure pipe intended for use in supply lines and distribution systems that carry water under pressure.

752.2 CLASSES:

Asbestos-cement pipe shall be manufactured and tested in accordance with AWWA C-400, except as modified herein, for pipe intended for use in water service at maximum operating pressures of 100, 150, or 200 psi. Pipe shall be designated as Classes 100, 150, or 200 respectively, for the corresponding maximum operating pressures. Unless shown otherwise on the plans or specified in the special provisions the minimum acceptable shall be Class 150.

752.3 MANUFACTURE:

The joining ends of the pipe shall be of such design that they may be properly connected to cast iron fittings and valves which are manufactured within the continental United States that meet applicable AWWA specifications. Pipe in sizes less than 6 inches in diameter may be supplied in either 10 foot or 13 foot lengths, and pipe in sizes 6 inches or greater in diameter shall be supplied in 13 foot lengths, except for random and special short lengths in all sizes as permitted in AWWA C-400.

752.4 INSPECTING AND TESTING:

The uncombined calcium hydroxide in the pipe and couplings shall not exceed 1 percent when tested in accordance with AWWA C-400. Certification of all manufacturers' tests in accordance with AWWA C-400 shall be required. In addition, the Contracting Agency may require all inspection and testing to be performed at the manufacturer's plant or at an approved testing laboratory.

All pipe manufactured outside the United States of America will be subject to inspection and testing by the Contracting Agency at the plant site or at an approved testing laboratory. In addition, all pipes shall have the Underwriters Laboratory, Inc. seal of approval and certification that all tests were in accordance with AWWA C-400.

752.5 FITTINGS:

Fittings shall be cast iron or ductile iron and conform to AWWA C-110 or C-153 for 250 psi minimum working pressure rating cast on fittings. All fittings shall have Ring-Tite, Fluid-Tite, or Weld-Tite bells to fit the class of pipe specified. All fittings shall be cement lined in accordance with AWWA C-104.

752.6 RUBBER RINGS:

Each coupling shall have 2 synthetic rubber joint sealing rings conforming to the requirements of ASTM D1869. This paragraph shall also apply to the rings furnished for use with fittings. Neoprene shall not be used.

- End of Section -

SECTION 753

GALVANIZED PIPE AND FITTINGS

753.1 GENERAL:

All galvanized pipe shall be new galvanized welded or seamless steel pipe, conforming to the requirements of ASTM A53 standard weight, schedule 40.

753.2 CORROSION PROTECTION:

All buried galvanized pipe and fittings shall be protected from corrosion by the application of a tight fitting, extruded or wrapped coating. Coating shall be not less than 0.030 inches in thickness at any point. Extruded coatings shall be of polyethylene or polyvinyl chloride, Extrucoat or equal. Wrapped coatings shall be of polyethylene, polyvinyl chloride, coal tar or asphalt tape, Pretecto Wrap No. 200, Saft-t-Clad FOS No. 655, Tapecoat, Trantex VID-10 or E-12, Polyken No. 900, Scotchrap No. 50 or approved equal Tape shall be edge lapped no less than 1/4 inch.

753.3 FITTINGS:

All fittings for screwed galvanized pipes shall be 150 psi, banded, galvanized malleable iron screwed fittings.

753.4 VALVES:

Valves on galvanized pipelines shall be all bronze, double disc, nonrising stem with wheel handle on top, such as Jones, J373 or equal, with bodies, bonnets, yokes and wedges made of material conforming to ASTM B62.

- End of Section -

SECTION 754

COPPER PIPE, TUBING AND FITTINGS

754.1 PIPE AND TUBING:

All copper pipe and tubing shall be new seamless copper pipes and tubes, designed for underground water services, plumbing purposes, etc. They shall conform to all the requirements of ASTM B88, Type K.

All pipe or tubing shall be made of copper free from cuprous oxide, as determined by microscopic examination at a magnification of 75 diameters.

Type K tubing, when furnished in coil, shall be annealed after coiling.

754.2 FITTINGS:

All fittings used in connection with copper pipe or tubing, shall be copper or bronze fittings as shown on standard details.

Service Material containing Brass or Bronze must comply with the current NSF 61-8 Standards at the time the Project begins.

All Brass or Bronze service material must meet the current AWWA C-800 Standards.

- End of Section -

SECTION 755

POLYETHYLENE PIPE FOR WATER DISTRIBUTION

755.1 GENERAL:

This specification is intended to describe water service pipe with a hydrostatic design stress of 620 psi for water at 73.4 °F produced from a high density ultrahigh molecular weight polyethylene pipe compound. Polyethylene pipe used for water distribution shall conform to all the requirements of ASTM D2239 and with the additional provisions listed herein. This specification describes pipe of the nominal I.D. and O.D. size as manufactured by Carlon, Celanese, Orangeburg, Phillips 66 Drisco pipe and Triangle Aycee and shall provide a water pressure tight joint when used with compression type fittings.

Service Material containing Brass or Bronze must comply with the current NSF 61-8 Standards at the time the project begins.

All Brass or Bronze service material must meet the current AWWA C-800 Standards.

Pipe may be rejected for failure to comply with any requirements of these specifications.

755.2 MATERIAL:

The polyethylene extrusion compound from which the pipe is extruded shall meet the requirements of Type III, Grade 34, Class C, material as described in ASTM D1248, except that the melt index shall be determined under a higher temperature than ASTM D1238. The test condition shall be as specified below under tests of pipe.

The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.

755.3 PIPE DIMENSION AND TOLERANCES:

The average inside diameters, wall thickness, and respective tolerances shall be, for any cross-section, as shown in ASTM D2239, when measured in accordance with ASTM D2122.

The standard thermoplastic pipe dimension ratio (SDR), the ratio of the pipe diameter to wall thickness, shall not exceed 7 for 160 psi design pressure.

755.4 MINIMUM BURST PRESSURE:

The minimum burst pressure for pipe made from Type III, Grade 34, Class C, polyethylene compound, Designation Code: PE-3406, when determined with at least 5 specimens shall be at least equal to 630 psi for water at 73.4°F. Pressures shall be determined in accordance with ASTM D1599.

755.5 SUSTAINED PRESSURE:

In addition to passing the sustained pressures given in ASTM D2239 for a temperature of 100°F. and 73.4°F. the pipe shall withstand, without failing, ballooning, bursting or weeping for a period of at least 300 hours, at 194 ± 2°F., 113 psi test pressure for 3/4 inch pipe and 112 psi for 1 inch pipe. These test pressures have been calculated on a basis of a 450 psi fiber stress. The test procedure outlined in ASTM D1598, shall be followed.

755.6 TESTS OF PIPE:

The pipe must be able to meet all tests that are specified in ASTM D2239, and the following test for melt index, as determined in ASTM D1238. Pellets of the original resin, placed into the testing device shall have flow rates as follows:

(A) Less than 0.5 grams per 10 minutes at 310°C with a plunger load of 27.5 pounds for pipe or tubing extruded by the Allied Chemical Process.

(B) Less than 3 grams per 10 minutes at 190°C with a plunger load of 47.65 pounds for pipe and tubing extruded by the Phillips Extrusion Process.

755.7 CERTIFICATION BY MANUFACTURER:

Each Contractor must be able to furnish a certification from the manufacturer of the pipe that the polyethylene plastic pipe is of uniform quality and will fully comply with these specifications, and that the pipe is manufactured of virgin polyethylene, that no scrap material has been used, and that it is satisfactory for potable water, in accordance with the specifications of the National Sanitation Foundation Testing Laboratories, Inc.

The pipe manufacturer shall further supply a copy of certification from the manufacturer of the polyethylene extrusion compound used to make the pipe that the compound fully complies with these specifications.

The manufacturer must have adequate equipment and quality control facilities to be sure that each extrusion of pipe is uniform in texture, dimension and strength, and have so manufactured this class of pipe in sufficient quantities to be certain that it will meet all normal field conditions of usage.

755.8 PIPE IDENTIFICATION:

The pipe shall be permanently marked indicating size and pressure-temperature rating. The appropriate lettering shall occur on the pipe at least once in every 24 inches. The seal of approval or marking of the testing laboratory shall be included in the marking on all pipes that is intended for transporting potable water.

PE PIPE MARKINGS

REQUIRED MARKINGS, EXAMPLE

Size	—	Pressure	—	Temp Rating	—	Test Lab. Seal
¾"		160 psi		PE 3406		NSF

OTHER MARKINGS(Not required by Spec. to be marked)
(However pipe must comply)

SDR-7 (Shall not exceed 7)

CS-255-63 (This is a commercial standard designation of the U.S. National Bureau of Standard. Any other number (CS———) is wrong)

NOTE: 3/4 inch Pipe has I.D. 0.824 inch, O.D. 1.060 inch and 3.328 inch circumference.
3/4 inch Tubing is not acceptable and has I.D. 0.681 inch, O.D. 0.875 inch, 2.747 inch circumference and an SDR-9 if shown.

- End of Section -

SECTION 756

DRY BARREL/FIRE HYDRANTS

756.1 GENERAL:

Fire Hydrants furnished by the Contractor shall be designed, manufactured, and tested in compliance with the latest edition of the American Water Works Association (AWWA) - C. 502 Standard for Dry-Barrel Fire Hydrants, supplemented as follows:

756.2 DRAWINGS:

Detail drawings or blue prints showing all components, principal dimensions, construction details and materials used shall be submitted to the Contracting Agency for approval. The Contracting Agency reserves the right to consider the quality, appearance and past performance of fire hydrants when reviewing drawings for approval.

756.3 HYDRANTS:

Fire hydrant makes and models (and approved alternates) shall be specified by the owner and designated on an approved products list, which will be maintained by the owner. Alternate hydrants by request only to Owner. The diameter of the main valve seat opening shall be not less than 5 inches in diameter. The entire valve assembly shall be effectively sealed against moisture.

All interior ferrous surfaces of the shoe exposed to fluid flow (including the valve plate and cap nut), shall be epoxy coated to a minimum dry thickness of 6 mils. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturer's printed instructions. The epoxy materials used shall be 100% powder epoxy or liquid epoxy that conforms to the requirements of AWWA C 550-81, NSF 61 approved, and to the prevailing requirements of the Food and Drug Administration and of the Environmental Protection Agency.

Style of inlet shoe connections shall be a restrained mechanical joint with accessories, gland, bolts, gaskets and having a 6 inch diameter inlet connection. Solid flange or ring tight “bump in” connections will not be allowed unless through exception by owner. Facing of the main valve against seats shall be rubber or synthetic rubber. The top of the stem or bonnet shall be equipped with the O ring seal. Hydrants shall be constructed so that extension sections in multiples of 6 inches, with rod and coupling, can be added to increase barrel length. The hose and streamer nozzle connections shall match the standard size and threads per inch of the Contracting Agency. Operating and outlet nozzle cap nuts shall be of solid pentagonal shape. The pentagon shall measure fifteen sixteenths to thirty one thirty seconds inch on side, 1 1/2 inch from point to flat. All barrels above ground shall have a prime coat and painted with two coats of fire hydrant yellow paint or as specified by owner. Hydrants shall be constructed so that the standpipe can be rotated 360 degrees to at least 8 different positions.

Hydrants shall be designed for a 250 psi working pressure and factory bench tested to a 500 psi hydrostatic pressure.

Hydrants shall be field tested consistent with the specified pressure ratings for the connecting pipes or as specified by AWWA.

