**TECHNICAL SPECIFICATIONS**

**FOR**

**CITY OF TOLLESON**
**PROJECT NO. ENG 17-02**

**91st AVENUE WIDENING IMPROVEMENTS**

**VAN BUREN STREET TO INTERSTATE 10**

**ROADWAY IMPROVEMENTS**


**PROPOSED WORK:**

The proposed work is located in the City of Tolleson within Maricopa County on 91st Avenue from Van Buren Street to Interstate 10. The work consists of removing asphaltic concrete, installing aggregate base course and asphaltic concrete, constructing storm drain, multi-use path, walls, traffic signals, lighting, landscaping, irrigation and other related work.

**Work Within The Contract Documents:** All work mentioned or indicated within the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such construction is to be performed by others.

**Technical Specifications and Plans:** The standard specifications for the City of Tolleson are the Uniform Standard Specifications for Public Works Construction, sponsored and distributed by the Maricopa Association of Governments (MAG), latest edition. Any section or any subsection of any Standard Specification included within these Contract Documents by reference only is understood to be made part of these Contract Documents. The Contractor shall have at least one copy of all referenced standard specifications and details at the job site at all times.

Except as otherwise indicated in these Special Provisions and construction plans, the work shall conform to the latest edition of the following Standard Specifications, Standard Drawings, and the manuals referenced in the project contract documents shall be required for construction of this project, insofar as applicable for any work to be performed within the public right-of-way and within the City jurisdictional limits. The project shall be constructed in conformance with the following standard details and specifications:

U.S. Department of Transportation, Federal Highway Administration Manual on Uniform Traffic Control Devices for Street and Highways, Latest Edition, hereinafter referred to as "MUTCD."

The Uniform Standard Specifications and Details for Public Works Construction, Maricopa Association of Governments, Latest Edition, hereinafter referred to as "MAG Standard Specifications."

The Arizona Department of Transportation (ADOT) Standard Drawings and Specifications.

**City Engineer:** Wherever the term "Engineer" is used herein or on the plan sheets it shall be understood to mean "City Engineer" or "City Representative".

**Pre-Construction Conference:** The Contractor's project superintendent, other key Contractor staff and the City will attend a Pre-construction Conference, conducted by the City to discuss, although not limited to, the following:

A. The scope of the project and the sequence and timing of all operations. Submission of Contractor's construction schedule, traffic control plan, and barricade plan.

B. City and Contractor's respective authority and responsibilities.

C. Notice to proceed date.

D. Scheduling of work and the need to perform certain items at various stages of the project, including safety concerns which may arise because of the proposed work.

E. The general requirements of quality control and testing. It should be clearly understood who will do the testing, what is to be tested, when it is to be tested, and the location and number of tests.

F. Change orders, time extensions, payment requests, and liquidated damages.

**Weekly Site Meetings:** Weekly site meetings will be held by the Contractor once a week at an agreed upon day and time between the City and the Contractor as required. The Contractor will be responsible for taking meeting minutes and issuing meeting minutes prior to the next meeting.

**Construction Schedule:** The Contractor shall submit to the City for approval, its proposed construction schedule at the Pre-construction Conference. The construction schedule shall be in the form of a tabulation, chart, or graph and shall be in sufficient detail to show the chronological relationship of all activities of the project including, but not limited to, estimated starting and completion dates of various activities, submittal of shop drawing to the City for approval, procurement of materials, and scheduling of equipment. The construction schedule shall reflect completion of all work under the contract within the specified construction duration.

If the Contractor desires to make a major change in the method of operations after commencing construction, of if the schedule fails to reflect the actual progress, the Contractor shall submit to the City a revised construction schedule for approval in advance of beginning revised operations.

In addition to the preliminary schedule, the Contractor shall prepare a weekly schedule to show all major elements of the work to be constructed in the next two (2) week period. This schedule shall consist of a neat, easy-to-read, bar graph format and shall be submitted to the City at the weekly progress meetings.

**Material Submittal Package:** Contractor shall submit four (4) Material Submittal Packages containing copies of all samples, shop drawings, catalog cuts, concrete design mix, materials, etc. for review and approval, three of which will be returned, when approved. If the Contractor wishes more copies returned, he may submit more than (4) copies, in which case the extra copies will be returned to the Contractor.

Submittals must show completely all the work to be done, and any error or omission in the construction work because of incomplete or submittals will be corrected by the Contractor at his own expense, even though the work is in place. Unless specifically requested as an exception by the Contractor, and approved by the City Engineer in writing, the approval by the City Engineer of any shop drawings, catalogs, schedule, sample, and related material is limited to compliance with the contract drawings and contract specifications, and such approval by the Engineer will not relieve the Contractor of the responsibility for errors or failure properly to coordinate all elements of the project affected by the submitted material. All submittals shall be clearly identified.

It is the responsibility of the Contractor to present all such submittals to the City Engineer at least two (2) weeks in advance of his need for such approval, and in any event the City will entertain no request for a time extension to the Contract resulting from a delay by the City Engineer in processing such submitted material unless the material is submitted in sufficient time to permit adequate review by the City Engineer commensurate with the complexity of the specific submittal. Submittals transmitted by other than the Contractor will be returned to the Contractor without action of any kind. Submittals will not be returned to subcontractors.

When specified or requested by the City Engineer, the Contractor shall submit a certificate executed by the manufacturer certifying that the materials or equipment to be incorporated in the work comply with the requirements of these specifications.

**Failure to Meet Required Production Rates:** Failure by the Contractor to timely and adequately respond to the Engineer's weekly notice of production requirements shall constitute a material breach of the Contract, whereupon the City may cancel the Contract and pursue any available legal remedy to recover for damages flowing from that breach.

**Quality Control Sampling and Testing:** The Contractor shall be responsible for material sampling and testing to ensure quality control per MAG Standard Specifications and to verify conformance with the Contract Documents. The Contractor shall utilize a certified testing laboratory and submit name and qualifications to the Engineer for approval. The Contractor shall be responsible for all costs related to Quality Control Sampling and Testing. All costs associated with this item shall be included in the Quality Control bid item.

Contractor shall provide Quality Control personnel. The City shall provide Quality Assurance Inspectors. Testing shall be performed as directed by the City or its representative. Should any tests fail, the Contractor shall be responsible for removal and replacement of the failed installed materials at no cost to the City.

A. Material sampling and density testing for subgrade materials shall be per MAG Standard Specifications Sections 301, 310 and 702. Samples and tests shall be performed on each successive lift of material placed or as directed by the Engineer. Each report shall indicate the location from which the sample was taken, the date, the type and source of material tested, test designation and name of person performing the test. All test records shall be submitted to the Engineer within five (5) field days after the test.

B. The frequency of samples taken shall be a minimum of one (1) per day or as determined by the Engineer.

C. The locations of density tests shall be not more than 800 linear feet apart, or as determined by the Engineer. Exact locations of tests may be designated by the Engineer. The Engineer may require density testing to be done by the sand cone method. All costs associated with the sand cone method shall be at the Contractor's expense.

**Pre-Construction Photographs:** The Contractor shall provide pre-construction photographs of the entire work area and adjacent areas in digital format. The pictures shall be taken at an appropriate size and in sufficient detail for comparison with as-built conditions.

**The Contractor shall submit the Pre-Construction Photographs to the City prior to the start of Construction.**

There shall be no separate payment for "Pre-Construction Photographs". All labor, materials and equipment necessary for completion of this item shall be included in the various Unit Prices bid. Any work or materials necessary but not specifically referred to in these items are considered incidental to the item and are include in the Unit Prices.

**Clearing and Grubbing:** Clearing and Grubbing shall be per MAG Standard Specification Section 201 within the Right of Way and Temporary Construction Easements. All costs associated with this section are incidental to the work and there is no separate bid item for this work.

**Sawcutting:** Sawcutting of asphaltic concrete pavement shall be per MAG Standard Specification Section 336.2. All costs associated with AC sawcutting are included in Bid Item Sawcut AC Pavement, Full Depth.

No separate measurement or payment will be made for sawcutting concrete curb, curb and gutter, sidewalk, driveways, etc. All costs associated with concrete sawcutting are incidental to the work and there is no separate bid item for this work.

**Environmental Mitigation Measures:**

- If suspected hazardous materials are encountered during construction, work shall cease at that location and the Engineer will be contacted to arrange for proper assessment, treatment, or disposal of those materials.
- To prevent the introduction of invasive species, wash down all earth-moving and hauling equipment prior to allowing entrance to the construction site.
- To prevent invasive species seeds from leaving the site, inspect all construction equipment and remove all attached plant/vegetation debris prior to allowing equipment to leave the construction site.

**Notifications:** Two weeks prior to the start of work, the Contractor shall notify property owners of the schedule to start construction along their property. A second notice will be issued between 24 and 48 hours prior to the start of construction. These notices shall be provided using hangers to be placed on the front door of each property and the Contractor shall provide a sample of the notifications to the Engineer for review and comment at least 48 hours prior to their distribution.

There shall be no separate payment for this item. Payment shall be made as part of the items in the proposal. All labor, materials and equipment necessary for completion of this item shall be included in the Unit Prices bid. Any work or materials necessary but not specifically referred to in these items are considered incidental to the item and are include in the Unit Prices.

**SECTION 105.6 COOPERATION WITH UTILITIES:**

Delete the section and replace with the following:

**105.6 COOPERATION WITH UTILITIES:**

The Contractor shall perform all requirements as prescribed in ARS 40-360.21 through 32. Contractor shall call AZ 811 for information relative to the location of buried utilities. The number to call is 602-263-1100.

The location of the underground and overhead utilities as shown on the Plans is based on the best available information obtained from utility companies and supplemented by surveying and potholing. The Contractor shall not assume that this represents an exact location of the line. No guarantee is made to the accuracy of the location shown on the Plans. The Contractor shall determine for himself the exact location of all utilities.

The Contractor is responsible for maintaining and supporting all utilities (not identified for relocation or removal) crossing the open trench for the length of the Project. All utilities crossing the open trench shall be protected to the satisfaction of the Utility Owner. Any damage to the existing utilities within the construction area shall be repaired by the Contractor to the satisfaction of the Utility Owner at no additional cost to the City.

**SECTION 105.8 CONSTRUCTION STAKES, LINES AND GRADES:**

Delete the section and replace with the following:

The Contractor shall be responsible for construction staking. As a first element of work, the Contractor shall verify data and datum for geometric layout and basis of bearings. Any discrepancies shall be immediately brought to the attention of the Engineer prior to start of any construction activities included in these construction documents.

The Contractor shall carefully preserve all construction stakes, reference points and other survey points including City of Tolleson control points and benchmarks. In the case of their loss or destruction, the Contractor shall replace them under the supervision of a licensed Arizona Land Surveyor. The replacement of all survey monuments will require that the surveyor reinstalls, certifies and completes the required forms as specified on the City's horizontal and vertical control.

All work under this section shall be performed under the direction of an Arizona registered land surveyor (AZ RLS) familiar with construction staking. The Contractor shall be responsible to provide all survey work including, but not limited to, the establishment of horizontal and vertical controls for the roadway, all construction staking, structures, alignment, and elevation.

The Contractor shall also be responsible to hire an Arizona Land Surveyor to mark the location of the traffic signal poles and foundations.

Offset control hubs with lath indicating horizontal offset to center line and cut or fill to finish grade at center per plan shall be set a sufficient distance from center to establish slope stake control points that will not be disturbed during construction.

Subgrade construction Blue stake hubs shall be set on a cross-section pattern consisting of stakes set at edge of pathway points for horizontal alignment and grade control.

Blue tops shall be set on fifty foot (50') stations, vertical curve low and high point stations or as determined by the Engineer. The Contractor shall give the Engineer at least 72 hours advance notice prior to inspections for sub-grade. The Contractor shall pre-string the sub-grades to achieve ±1/4 inch tolerance between hubs. Longitudinal and cross-slope grades may be checked at the Engineer's discretion.

Any monuments disturbed during construction shall be replaced by the Contractor under the direction of an AZ RLS per MAG Specification 405.

The Contractor will be responsible for the surveying and the recording of as-built field data.

The Contractor shall keep a full size set of drawings on-site and continuously update them to reflect any and all field adjustments, changes, additions and deletions as they occur during the

course of constructing the project. All changes to information shown on the original construction drawings shall be made by striking through the original information with a single line. As-built information shall be shown legibly using red pencil or red ink. All underground utilities shall be referenced to semi-permanent or permanent physical objects. The word “RECORD DRAWING FIELD DATA” with the as-built date shall appear in the lower right area of each sheet.

The “RECORD DRAWING FIELD DATA” redlines shall be made available for inspection by the City’s representative whenever requested during construction and shall be jointly inspected for accuracy and completeness by the Contractor, the City’s representative and consultant prior to each monthly pay application.

The Contractor shall deliver a complete and accurate set of preliminary final as-built field data drawings to the City within thirty (30) calendar days of the date of the City’s final acceptance of the work completed under this contract. Pending City review, if the City Inspector determines that the preliminary final as-builts contain errors and/or omissions the City Inspector will return the as-built to the Contractor for correction. The contractor shall make corrections and return the corrected as-builts to the City Inspector within 10 working days of receipt.

The City will not release any retention or make final contract payment to the Contractor until the Contractor’s as-built drawings have been accepted as accurate and complete by the City.

Payment for construction staking, layout shall be made on a lump sum basis under the item **Construction Survey, Layout, & Record Drawings** in the bid schedule.

***CONSTRUCTION SURVEY, LAYOUT, & RECORD DRAWINGS*** ***LUMP SUM***

## SECTION 109 MEASUREMENTS AND PAYMENTS:

Shall be in accordance with the MAG Standard Specifications, except as set forth in the Bid Schedule and in these specifications, and shall be for work satisfactorily completed.

All pay items relating to the work indicated on the project plans and/or specifications are listed in the Bid Schedule. All necessary costs to complete this project shall be included within these pay items. Any work necessary to complete the project as represented in the plans and/or specifications that is not specifically noted as a pay item in the Bid Schedule shall be considered integral to the project and no separate payment shall be made.

### 109.1 MEASUREMENT OF QUANTITIES:

Add the following:

Unless otherwise specified, walls will be measured horizontally along the front face of the wall.

Unless otherwise specified, fence will be measured in accordance with Section 520.

Unless otherwise specified, gates will be measured per each.

Replace MAG Subsection 109.2 with the following:

### 109.2 SCOPE OF PAYMENT:

### 109.2.1 SCOPE OF PAYMENT:

The “complete-in-place” rate shall include but not necessarily be limited to all labor, material and equipment costs for preparation, installation, construction, modification, alteration or adjustment of the items, which 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 rate shall also include but not necessarily be limited to all costs for indirect charges or overhead, mileage, travel time, subsistence, materials, freight charges for material to Contractor’s facility or project site, equipment rental, consumables, tools, insurance to the levels specified in the Contract Documents or in Section 103.6, CONTRACTOR’S INSURANCE, all applicable taxes, as well as Contractor’s fee and profit. This rate shall further include all site clean-up costs and hauling of construction debris to disposal sites approved by the Engineer.

### 109.2.2 PAYMENT:

Payment will be made for only those items listed in the proposal and will not be made in accordance with the measurement and payment provisions of the Uniform Standard Specifications where this differs from the items listed in the proposal. All materials and work necessary for completion of this project are included in proposal items. Any work or materials necessary but not specifically referred to in these items are considered incidental to the item and are included in the unit price.

Payments shall be made at the unit price and will not be made for unused materials.

## 109.4 COMPENSATION FOR ALTERATION OF WORK:

Add the following:

A Contract Allowance item is provided for the purpose of encumbering funds to cover the cost of possible change order work. The amount of the allowance items is determined by the City and is not subject to individual bid pricing. All bidders shall incorporate the amount pre-determined in the bid proposal and shall reflect the same in the total amount bid for the project.

This allowance item provides funding to cover unforeseen changes that may be encountered and corresponding extra work needed to complete the contract per plan. Unforeseen extra work, if any, shall be as approved by the City; for example, extension of unit bid prices, negotiated price or time and materials, in accordance with MAG Specifications Sections 108.4 and 109.5.

It shall be understood that this allowance item is an estimate only and is based on change order history of similar projects. It shall not be utilized without an approved contract change order. It is further understood that authorized extra work, if any, shall not exceed the contract allowance unless approved by the City.

All bidders are required to visit the site to examine existing conditions that may affect construction. Bidders shall be familiar with the site specifications and soils report, if any. No allowance shall be granted for Rock Excavation encountered during grading operations. Rock is defined as material which cannot reasonably be excavated with a Cat D9N Dozer equipped with a single shank ripper, or equal. Determination of “reasonably” and/or “equal” rests solely with the City Engineer. If rock is encountered, the Construction Manager shall be immediately notified for the purpose of construction coordination and scheduling.

***ALLOWANCE FOR EXTRA WORK*** ***LUMP SUM***

## 109.10 PAYMENT FOR MOBILIZATION/DEMOBILIZATION:

Add the following:

The City will compensate the Contractor for one time, round trip mobilization/demobilization of the Contractor’s personnel, equipment, supplies and incidentals, establishment of offices, buildings, or 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.

Payment for mobilization/demobilization, measured as provided above, will be made at the contract lump sum price (**L.SUM.**). 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 bid items, exclusive of payments for mobilization/demobilization, equals one-half or the total bid by the Contractor, 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 MAG Section 109, and if the costs applicable to such items of work include mobilization costs, such mobilization costs will be considered as recovered by the Contractor in the lump sum price paid for mobilization, and will be excluded from consideration in determining compensation under MAG Section 109.

The City has not specified areas that may be available for Contractor staging of materials and equipment. The requested staging site(s) shall be submitted to the City for approval before commencing use of site. The site(s) shall be restored to original condition, at the Contractor's expense, after the need has expired. The site(s) shall be inspected by the City and approved before the final payment for mobilization/demobilization.

***MOBILIZATION/DEMOBILIZATION*** ***LUMP SUM***

**SECTION 205 ROADWAY EXCAVATION:**

Add the following:

Earthwork for the project shall include, but not limited to, all clearing, grading, drainage swales, compaction, details, permits and approvals, labor, materials and equipment, in accordance with MAG Section 205, Section 211, and per the project plans.

When backfilling, sufficient amounts of water shall be added to achieve a consistent moisture content of +/- 2% of optimum to achieve required compaction.

**205.2 UNSUITABLE MATERIAL:**

Delete in its entirety and replace with the following:

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.

If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and a combination of percent passing the 200 sieve and plasticity index that would result in a correlated R-value (per ADOT method) of equal to, or better than the 43 value used for the pavement design on this project. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

**205.7 MEASUREMENT:**

Is modified to read:

Roadway Excavation shall not be measured.

**205.8 PAYMENT:**

Is modified to read:

Roadway Excavation shall not be paid separately. All earthwork shall be included in the Subgrade Preparation bid item at the Unit Price bid per “Square Yard” in the proposal and shall include all earthwork related labor, materials and equipment. No direct payment will be made for the removal and disposal of unsuitable material described above, the costs being considered included in other items of work.

It is the Contractor’s responsibility to determine the extent of earthwork to be accomplished, including excavation, borrow, fill construction, shrink / swell, removal, disposal and replacement

of unsuitable material. No additional compensation shall be made for errors or omissions related to the amount of earthwork required.

Refer to Section 109.4 of these Special Provisions for specific exclusions related to “Rock Excavation”. Any work or materials necessary but not specifically referred to in these items are considered incidental to the item and are include in the Unit Prices.

**SECTION 210 BORROW EXCAVATION:**

**210.1 LOCAL BORROW:**

Is modified to include the following:

If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and a combination of percent passing the 200 sieve and plasticity index that would result in a correlated R-value (per ADOT method) of equal to, or better than the 43 value used for the pavement design on this project. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

**210.2 IMPORTED BORROW:**

Is modified to include the following:

If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and a combination of percent passing the 200 sieve and plasticity index that would result in a correlated R-value (per ADOT method) of equal to, or better than the 43 value used for the pavement design on this project. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

**210.4 MEASUREMENT:**

Is modified to read:

Borrow Excavation shall not be measured.

**210.5 PAYMENT:**

Is modified to read:

Borrow Excavation shall not be paid, the costs considered as being included in Bid Item Subgrade Preparation and other related bid items.

**SECTION 211 FILL CONSTRUCTION:**

**211.5 MEASUREMENT:**

Is modified to read:

Fill Construction shall not be measured.

**211.6 PAYMENT:**

Is modified to read:

Fill Construction shall not be paid, the costs considered as being included in Bid Item Subgrade Preparation and other related bid items.

## SECTION 321 PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT:

### 321.1 DESCRIPTION:

Asphalt Concrete pavement shall be constructed in accordance with Section 321 and the project plans. AC mix design and application standards for roadways within the City of Tolleson right-of-way are to be per the requirements of the City and as shown on the plans. All materials shall meet the requirements of MAG Sections 321, 325, 710 and 717. Tack coat between ARAC and AC lifts shall meet the requirements of MAG Sections 321, 329 and 713. Subgrade preparation shall meet the requirements of MAG Section 301. Lime treated subgrade shall meet the requirements of MAG Section 309.

### CONSTRUCTION REQUIREMENTS:

AC paving for the new roadway widening pavement shall consist of the installation of Pavement Section No. 1 (16.5” total thickness), which includes one inch (1”) of ARAC Surface Course, two and half inches (2-1/2”) of Asphalt Concrete (AC) Base Course, MAG C-3/4” Mix (High Volume Traffic), three (3”) of Asphalt Concrete (AC) Base Course, MAG C-3/4” Mix (High Volume Traffic) over four (4) inches of Aggregate Base Course (ABC) and as shown on the plans. That pavement section shall be constructed over 6” of lime treated subgrade.

Crosswalks locations shall consist of the installation of Pavement Section No. 2 (2” total thickness), which includes two inches (2”) of ARAC Surface Course per MAG Sections 325 and 717. Tack coat between the ARAC and existing AC shall meet the requirements of MAG Sections 321, 329 and 713.

Bus bays shall consist of the installation of Pavement Section No. 3 (9” total thickness), which includes nine inches (9”) of PCCP (Class A) per MAG Sections 324 and 725 over compacted subgrade per MAG Section 301.

Stripe obliteration locations of the existing pavement shall consist of the installation of Pavement Section No. 4 (3/8” total thickness), which includes a Microseal, Type II per MAG Sections 331 and 714.

New Curb & Gutter shall be constructed over four inches (4”) of ABC per MAG Section 310 and 702 on six inches (6”) lime treated subgrade per MAG Section 309.

New concrete commercial driveways shall be ten inches (10”) Class A Concrete with Fiber Mesh per MAG Standard Detail 251.

The new concrete multi-use path shall be four inches (4”) Class B Concrete with Fiber Mesh per MAG Standard Detail 230 on four inches (4”) of ABC per MAG Section 310 and 702 over six inches (6”) lime treated subgrade per MAG Section 309.

Contractor is advised to examine existing conditions to insure the appropriate amount of pavement replacement has been included in the bid proposal. No additional compensation shall be made for errors or omissions related to the amount of pavement replacement required.

Contractor will be responsible for submitting Plant Location and mix design to the City Engineer a minimum of two (2) weeks in advance of paving, allowing an opportunity for the City to voice any concern or visit the plant to insure that any quality control issues can be addressed prior to

the placement of any asphalt. No asphalt shall be placed without City approved of asphalt mix designs.

Construction and testing within City of Tolleson right-of-way shall be in accordance with the latest versions of MAG, inclusive of Part 300, Section 321 and any amendments thereto. No asphalt shall be placed that is below the required temperature. No Asphalt shall be accepted that fails density tests. Asphalt finish course shall be free of rock pockets and imperfections. Asphalt shall be free of deleterious material.

Asphaltic Concrete pavement shall be removed and replaced to the satisfaction of the City of Tolleson. In the event that there is excess material or spoils on the site as a result of paving operations, the Contractor is to remove the material within three (3) days of pavement completion.

Contractor will remove the larger asphalt aggregate material when raking the matching edges and in area which requires hand work. The larger asphalt aggregate material shall be removed. The Contractor will not push the larger asphalt aggregate material back out onto the finished asphalt matt.

Reclaimed or recycled material for asphalt pavement shall not be used as material in the asphalt design mix. Only new materials shall be used.

Finished asphalt pavement shall not extend beyond or over the lip of concrete. If asphalt pavement material is place beyond or over the lip of concrete, the Contractor shall remove the asphalt material immediately.

**Pavement Cross Slope**

It shall be the responsibility of the Contractor to take all necessary survey measures in order to meet the required pavement cross slope called out on the plans, and to assure positive surface drainage into the gutter line. The Contractor shall use an “Automatic Slope Controller” during paving operations.

It shall be the responsibility of the Contractor to repair any low/ponding area (bird baths) and/or bumps at his/her own expense by infrared heating the affected areas to heat the asphalt material back up, and add additional asphalt concrete material to a level smooth surface and recompacted the asphalt to correct the drainage issues. Milling and replacing, and skin patching will not be allowed.

**Pavement Surface Drainage Test**

Upon completion of the Paving operations, the Contractor shall test the pavement surface drainage with a water truck. The Contractor shall call for inspection of the pavement surface drainage prior to the application of water to the pavement surface. Water testing is considered incidental to this item and is included in the Unit Price.

**Tack Coat**

Contractor shall apply Tack Coat according to MAG Section 329 or as directed by the Engineer. Tack coat shall be applied to all saw cut or milled asphalt pavement surfaces, faces of concrete for curbs, aprons and valley gutters abutting the new asphalt pavement. Tack Coat shall be

approved prior to paving. Tack Coat is considered incidental to this item and is included in the Unit Price.

**Material Testing**

Contractor shall be responsible for providing an on-site testing agency materials technician at the approved asphalt plant to monitor each day's production of the various asphalt design mixes associated with the project.

**Adjustments**

Contractor shall be responsible all manhole frames and covers, water valve boxes and covers, flushing valve water meter boxes and covers, and survey monuments which require adjustment to finish grade.

Contractor is to mark and maintain all utility locations prior to the preparation of subgrade. The collar around the adjustments and survey monuments shall be set using black integrally colored concrete.

Contractor shall be responsible for the removal of existing asphalting pavement material on manhole, sewer cleanout and water valve covers, including curbs.

**Survey Monuments**

Contractor shall be responsible referencing survey monuments prior to removal and marking (punching) the survey monument caps after installation. Survey monument points shall be punch marked by a Registered Land Survey in the State of Arizona. The work is considered incidental to the item and is included in the Unit Price.

**Cleanup**

Contractor after completion of construction shall clean all construction debris from streets, curbs and driveways. Additionally, any asphalt emulsion tracked onto the existing curbs shall be cleaned using soda stripping. The work is considered incidental to the item and is included in the Unit Price.

**Payment**

Payment shall be made at the Unit Prices bid in the proposal. All labor, materials and equipment necessary for completion of this item shall be included in the Unit Prices bid. Any work or materials necessary but not specifically referred to in these items are considered incidental to the item and are include in the Unit Prices. Any changes to the scope of work for this item shall be submitted for review in the same units as included in the original bid proposal.

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

**340.1 DESCRIPTION:**

Delete the paragraph and replace with the following:

The concrete banding shall be constructed to the dimensions and depths indicated on the plans, details, and standard detail drawings.

**340.3 CONSTRUCTION METHODS:**

The 15th Paragraph of the MAG Uniform Standard Specifications is modified to read:

Gutters having a slope of 0.25 foot per hundred feet or less shall be water tested. Water testing shall consist of establishing flow in the length of the gutter to be tested by supplying water from a hydrant, tank truck or other source. One hour after the supply of water is shut off, the gutter shall be inspected for evidence of ponding or improper shape. In the event water is found ponded in the gutter or on the adjacent asphalt pavement to a depth greater than ½ inch, the defect or defects shall be corrected in a manner acceptable to the Engineer without additional cost to the City.

***12" THICK X 8" DEPTH REINFORCED CONCRETE BANDING AT CROSSWALK PAVERS*** ***LINEAR FEET***

**340.5 MEASUREMENT:**

Delete the second paragraph and replace with the following:

Concrete sidewalks, driveways, alley intersections, valley gutters and aprons will be measured to the nearest square foot complete in place. When concrete sidewalk, driveways, alley intersections, valley gutters, and/or aprons are cut during trenching operations, the square foot measurement for payment will be in accordance with Section 336.

Concrete sidewalk ramps will be measured as each.

***CONCRETE SIDEWALK RAMP, SINGLE (DET P7, DWG PD2)*** ***EACH***
***CONCRETE SIDEWALK RAMP, DUAL (MAG STD DET 237-2)*** ***EACH***
***CONCRETE SIDEWALK RAMP, MID-BLOCK (MAG STD DET 235-4, TYPE D)*** ***EACH***
***CONCRETE SIDEWALK RAMP, MID-BLOCK (MAG STD DET 235-5, TYPE E)*** ***EACH***

**SECTION 342 DECORATIVE PAVEMENT, CONCRETE PAVING STONE OR BRICK:**

**342.2 MATERIALS:**

Add the following:

342.2.7 Paver base course shall be installed with the unit pavers and sand as shown on the project plans and details, and as described herein. Contractor shall seal all pavers with a clear

sealer: ‘Cohill’s 25 High Solid Sealer’ or approved equal as distributed by Cohill’s 602-266-0462, 3825 East Anne Street, Phoenix, AZ 85040.

**CROSSWALK UNIT PAVERS (3 1/8” PAVERS ON SAND W/ CONCRETE BASE)** ***SF***

**PEDESTRIAN PAVERS AT BUS SHELTERS** ***SF***
**(2 3/8” PAVERS ON SAND W/ CONCRETE SLURRY BASE)**

**RAISED MEDIAN PAVERS (2 3/8” PAVERS ON SAND W/ AGGREGATE BASE COURSE)** ***SF***

## SECTION 350 REMOVAL OF EXISTING IMPROVEMENTS:

### 350.1 DESCRIPTION:

Add the following:

This work shall consist of abandoning and decommissioning an existing drywell in accordance with Arizona Department of Environmental Quality (ADEQ) requirements.

Add the following:

### 350.2 CONSTRUCTION REQUIREMENTS:

**Drywell Abandonment**
ADEQ's Drywell Program information can be found at the following website: http://legacy.azdeq.gov/environ/water/permits/drywell.html. The Contractor shall abandon the existing drywell shown on the project plans in accordance with ADEQ's Drywell Decommissioning Guidelines (Revised June 2005), which can be found at the following website: http://legacy.azdeq.gov/environ/water/permits/download/drydecom.pdf.

The Contractor shall submit drywell abandonment shop drawings in accordance with Section 105.2 of the MAG Specifications and these Special Conditions.

**Pavement Removal**
The existing pavement to be removed shall be sawcut at the tie-in location(s) as shown on the plans. Then the existing asphalt shall be milled, salvaged, and then hauled to one of the following stockpile sites or both:

1. City of Tolleson Field Operations Stockpile, 9601 W. Jefferson Street, Tolleson, AZ 85353. Stock pile is located in the southeast corner of the site or as directed by the City Engineer.