Hydrants shall be of the break flange traffic model type with a replaceable breakable unit immediately above the ground line to minimize repairs necessary due to traffic damage. The breakable stem coupling will be made of a corrosion resistant material such as stainless steel or bronze, or have a permanently applied non corrosive finish such as nickel plating or fusion bonded epoxy coating.

Hydrants shall be of the compression type; constructed such that the main valve closes with the water pressure to assure no loss of water in the event of damage to the upper portion of the fire hydrant.

Main valve opening shall have a minimum diameter of 5-inches to assure optimum flow. Facing of the main valve against the seats shall be of rubber or synthetic rubber minimum of 1 inch in thickness. Plastic or Neoprene type main valves will not be allowed.

Hydrants shall be of the dry top design with o-ring seals to ensure that the operating threads will be protected from water entry. Dry top design to include factory- lubricated operating mechanism which allows supplemental lubricant to be added in the field without removal of the upper barrel.

Standard lubricant shall be a NSF 61 approved oil or grease suitable for a temperature range of 20 degrees to 150 degrees F.

Hydrants shall have a cast iron weather shield at the operating nut to protect the clearance area between the top casting and the operating nut.

The operating nut shall be a one-piece bronze casting. Both the operating nut and the nozzle cap nuts shall be National Standard Pentagon in shape and measure 1-1/2 inches from point to flat at the base of the nut.

Hydrants shall have two hose nozzles, 2.5 inches in diameter, and one pumper nozzle approved by the Owner. Rubber gasket nozzle caps shall be provided. Screw Threads shall be per owner requirements.

Hydrant nozzle section shall be capable of rotation through 360 degrees to at least 8 points of rotation with respect to the standpipe to allow the positioning of the hose or pumper nozzles

Minimum distance allowable between the centerline of the lowest nozzle and ground / bury line is 18-inches. Bury line shall be visibly marked on lower barrel of hydrant.

Hydrants shall have markings indicating direction of opening right to left (counter-clockwise).

Hydrants shall have permanent markings identifying the manufacturer name, model identification, size of the main valve opening and the year of manufacture.

Hydrants shall have an automatic drain that is operated by the main valve rod. The drain valve is to open as the main valve is closed and close as the main valve is opened. The port and seat of the drain valve shall be bronze. Drain facings shall not be leather.

The outside of the hydrant top section shall be painted a minimum of one coat of non- lead base premium primer and two (2) finished coats of non-lead base premium durable paint. The surface will be properly prepared, smooth, clean, and dry before primer is applied. The primer coat will be applied to a DFT (Dry Film Thickness) of 3-4 mils. The final 2 coats will be applied to achieve a DFT of 6-8 mils on top of the primer coat. Paint will be a semi-gloss, bright chrome safety yellow in color or as specified by owner. Paint will have high color retention. Paint will be fade and UV resistant, rust resistant, resistant to abrasions and chipping and have flexibility qualities.

Hydrants shall have a bronze valve seat and shall be threaded into a bronze drain ring or shoe bushing to prevent electrolysis between these components

Hydrants shall be designed to permit the use of extension sections.

Hydrants shall be designed to allow all working parts to be removed through the bonnet/dome or upper nozzle section of the hydrant without removal of the entire upper barrel section.

Hydrants shall be suitable for installation in 36-inch to 72-inch trench depth or as specified by owner.

All nuts and bolts of the factory hydrant to be buried below ground will be a minimum of 304 stainless steel and coated for gall protection.

The friction loss must be guaranteed by the manufacturer to match statistics in Table 756-1.

756.4 MANUFACTURER:

The manufacturer shall guarantee that the hydrant is so constructed that the valve stem will not be bent when hydrant is damaged or broken at or near the grade level. A safety breaking flange or thimble, shall be provided. The friction loss must be guaranteed, by the manufacturer, to satisfy Table 756-1.

TABLE 756-1			
MAXIMUM PERMISSIBLE LOSS OF HEAD FOR HYDRANTS			
Number of Outlet Nozzles	**Nominal Diameter of Outlet**	**Total Flow From Outlet Nozzles GPM**	**Maximum Permissible Head Loss PSI**
2	2 1/2 inches	500	2.0
1	4 inches	600	2.5

756.5 WARRANTY:

All items shall be warranted by the manufacturer for a minimum period of five (5) years from date of acceptance by the Owner, against defects in material and workmanship. At any time during that period, if a defect should occur in any item, it shall be repaired or replaced by the manufacturer at no obligation to the Owner, except where it would be shown that the defect was caused by misuse and not by fault of manufacturer. The manufacturer shall make necessary repairs within the time frame specified by the owner or reimburse the owner if emergency repairs are required. The manufacturer expressly warrants all items to be new, free from defect in design, materials, and workmanship and to be fit and sufficient for their intended purpose. All warranties shall survive acceptance and payment by the city.

756.6 INSPECTION:

All items shall be inspected before acceptance by an authorized representative of the Owner for workmanship, acceptance and proper functioning of components, and conformance to all requirements of this specification.

Should deficiencies be found, it shall be the responsibility of the supplier to pack the item(s) in question, make necessary corrections, and then return to the Owner for re-inspection and acceptance at no additional expense or obligation to the Owner.

- End of Section -

SECTION 757

SPRINKLER IRRIGATION SYSTEM

757.1 GENERAL:

All materials and fittings shall be new, of the manufacturer's most current design, and shall bear the appropriate National Association seal of approval for example, NSF, UL, etc. Similar units shall be procured from the same manufacturer and internal parts shall be common and interchangeable. Parts listing and source of supply for replacement parts will be furnished to the Engineer.

757.2 PIPE AND FITTINGS:

The type of pipe material and fittings shall be as designated on the plans or in the special provisions. The type utilized shall comply with one of the following:

757.2.1 Steel Pipe: All steel pipes shall be newly galvanized, standard weight, Schedule 40 conforming with Section 753.

757.2.2 Plastic Pipe: Plastic pipe shall be rigid, unplasticized polyvinyl chloride, PVC 1120 or 1220, with an SDR of 26 or less, complying with ASTM D1785. Schedule 40 or 315 psi pipe shall be used for the continuously pressurized run on the supplyside of Control Valves. PVC 1120 to 1220, SDR 26, pressure rated at not less than 125 psi shall be used on the discharge side of all control valves.

757.2.3 Pipe Fittings and Couplings:

(A) Steel Pipe Fitting and Couplings - Steel pipe fittings and couplings shall be galvanized, malleable iron, screwed fittings or couplings, conforming with Section 753.

(B) Plastic Pipe Fittings and Couplings - Plastic pipe fittings and couplings shall be either threaded type or slip fitting tapered socket solvent weld type. Schedule 80 pipe only will be used for threaded joints. Tapered solvent weld fittings may be either Schedule 80 or Schedule 40, but in any case, will be equal to or greater than the Schedule and Pressure Rating of the plastic pipe being joined. Tapered fittings shall be sized so that a dry, unsoftened taper cannot be inserted more than halfway into the socket. Plastic saddles and flange fittings are not permitted.

(C) Copper Pipe Fittings and Couplings - Copper pipe fittings and couplings shall conform with Section 754.

757.2.4 Solvent Cement: The solvent cement shall be a solution of Type 1, Grade 1, unplasticized, polyvinyl chloride molding or extrusion compound as specified in ASTM D1784, or an equivalent PVC resin. The cement shall be free flowing and shall not contain lumps, microscopic undissolved particles or any foreign matter that will adversely affect the ultimate joint strength. It shall show no stratification or separation that cannot be removed by stirring. Container labeling shall be in accordance with ASTM D2564.

757.3 VALVES AND VALVE BOXES:

757.3.1 General: Valves shall be of the size, type, and capacity designated on the plans or in the special provisions and shall comply with the requirements specified herein.

All valves except garden valves shall be capable of satisfactory performance at a working pressure of 200 psi. Valves shall be designed to permit disassembly to replace sealing components without removal of the valve body from the pipeline.

757.3.2 Gate Valves: Gate valves in size two inches and smaller shall be all bronze double disc wedge type with integral taper seats and non-rising stem. Sizes two and one-half inches and larger shall be iron body, brass trimmed, with the other features the same as for the two inch. Section 753 applies.

757.3.3 Manual Control Valves: Manual control valves shall be brass or bronze, and shall be straight or angle pattern glove valves, full opening; key operated with replaceable compression disc and ground joint union on the discharge end.

757.3.4 Electrical Remote Control Valves: Remote control valves shall be electrically operated, designed for a 24 volt, 60 cycle system. They shall be brass or bronze with accurately machined valve seat surfaces, equipped for flow control adjustment,

and with the capability for manual operation. They shall be readily disassembled for repair and the internal parts shall be easily accessible for service even when installed in the line.

The internal valve shall be a normally closed, diaphragm type with slow opening and closing action as protection against surge pressures. Actuation shall be by an encapsulated type solenoid with the solenoid shunt band, tube, and plunger of stainless steel for corrosion protection. A removable and cleanable strainer shall be provided at the control chamber inlet to prevent debris from entering the solenoid operating section.

757.3.5 Garden Valves: Garden valves shall be brass or bronze except for the handle. They shall have a replaceable compression disc, and shall be 3/4 inch straight-nosed, key operated and pressure rated for operation at 150 psi.

757.3.6 Quick-Coupling Valves and Assemblies: Quick-coupling valves shall be brass or bronze with built-in flow control and self-closing valve and supplied in 3/4-inch size unless otherwise required. When a quick-coupler assembly is specified, it shall consist of the valve, quick-coupler connection and hose swivel. Keys and hose swivel ells shall be furnished as specified on the plans.

757.3.7 Valve Boxes: Valve boxes with locking covers shall be molded, non-corrosive plastic. Applicable ASTM references: D638.

757.4 BACKFLOW PREVENTER ASSEMBLY:

The backflow preventer assembly shall consist of pressure type or reduced pressure type backflow preventer unit and associated components conforming to the governing code requirements and as shown on the plans. It shall be equal in quality and performance to a “Foundation for Cross-Connection Control and Hydraulic Research.”

757.5 SPRINKLER EQUIPMENT:

Sprinkler heads, bubbler heads and spray nozzles shall be of the types and sizes as shown on the plans. All major components shall be brass, bronze, stainless steel, or high impact plastic.

Equipment of one type with similar flow characteristics shall be from the same manufacturer and shall bear the manufacturer's name and identification code in a position where they can be identified after installation.

Fixed head sprinklers shall have a one-piece housing with provisions for interior parts replacement. Pop-up sprinklers shall be designed to rise at least 2 inches during operation. Full or part circle sprinklers shall be interchangeable in the same housing.

Bubbler heads shall be of corrosion-resistant, durable bodies, injection molded out of cycolac, and tapped for 1/2 inch I.P.S. threads. The bubbler shall be fully adjustable from 0 to 5 gallons per minute and shall have a minimum discharge of 1.7 gallons per minute under pressure of 15 pounds per square inch and a minimum discharge of 2.4 gallons per minute under pressure of 30 pounds per square inch supplied at the head.

757.6 ELECTRICAL MATERIAL:

All equipment and material shall comply with the requirements of the governing code and shall be listed by Underwriters' Laboratories, Inc.

757.6.1 Conduit: Conduit shall be galvanized steel conforming to Section 753.

757.6.2 Conductors: Service line conductors shall be supplied in the size shown on the plans and shall be THW 600 volts insulation rating conforming to ASTM D2219 or D2220. Low voltage control conductors shall be Type UF No. 14 AWG copper unless otherwise shown on the plan and shall be UL approved for direct burial installation.

757.6.3 Controller Unit: The controller unit shall be fully automatic, with provisions for manual operation, sized to accommodate the number of stations or control valves included in the system and designated on the plans or in the special provisions. Outdoor models shall be housed in a vandal-resistant, weatherproof enclosure which has a locking cover.

SECTION 757

The unit shall require a standard 117 volt, 60 cycle input and provide a 26.5 volt, 60 cycle output and shall incorporate a 14-day programming capacity. The unit shall have a “Master On-Off” switch which will deactivate the controller but allow the day and hour clocks to continue operation.

In addition, it shall include a resettable circuit breaker for unit protection.

Each station timing dial shall have an “Omit” or “Off” position and incremental dial settings for timing controls up to 30 minutes.

- End of Section -

SECTION 758

CONCRETE PRESSURE PIPE - STEEL CYLINDER TYPE

758.1 GENERAL:

These specifications apply to Concrete Pressure Pipe intended for use in water supply pipelines that carry water under pressure. Concrete pressure pipe is specified as follows:

(A) Reinforced concrete pressure pipe-steel cylinder type, pretensioned, shall be designed, manufactured and tested in accordance with AWWA C-303. With agreement by the purchaser and the manufacturer, pipe may be manufactured to larger sizes and for higher pressures than indicated herein.

Reinforced concrete pressure pipe may be furnished in pipe diameters of eighteen (18) inches through seventy-two (72) inches.

Pipe shall be designed by the methods described in Appendix A, AWWA C-303 to resist the internal pressures and external loading conditions designated on the approved plans or in the project specifications.

(B) Prestressed concrete pressure pipe steel cylinder type, shall be designed, manufactured and tested in accordance with AWWA C-301 and AWWA C-304.

Prestressed concrete pressure pipe may be furnished in pipe diameters forty-two (42) inches and larger.

Pipe shall be designed by the methods described in AWWA C-304 to resist the internal pressures and external loading conditions designated on the approved plans or in the project specifications.

758.2 MANUFACTURE:

The Contractor shall submit design calculations, a tabulated layout schedule, and details of specials and fittings to the Engineer for review and approval.

When specified in the project specifications, the manufacturer shall furnish all samples, test reports, test specimens and perform tests as provided in AWWA C-303 or AWWA C-301.

An approved rust inhibitor shall be applied on the exposed portions of the steel joint rings.

The Contractor shall submit an affidavit of compliance from the manufacturer that the pipe and fittings furnished comply with all applicable provisions of AWWA C-301 or AWWA C-303.

The Engineer or his representative shall be allowed access to the manufacturer's plant for the purpose of inspecting the pipe and fittings.

- End of Section -

SECTION 759

STEEL PIPE

759.1 GENERAL:

These specifications apply to Steel pipe intended for use in water supply pipelines that carry water under pressure. Steel pipe is specified as follows:

Steel pipe shall be designed, manufactured and tested in accordance with AWWA C-200.

Steel pipe and fittings may be furnished in pipe diameters of six (6) inches and larger.

Pipe shall be designed by the methods described in AWWA C-200 and AWWA Manual M11, to resist the internal pressures and external loading conditions designated on the approved plans or in the project specifications.

Trench excavation, backfilling and compaction shall be in accordance with Section 601 unless otherwise specified in the plans and specifications. For Steel Pipe with a flexible coating the backfill pipe zone material shall consist of Granular Material, maximum 3/4 inch size.

As an option, the backfill in the pipe zone may be Controlled low strength material (CLSM) in accordance with Section 728 and placement per Section 604.

759.2 LINING AND COATING OPTIONS:

(A) Cement mortar lining and cement mortar coating shall be in accordance with AWWA C-205.

(B) Polyurethane coatings for interior and exterior of steel pipe shall be in accordance with AWWA C-222. The MDFT shall be 20 mils. on the interior lining and 25 mils. on the exterior coating.

(C) Polyethylene tape coating shall be in accordance with AWWA C-214. The total thickness of the tape coating shall be minimum 50 mils for pipe up to 54 inches diameter and minimum 80 mils for pipe 54 inches diameter and larger.

(D) Liquid-Epoxy coating systems for the interior and exterior of steel water pipelines shall be in accordance with AWWA C-210. Interior lining will be applied in one or two coats MDFT of 16 mils.

All linings for potable waterlines shall be NSF approved.

759.3 MANUFACTURE:

The contractor shall submit design calculations, a tabulated layout schedule, and details of specials and fittings to the Engineer for review and approval.

When specified in the project specifications, the manufacturer shall furnish all samples, test reports, test specimens and perform tests as provided in AWWA C-200 or AWWA manual M11.

Standard pipe shall be furnished with rolled-groove bell and spigot rubber gasket joints. Restrained joints shall be lap-welded slip joints with the bell formed by cold formed expanded dies.

Unless otherwise specified, fabricated steel pipe shall be manufactured in uniform lengths to fit the pipeline alignment shown on the plans, subject to a maximum length of 40 feet. For Steel Pipe with flexible coatings the pipe length may be 60 foot maximum, subject to the Manufacturer's recommendations. Shorter lengths may be furnished to facilitate special conditions.

The Contractor shall submit an affidavit of compliance from the manufacturer that the pipe and fittings furnished comply with all applicable provisions of AWWA C-200 or AWWA Manual M11.

The Engineer or his representative shall be allowed access to the manufacturer's plant for the purpose of inspecting the pipe and fittings.

- End of Section -

SECTION 760

COATING CORRUGATED METAL PIPE AND ARCHES

760.1 GENERAL:

Corrugated metal pipe, pipe arches, and connectors to be used or furnished under this specification shall be manufactured and inspected in conformance with the requirements of AASHTO M-36, and as hereinafter specified. The size, type, and wall thickness of the pipe to be furnished shall be as specified on the project plans or specifications.

760.2 MATERIALS:

Corrugated metal products covered by this specification shall be plain galvanized conforming to the requirements of AASHTO M-36 as modified herein.

The types of bituminous coated pipe shall be as specified by the standard details or special provisions. In addition to the types listed in AASHTO M-190, there will be Type E.

Type E Pipe - Corrugated Metal Pipe with Smooth Metal Liner: The pipe shall be manufactured as per AASHTO M-36, Type 1A except that the lock seam shall be on the tangent of the helical corrugation. The ends of each pipe shall be reformed with two annular corrugations for joining the pipes with approved band couplers. The minimum thickness of the pipe shell shall be as required to support external load with no credit for load carrying support given to the liner. The minimum thickness for the liner shall be 22 gauge (0.034 inches).

760.3 BASE METAL, SPELTER AND FABRICATION:

The nominal pipe diameter shall meet the tolerances of this specification. Elliptical pipe, when specified, shall be shaped after fabrication and coating have been completed.

Helically Corrugated Metal Pipe: The pipe shall be fabricated from flat sheets in coils. The base metal, spelter coating, method of sampling, accepted brands of metal, sheet manufacturer's certified analysis and guarantee, workmanship, marking, inspection and rejection, shall meet the requirements of AASHTO M-36. Structures furnished shall be either full circle, or pipe-arch in accordance with Table 4 of AASHTO M-36, or other shape as shown on the plans. The pipe dimensions shall conform to AASHTO M-36 in all respects, except that the corrugations shall be helical instead of annular. The thickness of the galvanized metal shall be in accordance with project plans or specifications as otherwise specified. Pipe with helical corrugations shall have a continuous lock or weld seam extending from end to end of each length of pipe. The seams shall be fabricated in such a manner that they will not affect the shape or nominal diameter of the pipe and so that they will not create an element of weakness in the pipe.

Spiral Rib Metal Pipe: The pipe shall be fabricated from flat sheets in coils. The base metal, spelter coating, method of sampling, accepted brands of metal, inspection and rejection, shall meet the requirements of AASHTO M-36. Structures furnished shall be full circle on sizes of 18 inch and above as shown in Table 4 of AASHTO M-36. The pipe shall be fabricated with helical rectangular ribs projecting outwardly from the pipe wall with a continuous lock seam extending from end to end of each length of pipe. Spiral Rib Pipe shall consist of two rectangular ribs and one half-circle rib equally spaced between seams. Rectangular ribs shall be 3/4 inch wide by 1 inch high. The half-circle rib diameter shall be 1/2 inch and shall be midway between the rectangular ribs. Maximum rectangular rib spacing shall be 11 1/2 inches. The thickness (gage) of the metal shall be in accordance with project plans and/or specifications or as otherwise specified.

760.4 COUPLING BANDS:

Watertight joints shall be fabricated for corrugated metal pipe by the use of galvanized couplers or connecting bands, bituminous coated where required, with each band overlapping by at least 2 inches. Corrugated coupling bands shall be constructed and connected as specified in AASHTO M-36, except as otherwise required herein. The couplers or bands shall be manufactured of material 2 gages lighter than the gage specified for the pipe material, shall have corrugations or dimples to match the pipe corrugations or end treatment or may be flat, and shall be fastened with bolts. Dimpled coupling bands shall be 10 1/2 inches wide for diameters 12 through 60 inches, and 17 inches wide for diameters above 60 through 96 inches. The 10 1/2 wide bands shall have 2 rows of dimples of not less than 7 dimples per row, and the 17 inch wide bands shall have 4 rows of dimples of not less than 7 dimples per row. The dimple arrangements shall be such that a maximum spread can be attained.

The shape of the dimple shall be such that it shall, in general conform to the standard pipe corrugation. The connecting angles for dimpled coupling bands may be riveted as for standard corrugated coupling bands, or may have slotted angles. The bands shall be attached by means of 1/2 inch nominal diameter carriage bolts. Two bolts are required for pipe up to 36 inches in diameter, 3 bolts for 36 through 60 inch diameters and 5 bolts for pipes above 60 inches in diameter. Plain flat coupling bands and spiral rib flange bands shall have the same width and number of bolts as specified above. Flat coupling bands having a single circumferential corrugation rolled in each edge to match a similar corrugation in the end of each pipe may be 10 1/2 inches wide regardless of pipe diameter and shall be fastened with 2 bolts.

When flanges are provided on the pipe ends, the coupling shall be made by interlocking the flanges with a preformed channel band or other band incorporating a locking channel not less than 3/4 inches in width. The depth of the channel shall be not less than 1/2 inch. The channel band shall have a minimum nominal thickness of 0.079 inches.

760.5 PERMISSIBLE VARIATIONS IN DIMENSION:

The internal diameter of 12 through 24 inch pipe shall not vary more than ±1.5 percent from the design diameter. The internal diameter of 27 through 108 inch shall not vary more than ±1 percent or 3/8 inch, whichever is greater from the design diameter.

Type D Pipe: The design diameter of the metal pipe before paving shall be the diameter shown on the plans plus 1/4 inch. The design diameter may vary as above.

- End of Section -

SECTION 761

STRUCTURAL PLATE PIPE, ARCHES, AND PIPE ARCHES

761.1 GENERAL:

Structural plate pipe, arches, and pipe arches shall be of the sizes, gages, and dimensions designated on the plans or in the special provision and as specified herein.

761.2 MATERIALS:

Plates, nuts and bolts shall conform to the specifications of AASHTO M-167.

Galvanized surfaces which are damaged shall be repaired in accordance with the provision in Section 771.

Bituminous coating shall conform to the provisions of AASHTO M-190.