2. Wastewater Treatment Plant Stockpile, 9501 W. Pima Street, Tolleson, AZ 85353. Stock pile is located in the southeast corner of the site or as directed by the City Engineer.

### 350.3 MISCELLANEOUS REMOVAL AND OTHER WORK:

Add the following:

The contractor shall remove and salvage existing pedestrian lights, light fixtures, traffic signals and traffic signal equipment as designated on the project plans and in accordance with Section 470.6 Removal and Salvage of Existing Facilities of these Special Provisions.

The contractor shall contact the City at least three working days prior to removing the salvaged equipment to coordinate delivery to the City's Warehouse. The contractor shall be responsible for any damage incurred to the equipment during the removal, salvage and delivery process.

**350.4 PAYMENT:**

Add the following:

Measurement and payment will be made for Abandon Drywell and shall include full compensation for furnishing all labor, materials, tools, equipment, shop drawings, ADEQ fees, permitting approvals, and incidentals complete in place as indicated in the plans and as specified herein.

The accepted quantities of Remove and Salvage Pedestrian Light to COT and Remove and Salvage Light Fixture to COT, will be paid for at the contract unit price each, which price shall be full compensation for the work, complete in place, including transporting and unloading the pedestrian lights and light fixtures, as specified herein and shown on the plans.

| | |
|---|---|
| ***REMOVE TREE, BACKFILL & COMPACT VOID*** | ***EA*** |
| ***MILL 2" AC PAVEMENT*** | ***SY*** |
| ***SAWCUT AC PAVEMENT, FULL DEPTH*** | ***LF*** |
| ***REMOVE AC PAVEMENT, FULL DEPTH*** | ***SY*** |
| ***REMOVE CONCRETE CURB & GUTTER TO NEAREST JOINT*** | ***LF*** |
| ***REMOVE CONCRETE CURB TO NEAREST JOINT*** | ***LF*** |
| ***REMOVE CONCRETE SLAB TO NEAREST JOINT*** | ***SF*** |
| ***REMOVE CONCRETE PAVERS*** | ***SF*** |
| ***REMOVE FIRE HYDRANT*** | ***EA*** |
| ***REMOVE 6" WATER MAIN*** | ***LF*** |
| ***REMOVE BOLLARD, BACKFILL & COMPACT VOID*** | ***EA*** |
| ***RELOCATE ELECTRIC METER*** | ***EA*** |
| ***REMOVE MONUMENT SIGN BACKFILL & COMPACT VOID*** | ***EA*** |
| ***REMOVE CURB STOP, FLUSHING PIPE, & WATER METER BOX*** | ***EA*** |
| ***REMOVE CHAIN LINK FENCE*** | ***LF*** |
| ***REMOVE METAL HANDRAIL*** | ***LF*** |
| ***REMOVE 18" RGRCP STORM DRAIN*** | ***LF*** |
| ***REMOVE 24" RGRCP STORM DRAIN*** | ***LF*** |
| ***REMOVE ABANDONED 6" ACP WATER MAIN*** | ***LF*** |
| ***REMOVE ABANDONED 8" ACP WATER MAIN*** | ***LF*** |
| ***REMOVE ABANDONED 12" SEWER*** | ***LF*** |
| ***ABANDON DRYWELL*** | ***EA*** |
| ***REMOVE HEADWALL*** | ***EA*** |
| ***REMOVE CONCRETE-LINED DITCH*** | ***LF*** |
| ***REMOVE STORM DRAIN MANHOLE*** | ***EA*** |
| ***REMOVE CONCRETE CATCH BASIN*** | ***EA*** |
| ***REMOVE TRAFFIC SIGN ASSEMBLY, POST & FOUNDATION*** | ***EA*** |
| ***OBLITERATE PAVEMENT MARKINGS*** | ***LS*** |
| ***RELOCATE RADAR SPEED SIGN & POST*** | ***EA*** |
| ***REMOVE 2-27" STORM DRAIN CULVERTS*** | ***LF*** |
| ***REMOVE AND SALVAGE PEDESTRIAN LIGHT TO COT*** | ***EA*** |
| ***REMOVE AND SALVAGE LIGHT FIXTURE TO COT*** | ***EA*** |
| ***RELOCATE STREET LIGHT*** | ***EA*** |

**SECTION 401 TRAFFIC CONTROL:**

**401.1 DESCRIPTION:**

Add the following:

Maintenance and protection of traffic shall conform to the applicable paragraphs of Section 401 of the MAG Specifications and these Special Conditions.

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.

**Traffic Control Plans:**

Construction shall not commence or proceed without a City of Tolleson approved Traffic Control Plan (TCP). The Contractor shall submit traffic control plans for review along with the required application form to the City of Tolleson. The TCP shall show placement of all traffic control devices including all conflicting signs to be covered/removed or relocated, or other features that may conflict with the placement of temporary signage. This plan is to be professionally drawn on a 24 inch x 36 inch reproducible medium and shall be submitted to the Engineer at the pre-construction meeting. The City of Tolleson requires three (3) working days (72 hours) for review of all traffic control plans. If the TCP is denied, the City of Tolleson will again require an additional three (3) working days (72 hours) for a re-review. Traffic/Pedestrian control shall comply with the latest editions to the MUTCD (Part 6), City of Phoenix Barricade Manual, MAG Section 401. The contractor will be required to maintain minimum 11' wide traffic lanes during all construction activities unless otherwise directed by the Engineer. At the time of the pre-construction conference, the Contractor shall also submit for review preliminary traffic control plans for advance closure signing. The Contractor shall submit a preliminary traffic control plan at the pre-construction meeting outlining the anticipated traffic control, phasing and anticipated devices that will be used during construction. A final traffic control plan(s) shall be later submitted in accordance with this specification and shall include any review comments provided as a result of the pre-construction meeting. A copy of the accepted TCP shall be on-site at all times during construction and available for review by the City of Tolleson.

If the project is constructed in multiple phases, a separate TCP shall be submitted and approved for each phase.

In order to eliminate the possibility of causing or exacerbating air quality violations resulting from construction activities, any traffic control plans which include temporary traffic detours involving adjacent streets or alternate routes must be approved by the Engineer.

**Air Pollution:**

In the event that the Governor declares an air pollution emergency, pursuant to ARS 49-465.B, which restricts work schedules for all employees of the state and its political subdivisions, the Engineer will direct the Contractor to suspend all work activities until further notice. The Contractor shall discontinue all current work activities as soon as possible, but not later than four hours after notification by the Engineer. The Contractor will be compensated for labor costs incurred through the end of the work shift in which the notification occurs. No payment adjustments will be made for equipment or overhead costs resulting from the suspension of work. An extension of the time

allowable under the contract will be granted. In the event that any local air quality authority declares an air pollution advisory, the cooperation of the Contractor is requested in complying with the actions recommended by the local authority to the maximum extent possible.

**401.2 TRAFFIC CONTROL DEVICES:**

Add the following:

It shall be the Contractor's responsibility to provide, erect, and maintain and remove all necessary signs, barricades, temporary paved travel lanes, barriers, high level warning devices, light, delineators, flagmen and other devices necessary to properly mark and control the construction areas for the safe and efficient movement of traffic. Temporary traffic control warning signs and devices shall be installed prior to the start of any work. The Contractor shall provide other adequate devices or measures deemed necessary by the Engineer. The Contractor shall inspect the traffic control measures at the end of each work shift to ensure that all required traffic control devices are in place. The Contractor shall also remove any unnecessary traffic control devices and remove construction equipment from the roadway at the completion of each work shift to open the roadways to traffic to the maximum extent practical.

All temporary traffic control devices shall be ballasted with sandbags or other approved ballast. Ropes, flagging, fencing and woven plastic tape may be required at open excavations and/or used between barricades and channeling devices to provide additional guidance and security.

All advanced warning construction signs shall be mounted on channels driven into the ground. Advanced warning signs 500 feet prior to the project shall be signed with construction and speed limit signs, mounted on channels driven into the ground and placed at locations where the need for relocation during construction is minimized.

The Contractor shall mount signs on wind resistant, spring-type bases when conditions warrant or as requested by the Engineer.

The Contractor shall use warning lights to mark traffic control devices at night.

The Contractor shall mount Type B high-intensity flashing warning lights on all stop signs within the work zone.

The Contractor shall use an arrow board for all stationary or moving lane closures.

The Contractor is responsible for all costs incurred in replacing all lost or damaged traffic control devices and traffic control warning signs.

The Contractor shall notify the Engineer prior to the removal of any permanent traffic control devices. The Contractor shall remove (without damage) all permanent signs including sign posts that are no longer applicable and deliver them to the City's maintenance yard.

Pavement markings used as an integral part of the Traffic Control Plan shall be kept distinct and visible during their use. Temporary pavement markings shall match and meet the markings in place at both ends of their usage.

The **"SPEED LIMIT 25"** sign shall be posted where the existing pavement has been removed, on traffic lanes that are severely restricted or as directed by the Engineer.

The Contractor shall provide and maintain all necessary temporary traffic control devices as indicted on the City approved TCP. The City of Tolleson will not allow devices that, in their judgment, fall into the “unacceptable” category. Should the City determine that the traffic control devices fall into the “unacceptable” category the contractor shall be immediately informed by the City and take necessary steps to bring the traffic control devices into compliance with the approved TCP. Failure of the contractor to take such action will result in the City issuing a Cease Work Order. The Contractor shall secure the work zone and remove all traffic control devices from the roadway immediately and the contractor could be subject to penalty by the City.

The traffic control devices shall be set in place in accordance with the approved traffic control plan and maintained by a traffic control technician certified by a recognized organization such as ATTSA or IMSA or other organizations recognized by the City of Tolleson.

The Contractor shall provide complete and accurate 24 hour emergency contact information to the City.

The Contractor shall designate an on-site employee during work hours who is ATSSA certified in construction traffic control to monitor and respond immediately to correct traffic control measures as necessary. This individual shall be authorized to receive and carry out requests from the Engineer. Requests and information given by the Engineer to this individual shall be considered as having been given to the Contractor.

The Engineer reserves the right to contact the traffic control subcontractor at any time to provide any materials or services deemed necessary for the safety of the public or workers. The cost of these materials or services shall be considered included in the Traffic Control bid item.

Traffic cones shall be used during daylight hours and shall be a minimum of 711 mm (28”) high. Daylight hours are defined as 1/2 hour after sunrise to 1/2 hour before sunset. All traffic cones shall have retroreflective bands installed as per MUTCD guidelines.

**Variable Message Boards:**

The Contractor shall install advance warning variable message boards. Phased traffic control restrictions requested by the Contractor may require placement of additional variable message boards as required by the City. Final locations shall be as determined by the Engineer. All message boards shall be in place a minimum of seven (7) days prior to the start of traffic control restrictions. The Contractor shall coordinate with the Engineer what message will be displayed on each board. Display message shall be limited to two pages of text.

**401.3 FLAGMEN AND UNIFORMED OFFICERS:**

Add the following:

Flagmen and uniformed officers shall consist of providing sufficient personnel and off-duty law enforcement officers as needed to expedite the safe passage of traffic.

City of Tolleson uniformed off-duty law enforcement officers shall be provided when construction activities occur within 300 feet of a signalized intersection. In the event that city officers are not available, alternative arrangements shall be made by the Contractor to provide a replacement off-duty officer in accordance with these Specifications and as approved by the Engineer.

Requests for City of Tolleson Police Officers must be received at least five (5) working days prior to when they will be needed. All work associated with providing and payment for Off-Duty Police Officers shall follow City of Tolleson guidelines.

The Contractor or its insurance carrier must also submit a certificate of insurance indicating:

a) Liability Insurance
b) A statement (usually written in the “description of operations” box) as follows: Coverage is extended to the assigned officer(s) of the Tolleson Police Department.

If a certificate of insurance prepared as indicated is not received prior to the event, the off duty officer(s) will be cancelled.

Officers shall be knowledgeable of city and state traffic control systems and their manual use. A key for the traffic control cabinet, along with any special instructions, shall be obtained from the City of Tolleson.

Off-duty uniformed police officers are required at all major intersections when restrictions are present and may be required at additional locations and stages of the traffic control as requested by the Engineer.

All persons used as flaggers shall be properly trained and certified by a recognized source prior to their use on the project.

Allowable hours must be directed by the City. Partial payment requests must be supported by timesheets or invoices.

**401.4 TRAFFIC CONTROL MEASURES:**

Add the following:

Construction shall not commence without an approved Traffic Control Plan (TCP). At the time of the pre-construction meeting, the Contractor shall submit preliminary TCPs for each phase of the work for review. The Contractor shall design the TCP using the posted speed limit existing prior to work starting as the design speed. The TCP shall show all striping, signing, barricading and distances for all devices for all movements of roadway users during each phase of construction. The TCP shall also show the duration with the start and end date of each phase. The City will within 10 working days review the plan and notify the Contractor of approval or changes needed.

The Contractor shall appoint a Traffic Control Technician (other than the superintendent/foreman or barricade sub-Contractor), who has been properly trained and IMSA certified in the application of work zone traffic control, to maintain all necessary traffic control devices. At the beginning and end of each workday, and periodically throughout the day, the Traffic Control Technician shall inspect the construction work site. The Traffic Control Technician shall ensure that all construction signs and barricades are standing upright in accordance with the approved TCP, free of dirt and debris and visible to intended traffic. At the end of the workday, all non-essential traffic control devices will be removed. The Contractor shall immediately correct deficiencies noted by the Engineer. The Contractor shall provide an after-hours pager and telephone number for the Traffic Control Technician at the pre-construction meeting.

The Contractor shall provide and maintain all necessary traffic control devices until acceptance of the project by the City.

All flaggers shall be properly trained and certified by a recognized source, such as the International Municipal Signal Association (IMSA) and shall carry proof of training with them at all times.

If the Contractor fails to provide adequate traffic control measures, the Engineer may have the work accomplished by other sources. The cost of having this work accomplished by other sources will be computed in accordance with Section 109.5. The total cost will be deducted from monies due or to become due to the Contractor.

**401.5 GENERAL TRAFFIC REGULATIONS:**

Add the following:

The Contractor shall maintain or relocate all warning signs, **STOP, YIELD** and street name signs. These signs shall be maintained erect, cleaned and in full view of the intended traffic at all times. Portable signs should be used to supplement blocked or removed signs. All unnecessary traffic signs shall be covered or removed and stored.

The City of Tolleson Police Department shall be provided with the name and phone number of the Traffic Control Technician responsible for 24-hour maintenance of all traffic control devices.

A road closure for the convenience of the Contractor can only be accomplished with prior written approval from the City of Tolleson. Traffic restrictions are not permitted on major or collector streets during peak traffic hours of 6:00 a.m. to 8:30 a.m. and 4:00 p.m. to 7:00 p.m.

At signalized intersections, during peak hours, three lanes shall be open on all roads with four or less lanes with a center lane. During off-peak traffic hours, the minimum number of lanes shall be two lanes (one in each direction) on streets with four lanes or less.

For construction that requires movement of traffic from the normal travel lanes, temporary lane diversions may be used only during daylight hours and the normal traffic lanes shall be restored prior to the end of daylight hours. The Engineer, under unusual conditions, may authorize exceptions.

An appropriate regulatory speed limit sign shall be used where traffic is maintained on temporary detour roads, diversions, or on traffic lanes that are severely restricted.

Access to all adjacent properties shall be maintained whenever possible. When access cannot be maintained, Contractor shall notify the adjacent residents and businesses at least 48 hours in advance of the access closure. In no case shall the access be closed for more than four (4) hours. Access to fire stations, hospitals, police stations, and schools shall be maintained at all times. Access to existing bus stop locations shall be maintained in a safe manner or provide alternative bus stop locations as required by the Engineer.

Open excavations and trenches within 10 feet of an active traffic lane shall be protected at night and during non-working days from vehicle traffic by steel plating.

OSHA approved rope, flagging, fencing and woven plastic tape may be used between barricades and channeling devices to provide additional safety.

**Construction Schedule:**

In addition to the schedule requirements contained in Subsection 108.4 “Commencement, Prosecution and Progress” of the Standard Specifications and as modified in these Special Conditions, the Contractor shall provide separate construction progress schedules for each individual construction activity and the required traffic control for those activities. The schedule shall specify the limits of the work activities and related traffic control plan by station or milepost, by day and by time of day.

The schedule and the related traffic control shall be developed in such ways that access or alternative access is maintained at all times to all adjacent residences and businesses. The schedule should be developed in such a manner that it can be released to the public. The schedule shall be updated as necessary.

**Traffic Restrictions:**

The traffic-carrying capacity of the roadways and structures within the limits of the project shall not be reduced without the approval of the Engineer. Restrictions will not be permitted during recognized holidays. If special events will be occurring during construction for the City of Tolleson or the Tolleson Unified School District, the Contractor will be notified two weeks in advance by the Engineer to make adjustments to traffic control to accommodate event traffic.

**Access Requirements and Notification to Property Owners, Businesses, and Public Streets:**

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 having more than one point of access shall not have more than one access restricted for more than 14 calendar days at any given time. Access to adjacent driveways shall be provided during all non-working hours. All business restrictions shall be coordinated with the affected business in writing at least one week prior to imposing restrictions.

**Pedestrians:**

The Contractor shall maintain safe and passable walkways on at least one side of the roadway at all times. The Contractor shall ensure that all sidewalks on this project remain open and safely usable at all times. 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 plywood sheets or temporary asphalt to be installed and removed at no additional cost.

The Contractor must provide and maintain clean, safe and adequate pedestrian walkways and sidewalks that are free of mud, dust, debris and equipment. They must also maintain access to all transit facilities and bus stops by providing temporary BUS STOP signs as needed (if any).

**Schools:**

The Contractor shall maintain adequate signing, safe pedestrian access, school traffic access and school bus access to all schools within the vicinity of the project during all hours the schools are in use. The Contractor shall coordinate all roadway and walkway restrictions with the schools in writing at least one week in advance of instituting the restriction.

**Special Sign Requirements:**

The Contractor shall provide, erect and maintain advance notification, informational and directional access signs (for businesses, churches, hospitals, etc.) that may be required by the Engineer.

**Side Streets:**

All side streets shall remain open at all times, unless otherwise approved by the Engineer.

**401.5 MEASUREMENT:**

Add the following:

Measurement for payment of the uniformed off-duty law enforcement officer will be the actual number of man-hours used. As part of the payment request for Off-Duty Police Officer, the Contractor shall provide the Engineer with copies of all request forms and invoices as backup information showing the actual cost incurred.

Measurement of all remaining traffic control work, as described herein and as required for the Project, will be measured on a lump sum basis.

**401.6 PAYMENT:**

Add the following:

Payment for traffic control shall be made at the contract unit price, lump sum, under the item **Traffic Control** in the Bid Schedule. Price shall be full compensation for the work, including labor, materials, traffic control devices including variable message boards, and miscellaneous incidentals necessary to complete the work. This includes flagging services.

***TRAFFIC CONTROL*** ***LUMP SUM***

Payment for Off-Duty Uniformed Officer shall be made at the contract unit price, per Hour, under the item Off-Duty Uniformed Officer in the Bid Schedule. Price shall be full compensation for the work, including labor and materials.

***OFF-DUTY UNIFORMED OFFICER*** ***HOUR***

Add the following section:

**SECTION 403 SIGNING:**

**403.1 DESCRIPTION OF WORK:**

The work under this section shall consist of furnishing and installing all roadside signs, sign supports, support foundations and object markers as indicated on the plans and constructed in accordance with Section 607, 608 and 703 of the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction 1990 revisions and stored special provisions.

**Removal of Traffic Control Signs:**

The Contractor shall coordinate the removal of existing traffic control signs as designated on the construction plans with the City of Tolleson a minimum of 24 hours in advance**.**

**Installation of Traffic Control Signs:**

The Contractor shall install traffic control signs prior to or simultaneously with the striping of the roadway or intersection. The roadway or intersection shall not be open to traffic until such time as the striping and signage is complete.

**403.2 MEASUREMENT AND PAYMENT:**

Measurement and payment will be made for Permanent Traffic Signs and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals complete in place as indicated in the plans and as specified herein.

***TRAFFIC SIGN PANEL*** ***SQUARE FEET***

Measurement and payment will be made for Perforated Sign Post & Foundation and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals complete in place as indicated in the plans and as specified herein.

***TRAFFIC SIGN POST & FOUNDATION*** ***EACH***

## SECTION 430 LANDSCAPING AND PLANTING:

Landscaping and planting shall conform to Section 430 of the MAG Uniform Standard Specifications except as modified herein.

### 430.1 DESCRIPTION:

Modify the first paragraph to read:

This section shall govern the preparation and planting of landscape areas as depicted and as required in the plans and specifications. All materials and products shall be in accordance with MAG Section 795.

Modify the second paragraph to read:

Existing utilities and improvements not designated for removal or relocation shall be protected in place. Determine the location of underground utilities (call Blue Stake) and perform all work in a manner which will avoid possible damages to the utility. The Contractor shall repair any damages at no additional cost to the City. Hand excavate around utilities as required.

Add the following:

The work under this section shall consist of furnishing all labor, materials, and equipment to install decomposed granite, trees, shrubs, ground covers, palms, boulders, and potted plant materials designated for installation.

### 430.2 GENERAL:

Add the following:

The Contractor shall furnish all labor, materials, equipment, and incidental and appurtenant items of work needed to install the landscape, to the lines and details shown in the plans.

Applicable publications listed below form a part of this specification:

Arizona Nursery Association Growers Committee Recommended Tree Specification (Revised August 2005).
American Standard for Nursery Stock (2004)

The Contractor shall perform all 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.

All planting areas shall be left free of construction debris including but not limited to concrete, grout, re-bar, wood, nails, debris and/or toxic material and graded to a level to permit landscape and irrigation construction. Trenches, foundation backfill or other filled excavations shall be compacted prior to turning the site over to the Landscape Contractor. Compaction of fill areas for planting shall be at 85 percent maximum. No soil preparation or planting shall begin before the site has been cleared and cleaned of debris. The Engineer shall approve the condition of all

planting areas prior to commencement of soil preparation for planting. Commencement of work indicates acceptance of job site conditions by the Contractor.

The Contractor shall cooperate and coordinate with other contractors and trades working in and adjacent to landscape areas.

The Contractor shall maintain stakes set by others until all parties concerned mutually agree upon their removal.

The Contractor shall ship materials with Certificates of Inspection required by governing authorities.

If any of the specified plant material is not obtainable, submit proof of non-availability, together with a proposal for use of equivalent materials, similar in appearance, ultimate height, shape, habit of growth and general soil requirements. The Contractor may make substitutions of a larger size of the same species and variety with the approval by the Engineer and at no additional cost to the City.

Before delivery, submit Certificates of Compliance certifying that materials meet the specified requirements. Submit certified copies of the compliance reports for the following materials:

1. Transporting of landscape plant materials (from the Arizona Department of Agriculture)
2. Soil amendments and conditioners

Certification shall indicate suppliers name, address, telephone number, date of purchase, name, model number and technical description of item purchased, and quantity of each item purchased.

The Engineer reserves the right to take and analyze samples of materials for conformity to the specifications at any time. The Contractor shall furnish the samples upon request. Contractor shall immediately remove rejected materials from the site at the Contractor's expense. The Contractor shall pay for the cost of removing any materials not meeting specifications.

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.

As directed by the Engineer, treat all non-paved areas with a chemical contact herbicide, such as Round Up or approved equal, to kill existing weeds. Clear, grub and remove the weeds from these areas after establishing the weed kill to the satisfaction of the Engineer.

Finished grades for landscape areas shall be a smooth, uniform surface, free of abrupt grade changes or depressions. Finished soil grades adjacent to paving, curbs or headers shall be as shown in the drawings and may be adjusted by the Engineer for surface materials.

During the installation of landscape plantings, keep pavements clean and work areas in a neat and orderly condition on a daily basis. Remove all debris, trash and excess materials generated

by the landscape installation. Sweep, scrub or hose affected areas as directed by the Engineer to maintain a clean and neat work area.

Landscape Contractor shall call for "blue stake" as required. Exercise extreme caution in all planting operations, as there are underground electric and telephone cables, sewer lines and water lines throughout the entire area. Contractor shall study and be familiar with the location of these obstructions and underground utilities. Place plantings where shown on the plans. If there are obstructions or underground utilities, relocate plants clear of any interference at the direction of the City inspector. Landscape Contractor shall repair all damages caused by him to obstructions and underground utilities at no expense to City.

Determine location of underground utilities and perform work in a manner, which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes until removal is mutually agreed upon by all parties concerned. The Contractor shall layout all plant material using stakes or flags to indicate the location of all plant materials. Spacing of shrub and groundcover material shall be as specified in schedule on plans. Determine the location and spacing of trees by the plan scale and locate as accurately as the scale permits. Accomplish preliminary adjustments to conform to actual site conditions acquire the approval of the City Inspector or his authorized representative on the stakeout of all plant material.

Note: Contractor shall not begin planting operations until landscape grading and irrigation system has been installed and is fully operable.

**430.4 Decomposed Granite:**

Delete subsection in its entirety and replace with:

A. Decomposed Granite

1. Decomposed granite shall be native, local, desert, decomposed granite stone at the size and color specified on the plans. The decomposed granite shall be from a single source, free from coating, clay, caliche or organic matter. Contractor shall provide City Inspector with a sample of material for approval before installation. Multiple samples may be required.

2. 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 1-inch diameter and larger. Contractor shall apply one application of pre-emergent herbicide as per manufacturer’s directions prior to installing granite, one application after granite has been installed, compacted and raked level and one application 30 days prior to the end of the maintenance period. The City Inspector is to be notified prior to all pre-emergent applications.

3. Installed granite shall be raked to remove any irregularities. Installation shall provide a two-inch depth of decomposed granite after compacting. Methods of compacting such as rolling, water settling, etc., shall be approved by the City Inspector. Unless otherwise specified in the drawings, granite finish grade shall be one (1) inch below top of curb or adjacent sidewalk surfaces.

4. All disturbed (non-seed) areas shall be treated with a pre-emergent weed spray "Gallery",

or an approved equal. In addition, any existing weeds or Bermuda grass shall be treated with a post-emergent spray, such as “Round-up”, or an 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 where designated by the Engineer from landscape, sand or decomposed granite areas.

**430.4-1 Decomposed Granite 1-Inch Screened and Decomposed Granite to Match Existing Off-site Granite:**

Contractor shall supply and place decomposed granite in areas designated on the plans. Gradation requirements for the Items Decomposed Granite 1” Screened and Decomposed Granite to Match Existing Off-site Granite are as follows:

**Decomposed Granite 1-Inch Screened As Distributed by Granite Express**

| Sieve Size | Percent Passing |
|---|---|
| 6 Inch | 100 |
| 4 Inch | 100 |
| 3 Inch | 100 |
| 2 Inch | 100 |
| 1½ Inch | 100 |
| 1¼ Inch | 100 |
| 1 Inch | 99 |
| ¾ Inch | 99 |
| ½ Inch | 65 |
| ⅜ Inch | 31 |
| ¼ Inch | 6 |
| #4 | 4 |
| #8 | 3 |
| #10 | 2 |
| #16 | 2 |
| #30 | 2 |
| #40 | 2 |
| #50 | 2 |
| #100 | 2 |
| #200 | 1.3 |

**Decomposed Granite to Match Existing Off-Site Granite**

See Plans

Contractor shall provide samples to the City of Tolleson for all granite specified above for approval by City prior to placement.

All disturbed areas shall be treated with a pre-emergent per the plans and details and any active weed growing area with a post-emergent spray, such as “Round-up” or an approved equal. There will be no separate payment for the weed spraying. Bermuda grass or weeds must be completely eradicated where designated by the City of Tolleson from landscape or decomposed granite areas. All weed control products and the City of Tolleson shall approve herbicides for use prior to any applications. Contractor shall submit copies of all manufacture specifications and application rates to the City 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 City of Tolleson for approval. Contractor shall apply two applications of pre-emergent herbicide- the first at the time of granite installation and the second within one week prior to the end on the maintenance period. The contractor shall contact the Engineer prior to herbicide application so that the Engineer can inspect the proper mixing and application of the herbicide. The contractor shall guarantee a weed free condition will exist for a 6 month period following the end of maintenance of the project. Should any weeds occur the contractor shall remove and dispose of all weeds and reapply the pre-emergent herbicide again at no cost to the City. The contractor shall again guarantee a weed free condition for an additional 6 months.

**430.5 Tree, Shrub and Ground Cover Planting**

Add the following:

1. The Contractor shall coordinate pre-approval of plant material and delivery with the City and applicable nurseries as required.

2. Upon delivery to the site, all nursery stock shall be planted as soon as possible. Until planting, plants shall not be exposed to excessive sun or drying winds. Stock, which is not satisfactory in the opinion of the City Inspector, shall be immediately replaced with acceptable stock.

3. The planting of all trees shall be performed during favorable weather conditions, during the season or seasons, which are normal for such work, as determined by acceptable local practice.

4. Planting pits for trees, shrubs, and groundcover shall be excavated per the landscape details but shall not be deeper than the container. Planting pit backfill soil shall be per the landscape details. No additional payment shall be made for removal and disposal of excavated topsoil, as it is considered part of the tree planting unit cost.

5. Tree, shrub, and groundcover plant pits shall be water-settled to a grade sufficient, that in the setting of the plant, the finish grade level after settlement will be the same as that at which the plants were grown (see details in landscape plans). No additional payment shall be made for supply of the backfill soil or amendments, as it is considered part of the tree planting unit cost.

6. Fertilizer and soil conditioner for all plantings shall be mixed in and applied to the planting backfill at the ratios recommended in the geotechnical report. Fertilizer tablets shall be installed in the plant pits as indicated in subsection 430.5.6 of these special provisions.

7. Container Removal: Remove container by turning plant upside down, supporting root ball with hand and tapping container gently to dislodge plant. Support root ball with both hands until planted in pit. Do not injure root ball, or hold plant by the stem.

8. Box Removal: Remove bottom of plant boxes before planting. Remove sides of box without damage to root ball after positioning plant.

9. Set container and boxed stock on undisturbed native soil, plumb, and hold rigidly in center of pit or trench with top of ball at elevation as shown on planting details. When set, place additional soil backfill and fertilizer tablets around base and sides of ball, and work each

layer to settle planting soil backfill to eliminate voids and air pockets. Working in 6-inch lifts of planting backfill mix water settle the area every twelve (12) inches of depth applied around plant thoroughly before placing next two lifts, repeat process until completed.

10. After removal of plants from containers or sides from boxes superficially cut edge-roots with a sharp knife on one side and tease out feeder roots to assure positive contact and embedment into planting soil.

11. After watering, any settlement within basins shall be refilled to required grade with native soil.

12. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by the City Inspector, do not cut tree leaders, and remove only injured or dead branches.