Damaged bituminous coatings shall be repaired by the Contractor at his expense by applying bituminous material conforming to AASHTO M-190.

761.3 IDENTIFICATION:

The gages of structural plates will be identified on the plans in accordance with the following:

Each installation will be designated not only by size, but also by symbol indicating the number and gage of plates required. Thus, (412-18) will be used to designate an installation for 1 plate length composed of 4, 12 gage plates and 1, 8 gage plate, the heaviest to be placed in the invert.

761.4 DISTORTION:

In advance of placing backfill material around circular structural plate pipes, the pipe shall be distorted.

Distortion may be performed either at the fabricating shop or in the field.

If the plates are distorted in the fabricating shop, the plates shall be distorted to provide an increase in the vertical diameter of the pipe, after assembly, of approximately 5 percent for the full length. Plates shall be marked in order to assure that they will be placed in proper position.

If the pipes are distorted in the field the method of distortion shall conform to the details shown on the plans. The vertical diameter shall be increased the approximate percentages listed in the following table, throughout that portion of the pipe between shoulder lines.

Pipes using 1 or 3 gage top and side plates - 1 percent

Pipes using 5 or 7 gage top and side plates - 2 percent

Pipes using 8, 10, or 12 gage top and side plates - 3 percent

Between the shoulder lines and the outer ends of the pipe the distortion may decrease uniformly to zero.

- End of Section -

SECTION 770

STRUCTURAL AND RIVET STEEL, RIVETS, BOLTS, PINS, AND ANCHOR BOLTS

770.1 GENERAL:

All steel, unless otherwise designated on the plans or in the special provisions, shall conform to the requirements of ASTM A36.

Report of Tests: Before fabrication, the Contractor shall furnish to the Engineer a certified mill report in triplicate, for each identifiable melt of steel or iron from which the material is to be fabricated. The report shall include the chemical and physical tests required by the ASTM specifications.

Additional Tests: The Contracting Agency reserves the right to require and to make additional mill and laboratory tests. The number of such additional tests will be limited as follows, except that in the case of failure of the material to comply with the ASTM requirements, more tests will be made:

Structural steel, 1 complete test for each heat or each 10 tons of identifiable stock. Rivets, 1 complete test for each size. Bolts, 1 complete test for each lot.

Identifiable stock is material for which authentic records of the chemical and physical properties are available.

Test specimens shall be furnished, cut, and machined in accordance with the ASTM specification, for the material to be tested, as referred to herein. Test specimens shall be furnished and machined by the Contractor at no additional cost to the Contracting Agency.

Mill Tolerances: Rolling and cutting tolerances, permissible variations in weight and dimensions, defects and imperfections shall not exceed the limits for structural steel contained in ASTM A6.

Stock Material: When the Contractor proposes to use material already in stock, he shall notify the Engineer of such intention at least 10 days in advance of beginning fabrication, to permit sampling and testing.

770.2 STRUCTURAL STEEL:

Stock Materials: The Contractor shall select the material he wishes to use from stock. The Contractor shall furnish 3 certified mill reports for each of the heat numbers. Two samples shall be taken by a representative of the Engineer from each heat number, one for the tension test and one for the coldbend test. If the heat numbers cannot be identified, the representative of the Engineer shall select random test specimens from the unidentifiable heats. The number of such test specimens shall be at the discretion of the Engineer. The cost of all tests on stock material shall be borne by the Contractor.

High Strength Low-Alloy Structural Steel: The material shall conform to the requirements of ASTM, A572, A709 or A992, as specified in the special provisions.

General Purpose Structural Steel: Structural steel shall conform to the requirements of ASTM A36 with a minimum of 0.2 percent copper.

770.3 RIVETS:

Stock Material: Rivets taken from identifiable stock shall be accepted by the Engineer in accordance with this specification.

Rivets from unidentifiable stock, for which authentic records of the chemical and physical properties are not available, shall not be used except where shown on the plans or when approved by the Engineer.

High-Strength Structural Rivet Steel: The material shall conform to the requirements of ASTM A502.

Structural Rivet Steel: The material shall conform to the requirements of ASTM A502, except that the test specimen shall be bent upon itself when performing the bend test.

770.4 BOLTS:

Unfinished Bolts: The bolts shall have square heads and square nuts unless otherwise specified. The bolts shall be long enough to extend entirely through the nut but not more than 1/4 inch beyond. Washers shall not be furnished unless specified.

Steel bolts shall conform to the requirements of ASTM A307, except that steel manufactured by the acid Bessemer process shall not be used.

High Strength Bolts: High strength bolts shall conform to the provisions of the specification for the design, fabrication and erection of structural steel for buildings of the AISC.

770.5 ANCHOR BOLTS:

Anchor bolts shall be manufactured from steel conforming to ASTM A36 or A307.

770.6 MILD-STEEL FORGINGS FOR STRUCTURAL PURPOSES:

Steel forgings shall be made from steel of forging quality and shall conform to the requirements of ASTM A668. They shall be Class C forgings with a maximum carbon content of 0.35 percent and shall be given a thorough annealing. The metal shall have a minimum Brinnel hardness number of 130, and a maximum of 190, when tested in accordance with ASTM E10.

- ***End of Section*** -

SECTION 771

GALVANIZING

771.1 GENERAL:

Materials shall be hot-dip galvanized and the weight and uniformity of coating determined in accordance with the standard specifications given in Table 771-1.

TABLE 771-1

GALVANIZING SPECIFICATIONS

Material	ASTM Spec.	Wt. of Coating Oz./Sq. Ft. (Min.)
Corrugated Metal Pipe	A929	1.80
Flat Steel or Iron Sheets	A653, A924	1.25
Iron or Steel Wire	A116	.80
Chain Link Fabric	A392	1.20
Barbed Wire	A121	.50
Steel Pipe - Rails and Posts	A53	1.80
Structural Shapes, Tie Rods, Ornamental Iron Railings, Handrails, Manhole and Catch Basin Steps, and Curb Armor	A123	2.00
Bolts, Nuts, Washers, Anchor Bolts, Packing Spools, Gray Iron and Malleable Iron Castings and Steel Castings	A153	1.25

771.2 WORKMANSHIP:

The galvanizing shall be applied in such a manner that the spelter will not peel off. The finished product shall be free from blisters and excess spelter, and the coating shall be even, smooth, and uniform throughout. Machine work, die work, cutting, punching, bending, welding, drilling, thread cutting and other fabricating shall all be done as far as is practicable before the galvanizing. No member shall be galvanized which is out of alignment. All members (nuts, bolts, washers, etc.) shall be galvanized before a structural unit is assembled. All uncoated spots or damaged coatings due to poor workmanship, rough handling, or any other reason shall be cause for rejection.

771.3 TEST COUPONS:

Test coupons for determining the quality of the galvanizing shall be wired to the materials to be galvanized before immersion in such a manner as to represent the amount of coating deposited on the materials.

771.4 REPAIR OF GALVANIZED SURFACES:

Unless otherwise specified, where galvanized surfaces are field or shop cut, broken, burned or abraded, thus breaking the galvanizing, the locations thus damaged shall be repaired to the satisfaction of the Engineer with zinc dust-zinc oxide coating conforming to AASHTO M-36.

- End of Section -

SECTION 772

CHAIN LINK FENCE

772.1 GENERAL:

All material shall be new and, upon request, the Contractor shall furnish to the Contracting Agency, a certification of inspection stating that the materials have been manufactured, sampled, tested and inspected so as to meet the requirements for its type as specified below.

772.2 POSTS, RAILS AND BRACES:

Posts, rails and braces shall be constructed of pipe in conformance with types A, B or C below. Unless specifically designated by type in the plans or specifications, the Contractor may utilize any of the three types. The posts and rails in this section will cover fencing up to 12 feet in height with post spacing not to exceed 10 feet. The nominal outside dimensions and minimum weights shall be in accordance with Table 772-1. The manufacturer or his representative shall legibly mark each length of pipe by rolling, stamping or stenciling to identify the product by product name, ASTM standard, etc. and the country of manufacture.

Type A: Pipe shall be black steel, welded or seamless, hot-dipped zinc coated, manufactured in conformance to ASTM F1083, plain end, standard weight (schedule 40). The hot-dipped zinc coating (galvanized) shall be applied both inside and outside with not less than 1.8 ozs. per square foot ± 0.1 ozs.

Type B: Steel used in the manufacturing of the pipe shall be hot-rolled strip steel in compliance with ASTM A1011 having a minimum yield strength of 50,000 psi. The pipe will be manufactured by electric welded cold-formed process per ASTM A500. The exterior surface will be triple coated and the interior surface single coated per ASTM F1043. The triple coated external surface shall be hot-dipped zinc coated (galvanized) having a weight of not less than 1.0 ozs. per square foot ±0.1 ozs., followed by a chromate conversion coating, having a weight not less than 1.05 micro ounces per square foot±0.353 micro ounces (30 micrograms per square inch ±15 micrograms) and an acrylic coating having a thickness of 0.0005 inches ± 0.0002 inches. The internal surface shall be coated with a zinc base paint having a 90% zinc powder loading and having a minimum thickness of 0.0005 inches.

Type C: Steel used in the manufacturing of the pipe shall be strip steel in compliance with ASTM A653 Grade D having a minimum yield strength of 50,000 psi. Both sides of the strip shall be hot-dipped zinc coated (galvanized) per ASTM A653 and A-924 having the weight of not less than 1.0 oz. per square inch ± 0.1 oz. The zinc coating will form the first coat of a triple coated external surface and the final coat of the interior surface. The pipe will be manufactured by electric welded cold formed process per ASTM A789. After manufacturing, the final two external coatings shall be a chromate conversion having a weight of not less than 1.05 micro ounces per square inch ± 0.353 micro ounces and an acrylic coating having a thickness of 0.0005 inches ± 0.0002 inches.

772.3 CHAIN LINK FABRIC:

Chain link fabric shall conform to the requirements of ASTM A392 (Zinc-Coated) or ASTM A491(Aluminum-Coated). The coating process must leave the fabric completely free of barbs, icicles, or other projections which might be hazardous. The wire used in the manufacture of the fabric shall be 11 gage for all fence 60 inches or less in height and shall be 9 gage for all fence over 60 inches in height unless otherwise specified.

All chain link fabric shall be woven into approximately 2 inch mesh. Fabric less than 60 inches wide shall have knuckled finish on the top edge, and twisted and barbed finish on the bottom edge. Fabric 60 inches or greater in width shall have twisted and barbed finish on both edges. Barbing shall be done by cutting the wire on the bias.

772.4 TENSION WIRES AND FABRIC TIES:

Tension wires shall be at least 7 gage galvanized coil spring steel wire per ASTM A824. Ties used to fasten the fabric to posts, rails, and gate frames shall be not smaller than 11 gage galvanized steel, 6 gage aluminum wire, or approved non-corrosive metal bands.

Tension bars used in fastening fabric to end and corner posts and gate frames shall be galvanized high carbon steel bars not smaller than 3/16 inch x 3/4 inch.

TABLE 772-1 FENCE MEMBER SIZES & WEIGHTS					
USE	**FENCE HEIGHT (Feet)**	**NPS DESIGNATOR**	**OUTSIDE DIAMETER (Inches)**	**WEIGHT (Lb/Lf Minimum)**	
				TYPE A Schedule 40	**TYPE B and C**
FENCE POSTS					
End, corner, slope, pull and strain posts	Less than 6	2	2.375	3.65	3.12
	6 and over but less than 9	2 1/2	2.875	5.79	4.64
	9 and over but not over 12	3 1/2	4.000	9.11	6.56
Line posts	less than 6	1 1/2	1.900	2.72	2.28
	6 and over but less than 9	2	2.375	3.65	3.12
	9 and over but not over 12	21/2	2.875	5.79	4.64
GATE POSTS					
Single swing gates 6 feet or less in width or double swing gates 12 feet or less	less than 6	2	2.375	3.65	3.12
	6 and over but not over 12	3 1/2	4.000	9.11	6.56
Single swing gates over 6 feet but not over 13 feet in width or double swing gates over 12 feet but not over 26 feet in width	—	3 1/2	4.000	9.11	6.56
Single swing gates over 13 feet but not over 18 feet in width of double swing gates over 26 feet but not over 36 feet in width	—	6	6.625	18.97	—
Single swing gates over 18 feet in width or double swing gates over 36 feet in width	—	8	8.625	28.55	—
OTHER MEMBERS					
Top rail and braces	—	1 1/4	1.666	2.27	1.84
Frame for gates	—	1 1/2	1.900	2.72	2.28
Stiffners for gates	—	1 1/4	1.666	2.27	1.84

Notes to Table 772-1:

- All unit weights shall be subject to the standard mill tolerance of ±5 percent.
- Posts shall be fitted with tops designed so as to fit securely over the posts and carry a top rail where specified. They shall have a total length of not less than the depth of the concrete footings, as specified, plus the length required above ground. Where no top rail is required, pipe posts shall be fitted with suitable caps.
- Top rail shall be furnished in random lengths of approximately 20 feet where required.

772.5 TRUSS OR TENSION RODS:

Truss or tension rods used in trussing gate frames and line posts adjacent to end, corner, slope or gate posts shall be adjustable 3/8 inch diameter galvanized steel rod. When used in trussing line posts, adjustment shall be provided by means of galvanized, turnbuckle or other suitable tightening devices.

772.6 FITTINGS:

Fittings shall conform to ASTM F626.

Fittings, hardware, nuts and bolts shall be galvanized.

Couplings to connect the individual lengths of top rail shall be of the outside sleeve type at least 7 inches long. The bore of the sleeves shall be sufficiently true to maintain adjacent lengths of rail in alignment.

Extension arms for barbed wire on pipe posts shall be of 13 gage steel or heavier, single piece construction and a type that can be attached to the tops of the posts. Extension arms shall carry 3 wires at approximately 5 1/2 inch centers in a plane approximately 45 degrees from the vertical, inclined as shown on the plans or as directed by the Engineer.

772.7 BARBED WIRE:

Barbed wire shall be 4 point pattern; composed of 2 strands of 12 1/2 gage galvanized steel wire with barbs spaced 5 inches apart and shall conform to ASTM A121.

- End of Section -

SECTION 775

BRICK AND CONCRETE MASONRY UNITS (BLOCKS)

775.1 BRICK:

Brick shall be whole, sound, and hard burned and shall give a clear ringing sound when struck together. They shall be uniform in quality and shall be culled or sorted before delivery to the work.

775.1.1 Manhole Brick: Agency approval is required prior to using brick within manholes. When approved, brick may be used for maintenance and adjustment of the existing manholes or rings and covers.

Manhole brick shall conform to Table 775-1.

TABLE 775-1

MANHOLE BRICK DIMENSIONS

Brick	Inches Depth	Inches Width	Inches Length
Standard Size	2 1/4	3 1/2	7 1/2
Allowable Variations	±1/8	±1/8	±1/4

The following paragraphs shall be added to the section on visual inspection:

No individual brick shall be rejected unless it shows visual evidence of major cracking. A major crack is defined as one that has at least one complete separation, for a distance of 1 3/4 inches, through the brick in any direction, including any cored area. Such a crack shall be regarded as affecting the serviceability of the brick and shall be rejected and not used in the structure.

Fifty bricks may be sampled at random intervals from any cube for visual inspection. Of the 50 samples, 45 must pass visual inspection for major cracks. Should less than 45 pass, the cube of brick shall be rejected and the brick must not be used in the structure.

775.1.2 Building Brick: Building brick shall conform to the requirements of ASTM C62, grade MW.

775.1.3 Facing Brick: Facing brick shall conform to the requirements of ASTM C216, Grade MW, Type FBS. The size, color, and texture shall be as specified on the plans or as approved by the Engineer.

775.2 CONCRETE MASONRY UNITS:

Unless otherwise noted on the plans or special provisions, concrete masonry units shall conform to ASTM C90, Normal Weight, Type I with a minimum compressive strength of 1900 psi.

The units shall be fully cured and shall have been made not less than 28 days prior to delivery.

The moisture content at the time of delivery shall not exceed 30 percent of the minimum absorption value of the units. The Contractor shall provide any protection he deems necessary to maintain the units in this condition until time of use.

The linear change from saturated to cool oven dry shall not exceed 0.0054 inches per linear foot or 0.045 of 1 percent conducted in accordance with test method in ASTM C426.

The units shall be made with normal weight aggregate conforming to ASTM C33.

The nominal size of the units shall be as indicated on the plans. The overall dimensions for width, height and length shall differ by not more than ±1/8 inch from the specified standard dimensions. Standard dimensions of units are the manufacturer's designated dimensions. Nominal dimensions of units are equal to the standard dimensions plus the thickness of one mortar joint.

No less than 5 samples of the units shall be submitted to the Engineer for approval and to show the full variance of texture and full range of color. Units used in the work shall match the approved samples. These samples may be tested for strength.

SECTION 775

All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or would significantly impair the strength or permanence of the construction. When units are to be used in an exposed setting, the face or faces that are to be exposed shall not show chips or cracks, not otherwise permitted, or other imperfections when viewed from a distance of not less than 6 feet under diffused lighting.

Units that are intended to serve as a base for plaster or stucco shall have a sufficiently rough surface to afford a good bond.

- End of Section -

SECTION 776

MASONRY MORTAR AND GROUT

776.1 GENERAL:

Masonry mortar and grout shall consist of a mixture of cementitious material and aggregate to which sufficient water has been added to bring the resulting mixture to the desired consistency.

Table 776-1 and 776-2 indicates the average compressive strength obtained when the cementitious material, aggregate, and water (the required amount to provide a flow of 110±5 percent) are combined in the proportion shown in Table 776-3 and Table 776-4.

The mortar or grout to be used will be designated by class in the special provisions and the correct proportions of cementitious materials and aggregate will be combined with the minimum amount of water to provide a workable mixture.

Retempering of the mortar or grout will not be a standard practice and the Engineer's approval will be required for any exception.

TABLES 776-1 & 776-2

MASONRY MORTAR AND GROUT COMPRESSIVE STRENGTH

Table 776-1 Masonry Mortar		Table 776-2 Grout	
Type	**Compressive Strength 28 Days (psi)**	**Type**	**Compressive Strength 28 Days (psi)**
A	5500	Fine Grout	2500
B	5000	Coarse Grout	2500
C	4000		
D	3000		
M	2500		
S	1800		

TABLE 776-3

MASONRY MORTAR PROPORTIONS BY VOLUME

Type	Portland Cement	Hydrated Lime	Aggregate ASTM C144
A	1	0	1
B	1	0	1 1/2
C	1	0	2
D	1	0	2 1/2
M	1	1/4	2 1/4 to 3
‘S	1	1/2	2 1/4 to 3

*Masonry cement type S may be substituted for the cementitious material. Prior approval of the Engineer is required.

TABLE 776-4

GROUT FOR REINFORCED MASONRY PROPORTIONS BY VOLUME FOR FIELD BATCHING

Type	Portland Cement	Fine Aggregate (ASTM C404)	Coarse Aggregate (ASTM C404)
Fine Grout	1	2 1/4 to 3	0
Coarse Grout	1	2 1/2	1 to 2

SECTION 776

776.2 PORTLAND CEMENT:

The cement used shall conform with Section 725. For volumetric proportioning an unopened sack of cement weighing 94 pounds shall be considered as having a 1 cubic foot volume.

In proportioning the cement, it shall be measured loose, without shaking or compacting, in measuring devices of known capacity.

776.3 AGGREGATE:

All aggregate shall be approved by the Engineer prior to being utilized on the job.

Fine aggregate (sand) to be used in mortar shall be thoroughly and uniformly washed and shall be entirely free from oil and deleterious substances. The size and grading of fine aggregate shall conform to the applicable requirements of ASTM C144.

Fine or coarse aggregate to be used in masonry grout shall be thoroughly and uniformly washed and shall be entirely free from oil and deleterious substances. The size and grading of fine or coarse aggregate shall conform to the applicable requirements of ASTM C404.

The average value of sand equivalent determined on 3 successive samples shall not be less than 70 when tested in accordance with ASTM D2419. No individual sample shall have a sand equivalent less than 65.

In proportioning the aggregate, it shall be measured damp, loose without shaking or compacting, in measuring devices of known capacity.

776.4 MASONRY CEMENT:

Masonry cement used shall conform to ASTM C91 with the exception that the average compressive strength shall not be less than 2500 psi at 28 days.

776.5 HYDRATED LIME:

Hydrated lime used shall conform to ASTM C207, Type S.

776.6 WATER:

The water used shall conform to Section 725.

776.7 ADMIXTURES:

Admixtures, unless prescribed in the special provisions, will not be used without prior approval of the Engineer.

776.8 TESTS:

776.8.1 Mortar: If in the opinion of the Engineer there is sufficient cause to question the quality of the mortar being utilized, random field test in accordance with ASTM C780 Annex A-1 and A-6 will be performed. For this area, the penetration of the cone penetrometer correlating to a flow of 110± 5 percent is 40± 3 mm.

776.8.2 Grout: If required, tests shall be performed in accordance with Uniform Building Code Standard No. 24-23 Section 24.2301.

- End of Section -

SECTION 778

LUMBER

778.1 GENERAL:

Unless otherwise specified or shown on the plans, all lumber shall be Douglas Fir or graded pine and shall be selected as to grade and shall conform in all particulars to the standard grading and dressing rules of the West Coast Lumber Inspection Bureau.

Plywood shall be not less than 3 ply, manufactured and graded in accordance with the standard grading rules of the APA.

Lumber for uses listed shall not be lower than the following grades:

	Uses	Grade
(A)	Permanent Construction, such as bridges and cluverts.	Select Structural, for beams and stringers; Construction, for balance of structure.
(B)	Minor permanent construction, such as fences, guard rails and posts, pavement headers, bulkheads, retaining structures, etc.	Construction.
(C)	Falsework and studs, and wales for formwork.	Construction, for framing, beams, or timbers.
(D)	Form sheeting for nonshowing surfaces of concrete.	Standard, for boards; shiplap; or any grade of plywood.
(E)	Form sheeting for showing surfaces of ornamental concrete.	C and Better Industrial clear; concrete form grade of plywood; or overlay plywood.
(F)	Form sheeting for curved soffits of bridge & tunnel arches, plastered or unplastered.	Select Merchantable, board; concrete form grade of plywood; or overlay plywood.
(G)	Soffits of beams and girders and slabs between beams and girders; for beam and girder sides, except ornamental concrete; and for headwalls or endwalls of culverts or covered conduits.	Concrete form grade of plywood or overlay plywood.
(H)	Form sheeting for showing surfaces of channel walls or interior surfaces, except floors; for covered conduit and all other showing surfaces not specified above.	Tongue and groove flooring equal to C and Better flat grain; concrete form grade of plywood; or overlay plywood.
(I)	All other lumber.	Construction.