13. Excessively pruned or malformed stock resulting from improper pruning shall be removed from site and replaced at no additional cost to the City.

14. Stake trees as identified on the plans.

15. Any rock or other underground obstructions shall be removed, if possible, to the depth necessary to permit proper planting, according to plans and specifications. If underground construction, obstructions, or rock are encountered in the excavation of planting areas, other locations of the planting may be selected by the Contractor only upon approval of the City Inspector. Prior to any work, the Contractor must be knowledgeable of the locations of all existing underground installations, and their protection is his responsibility. All damage will be corrected at the expense of the Contractor to the satisfaction of the City Inspector. Coordinate all work with other trades so conflicts will not exist or delay the work in any way. Coordinate grades with earthwork and with placement of irrigation systems fixtures.

16. All trees specified for staking shall be staked in line with prevailing winds. Stakes shall be 2-inch round knot-free pine, length as required and installed as follows: Stakes shall be placed immediately adjacent to, but in no case through, the root ball, and penetrate at least 612 inches into undisturbed soil, be aligned vertically, be pointed at one end, and be aligned so as not to interfere with the existing branch structure of the tree, extending 5 to 6 feet above grade. Woven tree tie for fastening trees to stakes shall be stapled to the wood stakes, or otherwise attached to prevent removal of the tree tie. Provide not less than two (2) stakes spaced equally around trees (see tree staking details).

**430.5.5 Ground Cover Areas:**

Delete this entire section and replace with the following:

All ground cover plants shall be planted in accordance with Section 430.5.6.

**430.5.6 Shrub and Tree Pits:**

Is modified to add:

Plant Layout – The Contractor shall stake the location of individual trees, shrubs, accent plants, and ground covers in accordance with the plans for the Engineer to approve. The Contractor shall also make adjustments in the plant locations as directed by the Engineer and plant trees, shrubs, ground covers and accent plants after final grades and plant locations are established and approved by the Engineer.

Delivery - Deliver plants just prior to planting. All packaged materials that will be utilized during the planting operation shall be delivered in containers showing weight, analysis and name of manufacturer. Contractor shall protect materials from deterioration during delivery and while stored on site. Submit certification of contents, quantity and source of all plants and planting materials to the Engineer for approval.

Protection of Plant Materials - If planting is delayed more than 6 hours after delivery, protect the plants from the sun, wind and mechanical damage. Keep roots and root balls moist watering as often as necessary to maintain good health and vigor. Remove and replace all damaged and unhealthy plants as directed by the Engineer. Do not bend or bind any plants in such a manner as to damage bark, break branches or destroy their natural shape. Provide adequate protection for root systems. Do not handle container plants by their foliage, branches or trunks.

Pre-Delivery Inspection of Materials - Prior to 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. The Contractor will pay for travel and expenses to non-local nurseries, out of the metropolitan Phoenix area, when requested by the Contractor. Any plants found to be unsuitable in growth habit or condition, or plants which are not true to the specification, shall be removed immediately from the site and replaced with acceptable plants.

The Contractor shall notify the Engineer at least 48 hours in advance for any inspection of the plant material at the offsite location. Prior to notifying the Engineer, the Contractor shall physically verify that all of the designated plant material meets the specified sizes and conditions.

Construction of Plant Pits and Trenches - Prior to planting, a percolation test shall be performed on all plant pits to determine that adequate drainage exists. Fill the pits half-full with water. Allow the pits 24 hours to drain. If any pit has not substantially drained, a rock caisson shall be installed. Each caisson shall have a 4-foot deep by 8-inch diameter hole filled with 1-1/2-inch diameter crushed stone filled to the bottom of the pit. Increase the depth of the caissons if ground water, caliche, or impervious rock is encountered.

Second paragraph is modified to read as follows:

Plant backfill mix - The planting backfill mix for trees, shrubs, ground covers and accent plants shall be as shown on the plans or specified herein along with compliance with Sub Section 430.5 as listed above. Include 20-10-5 slow release fertilizer tablets at the following rates: 1 gallon - 1 tab, 5 gallon - 2 tabs, 15 gallon – 4 tabs, 24” box – 6 tabs, 30” box – 8 tabs, 36” box – 10 tabs, 48” box – 12 tabs.

Is modified to add:

Provide proper surface drainage within all planted areas. Any grading conditions found in the plans or specifications, in obstructions on the site, or in prior work done by another party that the Contractor feels precludes establishing proper drainage, shall be brought to the attention of the Engineer in writing for resolution.

**430.8 PLANT GUARANTEE AND MAINTENANCE:**

Is modified to add:

1. Contractor shall begin maintenance immediately after the Engineer has accepted entire plantings.

2. Contractor shall maintain landscape work until final acceptance, but in no case less than 90 days after the work has been accepted by the Engineer.

3. NOTE: Instruct City Maintenance personnel in the proper maintenance of landscape work.

4. The Contractor shall furnish all labor, materials, equipment, tools, services, skill, etc., required to maintain the landscape in an attractive condition throughout the contract period. Maintenance of plant materials shall include, but not be limited to, pruning, weed control, fertilizing, irrigation programming, pest control, and landscaped areas debris clean up, per specifications. Maintenance shall be performed a minimum of once a week throughout the maintenance period.

5. Contractor Supervisor shall be responsible for the training and supervision of the maintenance personnel's performance of their duties during the maintenance period.

6. All materials as noted (but not limited to this list) shall conform to the bid specifications:

    a. Pre-emergent
    b. Fertilizer
    c. Plant material
    d. Decomposed granite
    e. Stabilizer

**TREE AND SHRUB CARE**

Maintain trees and shrubs in a healthy, growing condition by performing necessary operations, including the following:

1. Pruning: The Contractor shall prune and shape only as necessary to maintain the usual form of the plant, to stimulate growth, to maintain growth within space limitations, and to maintain a natural appearance.

2. Staking: Stakes are to be inspected weekly and adjusted or removed as necessary.

3. Weed Control: In groundcover area, keep areas between plants free of weeds. Use recommended, legally approved, herbicides whenever possible. Avoid frequent soil cultivation.

**GROUNDCOVER CARE**

Foster attractiveness at all times by following these practices:

1. Decomposed Granite: Landscape granite shall be inspected weekly. Man-made debris shall be removed and weeds and grass controlled with chemicals. Any erosion that has occurred in any granite areas shall be remedied, repaired and granite replaced by the contractor at the contractor's expense.

2. Weed Control: Keep all landscape areas free of broadleaf or grassy weeds, with pre-emergent and/or selective contact herbicides. Cultivating or hoeing weeds is not an allowed practice. Project shall not be accepted until all noxious weeds are eradicated. Treat all planting areas with pre-emergent herbicide prior to granite installation.

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 project acceptance by the Engineer. The Contractor shall provide adequate and experienced personnel to accomplish the maintenance. Maintenance shall include keeping the landscape areas free of debris on a weekly basis, chemical control and hand removal of weeds, fertilization as needed, cultivating the planting areas, and repairing tree stakes. An Arizona pesticide licensed contractor shall perform all chemical control.

All plant material and installation shall be 100 percent guaranteed by the Contractor for an additional 90 Calendar Days following completion of the Plant Establishment Period and the acceptance of the planting areas by the Engineer.

Make replacements of plants within seven (7) days of notification from the Engineer. Remove and replace dead, damaged or vandalized plants within seven days of notification. Replacements shall be of the same kind and size as originally specified and shall be installed as described in the contract documents.

Plants shall be kept in a healthy, growing condition by watering, pruning, spraying, weeding and any other necessary operation of maintenance. Plant beds shall be kept free of weeds, grass and other undesirable vegetation. Plants shall be inspected by the Contractor at least once per week and appropriate maintenance performed. Pruning and re-staking shall be required as needed to remove any plant growth conflicting with vehicular or pedestrian movement.

The Contractor shall maintain the irrigation system as specified in Section 440 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.

The Contractor shall notify the Engineer 48 hours prior to the application of any chemical treatments. Chemical mixing and the use of application equipment shall be done by qualified personnel in the presence of the Engineer. An Arizona pesticide licensed contractor shall perform all chemical control. The Engineer shall approve the personal, materials and methods of application of chemicals prior to beginning the operation.

There shall be no separate measurement and payment for the Plant Guarantee and Maintenance Period. This cost shall be included in landscape bid items for: plant materials and inert

groundcover. Ten percent of each landscape bid item amount in addition to retention will be held for distribution until after the maintenance and establishment period.

**430.9 PLANT ESTABLISHMENT PERIOD:**

Delete the entire section and replace with the following:

The Contractor shall request an inspection by the Engineer when the Contractor believes the landscape work is substantially complete and 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 the Plant Establishment Period. The plant establishment period for trees, shrubs, and ground cover shall be for a period of 90 days, but is subject to extension by the Engineer if the landscape planting is improperly maintained, appreciable plant replacement is required, or other corrective work becomes necessary. This work will be considered incidental to ITEMS 430-1 through 430-11 within this section and no separate payment will be made for the Plant Establishment Period.

Contractor shall apply two application of pre-emergent herbicide- the first at the time of granite installation and the second within one week prior to the end on the maintenance period. The contractor shall contact the Engineer prior to herbicide application so that the Engineer can inspect the proper mixing and application of the herbicide. The contractor shall guarantee a weed free condition will exist for a 6 month period following the end of maintenance of the project. Should any weeds occur the contractor shall remove and dispose of all weeds and reapply the pre-emergent herbicide again at no cost to the City. The contractor shall again guarantee a weed free condition for an additional 6 months.

The contractor shall do a monthly inspection of the landscape and irrigation with the City of Tolleson inspector. All necessary work items noted during the inspection including but not limited to plant replacements, erosion repairs and irrigation repairs shall be completed prior to the following monthly inspection. Should noted repairs not be completed prior to the following monthly inspection, the plant establishment period shall be extended for another month.

Removal and disposal of all trash and other debris is included as a part of the plant establishment work. The trash includes materials generated by the contractor and all other outside sources. Trash shall be removed on a weekly basis, minimum.

At final project acceptance or at the end of the plant establishment period, a final acceptance inspection of the planted areas will be made by the Engineer.

One year plant warranty shall be per MAG Section 430.

**430.10 MEASUREMENT AND PAYMENT:**

Is modified to add:

Payment for the landscape and planting shall be made on the basis of the bid price for each element of work identified on the bid schedule. These unit cost prices shall be full compensation for the system complete and in-place as described herein and on the plans. No additional payment will be made for plant establishment, maintenance, or warranty – the costs being considered incidental to the planting items.

| | |
|---|---|
| ***TREE (36” BOX)*** | ***EACH*** |
| ***SHRUBS AND ACCENTS (5 GAL)*** | ***EACH*** |
| ***SHRUB (1 GAL)*** | ***EACH*** |
| ***LANDSCAPE RESTORATION (AT PRIVATE PROPERTY EDGES) (DG)*** | ***LS*** |
| ***DECOMPOSED GRANITE (1” SCREENED)*** | ***SF*** |

Add the following:

## SECTION 431 EXISTING TREE PROTECTION:

### 431.1 DESCRIPTION:

All existing trees in the project area shall be protected in place unless otherwise indicated. Contractor shall obtain a certified arborist to implement a tree protection plan for protection of existing trees. The tree protection plan shall be submitted by the Contractor for City and Landscape Architect review and approval within 2 weeks of the Pre-Construction Conference. No construction operations shall take place within 50 feet of the tree canopy edge prior to City and Landscape Architect's review and written approval of the Tree Protection Plan.

1. Labor, materials and installation necessary to protect and care for existing trees.
2. Related Work Described Elsewhere:

    a. Section 430 Landscaping and Planting
    b. Section 795 Landscape Material

### 431.2 DEFINITION:

1. Tree Protection Zone – Area surrounding individual trees or groups of trees to remain during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees unless otherwise indicated.

### 431.3 SUBMITTALS:

1. Tree Protection Plan – A written tree protection plan shall be produced for the Contractor by a certified arborist to ensure the protection of the existing trees within the Right-of-Way. The Plan shall outline protective measures to be taken by the Contractor during construction operations to protect the trees and root systems. The tree protection plan shall be submitted by the Contractor for City and Landscape Architect review and approval within 2 weeks of the Pre-Construction Conference. No construction operations shall take place within 50 feet of the tree canopy edge prior to City and Landscape Architect's review and written approval of the Tree Protection Plan.

2. Qualification Data – For tree service firm and arborist.

3. Shop drawing showing proposed temporary irrigation system including timer, controls, heads and other fixtures for approval by Owner's Representative.

4. Certification from arborist certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

5. Maintenance recommendations from arborist for care and protection of trees affected by construction during and after completion of work.

6. Tree Pruning Schedule – Written schedule from certified arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

**431.4 QUALITY ASSURANCE:**

1. Tree Service Firm Qualifications – An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for the project and that will assign an experienced, qualified arborist to the project site during execution of tree protection and trimming.

2. Arborist Qualifications – An arborist certified by International Society of Arboriculture.

**431.5 TREE PROTECTION FENCING:**

1. Fence shall be standard polyethylene construction safety fence (4 feet height) supported by posts driven in the ground, concrete anchors or metal braces.

2. Install continuous tree protection fencing to all trees to remain as staked and approved by arborist or Owner's Representative.

3. Fencing shall remain in place during the progress of work and shall only be removed when heavy construction work (such as paving, structures, earthwork, etc.) is completed and final landscape and irrigation work is started. Submit schedule for removal of fencing to Owner's Representative for approval.

4. No construction activity, including equipment and material storage, shall be allowed within boundaries of tree protection fencing.

**431.6 FERTILIZER/AMENDMENTS:**

1. Fertilizer shall be Osmocote or approved equal, 16-7-12 controlled release fertilizer.

2. Iron chelate (ferrous or ferric) shall be "Tru-green" or approved equal.

**431.7 RE-GRADING:**

1. Grade Lowering – Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

2. Grade Raising – If new finish grade is indicated above existing grade within tree protection zones, the arborist shall submit in writing a proposal for correction to the contractor and Owner's Representative for approval before proceeding with work.

**431.8 CUTTING ROOTS WITHIN THE ROOT ZONE:**

1. Obtain arborist's and Owner's Representative's authorization in writing prior to the start of any work within the tree protection zone. Whenever possible, excavation within the drip line or under foliage canopy of existing trees shall be avoided. Where it is necessary to excavate adjacent to existing trees (within the tree protection zone), the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where it is reasonably anticipated there to be roots two inches and larger in diameter shall be done by hand. All roots two inches and larger in diameter shall be tunneled under and any roots exposed during tunneling shall be covered with wet burlap to prevent damage and excessive dehydration. Roots that are directly in the path of pipe or conduit shall be brought to the attention of the arborist and Owner's Representative for

remediation. Where trenching machinery is operated close to trees having roots small than two inches in diameter, the wall of the trench adjacent to the tree shall have the severed roots trimmed by hand, making clean cuts to the severed root ends. Trenches adjacent to trees should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with wet burlap until the trench is closed. Backfill material for trenches containing severed roots shall be a mixture of one half native soil and one half organic mulch. All burlap used for shading and protection shall be removed from trenches prior to closure.

**431.9 TREE CARE:**

1. Contractor shall be fully responsible for the protection, care and healthy growth of existing trees to remain on site. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, compaction of soil through foot, vehicular traffic, or parking of vehicles within drip line. Provide temporary guard fencing to protect trees and vegetation to be left standing.

2. Contractor shall maintain tree protection zones free of weeds and trash.

3. Contractor shall not allow fires within tree protection zones.

4. The contractor shall provide all care including watering, fertilizing, control of insect infestations and disease, and physical protection until Final Acceptance. Water trees and other vegetation to remain within the Contractor's limits of construction area as indicated on the Drawings as required to maintain their health during course of construction operations.

5. Fertilizers and soil amendments shall be applied within the drip line of all trees (the area covered by the tree's branches) per arborist's instruction and approval from Owner's Representative at manufacturer's recommended rate.

6. Contractor shall provide to arborist and Owner's Representative a signed certification of type of fertilizer/soil amendment applied and rate of application.

**431.10 TEMPORARY IRRIGATION:**

1. Temporary irrigation shall be applied to each tree and shrub within the protection zone as required to maintain healthy plant growth.

2. Irrigation may be delivered by flooding or drip irrigation.

3. Contractor shall be responsible for establishing a water supply for temporary irrigation.

4. Temporary irrigation of all trees shall commence five working days after the Contractor's receipt of the Notice to Proceed, and shall be in operation until the permanent irrigation system is in place and fully operational. The contractor shall remain responsible for effective sustained tree watering until Final Acceptance with or without the use of the permanent irrigation system.

**431.11 TREE PRUNING:**

1. Certified arborist or ISA certified tree worker shall prune trees to remain that are affected by temporary and permanent construction.

2. Branches shall be cut with sharp pruning instruments; do not break or chop.

3. Contractor shall remove pruned tree branches and dispose of off-site.

**431.12 TREE REPAIR AND REPLACEMENT:**

1. Tree damage by construction operations shall be promptly repaired within 24 hours. Treat damaged trunks, limbs and roots according to arborist's written instructions.

2. Contractor shall remove and replace trees indicated to remain that die or are damaged during construction operations that arborist and Owner determine are incapable of restoring to normal growth pattern. Contractor shall provide new trees of same size, caliper, and species as those being replaced, at no additional cost to the Owner. Minimum tree replacement size shall be 48" box. Tree size and specifications shall be per ANA Guidelines.

**431.13 MEASUREMENT AND PAYMENT:**

Measurement and payment for Existing Tree Protection shall be based on a lump sum price and shall be full compensation for furnishing all labor, arborist services, material, tools, and equipment for performing all work necessary to complete Existing Tree Protection as described herein.

***EXISTING TREE PROTECTION*** ***LUMP SUM***

## SECTION 440 SPRINKLER IRRIGATION SYSTEM INSTALLATION:

Sprinkler Irrigation System Installation shall conform to Section 440 of the MAG Uniform Standard Specifications and the City of Tolleson Specifications and details except as modified herein.

### 440.1 DESCRIPTION:

Add the following:

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.

The plans indicate a detailed layout of irrigation lines, laterals, and emitter locations; however, some of the piping may be shown diagrammatically outside of the planting areas for graphic clarity. The contractor shall follow the intent of the plan layout and shall review and obtain written approval from the City's Authorized Representative for any requested changes.

Due to the scale of the drawings, it is not possible to indicate all offsets, fittings and sleeves that 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 irrigation system shall be constructed utilizing existing City of Tolleson water meter, backflow prevention device with enclosure, and controller with 120 volt electrical hook-up, and a new master valve, flow sensors, drip remote control valves, piping, fittings, emitters, wiring, and other components, of sizes and types as shown on the drawings and as called for in these specifications. The system shall be constructed to grades and conform to areas and locations as shown on the drawings.

The project scope involves the installation of new irrigation system components along with existing water meter, backflow prevention device with enclosure, and controller in landscape areas within the City rights-of-way. The new irrigation components shall be installed to City of Tolleson standards. The City of Tolleson will operate and maintain the completed irrigation system. Repair or modification to existing irrigation system components may be required. Contractor shall coordinate and obtain City Engineer's approval prior beginning any irrigation construction work.

### 440.2 GENERAL:

Add the following:

Conform to MAG Section 440, 757 and 610 and as further modified herein.

If quantities are furnished either in specifications or on drawings, quantities are furnished for information only. It is Contractor's responsibility to determine actual quantities of material, equipment, and supplies required by the project and to complete independent estimate of quantities and wastage.

Provide work and materials in accordance with latest edition of National Electric Code, Uniform Plumbing Code as published by the International Association of Plumbing and Mechanical Officials, and applicable laws, regulations and codes of governing authorities.

All irrigation equipment and materials shall be supplied by the manufacturers as indicated on the plans, details and specifications. If no manufacturer is specified, the contractor shall supply as part of his submittal package complete manufacturer cut sheets detailing materials, construction methods and standards

**440.2.1 Permits:**

All permits and fees 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 examination required by these authorities.

**440.2.2 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.

**440.2.3 References:**

Conform to the requirements of reference information listed below except where requirements that are more stringent are shown or specified in the Contract Documents.

American Society of Testing Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section, and Underwriter Laboratories (UL) - UL wires and cables, City of Tolleson Supplements to MAG and MAG Standards.

**440.2.4 Quality Assurance:**

Work involving plumbing for installation of meters, vaults, meter boxes, water taps, copper piping, backflow preventer(s) and related work shall be executed by licensed and bonded contractors. Secure a permit from City of Tolleson at least 48 hours prior to start of installation.

Tolerances: Specified depths of mains and lateral pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, re-compaction, and repair of finish grade treatment.

Coordinate work with other trades.

For a period of one year from Final Acceptance, the Contractor shall guarantee/warranty irrigation materials, equipment, and workmanship against defects. The Contractor shall replace any pavement damage resulting from the installation of the irrigation system, repair damage to grading, soil preparation, or planting at no additional costs to the City and make repairs within 48 hours following notification by the Engineer.

**440.3 MATERIALS:**

Add the following:

**440.3.1 Submittals:**

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 one (1) pdf copy of manufacturers' literature including name and part numbers covering materials listed below and any other items requested by the Engineer. Contractor shall also submit all shop drawings specified at this time. **Do not order materials until the products and shop drawings are approved by the Engineer**. Multiple submittals may be required.

Items to be submitted:

All materials and equipment proposed to be utilized on the project including but not limited to: (Refer to Plans and Section 757 for materials list)

Pipe
Drip Equipment
Fittings and Solvents
Wire and Connectors
Ball Valves
Valve Boxes
Pressure Regulators
Automatic Control Valves
Master Valve
Flow Sensor Hydrometer
PVC Nipples
Valve I.D. Tags

All items shall be those specified and approved by the Engineer. Substitutions will not be allowed without approval.

**440.3.2 Equipment to be Furnished:**

All materials to be new and bear the appropriate National Association seal of approval for example, NSF, US, etc. Similar equipment shall be procured from the same manufacturer and internal parts shall be common and interchangeable.

**440.3.4 Record Drawings:**

The Contractor shall maintain project record (as-built) plans on site. Maintain on-site and separate from documents used for construction, one complete set of contract documents as Project Record Documents. Keep documents current on a daily basis. Current up-to-date Record Drawings are a prerequisite for scheduled payments. Do not permanently cover work until Record Drawing information is recorded.

The Contractor shall dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following:

Connection to water lines
Connection to electrical power
Location of Irrigation Controller
Location of Backflow Prevention Unit
Master Valve and Flow Sensor Hydrometers
Ball Valves
Routing of Main Pressure lines (dimension at a minimum of 100 feet along routing)
Routing of Lateral Lines
Remote Control Valves
Routing of Control Wiring
Wire Splices
Each Sleeve End
Other related equipment as directed by the City

Prior to Final Review, obtain from the Engineer a reproducible copy of the drawings. Using technical drafting pens, duplicate information contained on the project drawings maintained on site. Label each sheet "Record Drawing". Completion of the Record Drawings will be a prerequisite for the Final Review. The City will not certify payment requests or make final payment if as-built plans are not current or complete.

**440.3.5 Controller Charts:**

The City shall approve Project Record As-Built drawings before controller charts are prepared. The chart shall show the area controlled by the automatic controller and shall be the maximum size, which will fit inside the controller door, and still be legible. 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 City, 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.

**440.3.6 Operation and Maintenance Manuals:**

Submit 4 operation and maintenance manuals to the City 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 owners representative present, of how to adjust and maintain all sprinkler head types, controller functions, and recommended controller programs, as established by the Contractor. Contractor also to review recommended watering rates for new plant materials.

**440.3.7 Equipment to be Furnished:**

Prior to final close out the following equipment and spare parts shall be furnished to the City. Before final inspection evidence that the City has received this material must be shown to the Engineer.

Equipment to be furnished:

1. Master Remote Control Valve with Solenoid
2. Flow Sensor
3. Remote Control Valves with Solenoids - 5 of each type and size valve installed
4. Pressure Regulator- 5 of each type, size, pre-set pressure, and flow volume installed
5. Drip (wye) Filter – 5 of each type and size installed with screens
6. Quick Coupler Keys- Two (2) quick coupler keys with hose swivel
7. Ball Valves- three (3) complete ball valve of each size and type installed.
8. Ball Valve Operating Handles- two (2) operating handles (if required to turn valve)
9. Swing Joints – five (5) of each type and size swing joint installed
10. Emitters- 10 of each size and volume emitter (multi and single) installed
11. Polyflex Riser for Single Emitter – one hundred (100) 24” long polyflex risers
12. Drip Lateral Flush End Cap- Two complete assemblies
13. Valve Box with Lid- provide five (5) of each size and color valve box installed, include lids for each box

The equipment to be furnished to the City shall be provided at no additional cost, the cost shall be considered incidental to other items.

**440.4 LANDSCAPE IRRIGATION SYSTEM REMOVAL AND RESTORATION:**

Add the following:

The project scope involves the installation of new improvements in areas where privately owned irrigation systems may exist. The work under this item shall consist of testing, reconstructing and/or modifying the existing irrigation systems that are damaged by the improvements or by other construction activities within the project limits. Where there are existing systems the contractor shall cut, cap and modify the existing systems as necessary so that the system continues to operate and provide water to the plant materials that remain on the private property. All private irrigation systems shall be repaired to working condition within a 24 hour period.

Replace paragraph three with the following:

The contractor shall replace all disturbed private irrigation systems with new equipment of the same manufacture and size as the original.

Replace paragraph six with the following:

The contractor shall include all required material, labor, equipment, testing and system guarantees in his quoted cost to repair all damaged existing irrigation systems.

**440.5 TRENCH EXCAVATION AND BACKFILL:**

Add the following:

Waterlines continuously pressurized – 18 inches minimum for 2-1/2-inch and smaller pipes, 24 inches minimum for 3-inch and 4-inch and 36 inches for 6-inch and larger pipe.

Irrigation Control wire – 18” below grade. Where sleeves are required locate wires in own sleeve separate from pipe sleeves.

Lateral lines – 12 inches minimum for 2-inch and smaller pipes, 18 inches minimum for 2-1/2-inch and larger pipes.

Plastic lines in sleeves under pavement - 36 inches minimum

Each irrigation pipe or wire located beneath asphalt and concrete shall be installed in a PVC Schedule 40 sleeve that is 6 inch, 4 inch, 2 inch, or 1 inch diameter as noted on the plans, and a minimum of twice the combined diameter of the pipe or wires contained within the sleeve.

Pipe trenches shall be straight but if obstructions necessitate a change of direction, the limits of curvature for PVC pipe shall be followed in strict accordance with pipe manufacturer's recommendations.

Trenches may be curved to change direction or avoid obstructions within the limits of the curvature for PVC pipe. Minimum radii of curvature are 25 feet for 2-inch diameter pipe, 100 feet for 3- and 4-inch diameter pipe, and 150 feet for 6-inch pipe. All curvature results from the bending of the pipe lengths. No deflection will be allowed at a pipe joint.

**440.5.1 Staking:**

Mark with powdered lime, routing of pressure supply line and stake locations of various components, control valves and emitters. Unless otherwise specified, the system layout shall be considered schematic. 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.

**440.5.2 Bedding, Backfilling and Compaction:**

Pipe shall be bedded in at least 4 inches of finely graded native soil or sand to provide a firm, uniform bearing. After leveling, the pipe shall be surrounded with additional finely grained native soil or sand to at least 4 inches over the top of the pipe.

Bedding sand shall be required when site conditions dictate and clean backfill meeting the specifications is not available. Bedding sand shall be required under asphalt and concrete pavements such as roadways and parking surfaces.

Trench backfill, sufficient to anchor the pipes, may be deposited before pipeline pressure testing, except that joints shall remain exposed until satisfactory completion of testing.

Trenches and excavations shall be backfilled with clean material from excavations. Remove organic material as well as rocks larger than 1/2-inch in diameter. Place acceptable material in lifts, the height of which shall not exceed that which can be effectively compacted, depending on the type of equipment and methods used. 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.

## 440.6 PIPE INSTALLATION:

Add the following:

### 440.6.1 Piping:

Provide pipe, schedule and size as shown on the drawings and per Section 757 and as specified herein.

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 pipe line 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 laying is not in progress, the open ends of the pipe shall be closed by means approved by the Engineer.

Sand bedding or fine grained material shall be provided where ledge rock, hard pan, or boulders are encountered. Compact bedding material 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 manufacturers 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. Solvent will not be used on threaded pipe. Threaded joints shall be hand tightened, with final tightening with a strap wrench as necessary to prevent leaks.

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 that 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 connections is required, these connections shall be accomplished first. A plastic adapter with external pipe thread should be used, screwing it into the metal internal pipe threads. Use Teflon tape, or equal, on all plastic to metal threaded joints. The joint shall be hand-tightened. Utilize a light wrench, as necessary, to prevent leaks.

Piping or conduit of different trades crossing each other shall be separated by a minimum of 6 inches in the vertical direction.

Install thrust blocks for fittings on pipe greater than or equal to 3-inch diameter or any diameter rubber gasketed pipe. Use 3,000 PSI concrete, 2-mil plastic, and No. 4 Rebar. Use cast-in-place concrete bearing against undisturbed soil. Size, orientation and placement shall be as shown on the installation details. Wrap fitting with plastic to protect bolts, joint, and fitting from concrete. Install rebar as shown on the installation details. Do not allow PVC to come in contact with the thrust block.

Use a joint restraint harness on pipe greater than or equal to 3-inch diameter or any diameter rubber gasketed pipe wherever joints are not positively restrained by flanged fittings, threaded fittings, and/or thrust blocks. Use a joint restraint harness with transition fittings between metal and PVC pipe, where weak trench banks or vertical directional changes do not allow the use of thrust blocks, or where extra support is required to retain a fitting or joint. Use bolts, nuts, retaining clamps, all-thread, or other joint restraint harness materials that are zinc plated or galvanized.

Use restrained casing spacers for gasketed pipe routed through sleeving. Provide Ford Uni-Flange Restrained Casings Spacers or approved equal. Restrainer body and runner supports must be constructed of high strength ductile iron meeting ASTM A536 and grade 65-42-12. Connecting rods must meet ASTM A242, ANSI/AWWAC111/A21.11. Runners must be constructed of ultra high molecular weight polymer. Install harness in the manner recommended by the manufacturer and in accordance with accepted industry practices. Install self-restraining casing spacers at all gasketed pipe bell joints and every 10-foot along the gasketed mainline pipe installed through sleeving. Provide correct number and type of restraints per manufacturer's requirements.

**440.6.1 Sleeving:**

Piping located under asphalt, concrete, or other pavements shall be sleeved, size and schedule as noted on the plans. If not noted, sleeves shall be Schedule 40, and 2 times larger than the pipe being sleeved. Use separate sleeve for wiring, or as directed by Engineer.

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. All sleeve trenches shall incorporate MAG 200-1 T-Top trench repairs. Cost of trenching and patching shall be considered incidental to the sleeve installation. Permission to cut asphalt or concrete shall be obtained from the Engineer. When piping on the drawings is shown in paved area, but running parallel and adjacent to planted areas, the intent of the drawings is to install the piping in the planted area.

Extend sleeve ends twelve inches beyond edge of hardscape, or sidewalks. Cap sleeve ends and mark with stakes. Provide rope or wire through sleeve and secure to a stake at surface grade, at each end for future sleeve location. Sleeve ends shall be covered with duct tape prior to backfill.

Boring operations and/or asphalt cut and patch operations necessary for sleeve installation shall be considered incidental to the sleeve installation. All asphalt cutting shall be done with proper equipment to allow straight and true cuts through the entire depth of the asphalt being removed. Compact the trench backfill to 95% with a minimum of a 6-inch ABC base and 6-inch asphalt top patch cover. Contractor shall replace any patch work if the patch compacts more than ½-inch or if any of the patches becomes dislodged within one year. All asphalt shall comply with MAG section 336.

**440.7 VALVES, VALVE BOXES, AND SPECIAL EQUIPMENT INSTALLATION:**

Add the following:

Refer to Section 631 for water meter for the irrigation system.

Install all remote control valves with 24 volt solenoids, ball valves, hydrometers with 24 volt solenoids, pressure reducing valves, wye strainers, emitter flush plugs, and quick coupling valves

in suitable plastic valve access box of proper size as required for easy access to the installed components. All valve boxes supplied shall be new Carson 1324 colored tan or approved equal. Jumbo or economy boxes are not an acceptable alternative. All valve boxes shall be installed with six inches minimum of 3/4-inch sized clean washed gravel sump over filter fabric with valve located 2" clear above rock sump.

Valves shall include a solenoid plunger that shall be spring loaded so the valve may be operated when installed in any position and shall be constructed of stainless steel. The diaphragm shall be of durable nylon reinforced neoprene. Valve bonnet shall be equipped with an internally operated manual bleed mechanism for manual operation of the valve at any time. Valve bonnet shall be secured to the valve body by corrosion resistant stainless steel bolts.

2" Backflow Prevention Assembly including lockable Enclosure is existing and shall be protected in place. Backflow prevention assembly equipment is to be utilized on the irrigation system for the project. Contractor shall coordinate and obtain City Engineer's approval prior to any irrigation work.

All wiring for remote control valve operation shall be direct burial single strand copper, 600 volt. Common wire shall be 12 awg, control wire shall be 14 awg. Tape bundle wire at 20 foot centers. Allow for expansion at all changes in direction. No splices in wire will be allowed unless the wire length exceeds 2500 feet. All allowed splices shall be contained within valve boxes marked as Wire Splice.

Valve boxes shall not house more than one valve, quick coupler, or other type of equipment other than multiple flush caps is permitted in same box.

The valve boxes shall be branded with the letters and/or numbers of contents in valve as noted per details. The letter and number sizes 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 utilize stencils and be neat and legible.

Lateral flush end caps shall be installed at the end of all drip lateral pipes for the purpose of flushing the pipeline of debris. The flush end caps shall consist of eth following components: ¾" schedule 40 ell, ¾" flex PVC riser, ¾" male adaptor, ¾" FHT x MHT ball valve, 10" round valve box. The flush end caps shall be installed per the plan details at the location shown on the plans or as directed by the Engineer. The cost for the flush end caps shall be considered incidental to other items.

Quick coupler valve shall have a body constructed of red brass with a wall thickness guaranteed to withstand normal working pressure of 150 PSI without leakage, with female threads opening at base. Quick coupler valve shall have a hinge cover constructed of red brass with leather like vinyl cover bonded to it in such a manner that it becomes a permanent type of cover. Provide with a quick coupler key with hose swivel. Quick coupler assembly shall be a contractor assembled swing joint consisting of three (3) Marlex street ells and a 12-inch long Schedule 80 nipple. Use a single street ell at the connection to the mainline fitting and use two (2) street ells at the quick coupler end of the swing joint. Assembly shall be 1-inch size to match the inlet size of the quick coupler valve. Use a rebar stabilizing rod and two (2) stainless steel clamps to secure the quick coupler. Install quick coupler within a 10" round valve box with geotextile fabric and rock base per plan detail.

## 440.9 AUTOMATIC CONTROL SYSTEM INSTALLATION:

Add the following:

Existing irrigation controller; Rainmaster DX42-SPED 42 stations including stainless pedestal on concrete pad is existing and is to be relocated, installed and re-wired to existing electrical meter per plans. Irrigation controller is to be utilized to manage and control the irrigation system for the project. Contractor shall coordinate and obtain City Engineer's approval prior to any irrigation work.

All common and control wiring shall be direct burial UF-600 volt single strand copper wire, PVC insulation, 14 gauge for control wiring, 12 gauge for common wiring.

The solenoid plunger shall be spring loaded so the valve may be operated when installed in any position and shall be constructed of stainless steel. The diaphragm shall be of durable nylon reinforced neoprene. Valve bonnet shall be equipped with an internally operated manual bleed mechanism for manual operation of the valve at any time. Valve bonnet shall be secured to the valve body by corrosion resistant stainless steel bolts.

### 440.9.1 Materials:

All wire between the irrigation controller and remote control valves, sensors, and master valves to be 12 AWG solid copper for common, 14 AWG solid copper for control, UF-600 insulated type, direct burial.

Wire splices shall be Dri-Splice two piece waterproof wire connectors.

Wire splice boxes shall be Carson 1324, tan.

### 440.9.2 Construction Requirements:

Connections between the automatic controllers and the electric solenoids at the control valves shall be made with two wire direct burial copper cable consisting of UF-600 12 gauge copper common wire and 14 gauge control wire insulated with PVC. Install in accordance with controller manufacturer's specifications.

Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines whenever possible and shall never be installed above or below the pipe.

An expansion curl shall be provided within 3 feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.

Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the City's Representative.

All control wiring installed under paving shall be installed in UL listed Schedule 40 electrical conduit. Conduit shall terminate at least 2 feet inside of a planting area. Conduit joints and fittings shall be solvent weld. Size shall be as noted per plans. Conduits shall be separate from pipe sleeves.

All control and common wire runs shall be continuous between the controller and the valves which they control unless the run length exceeds 2500 feet. All splices shall be housed in 1324 valve boxes, branded with wire splice on the cover and the locations noted on the as-built plans. Valve boxes shall be tan in granite, green in turf, or purple when used with non-potable water.

All wire connectors shall have a two-piece PVC housing which, when filled with resin epoxy and pressed together, forms a permanent, one-piece, moisture-proof wire splice. All connectors shall be UL listed, rated 600 volt, for PVC insulated wire. No wire splices shall be buried. All wire connectors shall be Dri-Splice Waterproof Wire Connectors or approved equal.

Provide a 24-inch excess length of wire in an 8-inch diameter expansion loop at each 90-degree change of direction, at both ends of sleeves, and at 100-foot intervals along the wire routing. Do not tape wiring within expansion loops.

Wire shall be red control with white common and a green spare wire looped through all boxes.

The grounding circuit shall consist of one 5/8-inch diameter x 8-foot long copper grounding rod and one 4-inch x 96-inch ground plate placed as shown on the plan details. The ground rod and ground plate shall be tied together and to the controller's grounding circuit with #6 bare copper wire. Each ground rod shall be set a minimum of 8 inches below finished grade, ground straps 12 inches below finished grade, and shall be housed in 10-inch round valve boxes positioned to allow access to the ground clamp for service. The resistance of the ground to the controller should not exceed 10 ohms, as measured with a ground rod test set, to meet controller manufacturer's guarantee criteria.

A wiring schematic shall be placed in each controller cabinet. The schematic shall show all wire connections including the wire connections at the controllers and field splices in pull or junction boxes, such as those not occurring in scheduled and planned valve boxes.

**440.10 FLUSHING AND TESTING:**

Add the following:

The following volumetric leakage test may be performed for gasketed mainline piping segments only, in lieu of the mainline pressure testing procedure indicated in MAG Specification Section 440.10:

Provide all necessary pumps, bypass piping, storage tanks, meters, supply piping, and fittings in order to properly perform testing. Backfill the trench to prevent movement of the pipe under pressure. Expose couplings and fittings. Purge air from pipeline before test. Subject the mainline pipe to 150 PSI for four hours. Water pressure must be maintained for the four-hour duration.

Replace any defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the subject mainline pipe meets the above maximum allowable volume loss during the test period.

Add the following:

Operational Tests: Perform an operational test of the irrigation system in the presence of the Engineer and a representative from the City of Tolleson Maintenance Division. Contact the Engineer and City of Tolleson Authorized Representative five working days prior to testing.

The Contractor shall adjust or replace any type of irrigation heads or equipment to ensure proper distribution of water throughout the course of the Plant Establishment Guarantee and Maintenance Period.

Arrange for a preliminary walk-through with the City, 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 sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. Adjustments may include, at no additional cost to the City, changes in nozzle sizes, and degree of arcs.

Arrange for a Substantial Completion walk-through when all items generated from the preliminary walk-through have been corrected. Items deemed not acceptable by the City shall be reworked to complete satisfaction. The maintenance period will not begin unless authorized by the City. 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.

Add the following:

**440.10.1 Maintenance**

1. Maintain irrigation system for a duration of 90 calendar-days from formal written acceptance by Engineer. Make periodic examinations and adjustments to irrigation system components in order to achieve the most desirable application of water.

2. Following completion of Contractor's maintenance period, City will be responsible for maintaining system in working order during remainder of guarantee/warranty period, for performing necessary minor maintenance, for protecting against vandalism, and for preventing damage after landscape maintenance operation.

3. 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 City of Tolleson. Make repairs within 48 hours following notification by the Engineer. The City of Tolleson has the right to make emergency corrections and back-charge to the contract for his/her costs when determined necessary by the Engineer.

**440.10.2 Clean Up**

1. Remove from site machinery, tools, excess materials, and rubbish upon completion of work.
2. Maintain a clean and orderly jobsite on a daily and ongoing basis. Trash, discarded material and other debris shall not be allowed to blow around on the project. Discard all materials off site at an approved sanitary landfill.

3. Maintain a secure jobsite. Fence off jobsite to restrict general public access.

4. Any open trenches that are not backfilled the same day they are opened shall be flagged with yellow warning tape and tri-pod reflective warning stands.

**440.11 MEASUREMENT AND PAYMENT:**

Is modified to add:

Payment for the irrigation distribution system shall be made on the basis of the bid price for each element of work identified on the bid schedule. These unit cost prices shall be full compensation for the system complete and in-place as described herein and on the plans.

***RELOCATE EXISTING BACKFLOW PREVENTER WITH ENCLOSURE (1 1/2") (4" CONCRETE PAD)*** ***EACH***

Payment for the item RELOCATE EXISTING BACKFLOW PREVENTER WITH ENCLOSURE (1 1/2") (4" CONCRETE PAD) shall be made on the basis of single item lump sum. Price bid shall include all labor, materials, and equipment necessary to relocate, connect to new water meter, and install existing backflow preventer with enclosure on a new 4" thick concrete pad in accordance with the plans, details and Technical Specifications.

***RELOCATE EXISTING IRRIGATION CONTROLLER WITH STAINLESS PEDESTAL (DX42-SPED 42 STATIONS) (4" CONCRETE PAD)*** ***EACH***

Payment for the item RELOCATE EXISTING IRRIGATION CONTROLLER WITH STAINLESS PEDESTAL (DX42-SPED 42 STATIONS) (4" CONCRETE PAD) shall be made on the basis of single item lump sum. Price bid shall include all labor, materials, and equipment necessary to relocate, re-wired to electrical meter, and install existing irrigation controller with stainless pedestal on a new 4" thick concrete pad in accordance with the plans, details and Technical Specifications.

***MASTER VALVE (1 1/2")*** ***EACH***

Payment for the items MASTER VALVE (1 1/2") shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and associated valve box, ball valves, ID tags, fittings and equipment necessary to install master valves in accordance with the plans, details and Technical Specifications.

***FLOW SENSOR (1 1/2")*** ***EACH***

Payment for the items FLOW SENSOR (1 1/2") shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and associated valve box, communication cable, conduits, fittings, and equipment necessary to install flow sensor in accordance with the plans, details and Technical Specifications.

***ISOLATION BALL VALVE ASSEMBLY (1"), (1 1/4"), & (2")*** ***EACH***

Payment for the item ISOLATION BALL VALVE ASSEMBLY (1"), (1 1/4"), & (2") shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and equipment

necessary to install ball valve assemblies in accordance with the plans and Technical Specifications.

***QUICK COUPLER ASSEMBLY (1”)*** ***EACH***

Payment for the item QUICK COUPLER (1”) shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and equipment necessary to install quick coupler assemblies in accordance with the plans and Technical Specifications.

***DRIP CONTROL VALVE (REMOTE) (ELECTRIC) (1")*** ***EACH***

Payment for the item DRIP CONTROL VALVE (REMOTE) (ELECTRIC) (1”) shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and associated filter, regulator, valve box, ball valves, ID tags, unions, fittings, and equipment necessary to install drip remote control valves in accordance with the plans, details and Technical Specifications.

***FLUSH END CAP ASSEMBLY (3/4”)*** ***EACH***

Payment for the item FLUSH END CAP ASSEMBLY (3/4”) shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and equipment necessary to install flush end cap assemblies in accordance with the plans and Technical Specifications.

***MULTI-OUTLET EMITTER ASSEMBLY*** ***EACH***

Payment for the item MULTI-OUTLET EMITTER ASSEMBLY shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and equipment necessary to install multi-outlet emitter assemblies in accordance with the plans and Technical Specifications.

***SINGLE-OUTLET EMITTER ASSEMBLY*** ***EACH***

Payment for the item SINGLE-OUTLET EMITTER ASSEMBLY shall be made on the basis of the price bid per each. Price bid shall include all labor, material, and equipment necessary to install single-outlet emitter assemblies in accordance with the plans and Technical Specifications.

***PIPE (PVC) (3/4") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (PVC) (1") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (PVC) (1 1/4") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (PVC) (1 1/2") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (PVC) (2") (SCHEDULE 40)*** ***LINEAR FEET***

Payment for PVC pipe shall be made on the basis of the price bid per lineal foot. Price bid shall include all labor, material, and equipment necessary to install PVC pipe in accordance with the plans and Technical Specifications**.**

***PIPE (SLEEVE) (PVC) (1") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (SLEEVE) (PVC) (3") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (SLEEVE) (PVC) (4") (SCHEDULE 40)*** ***LINEAR FEET***
***PIPE (SLEEVE) (PVC) (6") (SCHEDULE 40)*** ***LINEAR FEET***

Payment for PVC pipe sleeves shall be made on the basis of the price bid per lineal foot. Price bid shall include all labor, material, and equipment necessary to install PVC pipe sleeves in accordance with the plans and Technical Specifications.

***LANDSCAPE IRRIGATION SYSTEM REMOVAL AND RESTORATION LUMP SUM***

Payment for Landscape Irrigation System Removal and Restoration shall be made on the basis of single item lump sum. Price shall include all required material, labor, equipment; testing and system guarantees to repair all damaged private existing irrigation systems.

## SECTION 450 PAVEMENT MARKING:

Section 450, as included in these Special Provisions, is currently not included in the MAG Specifications and is therefore considered by the City of Tolleson as an added specification required solely for the purpose of constructing pavement markings within the City. The City requires all pavement markings to be constructed in accordance with the latest edition of the Arizona Department of Transportation (ADOT) standard specification and details unless otherwise noted in these special provisions. Any references to ADOT standard specifications are noted and include any required modifications and revisions as required by the City.

These sections are the City of Tolleson's amendments or additions to the ADOT and MAG Standard Specifications.

### 450.1 DESCRIPTION OF WORK:

Installation of roadway pavement markings in the City of Tolleson shall be performed in accordance with the requirements of the latest editions of the Manual on Uniform Traffic Control Devices for Streets and Highways, Arizona Supplement to MUTCD, the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, Arizona Department of Transportation Signing and Marking Standard Drawings and these project plans and specifications.

The Contractor shall furnish labor, materials, tools, transportation and supplies required to complete the work in accordance with the plans, project construction specifications and these pavement-marking specifications. The work under this section shall consist of:

A. Cleaning and preparing the final surface course and the pavement marking layout

B. Applying temporary paint or permanent paint in accordance with the plans & specifications

C. Installing raised pavement markers in accordance with the plans & specifications

### 450.2 CONTROL OF WORK:

No pavement markings shall be applied to the project by the Contractor until field inspection of the striping layout is completed and approved by the Engineer. Any pavement markings placed prior to inspection and approval of the Engineer is subject to removal and reinstallation at the Contractor's expense.

In the event conflicts exist between actual field conditions and striping plans, Contractor shall notify the Engineer immediately.

Contractor shall maintain appropriate traffic control during the work and shall comply with these special conditions.

## 450.3 COORDINATION AND SEQUENCE OF WORK:

### 450.3.1 Striping Limits:

Contractor shall verify the striping limits of the project with the Engineer before beginning work. Striping limits may exceed the construction project limits to match existing striping as determined by the Engineer.

### 450.3.2 Removal of Existing Markings:

Removal of existing pavement markings shall be completed prior to the layout and marking activity and shall be performed in accordance with Section 470 of these specifications.

Pavement markings shall not be removed until proper traffic control has been installed as directed by the Engineer and City inspector. Any conflicting signs or striping shall be removed prior to pavement marking removal.

## 450.4 MATERIALS:

The paint shall not bleed, curl or discolor when being applied to the roadway surface. If bleeding, curling or discoloration occurs, the unsatisfactory areas shall be corrected by the contractor to the satisfaction of the Engineer at no additional cost to the City and given additional coat(s) of paint to correct the problem. In the event that the additional coat(s) are not sufficient, the Engineer will determine what method of correction may be used. Such corrections will be at Contractor's expense.

### 450.4.1 Temporary or Permanent Traffic Paint:

All pavement marking paint, temporary or permanent, shall conform to the requirements of the City of Tolleson and as set forth in Section 708 of the latest edition of the ADOT Standard Specifications for Road and Bridge Construction and these special conditions or the "Manual on Uniform Traffic control Devices (MUTCD) latest edition as applicable guidelines and warranties shall be in accordance with the MUTCD most current edition.

Unless otherwise directed, all final location lane striping including crosswalks and stop bars shall be thermoplastic material applied at a minimum thickness of 60 mils. All Pavement symbols, arrows, and lettering shall be thermoplastic, Type I (permanent) preformed pavement markings. Temporary pavement markings shall be reflectorized traffic paint. Temporary striping or half-street roadway striping shall be paint.

### 450.4.2 Raised Pavement Markers:

All Raised Pavement Markers shall be installed in accordance with ADOT Standard Drawings 4-M-2.02, 4-M-2.03, 4-M-2.03.2, and 4-M-2.04 and shall conform to Section 706 of the latest edition of the ADOT Standard Specifications for Road and Bridge Construction.

## 450.5 CONSTRUCTION REQUIREMENTS:

### 450.5.1 Methods and Equipment:

The methods and equipment used for this work shall be according to Section 704, 705, 706, 707, and 708 of the latest edition of the ADOT Standard Specifications for Road and Bridge Construction and these special conditions.

### 450.5.2 Cleaning and Preparing the Pavement Surface:

Before applying any paint or thermoplastic to the roadway surface, the surface shall be free of dirt, grease, oils, acids, laitance or other foreign matter that would reduce the bond between the pavement marking and the road.

Area that cannot otherwise be satisfactorily cleaned shall be scrubbed with a biodegradable chemical called Citrus Solv Plus or approved equal.

After a thorough cleaning, the surface shall be rinsed with water and completely dried before applying any paint, thermoplastic, or raised pavement markers. The roadway surface shall be dry and the air and pavement surface temperature shall not be less than 50° F and shall be rising for placement of temporary, permanent paint and thermoplastic striping.

### 450.5.3 Field Layout and Marking:

The Contractor shall coordinate with the City of Tolleson three working days (72 hrs) in advance of any pavement marking to obtain preliminary striping layout approval prior to placement of any pavement markings. This includes any temporary pavement markings required prior to placement of thermoplastic striping. Contact the City of Tolleson to schedule for striping layout approval.

The preliminary striping layout shall only be completed after all pavement marking Inspectors have been contacted, coordinated with, and are on site to review and approve the preliminary striping layout. The striping contractor shall make all necessary field adjustments that will be required by each of the Inspectors.

Any pavement marking completed prior to the City's inspection shall be removed if it is not consistent with the requirements included in these special provisions and the project plans. The cost of the removal shall be paid for by the Contractor and not the City of Tolleson.

The Contractor shall establish a string line or other method when laying out the striping in the field and shall properly spot mark all pavement markings.

All new longitudinal lane lines exceeding 200 feet in length shall be spot marked at 25 foot intervals all longitudinal lane lines less than 200 feet in length shall be spot marked at 10 foot intervals. Spot marking must include any angle points, interval changes and begin/end taper points.

Final striping shall not occur until preliminary striping layout approval has been completed by the Inspector. The Contractor is responsible for paying all construction costs needed to complete the pavement marking approval process, including restriping, striping obliteration

and mobilization/remobilization costs. The cost of the approval process shall be considered incidental to the pavement marking bid item.

All signing and marking work shall be completed at the same time. All new signs shall be installed prior to or concurrently with the striping work. Any conflicting new traffic sign installed prior to striping work shall be covered so they cannot be read. In addition any existing signs that will be in conflict with the new striping shall be removed or covered prior to the completion of the striping work. The Contractor shall coordinate with the City prior to removing/covering any new or existing signs.

Upon completion, the Contractor shall notify the Engineer that the project is ready for final inspection. The Inspector will inspect the project and either accept the work or identify unsatisfactory work within three (3) working days.

The completed roadway shall not be open to public travel, with exception to approved traffic control, until after all striping and signing has been completed unless the Contractor has prior approval by the City of Tolleson.

**450.5.4 Tolerances:**

New pavement striping shall not vary more than one-half inch (1/2”) in 50 feet from the specified striping design. The longitudinal deviation of pavement marking segment and gap shall not vary more than 6 inches in a 40 foot cycle.

**450.5.4.1 Pavement Markings:**

Unless otherwise directed, all final location lane striping including crosswalks and stop bars shall be thermoplastic material applied at a minimum thickness of 60 mils. All Pavement symbols, arrows, and lettering shall be thermoplastic, Type I (permanent) preformed pavement markings. The Contractor shall submit paint materials specifications and manufacturer’s data sheets for approval by the Engineer prior to use in accordance with Section 105 of these special provisions.

All measurements as shown on the plans for parallel lines shall be taken from center of stripe to center of stripe or center of stripe to face of curb.

**450.5.4.2 Preformed Pavement Marking Tape:**

Preformed Pavement Marking Tape shall be installed in accordance with manufacturer’s recommendations.

Preformed Pavement Marking Tape shall be installed in accordance with manufacturer’s recommendations.

**450.5.4.3 Crosswalks and Stop Bars:**

All crosswalks and stop bars shall be constructed in accordance with the Plans. Measurement for crosswalk lines shall be from inside the line to inside the line, not center to center.

**450.5.4.4 Raised Pavement Markers:**

All Raised Pavement Markers shall be installed in accordance with ADOT Standard Drawings 4-M-2.02, 4-M-2.03, 4-M-2.03.2, and 4-M-2.04 and shall conform to Section 706 of the latest edition of the ADOT Standard Specifications for Road and Bridge Construction.

**450.5.5 Inspection of Work:**

The City will conduct two field inspections of the signage and pavement markings. The first inspection shall be made during the preliminary layout. The second inspection shall be made after all markings have been installed.

Inspection and approval of spot markings shall not relieve the Contractor from the obligation of obtaining a final inspection.

If it is decided by the Engineer that more than two (2) coats of paint are required it will be done at the expense of the Contractor. If the paint has to be applied in more than two (2) coats, each previous coat shall be thoroughly dry before each new coat is applied.

**450.6 MEASUREMENT AND PAYMENT:**

Measurement and payment for these items will be made at the unit bid price per linear feet and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals complete in place as indicated in the plans and as specified herein.

| | |
|---|---|
| ***PERMANENT TRAFFIC PAINT, WHITE, 4" EQUIVALENT*** | ***LINEAR FEET*** |
| ***PERMANENT TRAFFIC PAINT, YELLOW, 4" EQUIVALENT*** | ***LINEAR FEET*** |
| ***THERMOPLASTIC TRAFFIC PAINT, WHITE, 4" EQUIVALENT*** | ***LINEAR FEET*** |
| ***THERMOPLASTIC TRAFFIC PAINT, YELLOW, 4" EQUIVALENT*** | ***LINEAR FEET*** |

Measurement and payment will be made at the unit price per each and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals complete in place as indicated in the plans and as specified herein.

| | |
|---|---|
| ***PAVEMENT LEGEND*** | ***EACH*** |
| ***PAVEMENT SYMBOL*** | ***EACH*** |
| ***THERMOPLASTIC PAVEMENT LEGEND*** | ***EACH*** |
| ***THERMOPLASTIC PAVEMENT SYMBOL*** | ***EACH*** |
| ***RAISED PAVEMENT MARKER (TYPE D)*** | ***EACH*** |
| ***RAISED PAVEMENT MARKER (TYPE G)*** | ***EACH*** |
| ***RAISED PAVEMENT MARKER (BLUE)*** | ***EACH*** |

## SECTION 470 GENERAL REQUIREMENTS FOR TRAFFIC SIGNAL AND INTERSECTION LIGHTING SYSTEMS:

### 470.1 DESCRIPTION:

It is the purpose of this section to provide general information necessary for completion of the installation of traffic signal and intersection lighting in accordance with the details shown on the Traffic Signal Plan, the City of Avondale Traffic Signal Details, and the MCDOT Details.

All electrical systems and appurtenances shall be complete, functional and in operating condition at the time of acceptance.

### 470.2 DEFINITIONS:

The words defined in the following section shall for the purpose of these specifications have the meanings ascribed to them pertaining to signals and lighting.

#### 470.2.1 Actuation:

The operation of any type of controller initiated by a detector.

#### 470.2.2 Back Plate:

A thin metal strip extending outward parallel to the signal face on all sides of a signal housing to provide suitable background for the signal indications.

#### 470.2.3 Controller:

That part of the controller assembly, which performs the basic timing and logic functions for the operation of the traffic signal.

#### 470.2.4 Controller Assembly:

The cabinet and complete assembly for controlling the operation of a traffic signal, consisting of a controller unit, and all auxiliary and external equipment housed in a weatherproof cabinet.

#### 470.2.5 Coordinated Traffic Signal System:

A group of signals timed together to provide a specific relationship among signal phases.

#### 470.2.6 Cycle:

A complete sequence of signal indications.

#### 470.2.7 Detector:

A device for indicating the passage or presence of vehicles or pedestrians.

(A) Inductive Loop Detector:

A detector capable of sensing the passage or presence of a vehicle by a change in the inductance characteristics of the wire loop.

(B) Magnetometer Vehicle Detector:

A detector capable of being actuated by the magnetic disturbance cause by the passage or presence of a vehicle.

(C) Pedestrian Detector:

A detector for pedestrians, usually of the push button type.

(D) Video Detector:

Video Camera capable of detecting the presence or passage of vehicles or pedestrians.

**470.2.8 Flasher:**

A device used to open and close signal circuits at a repetitive rate.

**470.2.9 Flashing Feature:**

This feature, when operated, discontinues normal signal operation and causes a predetermined combination of flashing signal lights.

**470.2.10 Interval:**

The part or parts of the signal cycle during which signal indications do not change.

**470.2.11 Luminaire:**

The assembly, which houses the light source and controls the light emitted from the light source. Luminaires consist of a housing, lamp socket, reflector and glass globe or refractor when specified.

**470.2.12 Manual Operation:**

The operation of a signal controller unit by means of a hand-operated switch.

**470.2.13 Mounting Assembly:**

The framework and hardware required to mount the signal face(s) and pedestrian signal(s) to the pole.

**470.2.14 Pedestrian Signal:**

A traffic control signal for the exclusive purpose of directing pedestrian traffic at signalized locations.

**470.2.15 Pre-timed Controller Assembly:**

A controller assembly for operating traffic signals in accordance with a predetermined fixed-time cycle.

**470.2.16 Red Clearance Interval:**

A clearance interval, which follows the yellow, change interval during which both the terminating phase and the next right-of-way phase display red.

**470.2.17 Signal Face:**

An assembly controlling traffic in a single direction and consisting of one or more signal sections. Circular and arrow indications may be included in a signal assembly. The signal face assembly shall include back plate and visors.

**470.2.18 Signal Indication:**

The illumination of a signal section or other device, or of a combination of sections or other devices at the same time.

**470.2.19 Signal Section:**

A complete unit for providing a signal indication, consisting of a housing, lens, reflector, lamp receptacle and lamp, or LED unit.

**470.2.20 Traffic Phase:**

A part of the time cycle allotted to any traffic movement or combination of movements receiving the right-of-way during one or more intervals.

**470.2.21 Traffic-Actuated Controller Assembly:**

A controller assembly for operating traffic signals in accordance with the varying demands of traffic as registered with the controller unit by detectors.

**470.2.22 Vehicle:**

Any motor vehicle normally licensed for highway use.

**470.2.23 Yellow Change Interval:**

The first interval following the green right-of-way interval in which the signal indication for the phase is yellow.

**470.3 REGULATIONS AND CODES:**

All electrical equipment shall conform to the current standards of the National Electrical Manufacturers Association (NEMA), National Electric Safety Code (NESC), Underwriters' Laboratory Inc. (UL), when applicable. All material and workmanship shall conform to the requirements of the National Electric Code (NEC), Illumination Engineers Society (IES),

Standards of the American Society for Testing and Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), requirements of the Traffic Signal Plan, these specifications, the special provisions, and to any other codes, standards, or ordinances which may apply. Whenever references are made to any of the standards mentioned, the reference shall be interpreted to mean the code, ordinance, or standard that is in effect at the time of the bid advertisement.

**470.4 SOURCE OF SUPPLY:**

The Contractor shall furnish all traffic signal material and equipment required to complete the work except as noted otherwise.

**470.4.1 Quality Requirements:**

Only materials and equipment conforming to the requirements of these specifications shall be incorporated into the work. Material and equipment shall be new except as may be provided in the special provisions.

The City of Tolleson reserves the right to reject proposed traffic signal material or equipment if, in the judgment of the Engineer any or all the following may apply:

The equipment does not meet the requirements of the specifications.

2) The material or equipment is not in the best interest of the City of Tolleson and the public.

3) The material or equipment past field performance has been unsatisfactory.

4) The material or equipment is not compatible with the material or equipment presently in use, which may cause the need to purchase additional spare parts, provide additional training, and/or long term maintenance problems.