778.2 REDWOOD:

Redwood lumber shall be selected as to grade and shall conform in all particulars to the standard specifications for grades of California Redwood of the California Redwood Association.

Redwood lumber for the uses listed shall not be lower than the following grades:

	Uses	Grade
(A)	Bridges, culverts, and guardrail posts	Dense Structural
(B)	All other Redwood Lumber	Foundation

778.3 GRADE MARKING:

Lumber: Each piece of lumber shall bear an official grade mark which, unless authorized otherwise, shall be the grade mark adopted by one of the following associations:

(A) For Douglas Fir and Pine -The West Coast Lumber Inspection Bureau or other agency approved by the Engineer.

(B) For Redwood -The California Redwood Association.

Plywood: Each sheet of plywood shall bear the official stamp of the APA stating the grading of the sheet.

- ***End of Section*** -

SECTION 779

WOOD PRESERVATIVES

779.1 GENERAL:

This work shall consist of treating lumber, timber, and piling. Lumber, timber, and piling to be treated shall conform to the requirements of the specification of the AWPA and as specified herein.

Where practical, lumber to be treated shall be cut to size and framed, prior to treatment. Proper allowance for shrinkage in the sizes of lumber shall be made by the Contractor where it is necessary to meet definite dimensions shown on the plans.

779.2 OIL TYPE PRESERVATIVE TREATMENT:

Preservatives under this specification shall be creosote, creosote-coal tar solutions, creosote petroleum solutions, or pentachlorphenol in petroleum oils, conforming to AWPA specifications and as specified by the Engineer.

Treatment: The treating operations shall conform to the applicable requirements of the AWPA specifications.

Unless indicated otherwise on the plans or in the special provisions, the amount of preservative to be retained and the treating process to be used for the various types of service shall conform to the appropriate AWPA specification.

Incising: Unless otherwise specified, timber to be treated under this specification that is 3 inches or more in nominal thickness and 4 inches or more in nominal width, shall be incised before treatment as a means of securing penetration of the preservative. If such thickness is less than 4 inches, the material may be incised on the wide faces only; otherwise, all 4 faces shall be incised.

779.3 WATER BORNE SALT PRESERVATIVES TREATMENT:

Preservatives under this specification shall conform to the requirements of AWPA specifications unless otherwise approved in writing by the Engineer, but restricted to the following preservatives:

Chromated Zinc Chloride (CZC)

Tanalith (Wolman Salts)

Ammoniacal Copper Aresnite (Chemonite)

Chromated Zinc Arsenate (Boliden Salt)

Chromated Copper Arsenate (Erdalith)

779.4 FIELD TREATMENT OF CUT SURFACES:

When sawing or drilling is necessary after plant treatment, the cut surfaces shall be thoroughly brushed with 2 coats of the same kind of preservative in conformance with AWPA specification. The maximum protection requirement specified therein shall be met in all instances.

- End of Section -

SECTION 787

GRAY IRON CASTINGS

787.1 GENERAL:

The castings shall be true to pattern in form and dimension and free from pouring faults, spongings, cracks, blowholes, or other defects in locations affecting their strength and value for the service intended. Castings shall be filleted boldly at angles, and the arises shall be sharp and true.

Before the castings are removed from the foundry, they shall be thoroughly cleaned and the parting lines, gates, and risers ground flush.

787.2 TEST SPECIMENS:

Test coupons shall be cast separately of the castings, using a mold as described in ASTM A48. A representative of the Engineer may be present at the time a melt is poured to identify both coupons and castings.

Two test coupons are required for each melt poured. Additional coupons shall be cast for use as replacements or in case a retest is required.

A representative of the Engineer may discard and replace specimens which show obvious lack of continuity of metal or if the machining is defective.

The manufacturer shall machine the tension specimens to the dimension specified for specimen B of ASTM A48, at no additional cost to the Contracting Agency.

When approved by the Engineer transverse tests may be made in lieu of tensile tests, in which case the castings shall meet the requirements of ASTM A48.

787.3 MANHOLE FRAME AND COVER SETS:

Castings shall conform to ASTM A48, Class 30. The bearing surfaces of the frames and covers shall be machined and the cover shall seat firmly onto the frame without rocking.

Covers shall be the types and shall be imprinted as shown on the plans or standard details.

787.4 RAILINGS, RAILING POSTS, AND WHEEL GUARDS:

Castings shall conform to ASTM A48, Class 40.

787.5 ROCKERS, ROCKER PLATE BEARINGS, AND BEARING PLATES FOR BRIDGES:

Castings shall conform to ASTM A48, Class 50.

Castings shall be machined and finished as specified on the plans provided that tool marks on sliding contact surfaces shall run in the direction of plate movement, or in the case of rocker plate bearings, perpendicular to the rocker movement. Tool marks shall be not more than 1/32 inch apart.

787.6 UNCLASSIFIED CASTINGS:

All castings not specifically classified, shall conform to the requirements of ASTM A48, Class 30.

- End of Section -

SECTION 790

PAINT

790.1 GENERAL:

Paint shall be homogeneous, free of contaminants, and of a consistency suitable for the intended use. Finished paint shall be well-ground and the pigment shall be properly dispersed in the vehicle according to the requirements of the paint; and this dispersion shall be of such nature that the pigment does not settle appreciably, does not cake or thicken in the container, or become granular or curdled. Paint and paint materials shall be delivered to the job site in new, unopened air-tight containers appropriately identified with the manufacturer's name, date of manufacture, type of paint or paint material, specifications paint number, and lot or batch number. The container shall have a formula label.

No paint shall be used until at least 7 days have elapsed from the date of manufacture. Paint containing lead shall comply with Subsection 107.5.2.

790.2 PROPRIETARY BRANDS:

For the purpose of this specification, proprietary brands of paint and paint materials shall be construed to mean paint or paint materials conforming to the requirements of this specification and produced for distribution and consumption through regular wholesale and retail outlets. Whenever paint or paint materials are designated on the plans or special provision by a manufacturer's name or catalog reference, any proprietary brand of equal quality will be permitted, subject to the approval of the Engineer. Information required by the Engineer as proof of the comparative quality shall be furnished by the Contractor.

790.3 PAINT COATS:

The first coat of paint applied to an unpainted surface shall be called the prime coat. The paint applied to field connections, welds, rivets, and all damaged or defectively painted or rusty areas on a prime coated surface shall be called a touch-up coat. The paint applied over the prime coat and touch-up coat shall be called the second coat. The final coat of paint shall be called the finish coat.

790.4 MATERIALS:

Materials shall conform in all respects to the requirements of references specifications indicated for such material.

Upon request of the Engineer, the Contractor shall furnish a certification from the manufacturer that the material conforms with this specification.

	Vehicles:	**Specification:**
	Raw Linseed Oil	ASTM D234
	Boiled Linseed Oil	ASTM D260
	Water-Resistant Spar Varnish	Navy Department Specification 52V20
	Alkyd Resin	TT-R-266C
	Driers	ASTM D600, Class A or Class B, as applicable
	Thinners:	
	Xylene	TT-X-916B, Grade A
	Turpentine (shall be used in paints used for timber)	ASTM D13, Gum Spirits
	Petroleum Spirits (Mineral Spirits)	ASTM D235

	Pigments	**Specifications:**
	Carbonblack	TT-P-343 Form 1, Class B
	Lampblack	ASTM D209
	Red Lead	ASTM D83
	Titanium Dioxide, Non-extended	ASTM D476, Type II, Class II
	Titanium Dioxide, Extended (Titanium Calcium, Rutile)	ASTM D476
	Titanium Dioxide	TT-P-422B, Type III, Class A

White Lead Basic Carbonate	ASTM D81
Zinc Yellow (Zinc Chromate)	ASTM D478, Type II
Zinc Oxide	ASTM D79
Iron Blue	TT-P-385
Iron Oxide, Yellow	TT-P-458A
Iron Oxide, Orange	ASTM D3721, D3722, D3724
Hansa Yellow G	MIL-H-10330
Organic Green Gold	Dupont YT 562-D or equal, specific gravity 161 ±0.05
Chromium Oxide, Green Graphite	TT-P-347

Graphite shall be natural amorphous material (American product) which shall contain not less than 35 percent nor more than 45 percent graphite carbon. The remainder shall be insoluble siliceous material containing a total of not more than 5 percent calcium and magnesium carbonate and sulfate. The pigment shall be ground to such a fineness that not less than 97 percent shall pass a No. 325 sieve. The graphite paste shall be made by grinding the pigment in pure raw linseed oil in the following proportions:

Amphorus Graphite ..... 68.0 percent
Linseed Oil ..... 32.0 percent

(C)	**Inert Materials:**	**Specifications:**
	Diatomaceous Silica	ASTM D604, Type A
	Magnesium Silicate	ASTM D605

790.5 MIXED PAINTS:

All mixed paints shall, in general, be machine-mixed and shall consist of the pigment of the required fineness and composition, ground to the desired paste consistency in pure raw or boiled linseed oil, to which shall be added the remainder of the vehicle to make paint conforming to the required formula as herein specified.

Paint which has hardened and thickened in the container such that it cannot be readily broken up to a smooth uniform paint of good brushing consistency shall not be used.

All materials used in mixed paints shall conform to the requirements as herein specified. The paint shall be made to satisfactory workable consistency conforming to one of the following formulas for paint as required on the plans or in the special provisions. All percentages shown are by weight.

Any of the following paints which are too thick to have a satisfactory workable consistency shall be thinned with a suitable thinner from the group of thinners herein specified. In no case shall gasoline be used as a thinner.

Fineness of grind for enamel shall conform to Hegman 7 minimum.

The following paints shall conform to the latest ADOT standard specifications for Road and Bridge Construction. All paints, except Paint No. 10 (Aluminum), shall be shipped ready for use.

When Paint No. 1 is specified, it may be Paint No. 1-A or Paint No. 1-B. Paint No. 1-D shall be used only when specifically designated.

Paint Number	Type
1-A	(Red Lead — Linseed Oil)
1-B	(Red Lead — Alkyd Resin)
1-D	(Zinc Chromate)
4	(Dull Black)
5	(Jet Black)
6	(Black — For Timber Primer Only)
7	(White — For Timber Primer Only)
8	(White)
9	(Light Grey)
10	(Aluminum)
11	(White Enamel)
15	(Zinc)

- ***End of Section*** -

SECTION 792

DUST PALLIATIVE

792.1 GENERAL:

Dust palliatives shall consist of various chemical dust suppressants which work by binding together lighter soil particles.

All materials must meet the environmental requirements of Section 792.3 and must be approved by the Engineer prior to their use.

792.2 TYPE OF MATERIALS AND APPLICATION RATES:

Emulsions shall be miscible with water in all proportions as noted in Table 792-1. The dilution ratio will vary based upon the local soil and weather conditions. The ratios shall be proposed by the Contractor and agreed upon by the Engineer.

The rate of application noted in Table 792-1 shall be for the treatment, method and use specified by the Contracting Agency, or as directed by the Engineer. To compensate for local conditions or changes in soil type, the Contractor may adjust the application rate within the ranges specified.

Products specifically formulated as tackifiers which prevent wind-blown erosion shall not be acceptable as dust palliatives for vehicular traffic, but may be used for their intended purposes.