In addition, the City of Tolleson reserves the right to pre-approve traffic signal material and equipment by brand name model or part number which in the judgment of the Engineer meets the intended purpose of these specifications. Pre-approved items are posted on MCDOT's Procurement website:

http://www.mcdot.maricopa.gov/technical/home.htm

Deviations from the pre-approved materials list, if any, will be listed in the project special provisions or construction plans.

**470.4.2 Approval of Material and Equipment:**

All traffic signal materials and equipment shall be approved by the Engineer prior to incorporation in the work. Any work in which materials or equipment not previously approved are used shall be performed at the Contractor's risk and may be considered as unauthorized and unacceptable and not subject to the payment provisions of the contract. Such materials or equipment may be subject to removal at the discretion of the Engineer.

The Contractor shall obtain the Engineer's approval before ordering or installing any material or equipment. The Contractor shall submit four (4) copies of each proposed material and/or

equipment list, including shop drawings. Submittal shall be to the City at the pre-construction conference. To be acceptable, the list shall be complete and comprehensive containing all items to be supplied on the project by the Contractor, including pre-approved items. The City of Tolleson reserves the right to reject any incomplete or unclear material submittal. All items on the list shall be identified by manufacturer's part number, model, specification or other pertinent catalogue information. The materials from any catalog cuts shall be clearly indicated by the contractor. One (1) copy will be returned to the Contractor for further action.

All equipment or material specified or shown on signal plans, or other drawings, by brand name, part number, or model number is intended to be descriptive of the type and quality of material or equipment desired. Another equal brand name, part number, or model number may be substituted so long as it is in accordance with these specifications and is equal in form, fit, function, performance, reliability, and is approved by the Engineer.

The contractor shall provide complete wiring diagrams for controller assemblies and auxiliary controller cabinets at the time of delivery for testing. A mylar original and four sets of prints shall be provided with each controller assembly. The wiring diagram shall illustrate all circuits and components in detail. All components shall be identified by name or number so as to be clearly noted in the drawings.

It is the Contractor’s responsibility to ensure adequate lead time in ordering signal equipment to prevent project delay. The Contractor shall notify the Engineer in the event signal equipment is not received in a timely manner.

**470.4.3 Warranties and Guaranties:**

In addition to the requirement of Section 108.8 manufacturer’s warranties and guaranties furnished for material and equipment used in the work, shall be delivered to the Engineer prior to acceptance of the project.

## 470.6 REMOVAL AND SALVAGE OF EXISTING FACILITIES:

All removals shall be done in accordance with MAG Section 350, and as shown on the Traffic Signal Plan. Removal of traffic signal pole foundations shall be to a depth of 60 inches below finished grade. Any item noted on the Traffic Signal Plan to be salvaged shall be delivered to the City warehouse or as directed by the Engineer. Delivery to the City warehouse shall include unloading the salvaged materials at a designated warehouse location by the Contractor using the Contractor’s own equipment. Two working days (forty-eight hours minimum) in advance of the intended date of delivery, the Contractor shall coordinate the proposed date, time and items to be delivered with the City’s Field Operations Supervisor (623) 936-7141. Warehouse hours for receiving deliveries are 6:00 am – 2:00 pm Monday through Thursday. The address for the City warehouse is:

City of Tolleson Field Operations Streets Division
9601 West Jefferson Street
Tolleson, Arizona 85253

Items called out for removal shall become the property of the Contractor and shall be removed from the project site. After foundation removal, the hole shall be filled in with native materials and shall be graded back to existing elevation and covered with similar materials to the surrounding area. All work with regard to re-filling foundation space and replacing landscaping to match nearby

conditions shall be included with this item.

**470.6.1 Measurement:**

Removal or salvaging of existing facilities will be measured on a lump sum basis as noted on the payment schedule for all traffic signal removal items.

**470.6.2 Payment:**

Removal or salvaging of existing facilities, measured as provided above, will be paid for at the contract price, said price shall be full compensation for the removal and delivery of salvaged items and the disposal of removed items not scheduled to be salvaged as specified and shown on the project plans.

**470.7 RELOCATE TRAFFIC SIGNAL EQUIPMENT:**

Work under this item shall consist of furnishing all labor, equipment and materials necessary to relocate any equipment called out in the project plans for relocation. Items expected to be relocated under this item include, Internally Illuminated Street Name Signs (IISNS), Video Detection cameras, Emergency Vehicle Pre-Emption detectors, traffic signal poles, mast arms, traffic signal heads, traffic signal mounts and luminaire mast arms. Any cable, connectors, mounting hardware, bolts, anchors or any other miscellaneous items needed to provide a complete system are included in this work. If the existing video detection cable or emergency vehicle cable is insufficient, the Contractor shall provide a new manufacturer approved cable under this work. The Contractor shall provide traffic control and police personnel as needed during mast arm re-location. All work shall be approved by the City and the Engineer 7 days prior to any traffic signal changeover or “flash” phase.

**470.7.1 Measurement:**

Relocation of existing traffic signal equipment will be measured on a lump sum basis as noted on the payment schedule for all signal poles and other equipment noted above for relocation and reinstallation.

**470.7.2 Payment:**

Relocation of existing traffic signal equipment, measured as provided above, will be paid for at the contract price, said price shall be full compensation for the relocation and reinstallation as specified on the project plans.

**470.8 REFURBISH EXISTING TRAFFIC SIGNAL POLES:**

Work under this item shall consist of furnishing all labor, equipment and materials necessary to improve all existing traffic poles within the project intersections to “like new” condition. Like new condition shall include painting all existing traffic signal poles, mast arms, luminaire mast arms and traffic signal mounts which will either remain or be relocated with the project. Paint shall be “cocoa brown” to match new powder coated poles. Also included in this work shall be the patching of all existing holes in either poles, mast arms or traffic signal mounts. Holes shall be capped and sanded flush and approved by the Engineer before new paint is applied.

**470.8.1 Measurement:**

Refurbishing of existing and relocated traffic signal poles will be measured on a lump sum basis as noted on the payment schedule for all signal poles and mounts refurbished.

**470.8.2 Payment:**

Refurbishing of existing and relocated traffic signal poles, measured as provided above, will be paid for at the contract price, said price shall be full compensation for the refurbishing, patching, sanding and painting of all poles specified on the project plans.

## 470.9 INSTALLATION OF TRAFFIC SIGNALS AND RELATED ITEMS:

**470.9.1 General:**

The Contractor shall furnish labor and supervision with experience in the construction of the traffic signals and all materials, equipment, tools, transportation and supplies required to complete the installation of traffic signals and the removal and relocation of traffic signals in an acceptable manner; within the time specified, and in full compliance to these specifications, terms of the contract, the Traffic Signal Plan and special provisions.

The contractor shall have on the work site at all times a competent supervisor capable of reading and thoroughly understanding the plans and specifications and thoroughly experienced in the construction of traffic signals. Unless waived by the special provisions, the Contractor's supervisor shall possess an International Municipal Signal Association (IMSA) Level II Traffic Signal Electrician Certification.

The Contractor shall notify the SRP Safety Services at (602) 236-8117 when working within the area of the SRP overhead powerlines.

**470.9.2 Traffic Signal Plan:**

The Traffic Signal Plan graphically describes the location of signal component parts, the equipment and materials to be used, and the standards for construction. The plans shall be supplemented by the City of Avondale Traffic Signal Details, MCDOT Details and/or other drawing(s) deemed necessary for the acceptable completion of the work.

Where dimensions on the plans are given or can be computed from other given dimensions, they shall govern over scaled dimension.

After completion of the project the Contractor shall provide the Engineer with a set of as-built drawings on clean prints of the original drawings. The as-built drawing shall indicate in a neat and accurate manner all changes and revisions in the original design. As-built drawings shall be submitted before final payment for completed work will be made.

| | |
|---|---|
| ***REMOVE & SALVAGE TRAFFIC SIGNAL & EQUIPMENT*** | ***LUMP SUM*** |
| ***RELOCATE TRAFFIC SIGNAL EQUIPMENT*** | ***LUMP SUM*** |
| ***REFURBISH EXISTING TRAFFIC SIGNAL POLES*** | ***LUMP SUM*** |

## SECTION 471 - ELECTRICAL UNDERGROUND INSTALLATION

### 471.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing electrical conduit, and pull boxes for traffic signals and intersection lighting including jacking, drilling, excavating placing and compacting backfill material in accordance with the locations shown on the Traffic Signal Plan, requirements of these specifications, and MAG specifications.

### 471.2 MATERIALS:

#### 471.2.1 Electrical Conduit:

All conduit and conduit fittings shall be listed by UL, and conform to NEC standards. Except as specified below, all conduit to be installed underground or in concrete structures shall be rigid polyvinyl chloride (PVC) conforming to the requirements of UL 651 for Rigid Nonmetallic Conduit. PVC conduit and conduit fittings shall be Schedule 80, heavy wall, manufactured from high impact material and shall be rated for use at 90º C. High Density Polyethylene (HDPE) conduit will be considered for approval for directional boring applications.

All exposed conduit and conduit fittings to be installed above ground shall be rigid metallic type manufactured of galvanized steel conforming to requirements of UL 6 for Rigid Metallic Conduit and to NEC standards.

#### 471.2.2 Conduit Warning Tape:

Conduit warning tape shall be a four (4) mil inert plastic film specially formulated for prolonged use underground and shall be a minimum of 3 inches wide. All tape shall be highly resistant to alkalis, acids, and other destructive agents found in the soil.

Tape shall have a continuous printed message warning of the location of underground conduits. The message shall be in permanent ink formulated for prolonged underground use and shall bear the words, 'CAUTION--ELECTRIC LINE BURIED BELOW' in black letters on a red background.

#### 471.2.3 Pull Boxes:

Pull boxes, pull box covers and pull box extensions shall be constructed of polymer concrete with reinforced heavy-weave fiberglass in accordance with MCDOT Details 4711 and 4712. Pull boxes and covers shall be concrete gray color and rated for no less than 8,000 lbs. over a 10” x 10” area and be designed and tested to temperatures of -55º F. Material compressive strength shall be no less than 1584 ksf. Covers shall have a minimum coefficient of friction of 0.5. Pull boxes shall be stackable for extra depth. Covers shall be secured with two (2) 3/8 inch corrosion resistant metallic hex bolts with corrosion resistant metallic washers. The bolts shall be in accordance with the requirements of MCDOT Detail 4711.

The words “TRAFFIC SIGNAL” shall be cast in the pull box covers in 1-inch high letters.

At the request of the Engineer the Contractor shall furnish pull box plans and specifications.

Chipped or cracked pull boxes, covers and extensions will not be accepted.

## 471.3 CONSTRUCTION REQUIREMENTS:

### 471.3.1 Installation of Electrical Conduit:

#### (A) General Requirements:

Conduit shall be furnished and installed at the locations and of the sizes shown on the Traffic Signal Plan. The contractor shall assume all conduit crossing roadways or existing driveways shall be installed by directional boring, unless otherwise specified on the plans. The Contractor shall either pothole or hand dig locations, where there is the potential for underground conflict, and this work shall be included with the bid. The work shall also include excavation, horizontal boring, installation of conduit, removal of spoil, backfill, pull tape, connectors and fittings, and restoration of the surface to match the surrounding area. Unless changes are necessary to avoid underground obstructions all underground conduit shall be installed in a straight line from pull box to pull box and/or from foundation to pull box and shall be of one continuous size. Any change in conduit routing must be approved by the Engineer and documented by the Contractor on as-built traffic signal plans.

All PVC conduit shall be stored and handled in an approved manner to minimize ultraviolet deterioration due to exposure to sunlight. The PVC conduit shall be cut square and trimmed to remove all rough edges. PVC conduit connections shall be of the solvent weld type. Purple primer conforming to the requirements of ASTM F 656 shall be applied to the joined surfaces prior to use of cement. The joint cement shall be the gray PVC cement conforming to the requirements of ASTM D 2564. Where a connection is made to rigid metallic conduit, the coupling used shall be a PVC female adapter.

Expansion joint fittings shall not be installed in PVC conduit runs between pull boxes unless specified. Expansion joint fittings shall be installed in conduit runs in which both ends of the conduit are fixed in place, such as conduit runs between two foundations. Expansion joint fittings shall be installed in conduit runs which cross a concrete structure expansion joint. Approved expansion fittings shall allow for a linear thermal expansion of up to 6 inches.

Conduit embedded in concrete structures shall be securely attached to the reinforcing steel at intervals of approximately 12 inches. Expansion fittings shall be installed where conduit crosses expansion joints in the structure. Where bonding is not continuous, expansion fittings shall be provided with a bonding jumper of number 6 AWG flexible wire. Where it is not possible to use expansion fittings, sleeves of sufficient size shall be installed to provide a minimum ½ inch clearance between the conduit and the inside wall of the sleeve. The sleeve shall be discontinuous at the expansion joints.

All existing conduits and conduit embedded in concrete structures shall be cleaned out with a mandrel and blown out with compressed air.

Field PVC conduit bends shall be made without crimping or flattening, using the longest radius practical but not less than specified by the NEC. Collapsed conduit, no matter how small, is not acceptable. The number of bends between pull boxes or between pull box and foundations shall not contain more than equivalent of two quarter bends (180 degrees, total), including the bends at the pull boxes or foundations, unless authorized by the Engineer.

Conduit entering a pull box or foundation shall be fitted with a factory made 90 degree elbow with a minimum sweep radius per the table below:

| Conduit Size | Sweep Radius |
|---|---|
| 2 inches | 10 inches |
| 3 inches | 13 inches |

Conduit entering pull boxes shall terminate a minimum of 3” inside the box wall. The conduit shall be between 2” and 4” above the bottom of the pull box and shall be sloped to facilitate the pulling of conductors. Conduit entering through the bottom of a pull box shall be located near the sides and ends and extend no more than 4” above the bottom of the pull box including the length of the conduit bell end in order to leave the major interior portion clear. At all outlets, conduits shall enter from the direction of the run and allow for expansion and contraction.

Conduit for future use shall have a ¼ inch nylon rope and a No. 8 AWG bare copper wire installed that extends 24 inches beyond each end of the PVC conduit run. The pull rope and bond wire shall be coiled and inserted into the conduit so as to be easily recovered from either end. Conduit ends shall be capped with conduit end cap fittings after the pull rope is installed. Conduit end cap shall remain in place until wiring is started. When end caps are removed, PVC ends shall be provided with an approved conduit end bell. End bells shall be installed prior to the installation of the conductors. Approved insulated grounding bushings shall be used on steel conduit ends.

The Contractor shall place warning tape (as specified in Section 471.2.2) in all open trenches in which conduit is placed. All warning tape shall be buried at a depth of 6” to 8” below final grade.

Where conduit is to be installed under existing roadway pavement by jacking or drilling methods, the jacking and/or drilling pits shall be kept 2 feet clear of the edge of the pavement.

Installation of conduit for underground electrical service shall be in accordance with the Standard Details, as shown on the Traffic Signal Plan and in accordance with the requirements of the utility company providing electrical service. Conduit installed in railroad right-of-way shall be installed in accordance with the requirements of the railroad company.

**(B) Conduit Depth Requirements:**

Conduits installed in protected areas such as behind curbs, under side-walks, etc. that are not subject to any vehicular traffic shall be at a minimum depth of 24 inches below final grade. Conduits installed under roadways, driveways, or any open area where there is the possibility of vehicular traffic, shall be installed at a minimum depth of 36 inches below final grade. When conduit cannot be installed at the minimum depth, it shall be completely encased in 3” of class C concrete in accordance with Section 725.

**(C) Trenching, Backfilling and Compaction:**

Trenches shall not be excavated wider than necessary for the proper placement of conduit and pull boxes. Trenching shall be done in accordance with MAG Section 601. Backfilling, compaction and bedding of conduit runs shall be in accordance with MAG Section 601.4.9.

Open trench excavation across any existing paved areas, shall have two (2) parallel cuts made at a distance not to exceed 16 inches. All removal and replacement of existing paved areas shall be in accordance with MCDOT Section 336.

Open trench excavation across an existing Portland concrete area shall have two (2) parallel cuts made at a distance not to exceed 16 inches. All removal and replacement of existing Portland concrete areas shall be done in accordance with MCDOT Section 336.

After each excavation is complete and materials in place, the Contractor shall notify the Engineer for inspection, and under no circumstances shall any underground material or equipment be covered with fill without proper approval.

**471.3.2 Installation of Pull Boxes:**

Pull boxes of the type specified on the Traffic Signal Plan shall be furnished and installed at the locations shown on the Plan. Pull boxes shall be installed in accordance with MCDOT Detail 4713. All relocation of pull boxes to avoid driveways and/or other structures shall be approved by the Engineer and documented by the Contractor on the as-built traffic signal plans.

Pull boxes shall be set and adjusted so that they are flush at curb or sidewalk grade. When no grade is established pull boxes shall be set as requested by the Engineer.

All pull box covers shall be secured with the required bolts and washers before final acceptance of the project.

All pull boxes shall be left in a clean condition, free of dirt and debris upon completion of the work.

## 471.4 MEASUREMENT:

Conduit will be measured by the linear foot for each diameter size between pull boxes. No measurement shall be made for the vertical portions of conduit.

Pull boxes will be measured as a unit for each pull box size.

## 471.5 PAYMENT:

The accepted quantities of conduit, measured as provided above, will be paid for at the contract unit price per linear foot, which shall be full compensation for the item, COMPLETE IN PLACE, including excavation, backfill, warning tape, pull rope or bond wire and any incidentals necessary to complete the work. No direct payment will be made for rigid metal conduit bends or rigid non-metallic conduit bends at pull boxes, expansion fittings and coupling fittings, the cost being considered as included in the contract price for the conduit items.

| | |
|---|---|
| ***CONDUIT, PVC, SCH 80, 2-INCH*** | ***LINEAR FEET*** |
| ***CONDUIT, PVC, SCH 80, 2 1/2-INCH*** | ***LINEAR FEET*** |
| ***CONDUIT, PVC, SCH 80, 3-INCH (TRENCH)*** | ***LINEAR FEET*** |
| ***CONDUIT, PVC, SCH 80, 3-INCH (DIRECTIONAL DRILL)*** | ***LINEAR FEET*** |

The accepted quantities for pull boxes, measured as provided above, will be paid for at the

contract unit price, each, which shall be full compensation for the item, COMPLETE IN PLACE, including any excavating, backfilling and landscaping necessary to complete the work.

***PULL BOX, #7*** ***EACH***
***PULL BOX, #7 W/ EXTENSION*** ***EACH***

## SECTION 472 TRAFFIC SIGNAL FOUNDATIONS:

### 472.1 DESCRIPTION:

The work under this section shall consist of furnishing all materials and constructing all traffic signal foundations and other designated pole foundations including signal poles, cabinet and electrical service pedestal foundations for the traffic signals, and intersection lighting system in accordance with the locations and details designated on the Traffic Signal Plan, MAG Specifications, and the requirements of these specifications.

Pole foundations shall include all conduit, conduit elbows, anchor bolts, re-bar cages, grounding electrode, and forms required for construction of the foundation. The traffic signal pole foundations shall conform to the requirements of City of Avondale Trombone Style Traffic Signal Pole Foundation Detail A1074, and MCDOT Details 4720 and 4721.

The controller and combination service pedestal and battery back-up system cabinet foundations shall conform to the requirements of MCDOT Details 4723 and 4724.

### 472.2 MATERIALS:

#### 472.2.1 Excavation and Backfill:

Trenches shall not be excavated wider than necessary for the proper placement of conduit and pull boxes. Trenching, backfilling and compaction shall be done in accordance with Section 601.

All excavations within the roadway shall be backfilled and compacted in accordance with Section 211.

#### 472.2.2 Concrete:

Concrete used for all foundations shall be class ‘A’ concrete and shall be in accordance with the requirements of Section 725.

#### 472.2.3 Anchor Bolts:

All anchor bolts shall meet or exceed the minimum requirements of ASTM F1554 Grade 105, shall be hot dip galvanized in accordance with the requirements of ASTM A153. Anchor bolts shall be in accordance with referenced details, for standard traffic signal foundations see Details 4725 and 4726. Welding shall not be performed on any portion of the body of anchor bolts.

Certificates of Analysis conforming to the requirements of Arizona State Department of Transportation Standard Specifications for Road and Bridge Construction Section 106.05 shall be submitted for high strength anchor bolts, washers and nuts.

#### 472.2.4 Rebar Cage:

All rebar cages shall be in accordance with MCDOT Detail 4721.

### 472.2.5 Electrical Conduit:

All electrical conduit and conduit fittings shall be in accordance with these specifications.

### 472.2.6 Grounding Electrode:

The grounding electrode shall be in accordance with these specifications and MCDOT Details 4720, 4721, 4723 and 4724.

## 472.3 CONSTRUCTION REQUIREMENTS:

The excavations required for the installation of foundations and other items shall be performed in such a manner as to avoid any unnecessary damage to streets, sidewalks, landscaping and other improvements. Any damage by the contractor's operation shall be replaced or reconstructed where determined by the Engineer at the expense of the contractor

The Contractor shall call Blue Stake (1-800-STAKE-IT) at least 96 hours in advance of any excavation activity. Contractor shall prevent or minimize conflict with all existing utilities and shall construct the improvements by maintaining the necessary clearances as required by each utility.

The Contractor shall contact Blue Stake in markings of all utilities in conflict with this project. Potholing shall be performed prior to excavation to verify a more precise location and depth of existing utilities. Payment shall be lump sum according to the Bid Schedule for all work completed and in place. All other costs associated with this item shall be included with the bid item.

The trenches shall not be excavated wider than necessary for the proper construction of the foundations and other equipment. Excavation shall not be performed until immediately before construction of foundations. The material from the excavation shall be placed in a position that will minimize obstructions to traffic and interference with surface drainage.

All surplus excavated material shall be removed and properly disposed of within 48 hours by the contractor, as directed by the Engineer. After each excavation is completed, the contractor shall notify the Engineer for inspection, and under no circumstances shall any underground materials or equipment be covered with fill without the approval of the Engineer.

Excavation and backfill shall be in accordance with the requirements of Section 105.12. At the end of each working period, all excavations shall be barricaded or covered, or both, to provide safe passage for pedestrian and vehicular traffic.

Excavations in the street or highway shall be performed in such a manner that not more than one traffic lane is restricted at any time, unless otherwise provided in the Special Provisions.

Sidewalk and pavement excavations shall be kept well covered and protected to provide safe passage for pedestrian and vehicular traffic until permanent repairs are made.

The elevation of signal and lighting pole foundations shall be set as follows unless otherwise noted within the construction plans or special provisions. Signal and lighting pole foundations shall be set flush with the existing or new sidewalk when sidewalk is present. Where curb exists without sidewalk, the foundations shall be set flush with a surface defined by a 1.5% upward slope from the top of curb. Where there is no curb or sidewalk pole foundations shall be as shown on the project plans. The dimensions and locations of foundations shall be as specified on the project

plans; however, the Engineer may direct that changes be made in locations due to obstructions or other existing conditions. Any change in locations shall be documented by the contractor on as-built traffic signal plans. The contractor shall verify top of foundation elevations with the Engineer prior to foundation construction.

Concrete shall be placed in holes which have been augured against undisturbed earth. If the material in the bottom of the hole is not firm and stable, it shall be compacted or treated as directed by the Engineer. The walls and the bottoms of the holes shall be thoroughly moistened prior to placing concrete.

If the soil is not stable, a deeper foundation than specified may be required or forms shall be used as determined by the Engineer. The forms shall be of the proper size and dimensions and shall be rigid and securely braced

Foundation forming material shall extend no more than 20 inches below the foundation final grade and shall be removed after placement and curing of concrete.

Anchor bolts shall be oriented such that the bolt pattern sides are both parallel and perpendicular to the roadway centerlines unless otherwise specified on the Traffic Signal Plan. A 25-foot coil of No. 4 AWG bare copper conductor shall be installed below the foundation and covered with fill material such that no part of the coils will be in contact with the concrete foundation. An extension of the No. 4 AWG bare copper wire shall extend into the pole. Anchor bolts, conduit and rebar cage shall be centered within the foundation, set at the specified height and plumb within ±1/2 degree. During placement of concrete, anchor bolts shall be securely held in proper alignment, position, and height with a suitable template.
After excavations are completed and anchor bolts and conduit installed, the Contractor shall notify the Engineer for inspection. Under no Circumstances shall concrete be placed without approval of the Engineer.
The concrete pour shall be continuous and consolidated by means of vibrators. All exposed surfaces of the foundation shall receive a finish that is smooth, level, and free of form marks.
Type 'A' and 'SB' pole foundations, type 'P' cabinet foundation, and type ‘SP’ service pedestal foundation shall set for a minimum of three (3) days prior to installation of poles and/or cabinets. Type 'E', 'F', 'J', ‘Q’, ‘K’ and 'R' pole foundations shall set for seven (7) days prior to installation of poles.
Before the concrete for the cabinet foundation has set, depressions shall be made around the anchor bolts for adjustment of the cabinet leveling nuts in accordance with MCDOT Detail 4723.

**472.4 MEASUREMENT:**

Foundations for traffic signals and intersection lighting system will be measured as a unit for each type of foundation constructed.

**472.5 PAYMENT:**

The accepted quantities of foundations for traffic signal and intersection lighting system, measured as provided above, will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE, including excavations, backfill and incidentals necessary to complete the work.

No measurement or direct payment will be made for anchor bolts or re-bar cages, the cost being included in the unit price paid for foundations.

| | |
|---|---|
| ***TRAFFIC SIGNAL FOUNDATION TYPE PB*** | ***EACH*** |
| ***TRAFFIC SIGNAL FOUNDATION TYPE A*** | ***EACH*** |
| ***TRAFFIC SIGNAL FOUNDATION TYPE Q*** | ***EACH*** |
| ***TRAFFIC SIGNAL FOUNDATION, TROMBONE*** | ***EACH*** |

## SECTION 473 VIDEO DETECTION:

### 473.1 DESCRIPTION:

The work under this item shall consist of furnishing all materials, equipment and labor, including cameras, cables and all miscellaneous equipment required to furnish and install a new complete and operational video detection system at the Van Buren Road and McKinley Street intersections with 91st Avenue. This system shall be installed as shown on the plans and as described in this specification. It is anticipated eight sensors will be required. An additional video detection camera shall be included for the 91st Ave and Latham intersection, compatible with the existing system in place.

This specification sets forth the minimum requirements for a system that monitors vehicles on a roadway via processing of video images. The detection of vehicles passing through the field of view of an image sensor shall be made available to a large variety of end user applications as simple contact closure outputs that reflect the current real time detector or alarm states (on/off) or as summary traffic statistics that are reported locally or remotely. The contact closure outputs shall be provided to a traffic signal controller and comply to the NEMA (National Electrical Manufacturers Association) type C or D detector rack or a 170 input file rack standards.

The system architecture shall fully support networking of system components through a variety of industry standard and commercially available infrastructure that are used in the traffic industry. The serial data communications shall support direct connect, [modem,] and multi-drop interconnects. Simple twisted pair wiring shall be supported to minimize overall system cost, improve reliability, utilizing existing infrastructure and ease of system installation and maintenance. Both video communications and serial data communications shall optionally be interconnected over long distances through repeat and daisy chain configurations. A single serial data communications multi-drop link on twisted pair shall extend up to 2 miles and include up to 24 units on a drop before the signal(s) must be repeated.

On the software application side of the network, the system shall be integrated through a client-server relationship. A communications server application shall provide the data communications interface between as few as one to as many as hundreds of machine vision processor (MVP) sensors and a number of client applications. The client applications shall either be hosted on the same PC as the communications server or may be distributed over a local area network of PC's using the industry standard TCP/IP network protocol. Multiple client applications shall execute simultaneously on the same host or multiple hosts, depending on the network configuration.

### 473.2 MATERIALS:

**System Hardware:**

The machine vision system hardware shall consist of four components:

1. A color, zoom, Machine Vision Processor (MVP) sensor.
2. A modular cabinet interface unit.
3. A communication interface panel.
4. A personal computer (PC).

The PC shall host the server and client applications that are used to program and monitor the other system components. The real-time performance shall be observed by viewing the video

output from the sensor with overlaid flashing detectors to indicate the current detection state (on/off). The MVP sensor shall optionally store cumulative traffic statistics, internally in non-volatile memory, for later retrieval and analysis.

The MVP shall communicate to the modular cabinet interface unit, communications panel and the software applications using the industry standard TCP/IP network protocol. The MVP shall have a built in Internet Protocol (IP) address and shall be addressable with no plug in devices or converters required.

Modular cabinet interface unit shall be available for the following cabinet arrangements (See plans & Specifications for type of system required):

1. NEMA TS1: The Cabinet Interface unit shall be standalone and supplied in its own enclosure. It shall support at least one MVP Sensor. This version shall have at least 8 outputs.

2. NEMA TS1: The Cabinet Interface unit shall be standalone and supplied in its own enclosure. It shall support at least 8 MVP Sensors. This version shall have at least 16 outputs.

3. NEMA TS2: The Cabinet Interface unit shall plug directly into a standard TS2 rack and shall communicate via the SDLC Bus. It shall support at least 8 MVP Sensors. This version shall have at least 64 outputs.

The communication interface panel shall provide the electrical termination of wiring for video, data and power for the MVP that is mounted on a pole or mast arm with a traffic signal cabinet or junction box. The communication interface panel shall provide high-energy transient protection to electrically protect the modular cabinet interface unit and connected MVP sensors. The communications interface panel shall be available in two models: a four-sensor model or a single-sensor model.

**System Software:**

The MVP sensor embedded software suite shall incorporate multiple applications that perform a variety of diagnostic, installation, fault tolerant operations and vehicle detection processing. The detection shall be reliable, consistent, and perform under all weather, lighting and traffic congestion levels.

There shall be a suite of client applications that reside on the host client / server PC. The applications shall execute under Microsoft Windows 98, 2000, NT or Windows XP. Available client applications shall include:

- Network Browser: Learn a network of connected modular cabinet interface units and MVPs then show the topology in a logical hierarchical relationship
- Detector Editor: Create and modify detector configurations to be executed on the MVP sensor.
- Operation Log: Extract the MVP run-time operation log of special events that have occurred.
- Software Installer: Reconfigure one or more MVP sensors with a newer release of embedded system software.

**Functional Capabilities:**

**MVP Image Sensor:**

The MVP image sensor shall be an integrated imaging color CCD array with optics, high-speed, image processing hardware and a general purpose CPU bundled into a sealed enclosure. The CCD array shall be directly controlled by the general purpose CPU, thus providing high video quality for detection that has virtually no noise to degrade detection performance. It shall be possible for the user to zoom the lens, as required for operation. It shall provide software JPEG video compression. The MVP shall provide direct real-time iris and shutter speed control. The MVP image sensor shall be equipped with an integrated zoom lens that can be changed using either configuration computer software or a hand-held controller. The MVP sensor shall output full motion color video through the means of a differential video port in NTSC format. The differential video is transmitted over a single twisted pair.