TABLE 792-1
DUST PALLIATIVE DILUTION RATIOS AND APPLICATION RATES

Product Type	Use/Treatment (1)	Dilution Ratio (2)		Application Rate (3) (gal/sy)
		Range	Typical	
Acrylic Copolymer And Polymers	Topical - Road or parking Lot Topical - Road Shoulder Surface Course (per inch of depth)	20:1 to 4:1 20:1 to 4:1 20:1 to 4:1	9:1 15:1 9:1	0.20 to 0.15 0.16 to 0.12 0.08 to 0.06
Lignin-Based Type (Lignosulfonate)	Topical - Road or parking Lot Topical - Road Shoulder Surface Course (per inch of depth)	1:1 7:1 to 4:1 1:1	1:1 8:1 1:1	0.10 to 0.05 0.05 to 0.03 0.30 to 0.10
Organic Resin	Topical - All Surface Course (per inch of depth)	10:1 to 2:1 2:1 to 1:1	5:1 1:1	0.25 to 0.15 0.15 to 0.10
Petroleum Resin	Topical - Road or parking Lot Topical - Road Shoulder Surface Course (per inch of depth)	4:1 10:1 to 7:1 4:1	4:1 8:1 4:1	0.15 to 0.10 0.15 to 0.07 0.11 to 0.07
Tall Oil Pitch Emulsion	Topical - Road or parking Lot Topical - Road Shoulder Surface Course (per inch of depth)	20:1 to 5:1 20:1 to 3:1 20:1 to 2:1	5:1 3:1 10:1	0.20 to 0.15 0.16 to 0.12 0.08 to 0.06
Other	As approved by the Engineer			

(1) Topical application rates shown are to obtain 1/2 to 1 inch penetration. Higher rates should be used if greater penetration is anticipated.
(2) The dilution ratio (water: product) is variable and shall be appropriate for the local soil and weather conditions, as proposed by the Contractor and agreed upon by the Engineer.
(3) Application rate of undiluted concentrate.

Contractor shall submit proof of conformance in the form of test reports to verify that the dust palliative product proposed for use meets the minimum material requirements specified in this Section. Testing must be specific to the proposed product and not generic to similar type palliative products. Testing shall be performed by independent AASHTO accredited laboratories, and signed and sealed by Professional Engineers registered in the State of Arizona. The Contractor is responsible for any costs associated with the testing of soil and palliative product prior to the application of as specified herein.

(A) Acrylic Copolymer and Polymer Types:

The material shall be a white or clear emulsion that can penetrate, saturate and bond together treated soils to create a hard, dust-free and water resistant surface. The material shall have the following properties in its undiluted state:

Specification Designation	ASTM Test Method	Requirements
Composition	--	Acrylics, acrylates & acetates
pH	E70	4.0 – 9.5
Residue (active solids content), %	D2834	40 min.
Flash Point	D92	None
Absolute Viscosity (Brookfield), cP, 77°F	--	1500 max.
Specific Gravity, 60/60°F	D1298	1.00 – 1.15

(B) Lignin-Based Types:

Lignin-based dust palliative shall be an aqueous lignosulfonates (a residual co-product of wood pulping by the sulfite process in the manufacturer of cellulose products) that dispersed readily in water to yield a stable, brown-colored solution. The material shall have the following properties in its undiluted state:

Specification Designation	ASTM Test Method	Requirements
Absolute Viscosity (Brookfield), cP, 77°	--	<1000
Residue (total solids content), %	D2834	48 min.
Lignin sulfonate content (% of solids)	D2834	60 min.
pH	E70	5.0 - 7.0
Specific Gravity (liquid), 77/60°F	D1298	1.00 min.

(C) Organic Resinous Types:

The material shall be a tan emulsion designed specifically for dust control of unpaved roads, traffic surfaces, and road shoulders that utilize non-petroleum based organic esters and resins combined with other additives to penetrate, bond and coat treated soils. The material shall have the following properties in its undiluted state:

Specification Designation	ASTM Test Method	Requirements
Absolute Viscosity (Brookfield), cP, 77°	--	50 – 200
pH	E70	3.0 - 9.0
Residue (active solids content), %	D2834	45 min.
Flash Point	D92	None
Specific Gravity, 60/60°F	D1298	1.00 min.

(D) Petroleum Resinous Types:

The materials shall be a light yellow petroleum resinous emulsion suitable for use as agglomerate for soil particles. The material shall have the following properties in its undiluted emulsified state:

Specification Designation	ASTM Test Method	Requirements
Kinematic Viscosity, SFS at 77°F	D244	188 min.
pH	E70	4.0 – 7.0
Residue, % wt (1)	D2834	60 min.
Sieve Test, % wt. Retained (2)	D244	0.1 max.
Particle Charge Test	D244	Positive
Flash Point of base product, CO, °F.	D92	400 min.
Specific Gravity, 60/60°F	D1298	1.00 min.

(1) ASTM test modified by heating 50 g of sample to 300 °F until foaming ceases, then cooling immediately and calculation results.
(2) Replace 2% sodium oleate solution with distilled water in test.

The emulsion shall be stable, i.e., should not break when stored in clean closed containers at temperatures between 35°F and 200 °F for a minimum of 3 months. The sequestering agents shall make the preparation stable against hard water, thus permitting dilution of the emulsion with almost all types of water. The emulsion shall be non-corrosive to metal containers. The materials shall penetrate into the soil and not form a skin at the surface or a crusted surface.

(E) Tall Oil Pitch Emulsion:

The material shall be a light brown tree resinous emulsion produced from distilled tall oil and not associated with the use of chlorine-based chemicals to bleach pulp from the production of paper. The product shall be designed specifically for dust control of unpaved roads, traffic surfaces, and road shoulders that can penetrate, saturate and bond together soils to create a hard, dust-free and water repellant surface. The product shall be non-water soluble once cured. The emulsion shall have the following properties in its undiluted state:

Specification Designation	ASTM Test Method	Requirements
pH	E70	2.5 - 9.0
Residue (active solids content), %	D2834	35 min.
Flash Point	D92	None
Specific Gravity, 60/60°F	D1298	0.998 min.

(F) Other Types:

Other types of dust palliative may be approved for use by the Engineer. Test methods, requirements, dilution ratios and application rates shall be as specified by the manufacturer.

792.3 PERFORMANCE STANDARDS AND TEST METHODS:

Product shall be blended at the specified stabilizer content application rate with soil that is either representative of the site soils to be treated or be a local A-7 in accordance with AASHTO M-145 (as determined by the Engineer) and tested in accordance with ASTM D1883. Results of treated soil must show a minimum 25% increase in CBR (California Bearing Ratio) value over the untreated soil for the product to be accepted for either topical dust suppression or soil stabilization.

Testing shall be in accordance with ASTM D1883, as modified herein. Test reporting shall include all the information required by ASTM D1883, Section 10.0 for both treated and untreated CBR samples. In addition, the penetration vs. stress plot for each test shall be included (ASTM D1883, Fig. 2) along with the rate of product application and the percent stabilizer solids. CBR specimens, after molding, shall be left in their mold, on their sides and cured in the laboratory air for 7 days prior to being immersed in water for 96 hours and then tested for CBR. At least three CBR test specimens shall be compacted at the optimum moisture content, both treated and untreated (ASTM D698, method C), with the result reported as the average value. The surcharge weight shall be 10 pounds.

792.4 ENVIRONMENTAL CRITERIA:

Contractor shall submit proof to the Engineer in the form of test reports and certificates to verify that the dust palliative product is in environmental compliance. The Contractor is responsible for any costs associated with the testing of soil and palliative product prior to the application of as specified herein.

Products shall not contain or emit chlorinated fluorocarbons (CFC's or Freon's) and shall not contain or emit volatile organic compounds (VOC's) that exceed Federal, State or Local air quality limitations.

Products and their degradation products shall not be composed of elements, compounds, mixtures or produce runoffs with the characteristics identified under Arizona Revised Statutes 36-2822 of the Arizona Hazardous Waste Management Act, emit or off-gas during placement, use or degradation of any hazardous air pollutant listed under Section 112 of the Federal Clean Air Act [42 U.S.C. § 7412], be a hazardous chemical substance or mixture pursuant to Section 7 of the Federal Toxic Substances Control Act [15 U.S.C.§ 2606], be designated by rule an extremely hazardous chemical substance pursuant to the Arizona Environmental Quality Act, be prohibited for use by the Arizona Department of Environmental Quality, the Environmental Protection Agency, or any applicable law, rule or regulation.

Product runoff and their degradation product runoffs shall not contain concentrations that exceed the parameters designated in Section 2.18 'Table 5' of the National Pollution Discharge Elimination System (NDES) Multi-Sector General Permit for Industrial Activities *(see Note A).* Adequate proof can be shown by providing one of the following:

(A) Complete aquatic toxicity test for lethal concentration at 50% (LC50).

(B) Provide complete and accurate listing of all individual chemical constituents (including proprietary chemical information) and percentage of each in a given volume of pure chemical product.

(C) Surface water runoff test. This test involves running distilled water over a treated soil area, collecting the test water, and submitting to a certified lab for analysis.

Contractor shall obtain from the dust palliative product manufacturer independent verification and certification of performance and environmental claims by a recognized agency of the United States, Canadian Precertification, Environmental Technology Verification, or EcoLogo Certification programs for chemical dust suppressants.

Products or their components and degradation products shall be tested and certified by the manufacturer not to be substances or composed of substances known to be, or reasonably anticipated to be carcinogenic or toxic by the U.S. Department of Health and Human Services.

Products must have hazardous Materials Identification System (HMIS) ratings equal to or less than the following for each category: H=1; F=1; R=1; PPE=X.

- End of Section -

Note A: Parameter benchmark values shall be provided by the Engineer and based on the Contracting Agency's Requirements.

SECTION 795

LANDSCAPE MATERIAL

795.1 GENERAL:

Material used for landscaping purposes shall be in conformance with this Section.

The common and scientific names of plants shall conform to the approved names in Standard Plants Names (SPN) or its successor, American Association of Nurserymen (ASN). For identification and inspection, durable, legible labels, bearing the plant's name in water-resistant ink, shall be attached to all nursery stock or container of stock delivered to the project site.

795.2 TOPSOIL:

Topsoil shall be a fertile, friable soil, obtained from well-drained arable land, and shall be free from nut grass, refuse, roots, heavy clay, clods, noxious weeds or any other material toxic to plant growth. At least 10 days prior to delivery of topsoil to the site, the Contractor shall furnish the Engineer at no additional cost, with a soil sample from each source for analysis and tests.

To be acceptable the pH factor shall not exceed 8.0 or be lower than 5.5, soluble salts shall not exceed 1500 PPM, the plasticity index shall be in the range of 3 and 15 inclusive, and it shall contain approximately 1 1/2%, by dry weight, or organic matter either natural or added. Gradation shall be in accordance with the following:

Sieve Size	**Percent Passing**
1 inch	100
1/2 inch	95-100
No. 4	90-100
No. 10	70-100
No. 200	15-70

795.3 SOIL FERTILIZING MATERIAL:

Fertilizing material shall comply with the applicable requirements of the State Agricultural Code. All fertilizing material shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer's guarantee analysis. It shall not contain toxic ingredients or fillers in quantities harmful to human life, animals or plants. It shall be delivered in unopened containers and shall have the chemical analysis as specified in the plans or specifications. Material which has become caked or otherwise damaged shall not be used.