Power:

The MVP sensor shall operate on 24 VAC, 50/60Hz at a maximum of 25 watts. The camera and processor electronics shall consume a maximum of 10 watts and the remaining 15 watts shall support an enclosure heater.

Detection Zone Programming:

Placement of detection zones shall be by means of a supervisor computer (PC) operating in the Windows 98, 2000 or Windows NT graphical environments, a keyboard, and a mouse. The VGA monitor shall be able to show the detection zones superimposed on images of traffic scenes.

The detection zones shall be created by using a mouse to draw detection zones on the supervisor computer's VGA monitor. Using a mouse and the keyboard it shall be possible to place, size, and orient detection zones to provide optimal road coverage for vehicle detection. It shall be possible to download detector configurations from the supervisor computer to the MVP, to retrieve the detector configuration that is currently running in the MVP, and to back up detector configurations by saving them to the supervisor computer’s removable or fixed disks.

The supervisor computer's mouse and keyboard shall be used to edit previously defined detector configurations to permit adjustment of the detection zone size and placement, to add detectors for additional traffic applications, or to reprogram the sensor for different traffic applications or changes in installation site geometry or traffic rerouting.

**Optimal Detection:**

The video detection system shall optimally detect vehicle passage and presence when the MVP sensor is mounted 30 feet (10m) or higher above the roadway, when the image sensor is adjacent to the desired coverage area, and when the distance to the farthest detection zone locations are not greater than 10 times the mounting height of the MVP. The recommended deployment geometry for optimal detection also requires that there be an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP is mounted directly above the traveled lanes, the MVP shall not be required to be directly over the roadway. The MVP shall be able to view either approaching or receding traffic or both in the same field of view. The preferred image sensor orientation shall be to view approaching traffic since

there are more high contrast features on vehicles as viewed from the front rather than the rear. The MVP sensor placed at a mounting height that minimizes vehicle image occlusion shall be able to monitor a maximum of six to eight traffic lanes simultaneously.

**Modular Cabinet Interface Unit:**

The modular cabinet interface unit shall provide the hardware and software means for up to eight MVP sensors to communicate real-time detection states and alarms to a local traffic signal controller. It shall comply with the electrical and protocol specifications of the detector rack standards. The card shall have 1500 Vrms isolation between rack logic ground and street wiring.

**Communications Interface Panel:**

The communications interface panel supports one to four MVPs. The communications interface panel consists of a predefined wire termination block for MVP power, data and video connections, a power transformer for the MVP, electrical surge protectors to isolate the modular cabinet interface unit and MVP, and an interface connector to cable directly to the modular cabinet interface unit.

The interface panel shall provide power for one MVP through a step-down transformer, taking local line voltage and producing 28 VAC, 50/60 Hz, at about 30 watts. A ½ amp slow-blow fuse shall individually protect the step-down transformers.

**Warranty, Service and Support:**

The supplier, for a minimum of two years, shall warrant the video detection system. Ongoing software support by the supplier shall include software updates of the MVP sensor, modular cabinet interface unit and supervisor computer applications. These updates shall be provided free of charge as long as the products are being manufactured and then on, as long as the software is being updated.

**Spare Equipment:**

The following spare equipment “shall” be supplied.

| | |
|---|---|
| 2 each | MVP Sensor and mounting bracket |
| 1 each | Modular Cabinet Interface Unit |
| 1 each | Communication Interface Panel |

**473.4 CONSTRUCTION REQUIREMENTS:**

The Contractor shall install the video detection system as shown on the traffic signal plans and in accordance with the requirements of the Standard Specifications and COM Standard Drawing M-96.4.

**System Installation & Training:**

The supplier of the video detection system shall supervise the installation and testing of the video detection system and computer equipment. A factory certified representative from the supplier shall be on-site during installation.

A four-hour session of training shall be provided to personnel of the contracting agency in the operation, setup and maintenance of the video detection system. Instruction and materials shall be provided for a maximum of 10 persons and shall be conducted at a location selected by the contracting agency.

The MVP sensor and its support hardware/software is a sophisticated leading-edge technology system. Proper instruction from certified instructors is required to ensure that the end-user has complete competency in system operation. The User's Guide is not an adequate substitute for practical classroom training and formal certification by an approved agency.

**473.4 METHOD OF MEASUREMENT:**

Video Detection System, 4 Camera will be measured as a unit for each traffic intersection furnished and installed.

Video Detection Camera – Will be measured as a single camera, compatible with the existing video detection system in place at the 91st Ave and Latham.

**473.5 BASIS OF PAYMENT:**

The accepted quantities of Video Detection System 4 – Camera will be paid for at the contract unit price, which price shall be full compensation for the item complete in place including video sensors, mounting brackets, cabinet interface units, communication interface panels and all other components necessary to provide a complete functional video detection system, as described and specified herein and as shown on the Project Plans.

***VIDEO DETECTION SYSTEM, 4 CAMERA*** ***EACH***

***VIDEO DETECTION CAMERA*** ***EACH***

## SECTION 474 TRAFFIC POLE INSTALLATION:

### 474.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing traffic signal poles, mast arms, and modifying multi-use poles in accordance with the plans, the referenced details, the special provisions, and these specifications. All poles and mast arms shall have an IGIC or urethane polyester powder coat finish applied in the color shown on the Traffic Signal Plans by the manufacturer.

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

The traffic signal poles, mast arms and luminaires shall conform to the requirements of City of Avondale Trombone Style Traffic Signal Pole Detail A1075 and A1076 or MCDOT Details (HAWK signal only).

### 474.2 GENERAL STANDARD:

Steel poles for traffic signals and highway lighting shall include pole shafts, mast arms, and pole bases.

Material standards for traffic signal and lighting supports shall be in conformance with the 2011 Interim Revisions to the (2009) 5th edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. All pole supports shall be designed to withstand the minimum wind load of the 3-second gust wind speed of 90 mph for Exposure C category in any direction.

All welding design, fabrication and inspection of welding for structural steel shall be performed in accordance with the requirements of the 2012 Interim Revisions to the (2010) 6th edition 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.

### 474.3 TYPES OF POLES:

Types of poles to be furnished are as follows:

1. Type ‘Q’, Standard Detail 4743
2. Type Trombone Type ‘Q’, Avondale Detail A1075
3. Type Trombone Type ‘R’, Avondale Detail A1075
4. Type ‘A’ Standard Detail 4738
5. Type ‘PB’ Standard Detail 4750

#### (A) Pole Shafts:

The tapered pole shafts shall be fabricated from sheet steel of weldable grade which shall meet or exceed the minimum strength requirements of ASTM A36 for all poles except for Type K and Type R poles. The Type K and Type R poles shall be constructed from sheet steel that has a minimum yield stress after fabrication of 48 ksi. A taper rate of 0.125” minimum to 0.140” maximum change in diameter per linear foot is required unless otherwise specified. Pole shafts

shall be fabricated according to the thickness requirements shown on the Standard Details.

Standard pipe pole shafts for Type A poles shall be fabricated from standard weight structural steel which conforms to the minimum strength requirements of ASTM A53, Grade B and an outside diameter in inches as indicated on the Standard Details. Each section shall be fabricated from not more than two pieces of sheet steel. When two pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded, seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of pole. Pole shafts shall be straight, with a permissive variation not to exceed 1-inch measured at the midpoint.

Pole shafts shall be galvanized in accordance with the requirements of ASTM A123. The visual appearance of the galvanized finish shall be uniform. Discoloration of the galvanized finish such as dark areas, dark streaks, dark rings or transportation handling marks, which are considered excessive by the Engineer, shall not be allowed. Pole shafts that have a finish unacceptable to the Engineer shall either be repaired or replaced to the satisfaction of the Engineer at no additional cost to the City.

Hand holes in the base of the poles shall conform to the details shown on the Standard Details. All welds shall be continuous and any exposed welds, except fillet welds, shall be ground flush with the base metal.

A metal tag shall be permanently attached to the pole above the hand hole stating the manufacturer's name, pole type per the City’s plan, pole drawing number, shaft length and inches of material thickness.

**(B) Standard Bases:**

Poles shall have standard bases fabricated from structural steel plates per City of Avondale and MCDOT Details, and conform to the minimum strength requirements of ASTM A36. Exposed surfaces shall be finished smooth and all exposed edges shall be neatly rounded to a 1/8 inch radius. Standard bases shall be galvanized in accordance with the requirements of ASTM A123.

**(C) Foundation Attachment:**

Foundation anchor bolt washers and nuts shall be fabricated from steel which meets or exceeds the minimum requirements of ASTM F1554 Grade 105 unless noted otherwise and shall be hot dip galvanized in accordance with the requirements of ASTM A153. Welding shall not be performed on any of the anchor bolts.

**(D) Mast Arms:**

The tapered mast arms shall be fabricated from sheet steel conforming to the requirements of ASTM A36. The mast arms for the Type K and Type R poles shall be constructed of sheet metal with a minimum yield stress of 48 ksi after fabrication. Mast arms shall be fabricated according to the thickness requirements shown on the MCDOT Details. A taper rate of 0.125” minimum to 0.140” maximum change in diameter per foot is required unless otherwise specified. All bolts, washers and nuts for mast arms shall be fabricated from steel conforming to the requirements of ASTM A325 and shall be hot dip galvanized in accordance with the requirements of ASTM A153.

Mast arms that have a finish unacceptable to the Engineer shall either be repaired or replaced to

the satisfaction of the Engineer at no additional cost to the County.

A metal tag shall be permanently attached on the side of the mast arm near the base stating the manufacturer's name, pole type per the City's plan, mast arm or pole drawing number, length and material thickness.

**(E) Luminaire Mast Arms:**

The tapered mast arms for the luminaires shall be fabricated from sheet steel conforming to the requirements of ASTM A36. Mast arms shall be fabricated according to the thickness requirements shown on the City of Avondale and MCDOT Details. A taper rate of 0.125" minimum to 0.140" maximum change in diameter per foot is required unless otherwise specified. All bolts, washers and nuts for mast arms shall be fabricated from steel conforming to the requirements of ASTM A325 and shall be hot dip galvanized in accordance with the requirements of ASTM A153.

Luminaire mast arms shall be galvanized in accordance with the requirements of ASTM A123.

A metal tag shall be permanently attached on the side of the mast arm near the base stating the manufacturer's name, pole type as required on the plans, mast arm or pole drawing number, length and thickness in inches.

## 474.4 WARRANTIES:

Each signal pole shall be warranted by the manufacturer against all defects in material and workmanship for a period of twelve (12) months and in accordance with the requirements of Section 108.8.

## 474.5 CONSTRUCTION REQUIREMENTS:

### 474.5.1 Base Plates and Poles:

High strength bolts, nuts, and washers for bases shall be assembled as specified in the Standard Details. Anchor bolts and nuts are to be drawn down tight to produce a snug-tightened joint. Anchor bolts, washers, and nuts required for relocating existing poles shall be furnished by the contractor.

Poles shall be drilled and tapped for mounting hardware as shown on the City of Avondale and MCDOT Standard Details.

Sidewalks, curbs, gutters, pavement, base material, lawns, plants, and any other improvements removed, broken, or damaged by the contractor's operations shall be replaced or reconstructed.

Where existing pole installations are to be modified, materials and equipment shall be used, salvaged, or disposed of as specified in the Special Provisions and as directed by the Engineer.

Existing poles shall be either relocated or used in place as specified in the project plans. The contractor shall inspect the poles and provide the materials and work necessary to recondition the poles so they can be reused. Holes left in the shafts of existing poles, due to removal of

items such as signal mounting assemblies, shall be repaired and painted with zinc galvanized paint.

If any poles are damaged by the contractor's operations, such repairs or replacements shall be at no additional cost to the Department.

New poles that are damaged by improper drilling of holes will be rejected.

**474.5.2 Signal Poles and Mast Arms:**

Poles and mast arms shall be of the type shown on the Traffic Signal Plan and shall be installed in accordance with the City of Avondale and MCDOT Details.

Poles shall be drilled and tapped for mounting of hardware. The use of a welding torch is not authorized.

All poles shall be plumbed to the vertical with all mast arms, signal heads, and luminaires installed. When mast arms are bolted to the pole shaft, the mast arm end over the roadway shall adjust to the horizontal.

**474.6 MEASUREMENT:**

Poles for traffic signals will be measured as a unit for each type pole installed, COMPLETE IN PLACE. The poles including signal and luminaire mast arms, base plates and all materials required shall be furnished by the contractor unless otherwise indicated.

**474.7 PAYMENT:**

The accepted quantities of poles will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE.

| | |
|---|---|
| ***TRAFFIC SIGNAL POLE, TYPE Q, COCOA BROWN*** | ***EACH*** |
| ***TRAFFIC SIGNAL POLE, TROMBONE TYPE R, COCOA BROWN*** | ***EACH*** |
| ***TRAFFIC SIGNAL POLE, TYPE A, COCOA BROWN*** | ***EACH*** |
| ***TRAFFIC SIGNAL POLE, TYPE PB, COCOA BROWN*** | ***EACH*** |
| | |
| ***SIGNAL MAST ARM, 30 FEET*** | ***EACH*** |
| ***SIGNAL MAST ARM, TROMBONE, 35 FEET*** | ***EACH*** |
| ***SIGNAL MAST ARM, TROMBONE, 40 FEET*** | ***EACH*** |
| ***SIGNAL MAST ARM, TROMBONE, 45 FEET*** | ***EACH*** |
| ***SIGNAL MAST ARM, TROMBONE, 50 FEET*** | ***EACH*** |
| ***SIGNAL MAST ARM, TROMBONE, 55 FEET*** | ***EACH*** |
| ***LUMINAIRE MAST ARM, 15 FEET*** | ***EACH*** |
| ***LUMINAIRE MAST ARM, TROMBONE, 15 FEET*** | ***EACH*** |

## SECTION 475 ELECTRICAL POWER SERVICE AND CONTROLLER CABINET INSTALLATION:

### 475.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing electrical power service equipment in accordance with the location and details on the Traffic Signal Plan, MCDOT Details, and the requirements of these specifications, and the specifications of the utility company serving the location, and the picking up, installing and wiring of the controller cabinet assembly in accordance with the type and location as designated on the Traffic Signal Plan and the requirements of these specifications.

### 475.2 MATERIALS:

#### 475.2.1 Electrical Service Pedestal System:

Each electrical service pedestal system consists of the cabinet, electrical service equipment wiring and wiring devices.

**Combination Electrical Service Pedestal and Battery Back-Up Cabinet:**

The combination underground service meter pedestal and battery back-up cabinet shall be TESCO catalog number 27-000/22-000 or pre-approved equal, consisting of the meter socket, circuit breaker panel, test bypass facilities, pedestal locking device, ground mount enclosure, batteries, full power by-pass, isolation module and necessary fittings all of which shall conform to the requirements of Detail 4731-1 Traffic Signal Plans, and the project Special Provisions.

**Service Pedestal Cabinet:**

The underground service meter pedestal cabinet shall be TESCO catalog number 26-000 or pre-approved equal, consisting of the meter socket, circuit breaker panel, test bypass facilities, pedestal locking device, ground mount enclosure and necessary fittings all of which shall conform to the requirements of Detail 4829-1, Traffic Signal Plans, and the project Special Provisions.

Electrical service equipment wiring and wiring devices shall be in conformance with NEMA, the NEC, MCDOT Details and the specifications of the utility company providing electrical service.

**(A) Breakers:**

All circuit breakers shall have an interruption capacity of 10,000 amperes and supplied as indicated in the wiring schematic diagram.

**(B) Meter Loop Assembly:**

The meter loop assembly shall be bonded and grounded in accordance with the requirements of these specifications.

**(C) Conductors:**

Conductor size and color shall be as specified on the Traffic Signal Plan conductor schedule and in accordance with the requirements of these specifications. All electrical apparatuses shall be UL listed.

**475.2.2 Controller Cabinet Assembly:**

The Controller Cabinet Assembly shall include a weatherproof cabinet. Cabinet type and configuration shall be supplied as specified on the Traffic Signal Plans, Standard Details, and in accordance with these specifications.

The Contractor shall program the signal controller and prior to installation.

## 475.3 CONSTRUCTION REQUIREMENTS:

**475.3.1 Electrical Service Pedestal System**

**Combination Service Pedestal and Battery Back-Up System:**

The electrical service meter pedestal and battery back-up system shall be assembled and installed on a concrete foundation at the location shown on the Traffic Signal Plan and in accordance with Detail 4724.

**Service Pedestal System:**

The electrical service meter pedestal shall be assembled and installed on a concrete foundation at the location shown on the Traffic Signal Plan and in accordance with Detail 4829-2.

**475.3.2 Controller Cabinet Assembly:**

Contractor shall install the controller cabinet assembly. After the installation and leveling of the controller cabinet, an approved non-shrink type grout shall be placed between the cabinet and foundation.

Contractor shall be responsible for connecting all of the field wiring, except the loop detector lead-ins, to the cabinet terminals. The traffic signal controller will be installed by the Contractor. The Engineer or his representative will test the connections before accepting the Controller Cabinet Assembly pay item.

## 475.4 MEASUREMENT:

Controller cabinet assemblies will be measured as a unit for each type installed.

Each type of Electrical Service Pedestal System installed and accepted will be measured as a unit.

## 475.5 PAYMENT:

The accepted quantities for the installation of the controller cabinet assemblies, measured as

above, will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE.

***TRAFFIC SIGNAL CONTROLLER AND CABINET*** ***EACH***

The accepted quantities for each type of electrical service pedestal system will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE

***METER PEDESTAL*** ***EACH***

## SECTION 476 SIGNAL INDICATIONS AND MOUNTINGS:

### 476.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing vehicular and pedestrian traffic signal indications and mounting assemblies in accordance with the types and locations shown on the Traffic Signal Plan, City of Avondale Detail A1076, MCDOT Details 4773, 4774, 4775, 4776, 4778-1, 4778-2, 4794, and 4795 and the requirements of these specifications. Signals, except pedestrian type, for newly signalized intersections shall be of the same manufacturer and of the same material.

### 476.2 MATERIALS:

#### 476.2.1 Vehicular Traffic Signal Heads:

Vehicular traffic signal heads shall be assembled of standard 12 inch lens size signal sections with the number of sections or combination of sections specified on the Traffic Signal Plan, City of Avondale Detail A1076, MCDOT Detail 4773 and the requirements of the Manual on Uniform Traffic Control Devices.

The optical performance and design of signal heads shall conform to the requirements of the Institute of Transportation Engineers Standards for Vehicular Traffic Control Signal Heads (ITE Publication No. ST-008B), the Traffic Signal Plan and the provisions of these specifications.

**(A) Housing:**

A standard 12 inch signal section shall be a one (1) piece housing with hinged door for housing all optical and electrical components.

Both the one (1) piece signal section housing and door shall be fabricated of corrosive resistant die cast aluminum conforming to Institute of Transportation Engineers Standards. The top and bottom of the housing shall have openings to accommodate standard 1½ inch pipe fitting. Each opening shall have a locking "Shurlock" boss integrally cast into the housing section.

A snap-in, swing-out cast aluminum reflector ring, supported by stainless steel hinge pins shall be provided. The hinge pins shall be supported by mounting lugs integrally cast on the left side of the housing.

The housing door shall be hinged to the signal section housing by stainless steel roll pins and hinge lugs integrally cast in the door and housing. The door shall be latched by means of integrally cast door latch slots, housing hinge bolt lugs and stainless steel hinge bolts and wing nuts. The 12-inch sections require two (2) latching bolts.

A gasket groove on the inside of the door shall accommodate a neoprene gasket to form a positive seal between the door and signal housing when the door is closed and latched. Four (4) quick change type lens clips and four (4) stainless steel screws shall be provided for securing the lens and lens gasket in the door lens opening. Four (4) stainless steel washer head type screws shall be provided to secure the signal visor.

Signal section housings shall be fastened together by two (2) stainless steel, (clover leaf type) clamping washers and three (3) carriage bolts and lock washers. Each complete signal head assembly shall be pre-drilled for mounting of signal backplates.

All signal sections and the outside surfaces of visors shall be painted gloss black. The inside of the visor shall be painted dull black. All painting shall be done by the manufacturer.

**(B) Visors:**

Each signal section shall have a tunnel type visor with a 5 to 7 degree downward tilt. Unless otherwise specified the 12-inch signal sections shall be furnished with 12-inch by 12-inch long visors. All visors shall be retained to the housing section door with stainless steel washer head type screws.

**(C) Backplates:**

Louvered backplates and backplate mounting hardware shall be furnished with each vehicular signal head assembly. The backplate shall be fabricated of anodized sheet aluminum. The 5.0 inch border backplates shall be provided for the 12-inch signal head assemblies. All backplates shall be painted dull black. All painting shall be done by the manufacturer.

**(D) Mounting Assemblies:**

For the HAWK signal, an elevator plumbizer conforming to the requirements of MCDOT Detail 4778-2 shall be installed with all mast arm mounted 12 inch signal heads, as shown on the Traffic Signal Plan. The plumbizer elongated bolt hole shall be positioned to align with the bolt hole drilled 2 3/8 inches from the end of the tenon on the mast arm. The plumbizer shall be held in place with a 3/8 inch bolt with a nut and two (2) washers per MCDOT Detail 4778-2. The plumbizer signal head mounting position shall be in accordance with the requirements of MCDOT Detail 4778-1.

Pole top and side mount mounting assemblies shall consist of 1⅞" outside diameter (1½" nominal size) standard pipe and fittings. All members shall be so fabricated that they shall provide plumb, symmetrically arranged and securely fabricated assemblies.

Terminal Compartments – A terminal compartment shall be assembled in the mounting brackets as shown in the Standard Details and as called for on the plans. The terminal compartment shall be manufactured of bronze.

A rainproof cover shall be provided for all terminal compartments which will provide ready access to the internal terminal block wiring.

The types of mounting assemblies used, and the methods of mounting them, shall be as shown on the Traffic Signal Plan and shall conform to MCDOT Details for the HAWK and City of Avondale detail A1076 for the Trombone Signals.

**476.2.2 Led Signal Lamps:**

**(A) General:**

LED traffic signal modules shall be designed to fit traffic signal housings that meet MCDOT specifications. The module shall be weather tight and shall fit securely in the housing and shall have wire leads long enough for easy connection to the traffic signal head wire terminal block. The wire shall have crimped on terminal connectors. The LED signal module shall be a single, self-contained device. The power supply shall be integral to the sealed LED module.

**(B) Module Identification:**

The Contractor shall ensure that the date of installation is filled in on the module label on each LED module.

**(C) Physical and Mechanical Requirements:**

The LED lamp unit shall be a single self-contained device, not requiring on site assembly for installation. The assembly and manufacturing process for LED Traffic Signal Lamp unit assembly shall be such as to withstand mechanical shock, and vibration caused by winds up to 80 mph.

Signal lens shall be convex to minimize sunlight reflectance.

**(D) Optical and Light Output Requirements:**

The LED shall be manufactured using AlInGaP Technology or other LEDs with low susceptibility to temperature degradation (AlGaS LEDs will not be allowed).

The LED signal lamps shall be in three colors: red, yellow, and green. Multiple color modules shall not be used.

Each LED traffic signal lamp shall meet the minimum laboratory light intensity values, color (chromatically), and light output distribution as described in ITE Standards as shown in Section 11.04, Table I and Section 8.04, Figure 1 of the Vehicle Traffic Control Signal Head Standard. Each LED traffic signal lamp shall meet the minimum requirements for light output for the entire range of allowed voltage.

**(E) Electrical:**

Each unit shall incorporate a regulated power supply engineered to electrically protect the LEDs and maintain a safe and reliable operation. The power supply shall provide capacitor filtered DC regulated current to the LEDs per the LEDs manufacturer's specification. MCDOT does not require the unit be dimmable.

The LED traffic signal lamp shall operate on a 60Hz AC line voltage ranging from 80 volts RMS to 135 volts RMS. The Circuitry shall prevent flickering over this voltage range. Nominal rated voltage for all measurements shall be 117 volts RMS. The LED traffic signal lamp unit shall be operationally compatible with controllers and conflict monitors used by MCDOT. Two, captive, color coded, 3 feet long, 600 V, 18 AWG minimum jacketed wires, conforming to the NEC, rated for service at 105º C, are to be provided for an electrical connection. One

Schematic diagram shall be provided for each LED lamp unit along with any necessary installation instructions. LEDs shall be arranged in no less than 6 loaded circuits. The LED shall operate with a minimum 0.90 power factor. Total harmonic distortion (current and voltage) induced into an AC power line by a signal module shall not exceed 20 percent. LED modules shall have female quick-disconnect type terminals.

**476.2.3 Pedestrian Signal Head:**

The pedestrian signal head shall include an aluminum housing with swing down door frame, a plug-in sealed LED message module, and visor. The pedestrian signal shall be energy efficient with a power consumption of less than 12 watts at 120 volts.

Optically, the pedestrian signal head shall display brightly and uniformly, the alternate symbol messages "HAND" in Portland orange, “COUNTDOWN NUMERALS” IN Portland orange and "WALKING PERSON" in lunar white under all ambient light conditions. The message symbols shall not be seen (blank-out) when the message symbol is not energized.

The HAND-WALKING PERSON symbol shall be a minimum of 11 inches high and 7 inches wide and the COUNTDOWN NUMERALS shall be 9” high and 7” wide conforming to the requirements of the Manual of Uniform Traffic Control Devices, Institute of Transportation Engineering Standards for Pedestrian Traffic Control Signal Indications, the Signal Plan and the requirements of these specifications.

**(A) Housing and Door Frame:**

The housing and door frame shall be a one piece corrosion resistant aluminum die casting. The maximum overall dimensions of the pedestrian unit signal housing including door and visor shall be 18 inches wide, 16 inches high, and 9 inches deep. The top and bottom of the housing shall have openings to accommodate standard 1½ inch pipe size fittings. The bottom opening shall have a locking "Shurlock" boss integrally cast into the housing. The distance between the mounting surfaces of the upper and lower opening shall be 15.75 inches.

The housing door frame shall be hinged to the housing by stainless steel pins and hinge lugs integrally cast in the housing and door frame. The swing down door shall be latched by two integrally cast housing hinge bolts lugs, two door latch slots and two stainless steel hinge bolts with wing nuts.

The housing shall be dust proof and weatherproof with the plug-in LED module installed and the door closed and latched. The housing and door shall be painted gloss black by the manufacturer.

**(B) LED Message Module:**

The lunar white and Portland orange LED, solid state controls, and transformers for energizing the LED shall be encased in a plug-in module. The HAND and WALKING PERSON symbol message lens shall be ultraviolet stabilized polycarbonate. The HAND and WALKING SYMBOL message shall be full indications only.

The rear of the module shall have three male quick disconnect lugs for connection of the AC+HAND signal and AC+WALKING PERSON signal. The HAND and WALKING PERSON

power consumption shall be less than 12 watts. The COUNTDOWN NUMERALS power consumption shall be less than 7 watts.

**476.2.4 Warranties:**

All LED signal lamps and heads shall be warranted for five (5) years against defects in workmanship and materials and the requirements of Section 108.8.

**476.3 MEASUREMENT:**

Vehicular and pedestrian signal indications completely (including wiring and mounting assemblies) will be measured as a unit for each type of signal installed. Pedestrian push buttons shall include pedestrian signs and mounting hardware.

**476.4 PAYMENT:**

The accepted quantities of vehicular and pedestrian signal indications, measured as provided above, will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE, including visors, louvered backplates, LED's and all hardware necessary to provide a complete, and functional signal installation.

| | |
|---|---|
| ***SIGNAL HEAD, TYPE F*** | ***EACH*** |
| ***SIGNAL HEAD, TYPE Q*** | ***EACH*** |
| ***SIGNAL HEAD, TYPE Q (RIGHT TURN)*** | ***EACH*** |
| ***SIGNAL HEAD, TYPE Q-2*** | ***EACH*** |
| ***SIGNAL HEAD, TYPE T*** | ***EACH*** |
| ***PEDESTRIAN INDICATION M/H WITH COUNTDOWN*** | ***EACH*** |
| ***PEDESTRIAN PUSH BUTTON*** | ***EACH*** |
| ***SIGNAL MOUNTING ASSEMBLY, TYPE II*** | ***EACH*** |
| ***SINGAL MOUNTING ASSEMBLY, TYPE V*** | ***EACH*** |
| ***SIGNAL MOUNTING ASSEMBLY, TYPE VII*** | ***EACH*** |
| ***SIGNAL MOUNTING ASSEMBLY, TYPE XI*** | ***EACH*** |

## SECTION 477 INTERSECTION LIGHTING:

### 477.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing LED luminaires for intersection lighting in accordance with the location shown on the Traffic Signal Plans and the requirements of these specifications.

### 477.2 MATERIALS:

#### 477.2.1 General:

Intersection lighting materials shall conform to the type of luminaire as indicated on the Traffic Signal Plans.

#### 477.2.2 LED Luminaire:

The luminaire shall be capable of operating on primary voltages between 120 and 277 volts. The luminaire shall be of the horizontal cut-off type. The light distribution pattern shall be Type IV with an Asymmetric Forward distribution.

Luminaire shall be 4000K CCT. Luminaire shall be GE Product number:
ERL2 0 18 C3 40 A DKBZ

### 477.3 CONSTRUCTION REQUIREMENTS:

The Contractor shall install the LED luminaires per ADOT Standard Specification Section 736-3.

### 477.4 MEASUREMENT:

Luminaires will be measured as a unit for each type of luminaire furnished and installed.

### 477.5 PAYMENT:

The accepted quantities of luminaires measured as provided above, will be paid for at the contract unit price. Payment shall be full compensation for the work, COMPLETE IN PLACE.

***LUMINAIRE, GE EVOLVE ERL2*** ***EACH***

## SECTION 478 ELECTRICAL CONDUCTORS:

### 478.1 DESCRIPTION:

The work under this section shall consist of furnishing and installing electrical conductors for traffic signals and intersection lighting in accordance with the Traffic Signal Plan, requirements of these specifications, and MAG specifications.

All new electrical conductors shall be installed with the traffic signal improvements at the intersections of: 91st Avenue/Latham Street, 91st Avenue/McKinley, 91st Avenue/Van Buren Street and the HAWK Beacon on 91st Avenue north of Washington Street.

The 91st Avenue SE corner traffic signal pole relocation will require specific cables to be replaced from the controller cabinet to the new pole location and to the devices including emergency pre-emption cabling, roadway lighting, signal wires and cables, and video detection cables.

Video detection and emergency vehicle pre-emption cables can be re-used if they have sufficient length. If the existing cables are insufficient, new cables shall be provided under this bid item. All cables shall be per the manufacturer's guidelines.