795.4 ORGANIC SOIL CONDITIONERS:

In general, soil conditioners shall consist of a ground or processed wood product derived from redwood, ground or shredded fir, redwood or ponderosa bark. It shall have a nitrogen content of 1%, a pH not exceeding 7.5, and organic matter not less than 85%. Its gradation shall be such that at least 85% passes the 1/4 inch screen. In addition, it shall be treated with a non-toxic agent so as to be hygroscopic.

When manure is used as a soil conditioner, it shall be the product of yard fed cattle, free of weed seeds, straw or any other inert material and aged at least 3 months. This manure shall have been processed by grinding and screening and shall be of a consistency that will readily spread with a mechanical spreader.

795.5 CHEMICAL SOIL CONDITIONER:

Chemical soil conditioners such as soil sulfur, gypsum or iron additive shall be commercially approved brands designated for agricultural use. Material which has become caked or otherwise damaged shall not be used.

795.6 SEEDS:

Seeds shall be fresh, clean seeds, pre-mixed to the specified proportion. They shall be delivered to the site in original, unopened containers bearing the dealer's guaranteed analysis and germination percentage. They shall have a certificate or a stamp or a release accomplished by an agricultural commission.

795.7 PLANTS, TREES, AND SHRUBS:

795.7.1 General: All landscape stock shall be grown in nurseries approved by the State Department of Agriculture. They shall have a growth habit normal to the specie. Stock shall be sound, healthy, and vigorous; free from insect pests, sun scald, excessive bark abrasions and other objectionable disfigurements. They shall have normal, well-developed branch systems and vigorous, fibrous root systems which are neither root nor pot-bound and are free of kinkled or girdling roots.

All stock shall have been grown in pots, cans, tubs, or boxes for a minimum of three months and a maximum of one year. They shall have sufficient roots to hold earth together after removal from the containers. This earth shall be free from noxious weeds including Bermuda grass.

Stock shall be inspected and approved by the Engineer at the Contractor's storage site prior to delivery to the project.

795.7.2 Flatted Plants: Flatted plants shall be grown and remain in the flats until transported to the project site. The soil and spacing of the plants in the flats shall insure the minimum disturbance of the root system at transplanting.

795.7.3 Trees: Trees shall be of the specified height, spread and caliper and shall stand erect without support. The height shall be measured from the root crown to the last division of the terminal leader with the branches in a normal position and the caliper shall be measured 12 inches above the crown roots. For palm trees only, the height shall be measured from the ground line to the base of the growing bud.

795.7.4 Shrubs: Shrubs shall be of the specified type, height and spread. They shall be selected from high quality, well-shaped nursery stock.

795.8 MISCELLANEOUS MATERIAL:

795.8.1 Headers and Stakes: Lumber for landscaping shall be construction heart, rough-sawn redwood in the sizes specified; splicing will not be permitted. Stake used with header boards shall be 2 x 4 inches, pointed and at least 18 inches long.

795.8.2 Tree Stakes: Unless otherwise specified, tree stakes shall be 2 x 2 inch redwood posts, free of knots and reasonably straight, and of sufficient length to properly support the tree.

795.8.3 Tie Wires: Tie wire shall be No. 12 AWG zinc coated wire and the cover for this wire shall be 1/2 inch garden hose.

795.8.4 Decomposed Granite: All material used for a specific project or location shall be from a single source and shall present a uniform appearance. The gradation shall be as shown below. If a specific color or type is required, it will be so indicated in the Contracting Agency's specifications.

Sieve Size	Percent Passing
3/4 inch	100%
1/2 inch	60-70
No. 40	5-20

- End of Section -

SECTION 796

GEOSYNTHETICS

796.1 GENERAL:

This section defines the requirements for geosynthetic fabrics, grids and membranes typically used as pavement fabric beneath asphalt concrete overlays, filtration/drainage separation between soil/aggregate layers, erosion control filter/separators for riprap protection, and soil or base reinforcement to improve the stability of weak soils or reinforce aggregate bases.

796.2 MATERIALS AND REQUIREMENTS:

Identification, packaging, delivery, storage and handling of geosynthetic materials shall be in accordance with manufacturer's recommendations and ASTM D4873. Each roll shall be labeled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number date of manufacture, and shipping date.

Geosynthetic materials shall be inert to commonly encountered chemicals, resistant to rot and mildew, and shall have no tears or defects which adversely affect or alter its physical properties.

Geosynthetic materials shall be packaged with material that will protect the geosythetic (including ends of rolls) from damage due to shipment, water, sunlight and contaminates. During storage, geosynthetic materials shall be elevated off the ground and protected from the following: site construction damage, precipitation, extended ultraviolet radiation, strong acid or strong base chemicals, flames (including welding sparks), temperatures in excess of 160°F, and any other environmental condition that may damage geosynthetic material property values. Protection shall be in accordance with manufacturer's specifications and shall be maintained during periods of shipment and storage.

Materials required for complete and proper installation of geosynthetic materials that are not specifically described herein (such as pins, nails, washers, etc.) shall conform to the manufacturer's recommendations and be as selected and supplied by Contractor subject to final approval by the Engineer.

Requirements represent minimum average roll values in the weaker principal direction. Average of test results from any sampled roll in a lot shall meet or exceed the minimum values noted herein. Lot sampling shall be in accordance with ASTM D4354.

796.2.1 Pavement: Pavement fabric geosynthetics are non-woven polyester or polypropylene fabrics that are field saturated with an asphalt binder and placed as an interlayer beneath a pavement overlay or between pavement layers. When placed, the fabric becomes an integral part of the roadway section, forming a barrier to water infiltration and absorbing stresses to reduce reflective and fatigue cracking of the new pavement surface layer.

Pavement fabric shall be constructed of at least 95 percent (by weight) nonwoven synthetic fibers of polyester or polypropylene, thermally bonded on one side. The fabric material shall additionally conform to the physical properties shown in Table 796-1.

TABLE 796-1

PAVEMENT GEOSYNTHETIC PROPERTIES

Property	Class A	Class B	Test Method
Weight: oz/yd^2	4.1 min.	4.0 min.	ASTM D3776
Grab tensile strength: lbs.	100 min.	90 min.	ASTM D4632
Elongation at break: %	50 min.	50 min.	ASTM D4632
Melting point: degree F	300 min.	300 min.	ASTM D276
Asphalt retention: gal/yd^2	0.25 min.(1)	0.20 min.	ASTM D6140

(1) May be reduced within street intersections, on steep grades or in other zones where vehicle braking is common, but not less than 0.20 gal/yd^2, when approved by the Engineer.

796.2.2 Filtration (Drainage) and Separation: Filtration and separation fabrics are nonwoven or woven polypropylene or polyester fabrics with specified strength characteristics used as permeable separators to restrain soil or other particles subjected

to hydrodynamic forces while allowing the passage of fluids into or across a geotextile and to prevent inter-migration of adjacent soil layers of vastly different particle sizes and particle distributions.

Filtration and separation fabrics shall be nonwoven or woven fabric consisting only of long chain polymeric filaments such as polypropylene or polyester formed or woven into a stable network such that the filaments retain their relative position to each other. The fabric material shall additionally conform to the physical properties shown in Table 796-2.

TABLE 796-2
FILTRATION & DRAINAGE GEOSYNTHETIC PROPERTIES

Property	Class A (1)	Class B (2)	Test Method
Grab tensile strength: lbs.	180 min.	80 min.	ASTM D4632
Seam strength: lbs.	160 min.	70 min.	ASTM D4632
Puncture strength: lbs.	80 min.	25 min.	ASTM D4833
Trapezoidal tear: lbs	50 min.	25 min.	ASTM D4533
Apparent opening size: US Standard sieve size	>50	>50	ASTM D4751
Ultraviolet Stability: %	50 min.	50 min.	ASTM D4355

(1) Class A - Use where installation stresses are more severe than for Class B application (i.e. very coarse sharp angular aggregate or high compaction requirements).
(2) Class B – Use with smooth graded surface having no sharp angular projections and sharp angular aggregate.

796.2.3 Erosion Control: Erosion control fabrics are used below areas to receive aggregate or riprap slope protection and act as filter/separators to provide sustained permeability while maintaining structural stability.

Erosion control fabrics shall be a woven monofilament fabric or a nonwoven fabric consisting only of long chain polymeric filaments such as polypropylene or polyester formed into a stable network that the filaments retain their relative position to each other. The fabric material shall additionally conform to the physical properties shown in Table 796-3.

TABLE 796-3
EROSION CONTROL GEOSYNTHETIC PROPERTIES

Property	Class A	Class B	Test Method
Grab tensile strength: lbs.	270 min.	200 min.	ASTM D4632
Elongation at break: %	45min., 115 max.	15 min., 115 max.	ASTM D4632
Puncture strength: lbs.	110 min	75 min.	ASTM D4833
Burst strength: psi	430 min.	320 min.	ASTM D3786
Trapezoidal tear: lbs	75 min.	50 min.	ASTM D4533
Permittivity: second^{-1}	0.07 min.	0.07 min.	ARIZ-730 (1)
Apparent opening size: US Standard sieve size	30 – 140	30 - 140	ASTM D4751
Ultraviolet Stability: %	70 min.	70 min.	ASTM D4355

(1) Arizona Department of Transportation test method.

796.2.4 Soil or Base Reinforcement: Geogrid geosynthetic materials are used for improving the stability of weak soils or reinforcing aggregate bases. Geogrids are defined as biaxial or triaxial polymeric grids formed by a regular network of integrally connected polymer tensile elements with apertures of sufficient size to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials to function primarily as reinforcement.

The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. Geogrids shall be integrally formed and deployed as a single layer; comprised of 100 percent polypropylene or high-density polyethylene. Geogrids shall additionally conform to the physical properties shown in Table 796-4.

TABLE 796-4

REINFORCEMENT GEOGRID PROPERTIES

Property	**Type 1**	**Type 2**	**Test Method**
Aperture size: inches	1 min.	1-3/8 min.	ID callipered
Ultimate Tensile Strength: lb/ft	850 min.	1300 min.	ASTM D4945
Flexural Rigidity: Mg-cm	250,000 min.	750,000 min.	ASTM D1388
Tensile Strength @ 2% Strain: lb/ft MD (1)	270 min.	410 min.	ASTM D6637
Tensile Strength @ 2% Strain: lb/ft CMD (2)	380 min.	620 min.	ASTM D6637
Tensile Strength @ 5% Strain: lb/ft MD (1)	550 min.	810 min.	ASTM D6637
Tensile Strength @ 5% Strain: lb/ft CMD (2)	720 min.	1340 min.	ASTM D6637
Junction Efficiency: % Ultimate Tensile Strength	75 min.		GRI-GG2 (3)
Ultraviolet Stability: % Retained Strength	70 min.		ASTM D4355

(1) MD = Test in the machine direction along roll length
(2) CMD = Test in the cross-machine (transverse) direction across roll width
(3) Geosynthetic Research Institute test method

796.3 TEST AND CERTIFICATION REQUIREMENTS:

Certificates of compliance shall be submitted to the engineer upon delivery of material for use on a specified project. Samples of materials shall be submitted for testing. Each geosynthetic material lot or shipment must be approved by the Engineer before the materials may be incorporated in the work.

Testing methods and results shown in the certificate of compliance shall conform to the listed specifications for the proposed geosynthetic use. Manufacturer's supporting documentation including, but not limited to, product information sheets, installation procedures and recommendations, recommended use, and project references shall be submitted to the Engineer for product evaluation and approval.

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