### 478.2 MATERIALS:

#### 478.2.1 Electrical Conductors:

The wire shall be annealed copper and shall be uncoated unless otherwise specified. The wire shall be solid for number 10, 12 and 14 AWG and smaller diameter wire, conforming to the requirements of ASTM B3 for annealed bare copper wire. Conductors for sizes number 8 AWG and larger diameter wire shall be stranded and shall conform to ASTM B8 for Class B stranding, unless otherwise specified, the conductors shall be insulated with THW grade thermoplastic compound and shall meet the requirements of UL 83. Insulation colors shall be permanent and an integral part of the insulation and shall not be applied as a surface treatment of coating. The insulation thickness shall conform to the requirements of the NEC. Conductor insulation shall be a solid color unless otherwise specified. The color shall be continuous over the entire length of the conductor.

Wire and cable shall be UL listed and rated at 600 volts. The UL label shall be present on each reel, coil or container of wire or cable. When requested, the Contractor shall submit to the Engineer the manufacturer's written certification that the product conforms to the requirements of these specifications.

All single conductors shall have plain, distinctive and permanent markings on the outer surface throughout their entire length showing the manufacturer's name or trademark, insulation type, conductor size, voltage rating and the number of conductors in the cable. Insulation colors shall be permanent and an integral part of the insulation and shall not be applied as a surface treatment coating.

Conductor colors and sizes for use in traffic signal and intersection lighting shall be as specified on the Traffic Signal Plan conductor schedule, and MCDOT Details 4799-1and 4799-2.

**(A) Wire Tagging:**

Individual conductors for each vehicular and pedestrian phase group shall be secured together by two layers of plastic electrical tape and tagged with an approved wire I.D. marker (3M Scotchcode Wire Marker Tape or approved equal). Cables for each vehicular and pedestrian phase group shall be wrapped with two layers of plastic electrical tape and tagged with an approved wire I.D. marker (Scotchcode Wire Marker Tape or approved equal). Wires and cables shall be individually marked in all cabinets and in pull boxes.

When IMSA cable is specified, wire insulation color assignment shall be in accordance with MCDOT Details 4799-1 and 4799-2.

**(B) IMSA Cables:**

IMSA cable shall be used when specified on the plans. IMSA cables shall be polyethylene insulated copper conductors, polyvinyl chloride jacketed, rated at 600 volts for use in underground conduit or as aerial cable conforming to IMSA Specification 19-1.

The IMSA 19-1 cable shall be provided with the number and size of conductors as specified on the plans. The colors and tracers shall be permanent and an integral part of the insulation and shall not be painted, surface coated or adhered to surface. Ink strips are unacceptable. Conductor insulation colors shall be standard IMSA colors (as shown by the following table). Cable conductor color, phase and interval assignments shall be in accordance with MCDOT Details 4799-1 and 4799-2.

| Conductor Number | Insulation Color | Stripe Color | Conductor Number | Insulation Color | Stripe Color |
|---|---|---|---|---|---|
| 1 | Black | --- | 11 | Blue | Black |
| 2 | White | --- | 12 | Black | White |
| 3 | Red | --- | 13 | Red | White |
| 4 | Green | --- | 14 | Green | White |
| 5 | Orange | --- | 15 | Blue | White |
| 6 | Blue | --- | 16 | Black | Red |
| 7 | White | Black | 17 | White | Red |
| 8 | Red | Black | 18 | Orange | Red |
| 9 | Green | Black | 19 | Blue | Red |
| 10 | Orange | Black | 20 | Red | Green |

## 478.3. WIRING PROCEDURES:

### 478.3.1 General Requirements:

All wiring shall be in conformance with the NEC and the requirements of these specifications. All wire nuts and other wiring devices shall be UL listed. Conductor sizes and colors shall be as specified on the Traffic Signal Plan conductor schedule. Conductors shall be pulled into runs in a smooth continuous manner, avoiding contact with sharp objects that might damage the insulation. Approved lubricants shall be used for inserting conductors in conduit. Before installation, conductors' ends shall be taped for moisture protection until connections are made. Splices are permitted in pull boxes, pedestals and cabinets.

Conductors shall have a minimum of 36 inches of slack from the conduit end bell in the pull box.

All phase wiring shall be boxed at the intersection, terminated and spliced in the number seven (# 7) pull boxes.

### 478.3.2 Conductor Splices:

Splices shall be made utilizing wire nut connectors (Ideal model numbers 451, 452 and 454, or approved equal). Wire stripping length and wire size combinations shall be in accordance with the manufacturer's instructions supplied with the wire nut connector. Soldered connections will not be permitted. All phases shall be spliced in all pull boxes and unused phase wiring shall be spliced to the ground rod in the controller cabinet.

Splices shall be dipped or brushed with a minimum of three coats of liquid waterproof splicing compound (3M Scotch Kote or approved equal). The finished splices shall be such that their electrical and mechanical characteristics and insulation quality are equal to those of the original cable.

### 478.3.3 Bonding and Grounding:

All metallic enclosures such as cabinets, pedestals, poles, conduit and cable sheaths shall be bonded to form a continuous grounded system. Non-metallic portions of the system, such as PVC conduit, shall have a No. 8 AWG bare copper bond wire installed with suitable connections to form a continuous grounded system.

At each service disconnect, cabinet foundation, or where otherwise specified, an approved copper-plated ground rod shall be installed. Each ground rod shall be a one-piece solid rod of the copper weld type or approved equal and shall be a minimum of 5/8 inch in diameter and 10.0 feet long. The rod shall be driven vertically into the ground to a minimum 9.0 feet below the surface. If the rod cannot be driven vertically it shall be installed in accordance with article 250-83 of the NEC. The ground rod may be located in a pull box. The service equipment neutral (grounded conductor) and the system grounding conductor (No. 8 AWG bond, solid) shall be connected to the ground rod with a copper-plated bolt or a brass bolt on the ground clamp.

The grounding electrode system shall be in accordance with articles 250-81 and 250-83 of the NEC.

Pole foundations shall have 25 feet of number 4 AWG bare copper conductor coiled and placed at the bottom of the excavation before concrete is poured. Pole foundation grounding electrodes shall be connected to the pole grounding screw in the hand hole with an approved lug connector. A ground resistance test shall be performed for each installed ground rod prior to final connection of the utility service. Pole foundation coil grounds shall be tested as determined by the Engineer in the field.

The ground resistance shall be measured with a three terminal, fall of potential, direct reading, battery powered earth tester with a 0.50 to 500 ohm scale or digital read-out. The 25 ohm reading shall be approximately at mid scale.

The test shall be performed according to the manufacturer's instructions and OSHA requirements. Two auxiliary copper clad ground rods shall be driven into the ground a minimum of 3 feet. The lateral spacing for each test rod shall be given in writing on the test report form and the spacing shall be approved by the Engineer.

All tests shall be performed in the presence of the Engineer and the test results shall be written down, dated and given to the Engineer for approval.

Each ground rod or foundation ground shall be isolated with the bond wires disconnected when the test is being performed. The resistance to ground shall be 25 ohms or less. If it is not, additional ground rods shall be installed as required at least 15 feet from the original ground and shall be bonded to it. The test shall then be repeated for multiple grounds as necessary to achieve proper grounding below 25 ohms. As many additional ground rods shall be installed as is necessary to achieve proper grounding of 25 ohms or less.

The test shall be performed when the soil is dry. The contractor shall not add any chemical or salt solutions to any portion of the grounding system. All grounding rods and foundation grounds to be tested shall be installed a minimum of ten days prior to testing unless otherwise determined by the Engineer in the field.

**478.4 MEASUREMENT:**

Conductors for traffic signals and intersection lighting will be measured on a lump sum basis.

**478.5 PAYMENT:**

Conductors, measured as provided above, will be paid for at the contract lump sum price, which price shall be full compensation for the item, COMPLETE IN PLACE.

***TRAFFIC SIGNAL CONDUCTORS AND CABLES*** ***LUMP SUM***

## SECTION 479 EMERGENCY PRE-EMPTION:

### 479.1 DESCRIPTION:

The work under this item consists of furnishing all labor, equipment, and materials necessary to provide an emergency vehicle pre-emption unit at the 91st Ave and Latham intersection as designated on the project plans or directed by the CITY and/or Designee. The device shall be compatible with the existing preemption system at the intersection.

### 479.2 CONSTRUCTION REQUIREMENTS:

The work under this item shall comply with the details shown on the plans and in compliance with the City of Tolleson requirements. All hardware, fasteners, wire, detectors, emitters, phase selectors and any other miscellaneous items necessary to provide a complete emergency vehicle pre-emption system shall be included and shall meet the specifications of the manufacturer. All items necessary for a complete system shall be provided by the contractor.

### 479.3 MEASUREMENT:

Emergency Preemption Unit shall be measured as EACH for each unit installed, including but not limited to all sensors, hardware, fasteners, washers, bolts, clamps, cables, wire and conductors required to attach the emergency vehicle preemption equipment to the new traffic signal poles and provide a fully functional pre-emption system.

### 479.4 PAYMENT:

The accepted quantities of Emergency Preemption Unit, measured as provided above, will be paid for at the contract unit price, COMPLETE IN PLACE.

***EMERGENCY PRE-EMPTION UNIT*** ***EACH***

## SECTION 480 INTERNALLY ILLUMINATED STREET NAME SIGNS:

### 480.1 DESCRIPTION:

The work under this item shall include furnishing all labor, equipment, materials and miscellaneous items necessary for the installation of an internally illuminated street name sign at the identified intersections, as shown on the project plans and specified herein.

### 480.2 MATERIALS:

This item shall include cabling and any miscellaneous equipment necessary to install an internally illuminated street name sign.

Sign cabinet shall be 0.090 extruded aluminum, 12 inches deep with 1.5 inch retainers.

Sign cabinets shall be dual faced.

Sign cabinet shall be powder coat black.

Sign cabinet shall have stainless steel latches.

Mounting shall be Pelco Astor Brac or approved equal.

### 480.3 CONSTRUCTION REQUIREMENTS:

All internally illuminated street name signs re-installed as shown on plans and in accordance with manufacturer's and these specifications. The signs shall be mounted, by the Contractor, on the traffic signal poles.

### 480.4 METHOD OF MEASUREMENT:

Measurement of the Install Internally Illuminated Street Name Sign will be measured as a unit each, including any auxiliary equipment for the sign assembly and any miscellaneous items required to provide a fully functional internally illuminated street name sign at the identified intersections.

Sign panel insert shall be measured separately.

### 480.5 BASIS OF PAYMENT:

Payment for this work will be made at the contract unit price for install internally illuminated street name sign, which price shall be full compensation for furnishing all labor, equipment and materials for the work, COMPLETE IN PLACE, for the identified intersections, as shown in the project plans and specified in these specifications.

Sign panel inserts shall be paid for under separate items.

***INTERNALLY ILLUMINATED STREET NAME SIGNS*** ***EACH***

Add the following section:

**SECTION 793 EROSION CONTROL:**

SWPPP shall be accomplished per ADOT Standard Specification Section 104.
Section 104.09 Prevention of Landscape Defacement; Protection of Streams, Lakes and Reservoirs: of the ADOT Standard Specifications is revised to read:

**(A) General:**

The contractor shall give attention to the effect of the contractor's operations upon the landscape, and shall take care to maintain natural surroundings undamaged.
The contractor shall be responsible to implement the requirements of the Arizona Pollutant Discharge Elimination System (AZPDES) for erosion and sediment control as specified in the "General Permit For Discharge From Construction Activities To the Waters Of The United States," issued by the Arizona Department of Environmental Quality (ADEQ). That document is hereinafter referred to as the AZPDES general permit.

Useful information related to stormwater controls and erosion and sediment control measures is presented in the "Fact Sheet For The Issuance Of An AZPDES Construction General Permit," available from ADEQ, and ADOT's "Erosion and Pollution Control Manual," available on the Department's website at:

http://www.azdot.gov/inside_adot/OES/Water_Quality/Stormwater/Erosion_Pollution_Control_Manual.asp.

The work shall include providing, installing, maintaining, removing and disposing of erosion and sediment control measures such as gravel filter berms, dikes, catch basin inlet protection, end of pipe filtering devices, silt fences, dams, sediment basins, earth berms, netting, geotextile fabrics, slope drains, seeding, stream stabilization, and other erosion and sediment control devices or methods. Erosion control, as hereinafter referenced, shall be deemed to include control of erosion and the mitigation of any resulting sediment. Erosion control measures may be temporary or permanent. The contractor shall also be responsible for the preparation and processing of all documents required in the AZPDES general permit.

The plans will include preliminary erosion control measures and additional information to be included in the project's Storm Water Pollution Prevention Plan (SWPPP), as specified in Subsection 104.09(B). The contractor, with input from the Engineer, shall finalize the SWPPP, file a Notice of Intent (NOI), implement the SWPPP, and file a Notice of Termination (NOT), all as described herein.

Except for the NOI, all signatures required of the contractor by the AZPDES general permit, including those required for the NOT, SWPPP, and inspection reports, shall be provided by a duly authorized representative of the contractor, as defined in Part VIII.J.2 of said permit. Signature of the NOI shall be by a responsible corporate officer, as defined in Part VIII.J.1 of the AZPDES general permit.

No clearing, grubbing, earthwork, or other work elements affected by the erosion control requirements in the SWPPP, shall be started until the SWPPP has been approved, the NOI completed and filed in accordance with Subsection 104.09(C), and the SWPPP implemented.

Submission of the contractor's NOI shall certify that the contractor and its subcontractors have read and will comply with all provisions of the AZPDES general permit.

**(B) Stormwater Pollution Prevention Plan (SWPPP):**

The plans will include descriptions of temporary and permanent erosion control measures; a project description; percent impervious area, including paved areas, rooftops, and other similar surfaces, for both pre-construction and post-construction conditions; inspection schedule; and site-specific diagrams indicating proposed locations where erosion and sediment control devices or pollution control measures may be required during successive construction stages. The plans may also include an initial schedule detailing the proposed sequence of construction and related erosion control measures.

The contractor shall review the preliminary information, including the erosion control features and phasing, evaluate all SWPPP requirements for adequacy in addressing pollution prevention during construction, and prepare a draft SWPPP for review by the Engineer.

The contractor shall designate an erosion control coordinator, in accordance with Subsection 104.09(D), to be responsible for finalization and implementation of the SWPPP, as well as all other applicable requirements of the AZPDES general permit. The contractor's erosion control coordinator shall be approved as specified in Subsection 104.09(D) before the draft SWPPP can be finalized and submitted to the Engineer. After approval, the contractor shall designate the erosion control coordinator as an authorized representative of the contractor in accordance with Part VIII.J.2 of the AZPDES General Permit.

The draft SWPPP shall include all information required in the AZPDES general permit, including a site map; identification of receiving waters and wetlands impacted by the project; a list of potential pollutant sources; inspection schedule; any onsite or off-site material storage sites; additional or modified stormwater, erosion, and sediment controls; procedures for maintaining temporary and permanent erosion control measures; a list of the contractor's pollution prevention practices; and other permit requirements stipulated in the AZPDES program as well as other applicable state or local programs. The contractor shall coordinate with the Engineer on all such additional information.

The draft SWPPP shall also identify any potential for discharge into a municipal separate storm sewer system (MS4), including the name of the owner/operator of the system.

Unless otherwise approved by the Engineer, the contractor shall not expose a surface area of greater than 750,000 square feet to erosion through clearing and grubbing, or excavation and filling operations within the project limits until temporary or permanent erosion control devices for that portion of the project have been installed and accepted by the Engineer.

The contractor shall indicate each 750,000 square-foot sub-area in the draft SWPPP, along with proposed erosion control measures for each sub-area. The draft SWPPP shall also include the sequence of construction for each sub-area, and installation of the required temporary or permanent erosion control measures.

The contractor shall give installation of permanent erosion control measures priority over reliance on temporary measures. Permanent erosion control measures and drainage structures shall be installed as soon as possible in the construction sequencing of the project, preferably concurrent with construction of the related sub-area or drainage device. However, except as specified in Part IV, Section B.2 of the AZPDES general permit and approved by the Engineer, erosion control measures shall be installed no later than 14 calendar days after construction activity has temporarily or permanently ceased for the affected sub-area.

Temporary or permanent sedimentation basins may be required for reducing or eliminating sediment from stormwater runoff. When required, such basins shall be completed before any clearing and grubbing of the site is initiated. The contractor shall evaluate the need and attainability of installing sediment basins as described in the AZPDES permit and, if approved by the Engineer, include the basins into the SWPPP as appropriate. When sedimentation basins are determined to be necessary and feasible, such work will be paid in accordance with Subsection 109.04(D). The plans may also include sediment basins as part of the preliminary information. No additional payment will be made for such basins, the cost being considered as included in contract items.

The draft SWPPP shall also identify and address erosion control at on-site fueling operations, waste piles, material storage sites, and off-site dedicated asphalt and concrete plants, contractor-use areas, storage areas, and support activity locations which are used solely for the project and are covered by the AZPDES general permit. The draft SWPPP shall also accommodate all requirements for the contractor's pollution prevention practices specified in Subsection 104.09(E). In addition, the SWPPP shall specifically identify the erosion control measures proposed by the contractor during any vegetation removal and salvaging phases of the project (such as during timber harvesting or native plant salvaging).

The draft SWPPP shall specify the mechanism whereby revisions may be proposed by the contractor or the Engineer throughout the project and incorporated into the plan, including review and approval procedure. The Engineer and contractor shall jointly approve and sign each revision to the SWPPP before implementation. Any subsequent submittals required by the contractor to revise or update the SWPPP will require at least 48 hours for review.

Contractors and subcontractors responsible for implementing all or portions of the SWPPP shall be listed in the draft SWPPP, along with the measures for which they are responsible.

The contractor shall submit two copies of the draft SWPPP, including all information specified herein, to the Engineer at the preconstruction conference if possible, but not later than 14 calendar days from the Department's approval of the contractor's Erosion Control Coordinator.

The Engineer will provide the contractor with the following forms at the preconstruction conference:

- Maintenance, inspection, and site-monitoring report forms;
- Other record keeping forms and procedures, as needed; and
- Notice of Intent (NOI) and Notice of Termination (NOT) forms.

Notice of Intent and Notice of Termination blank forms are also available on the internet at http://azdeq.gov/function/forms/appswater.html#cgp.

Within 10 calendar days from the SWPPP submittal, the Engineer and contractor will jointly review the contractor's draft SWPPP, and include any additional revisions directed by the Engineer. The finalized SWPPP shall meet the terms and conditions of the AZDPES general permit, and be compatible with construction sequencing and maintenance of traffic plans.

When agreement has been reached, the Engineer and contractor's authorized representative will sign the finalized SWPPP. The Engineer's signature will constitute approval of the SWPPP. Upon approval of the SWPPP, the contractor shall file a Notice of Intent (NOI) as specified in Subsection 104.09(C).

After the time period specified in Subsection 104.09(C), the contractor shall implement the requirements of the SWPPP. No clearing, grubbing, earthwork, or other work elements affected by the erosion control requirements in the SWPPP, shall be started until the SWPPP has been approved, the NOIs completed and filed in accordance with Subsection 104.09(C), and the SWPPP implemented.

The contractor shall maintain all related erosion control elements in proper working order throughout the project. Work under this section also includes inspections, record-keeping, and implementation of pollution prevention practices as described in Subsection 104.09(E).

The approved SWPPP shall be updated whenever a change in design, construction method, operation, maintenance procedure, or other activity may cause a significant effect on the discharge of pollutants to surface waters, or when a change is proposed to the personnel responsible for implementing any portion of the SWPPP. The SWPPP shall also be amended if inspections indicate that the SWPPP is ineffective in eliminating or significantly reducing pollutants in the discharges from the construction site. All necessary modifications to the SWPPP shall be made within seven calendar days following the inspection that revealed the deficiency.

ADEQ may notify the contractor at any time that the SWPPP does not comply with the permit requirements. The notification will identify the provisions of the permit that are not being met and parts of the SWPPP that require modification. Within 15 business days of receipt of the notification from ADEQ the contractor shall make the required changes to the SWPPP and submit a written certification to ADEQ that the requested changes have been made.

The contractor's erosion control coordinator shall maintain the SWPPP along with completed inspection forms and other AZPDES records in a three-ring binder. The erosion control coordinator shall maintain a current copy of the SWPPP, including all associated records and forms, at the job site from the time construction begins until completion of the project. The SWPPP shall be available for inspection by ADEQ, FHWA, and other entities identified in the AZPDES general permit, and for use by the Engineer. The erosion control coordinator shall provide copies of any or all of such documents to the Engineer upon request. When requested, such copies shall be provided within three working days of the request.

The SWPPP (including inspection forms) and all data used to complete the NOI and NOT shall be provided to the Department at the completion of the project. The contractor shall retain its own records for a period of at least three years from the filing of the contractor's NOT.

No condition of the AZPDES general permit or the SWPPP shall release the contractor from any responsibilities or requirements under other environmental statutes or regulations.

**(C) Notice of Intent (NOI):**

After the project Storm Water Pollution Prevention Plan (SWPPP) has been approved, the contractor will complete a Notice-of-Intent (NOI) form for the project. The NOI includes a certification statement which must be signed and dated by a responsible corporate officer of the contractor, as defined in Part VIII.J.1of the AZPDES General Permit, and include the name and title of that officer.

The NOIs shall be submitted to the Arizona Department of Environmental Quality (ADEQ) at the following address:

Arizona Department of Environmental Quality
Surface Water Section/Permits Unit/Stormwater NOIs (5415A-1)
1110 W. Washington Street
Phoenix, Arizona 85007
or fax to (602) 771-4528

The submittals shall be made to allow for the seven calendar-day review period required by ADEQ before the anticipated start of construction. The contractor shall also allow sufficient time, depending on the manner of submittal, for the NOIs to be received by ADEQ before commencement of the seven-day review period. An Authorization Certificate will be issued by ADEQ and, unless otherwise notified, the construction activities that are covered by the terms and conditions of the AZPDES permit may begin after the submittal period plus the seven calendar-day review period, or upon receipt of the Authorization Certificate, whichever occurs first. The contractor shall provide a copy of the authorization certificate to the Engineer, and keep a copy with the NOI.

The NOI may also be submitted electronically, through ADEQ's Smart NOI website at http://az.gov/webapp/noi/main.do. Regardless of the method of submittal, the contractor shall provide a copy to the Engineer.

At any time after authorization, ADEQ may determine that the contractor's stormwater discharges may cause or contribute to non-attainment of any applicable water quality standards. If ADEQ makes that determination, the contractor will be notified in writing. The contractor shall develop a supplemental erosion control action plan describing SWPPP modifications to address the identified water quality concerns. If the written notice from ADEQ requires a response, failure to respond in a timely manner constitutes a permit violation. All responses shall be in accordance with the AZPDES general permit.

If there is a potential to discharge into a municipal separate storm sewer system (MS4), a copy of the Authorization Certificate shall be submitted to the owner/operator of the system. Also, contractor's operating under an approved local sediment and erosion plan,

grading plan, or stormwater management plan shall submit a copy of the Authorization Certificate to the local authority upon their request.

The contractor shall post its NOI and the information required in the AZPDES general permit on the construction-site bulletin board throughout the duration of the project. A copy of the AZPDES general permit shall also be kept at the construction site at all times.

**(D) Notice of Termination (NOT):**

Upon final acceptance by the Engineer in accordance with Subsection 105.20, and as specified herein, the Contractor shall complete and mail a Notice-of-Termination (NOT) for the project to the address shown below. The NOT submitted by the Contractor includes a certification statement which must be signed and dated by an authorized representative of the Contractor, as defined in Part VII.K.2 of the AZPDES General Permit, and include the name and title of that authorized representative.

Arizona Department of Environmental Quality
Water Permits Section/Stormwater NOT (5415B-3)
1110 W. Washington Street
Phoenix, Arizona 85007

When the approved SWPPP includes the use of hydroseeding as an erosion control measure, seeded areas shall be maintained for 45 calendar days, as specified in the special provisions, and approved by the Engineer before the contractor's NOT can be submitted.

**Contractor's Responsibility for Work:** of the ADOT Standard Specifications is revised to read:

The Contractor shall implement the requirements of the Arizona Pollutant Discharge Elimination System (AZPDES) for erosion control due to storm water runoff during construction, Prevention of Landscape Defacement; Protection of Streams, Lakes, and Reservoirs.

Until final written acceptance of the project by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements, or from any other cause, whether arising from the execution or from the nonexecution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance. No reimbursement shall be made for work necessary due to the contractor's failure to comply with the requirements of the SWPPP.

In case of suspension of work from 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 provide for normal drainage. The Contractor shall also erect any necessary temporary structures, signs or other facilities. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings, seedings and soddings, furnished under its contract and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

Payment for SWPPP work shall on a lump sum (**L.SUM.**) basis and will include all work to comply with these Specifications.

## SECTION 801 ELECTRICAL:

Add the following to the standard MAG specifications:

### 801.1 GENERAL PROVISIONS:

This section describes in general, requirements of the electrical and related items and work necessary for the complete job indicated by the contract documents. The general conditions are applicable to this section and shall form a part of the contract.

### 801.2 GENERAL LIST OF WORK:

The work of this section and related work described in other sections is indicated on the drawings and included, but not necessarily limited to:

801.2.1 Electrical Service Entrance Section including all circuit breakers, hand off automatic switches, time clocks, control relays, and lighting contactors necessary to complete the job in a workmanlike manner;

801.2.2 All other electrical equipment and services needed to complete a usable and operable facility in accordance with all pertinent codes and regulations;

801.2.3 Electric service, complete, to point of connection with the utility company's facilities;

801.2.4 Main distribution panel with metering equipment and feeder switches or circuit breakers;

801.2.5 Complete feeder system, in conduit, to power panels and branch circuit panels;

801.2.6 Branch circuit panels for power and lighting;

801.2.7 Complete branch circuit wiring system for lighting and electrical;

801.2.8 Lighting fixtures, poles, pole bases;

801.2.9 Landscape lighting including housing and base/foundation;

801.2.10 Trenching and backfilling for underground electrical installation.

### 801.3 PERMITS:

Secure and pay for all necessary permits and licenses, services and all inspection fees as required by the City.

### 801.4 QUALITY ASSURANCE:

For the actual fabrication, installations, and testing of the work of this Section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements of this work and with the installation recommendations of the manufacturers of the specified items.

In acceptance or rejection of installed electrical system, no allowance will be made for lack of skill on the part of the installers.

## 801.5 CODES AND ORDINANCES:

Install all work in accordance with the National Electrical Code (2005 edition) and its latest revisions, with any City requirements, and with all pertinent requirements and standard specifications.

## 801.6 CERTIFICATES:

All work shall comply with all State and Local rules and regulations. Furnish to the City all certificates of inspection and approvals as required.

## 801.7 EXAMINATION OF PREMISES:

Prior to submitting proposal, the bidder shall examine all general construction drawings and visit construction site to become familiar with existing conditions under which he will have to operate and which will in any way affect the work under this contract. No subsequent allowance will be made in this connection in behalf of the Contractor for any error or negligence on his part.

Prior to ordering any materials or doing any work, verify dimensions at the site. Correctness of dimensions is the Contractor's responsibility. No extra charge or compensation will be allowed for differences between actual dimensions and dimensions indicated on drawings. Immediately report differences to Engineer and do not proceed with work until Engineer dictates direction.

## 801.8 CONCRETE, EXCAVATION, FILL AND BACKFILL:

Furnish all concrete, excavation, fill and backfill, and steel required for this work unless specifically noted otherwise.

All concrete shall be Class "A", 3000 P.S.I., or as otherwise specified on the plans and shall be mixed, placed and cured in conformance with M.A.G. Specifications Section 725.

Conduit trenches shall be backfilled in a manner to prevent any disturbance to the pipes or conduits. Fill under and around pipes thoroughly to a point approximately 6" above the top of the pipe and compact.

Compaction of backfill shall be horizontal lifts not exceeding 6 inches in thickness. Compact to 85 percent of maximum density at optimum moisture content in accordance with local codes and standards or as directed by the Engineer.

## 801.9 ELECTRICAL DRAWINGS:

The drawings are generally diagrammatic and indicate the manner, method and nature of the installation. The Specifications denote the style and quality of material and workmanship. Where a conflict exists between the Drawings and Specifications, promptly notify the Engineer. The Engineer will make the proper interpretation and his decision will be final.

Any items not mentioned in the specifications or special provisions or not indicated on the plans but which are necessary for successful and efficient operation of the work, shall be considered incidental to the work and shall be furnished and installed as part of the contract.

## 801.10 STANDARD OF MATERIAL AND WORKMANSHIP:

All materials shall be new and shall conform to UL Standards in every case where such a standard has been established and shall bear the UL label. All work shall be performed in a workmanship manner in accordance with the best-accepted standards and shall present a neat mechanical appearance when completed.

Ratings of all electrical equipment shall be in accordance with National Electrical Manufacturers Association (NEMA).

## 801.11 PAINTING:

All exposed electrical equipment, conduit, flush panel fronts, transformers, switches, switchboards, panels, panel mounting boards, and similar items shall be painted in accordance with Section 530 of the MAG Specifications. Paint color shall be RAL 6015. Contractor shall submit 1-foot by 1-foot draw down samples to the Engineer for review and approval prior to any work.

## 801.12 TEMPORARY POWER:

Contractor shall provide temporary power as required by the job. This service shall be maintained throughout the entire job as the work progresses.

## 801.13 CLEAN-UP PROCESS:

Contractor shall, at all times, keep the premises free from accumulation of waste materials or rubbish caused by employees. Metal floor pans shall be provided for pipe threading machines and benches and shall be used at all times to prevent concrete floors from becoming oil soaked. Upon completion of the job contractor shall remove all debris, clean all switchplates, fixtures, panel trims and in general leave the premises in a clean and tidy condition to the satisfaction of the Engineer.

## 801.14 FINAL INSPECTIONS AND TESTS:

Contractor shall furnish all meters, cable, connection and apparatus necessary for making tests. Test system for shorts and grounds. Faulty wiring shall be removed and replaced. Any device, apparatus or fixture installed showing substandard performance shall be removed and replaced as directed by the City Inspector and Engineer.

## 801.15 UTILITIES:

801.15.1 Location of underground utilities

a. The contractor shall notify the interested “utilities” prior to the start of construction, and shall ascertain the locations of the various underground utilities either shown on the plans and/or which may be brought to his attention. The exact locations of these underground utilities shall be determined by excavations made by the contractor prior to any trenching operations.

801.15.2 Damage to existing utilities

a. The contractor shall assume full responsibility for any and all damage to any and all utilities due to his operations and shall repair the damaged utilities as required

herein, at his own expense per the direction of the engineer. Damaged water and irrigation lines shall be replaced in kind.

**801.16 GUARANTEE:**

Contractor shall fully guarantee all work under this Section for a period of one year from the date of final acceptance by the City, against imperfect workmanship or failure or malfunction of materials and/or equipment due to faulty or imperfect workmanship. This guarantee shall be given in writing to the City at the time of issuing final certificate. Work found to be defective within this period shall be replaced without cost to the City.

**801.17 SHOP DRAWINGS:**

All data shall be submitted at one time, bound and indexed in an orderly manner. Prior to starting work, contractor shall submit to the Engineer for review and approval, five (5) sets of shop drawings, panels, lighting fixtures, poles, junction boxes, submersible electrical equipment and all other equipment to be fabricated or installed.

**801.18 DOCUMENTS:**

The contractor shall preserve all manufacturers' paperwork that is shipped with equipment assemblies, lighting control panel components and field installed components. All literature accompanying each and every item shall be considered a part of that item such as specification sheets, installation instructions, operating and maintenance write-ups, etc and shall be neatly bound and returned to the City upon final acceptance.

Record drawings shall be provided to the City and shall be of the highest quality. Poor quality copies will not be accepted.

**801.19 MEASUREMENT AND PAYMENT:**

**Lighting Receptacle Outlets:**

The work under this item consists of furnishing all labor, equipment, and materials for installing electrical receptacles on a steel tube, in accordance with the project plans, the standard specifications and these Special Provisions. The work shall also include all compliance calculations, and submittals necessary for luminaire approval by the Engineer.

Measurement for the Lighting Receptacle Outlets will be measured as a unit for each outlet furnished and installed as detailed in these special provisions and on the plans.

The accepted quantities of Lighting Receptacle Outlets measured as provided above, will be paid for at the contract unit price each, complete in place, which price shall be full compensation for the work described and specified herein and on the plan, as approved by the Engineer.

**Wire and Conduit:**

The work under these items shall consist of all labor, tools, equipment, and material necessary for the installation of electric conduit, conduit fittings, conductors, including pulling, splicing, junction boxes and appurtenances as shown on the project plans or needed to provide a complete and operational system. Also included in the work is the required method of burial, approved by

the Engineer, to be used for placement of conduit runs under the existing pavement at the locations shown on the project plans. The conduit portion of this bid item is intended to cover the conduit and trench.

Conductors shall be soft drawn, annealed copper having conductivity of not less than 98 percent of that of pure copper, uniform in cross-section, free from flaws, scale and other imperfections.

All interior branch wiring shall be Type “XHHW”, 600-volt, 75 degrees C, unless otherwise noted and a minimum of #12, control wiring shall be stranded and a minimum of #12.

Manufacturers shall be Simplex, General Cable, Okonite, Rome Cable, Anaconda, General Electric and Kaiser.

Conduit systems shall be rigid galvanized steel, non-metallic fiber or Polyvinylchloride (PVC) plastic as specified herein, or as indicated on the plans. All systems shall be continuous.

(1) Conductors:

Install all wire and cable in conduit.

Make all above ground connections and splices for #10 wire and smaller with Buchanan “B-Cap”, 3-M “Scotchlok”, or Ideal “Wing Nut” pre-insulated wire connector (sizes as recommended by manufacturer). Make connection and splices for #8 conductors and larger with solder-less pressure or compression type connectors by O.Z., Burndy, Buchanan, T & B, or Illsco. Tape all splices with plastic so insulation is at least equivalent to insulation of conductor. Thoroughly clean ends before splicing. Where plastic tape is used and there is any danger of insulation damage from pressure of joint against non-current carrying metal parts, use friction tapes for additional protection. Vinyl plastic tape shall be Scotch #33 or Plymouth.

Make all underground cable and conductor splices in a pull box or j-box and connected and insulated with a Tyco Electronics Gelcap-sl or connected with copper compression h-tap connector or approved equal and insulated with a 3M Scotchcast splice kit 85 series or Tyco Electronics Gelcap or City approved equal.

The Contractor shall exercise due care when pulling wire and cable through raceways, to prevent conductors from kinking and injuring insulations.

UL approved pulling compounds may be applied to the conductors to insure ease of pulling. Under no circumstances shall any medium containing water, acid or petroleum base be used.

Leave no less than 6” of wire at each outlet for connection to lighting fixture, switch receptacle, and other pieces of equipment. Where wires feed through an outlet or junction box, neatly tuck a 6-inch long loop in bottom of box.

Control wiring and all other stranded wiring to screw connections shall be provided with T & B “STA-KON” terminals.

Solid conductors shall loop tightly and completely around terminal screws on all wiring devices.

(2) Conduit:

No conduit placed in a concrete slab shall be greater than ¾" trade size diameter and no conduit smaller than ½-inch shall be installed underground. No conduit shall be imbedded in a slab that is less than 3-1/2 inches thick except for local offsets. Unless otherwise noted or specified, tops of underground conduit or ducts shall not be less than 24 inches below grade. Assemble joints together using approved couplings to make watertight joints.

Schedule 40 PVC electrical conduit, UL listed 2.5 inches and smaller may be used for direct burial of underground branch circuits (with bond wire). All bends shall be manufactured, not field made. GENERAL: Stubs and risers above grade to panels and cabinets shall be rigid steel conduit and shall be grounded as described under "grounding".

Where exposed, install conduit parallel to walls and partitions; do not cross-window openings.

All conduit bends 45 degrees and larger, and 2 inches and above shall be manufactured bends or field make with hydraulic bender.

Coat Metallic conduit below grade or encased in concrete with two coats of Koppers Bitumastic, or half lap with Scotch Wrap #50, minimum thickness to be 20 mils.

Conduit Fittings: Provide double lockouts and bushings at all rigid conduit terminations except at threaded hubs. Bushings shall be O.Z. type "A" molded bakelite except for 2-inch conduit and larger shall be O.Z. type "B" or type "BL" where groundings are required.

Any sidewalk removed due to the installation of new streetlights not designated for removal shall receive an asphalt patch per TOG Standard Detail 45 "T" Top.

(3) Junction Boxes:

All junction boxes shall be sized to meet NEC box fill requirements.

The Conductors shall be measured per linear foot installed. The measurement shall include conductors, complete in place, including all splices, installation, and any appurtenances.

The Conduit shall be measured by the linear foot for each diameter size from center to center of pull boxes or from end to end of conduit when no pull boxes are used. The measurement shall include conduit, complete in place, including all fittings, steel risers, duct stubs, and any appurtenances. The conduit portion of this bid item is intended to cover the secondary conduit and trench as well as the conduit and trench for the private electrical distribution system.

No separate measurement or direct payment shall be made for saw cutting, boring, trenching, pavement removal, debris disposal and pavement replacement done as part of conduit installation, the cost being considered as included in the contract price for the conduit items.

Payment for work for the Conductors will be made on a linear foot basis for all work and equipment, which price shall be full compensation for the work described and specified herein and on the plan, as approved by the Engineer. No separate measurement or direct payment will be made for any necessary permits and fees, the cost being considered as included in the contract price for the conductor items.

Payment for work for the Conduits will be made on a linear foot basis for all work and equipment, which price shall be full compensation for the work described and specified herein and on the plan, as approved by the Engineer. No separate measurement or direct payment will be made for conduit bends at pull boxes, expansion fittings and coupling fittings, the cost being considered as included in the contract price for the conduit items.

**Decorative Street and Pedestrian Lights:**

The work under this item consists of furnishing all labor, equipment, and materials for installing custom pole mounted luminaires, including poles, fixtures, hardware, conduit and wire for the associated item, in accordance with the standard specifications, the project plans, and these Special Provisions. The work shall also include all compliance calculations, and submittals necessary for luminaire approval by the Engineer.

The materials under this item shall be provided new per the following. The use of a vendor's name and catalog number is for convenience in specifying the quality, style, size, finish and performance required and does not intentionally exclude similar equipment available from other manufacturers. Judgment of equality shall be by the Engineer and his acceptance or rejection shall be final.

(1) Poles:

The poles shall be in accordance with the project plan details.

(2) Luminaires:

The luminaires shall be in accordance with the project plan details. This luminaire is to be pole mounted.

Certified copies of the testing laboratory's findings shall be submitted to the Engineer. No luminaires shall be ordered until approved by the Engineer.

Each luminaire shall be furnished with an instruction sheet, which clearly shows installation procedures and instructions for adjusting the lamp socket.

(3) Pull Boxes:

All concrete pull boxes to be furnished and installed for lighting, as a part of the electrical system, shall have an etched polyethylene face, anchored in concrete, with an ultraviolet inhibitor. Unless specified otherwise, pull box covers shall be of “fiberlight” material, polyester pre-mix with Calcium Carbonate, and shall be equipped with bolt-down covers. Covers on pull boxes installed as part of the lighting systems shall be marked ELECTRICAL in minimum 1” lettering.

All pull boxes shall be sized to meet NEC box fill requirements.

Decorative Street Lights w/ Associated Conduit & Wire will be measured as a unit for each pedestrian light furnished and installed with associated conduit and wire.

The accepted quantities of Decorative Street Lights w/ Associated Conduit & Wire measured as provided above, will be paid for at the contract unit price each, complete in place, which price shall be full compensation for the work described and specified herein and on the plan, as approved by the Engineer.

**New Electrical Service Cabinet:**

The work under this item shall consist of furnishing all labor, equipment and materials required for installing a new electrical service entrance section and all control enclosures and control devices per project plans within the project area. The work shall include the securing of required permits related to said electric service. The work to coordinate the service installation, coordination with utility company, setting of transformer concrete pad, meter enclosure, permit fee(s) documentation, connection to and coordination time and expenses borne by the contractor are intended to be covered by this per unit bid item.

The materials under this item are as follows. Furnish and install Service Entrance and Distribution Switchboards as herein specified and shown on the associated electrical plans. The service entrance section shall have an anodized aluminum finish provided by the manufacturer.

All wires in panelboards, gutters, switchboards, wireway and pull boxes shall be neatly arranged with terminations located directly opposite terminals and routed in a neat and workmanlike manner through spaces where the wire passes.

All busses shall be silver plated copper. The through bus shall have a capacity of 200 amperes and extend the full length of the switchboards. The through and neutral busses shall be one hundred (100) percent rated. The ground bus shall be sized per UL #891.

Circuit breakers shall be plug-in connection type, 22,000 AIC minimum rating. All breakers for two (2) pole circuits shall be common trip.

All panels containing ground or bonding wires shall be equipped with a ground bus for terminating all such wires.

Provide lamicoid nameplates for all distribution switches, breakers, lighting and power panels, contactors, and any control equipment.

The neutral conductors and all other exposed non-current carrying metal parts as required by Code shall be grounded. Grounding bushings shall be used as required and shall be O.Z. insulated Type “BL”, or approved equal. No grounding shall be made to gas piping. Where equipment or devises are served by non-metallic ducts, enclosure shall be grounded by means of a code size bare or green insulated equipment ground wire installed in the duct with the current carrying conductors and be bonded securely in each cabinet terminating the ground wire. Copper jumpers shall bridge flexible conduit and be installed with ground wire. All service grounds shall be in accordance with the “UFER” ground.

Lighting contactors shall be sized to facilitate all the lighting circuits within the pedestal or panel, and shall be Square D, Cutler Hammer, Furnas, Allen Bradley or Engineer approved equal.

The contractor shall secure the necessary construction company permits, pay the related fee(s) for said permit, and coordinate the installation of the required power services.

This item as described herein shall be measured on a per unit basis for each location shown on the plans.

This item shall be paid for on a per unit basis for all work and equipment necessary to secure electrical service for the project and all control equipment per project plans.

# Appendix A

## Pothole Results

**Note:** The elevation information provided in the pothole results do not match the elevations shown in the Plans. As shown on the Survey Control sheet, (Drawing G6) the Plans use the City of Phoenix NGVD ’29 datum prescribed by the City of Tolleson.

The pothole survey uses a brass cap in a hand hole at 91st Ave & Van Buren as their benchmark (GDACS Pt#54226-1, elevation=1016.41, NAVD ‘88).

The surveyed elevation (NGVD ’29) of the above-referenced benchmark is 1014.26, resulting in a difference of 2.15’ between the plans and the pothole results.

To accurately show the pothole results on the plans, the measured depth of the utility was subtracted from the NGVD ’29 elevation per the Plans, and this elevation is shown on the Plans.

# Full Service Survey Pothole Report

SSC Job No. 7289 P | Cust. Job No. | Test Hole No. 1 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Adams St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 5" Waterline

Station / Offset: 27+47.31 / 35.09 LT | Northing: 890801.99 | Easting: 596796.01 | Elevation: 1014.00

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1014.00 | | | | | Station / Offset: | 27+47.31 / 35.09 LT |
| Rod Reading (HUB - Pothole Crew): | 5.12 | HUB: | 5.12 | T.O.U.: | 8.24 | Northing: | 890801.99 |
| Height of Instrument ( H. I. ): | 1019.12 | G. L.: | 5.13 | B.O.U.: | 8.66 | Easting: | 596796.01 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1019.12 | H. I. : | 1019.12 | H. I. : | 1019.12 |
| (-) Rod Read Top Util. (T.O.U.): | 8.24 | (-) Rod Read Bottom Util. (B.O.U.): | 8.66 | (-) Rod Read Pothole (G.L.): | 5.13 |
| = Elevation Top Utility: | 1010.88 | = Elevation Bottom Utility: | 1010.46 | = Elevation Ground Level: | **1013.99** |

Station / Offset: 27+44.73 / 34.33 LT

Northing: 890799.41

Easting: 596796.76

Actual Field Measurement: 3.11
(Existing Grade to T.O.U.)

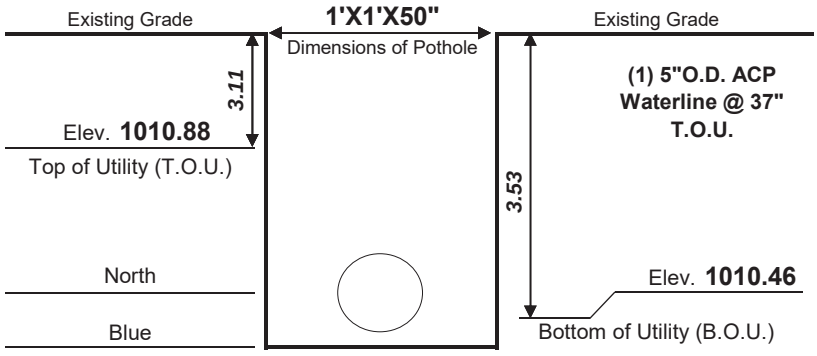
Elev. Top of Utility: 1010.88

Actual Field Measurement: 3.53
(Existing Grade to B.O.U.)

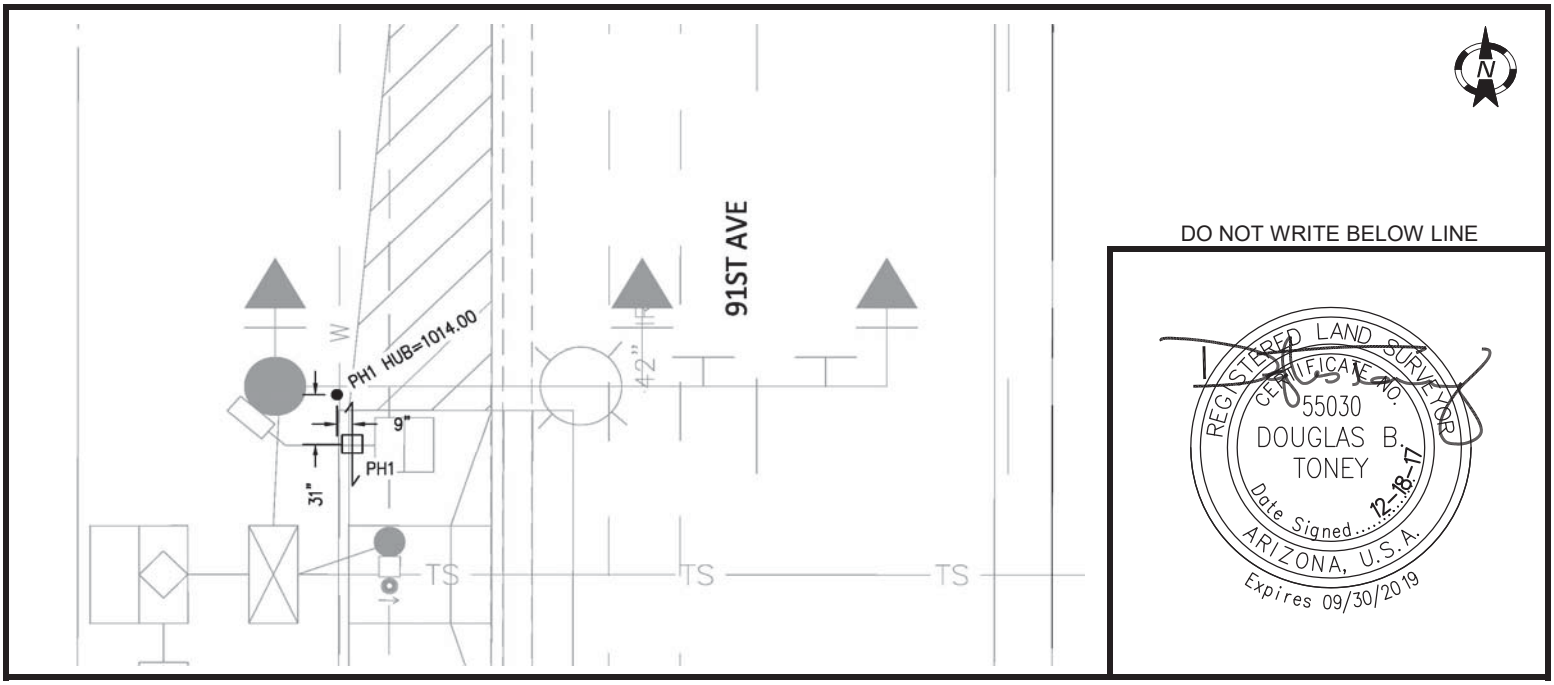
Elev. Bottom of Utility: 1010.46

Facing: North

Ribbon Color: Blue




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
55030
DOUGLAS B.
TONEY
Date Signed 12-18-17
ARIZONA, U.S.A.
Expires 09/30/2019

Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 2 | Date Dug: 12/8/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" DBC Comm

Station / Offset: 27+39.35 / 44.96 RT | Northing: 890793.95 | Easting: 596876.05 | Elevation: 1013.95

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1013.95 | | | | | Station / Offset: | 27+39.35 / 44.96 RT |
| Rod Reading (HUB - Pothole Crew): | 4.81 | HUB: | 4.81 | T.O.U.: | 9.01 | Northing: | 890793.95 |
| Height of Instrument ( H. I. ): | 1018.76 | G. L.: | 4.93 | B.O.U.: | 9.18 | Easting: | 596876.05 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1018.76 | H. I. : | 1018.76 | H. I. : | 1018.76 |
| (-) Rod Read Top Util. (T.O.U.): | 9.01 | (-) Rod Read Bottom Util. (B.O.U.): | 9.18 | (-) Rod Read Pothole (G.L.): | 4.93 |
| = Elevation Top Utility: | 1009.75 | = Elevation Bottom Utility: | 1009.58 | = Elevation Ground Level: | **1013.83** |

Station / Offset: 27+39.35 / 43.46 RT

Northing: 890793.95

Easting: 596874.55

Actual Field Measurement: 4.08
(Existing Grade to T.O.U.)

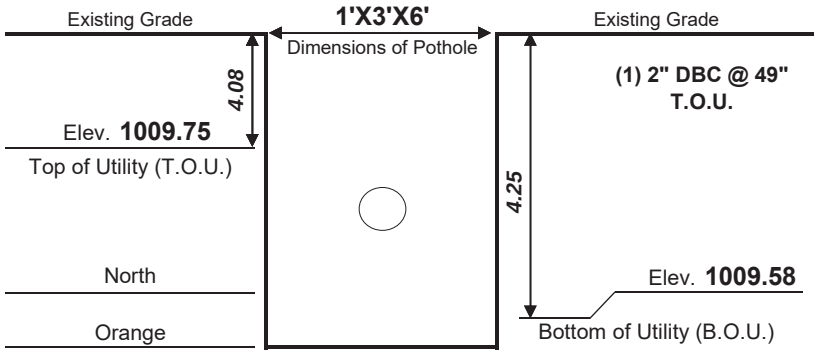
Elev. Top of Utility: 1009.75

Actual Field Measurement: 4.25
(Existing Grade to B.O.U.)

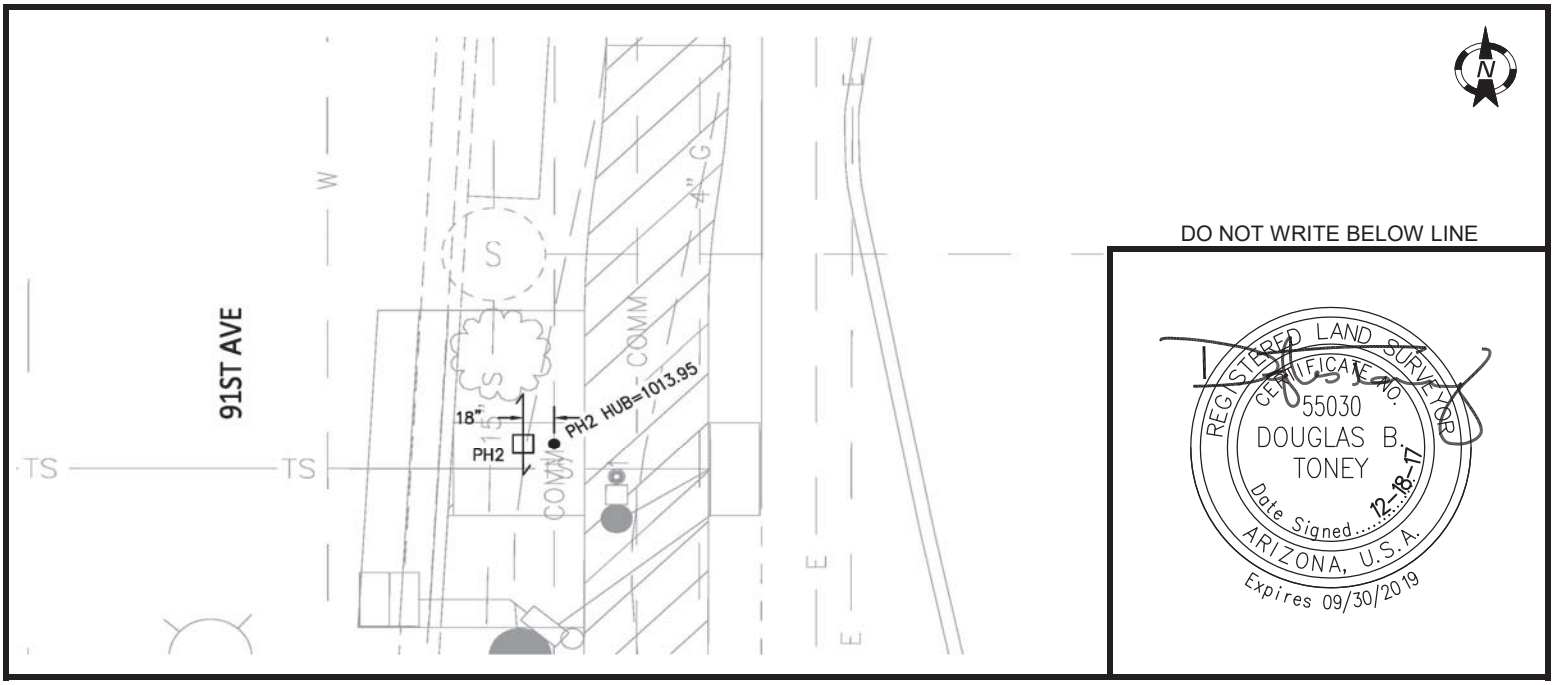
Elev. Bottom of Utility: 1009.58

Facing: North

Ribbon Color: Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 4 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Van Buren St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" Elec

Station / Offset: 35+67.39 / 67.08 RT | Northing: 891621.96 | Easting: 596898.98 | Elevation: 1016.58

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1016.58 | | | | | Station / Offset: | 35+67.39 / 67.08 RT |
| Rod Reading (HUB - Pothole Crew): | 5.71 | HUB: | 5.71 | T.O.U.: | 9.68 | Northing: | 891621.96 |
| Height of Instrument ( H. I. ): | 1022.29 | G. L.: | 5.68 | B.O.U.: | 10.01 | Easting: | 596898.98 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1022.29 | H. I. : | 1022.29 | H. I. : | 1022.29 |
| (-) Rod Read Top Util. (T.O.U.): | 9.68 | (-) Rod Read Bottom Util. (B.O.U.): | 10.01 | (-) Rod Read Pothole (G.L.): | 5.68 |
| = Elevation Top Utility: | 1012.61 | = Elevation Bottom Utility: | 1012.28 | = Elevation Ground Level: | **1016.61** |

Station / Offset: 35+64.89 / 67.67 RT

Northing: 891619.46

Easting: 596899.57

Actual Field Measurement: 4.00
(Existing Grade to T.O.U.)

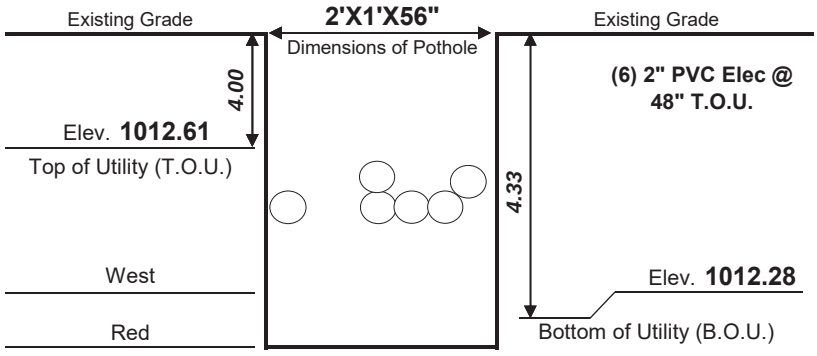
Elev. Top of Utility: 1012.61

Actual Field Measurement: 4.33
(Existing Grade to B.O.U.)

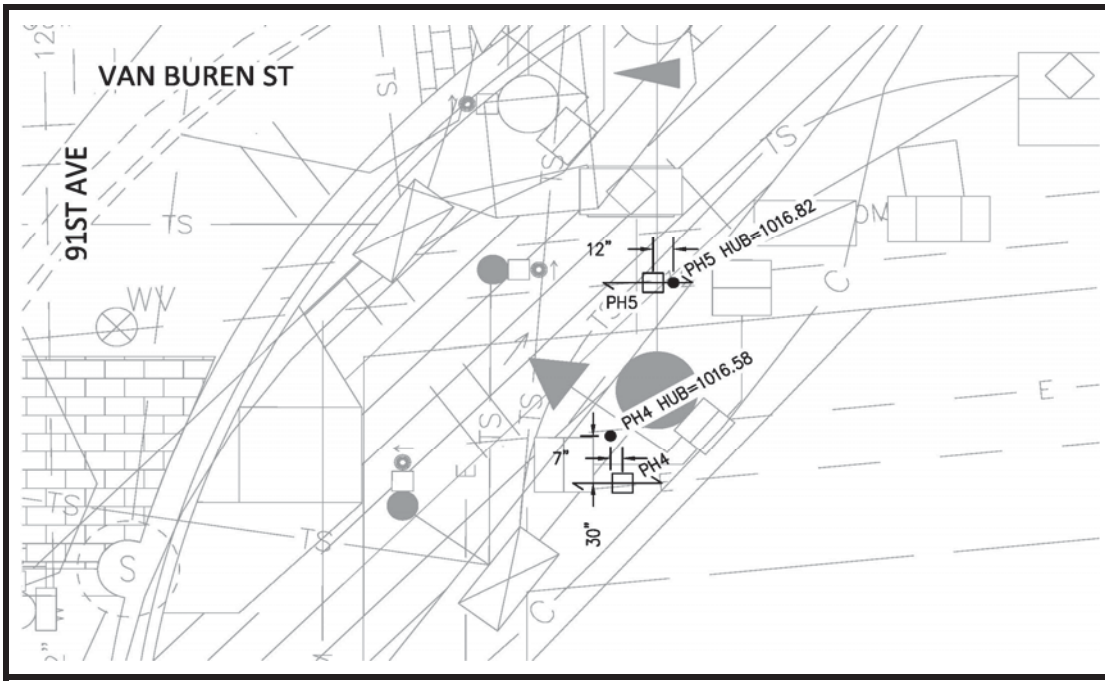
Elev. Bottom of Utility: 1012.28

Facing: West

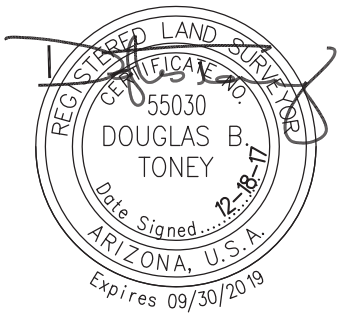
Ribbon Color: Red




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 5 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Van Buren St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 14" ACP

Station / Offset: 35+75.34 / 70.15 RT | Northing: 891629.91 | Easting: 596902.06 | Elevation: 1016.82

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1016.82 | | | | | Station / Offset: | 35+75.34 / 70.15 RT |
| Rod Reading (HUB - Pothole Crew): | 5.47 | HUB: | 5.47 | T.O.U.: | 10.76 | Northing: | 891629.91 |
| Height of Instrument ( H. I. ): | 1022.29 | G. L.: | 5.45 | B.O.U.: | 11.93 | Easting: | 596902.06 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1022.29 | H. I. : | 1022.29 | H. I. : | 1022.29 |
| (-) Rod Read Top Util. (T.O.U.): | 10.76 | (-) Rod Read Bottom Util. (B.O.U.): | 11.93 | (-) Rod Read Pothole (G.L.): | 5.45 |
| = Elevation Top Utility: | 1011.53 | = Elevation Bottom Utility: | 1010.36 | = Elevation Ground Level: | **1016.84** |

Station / Offset: 35+75.34 / 69.15 RT

Northing: 891629.91

Easting: 596901.06

Actual Field Measurement: 5.31
(Existing Grade to T.O.U.)

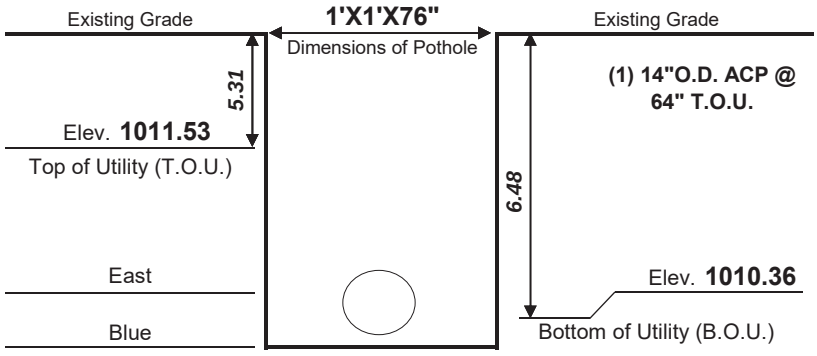
Elev. Top of Utility: 1011.53

Actual Field Measurement: 6.48
(Existing Grade to B.O.U.)

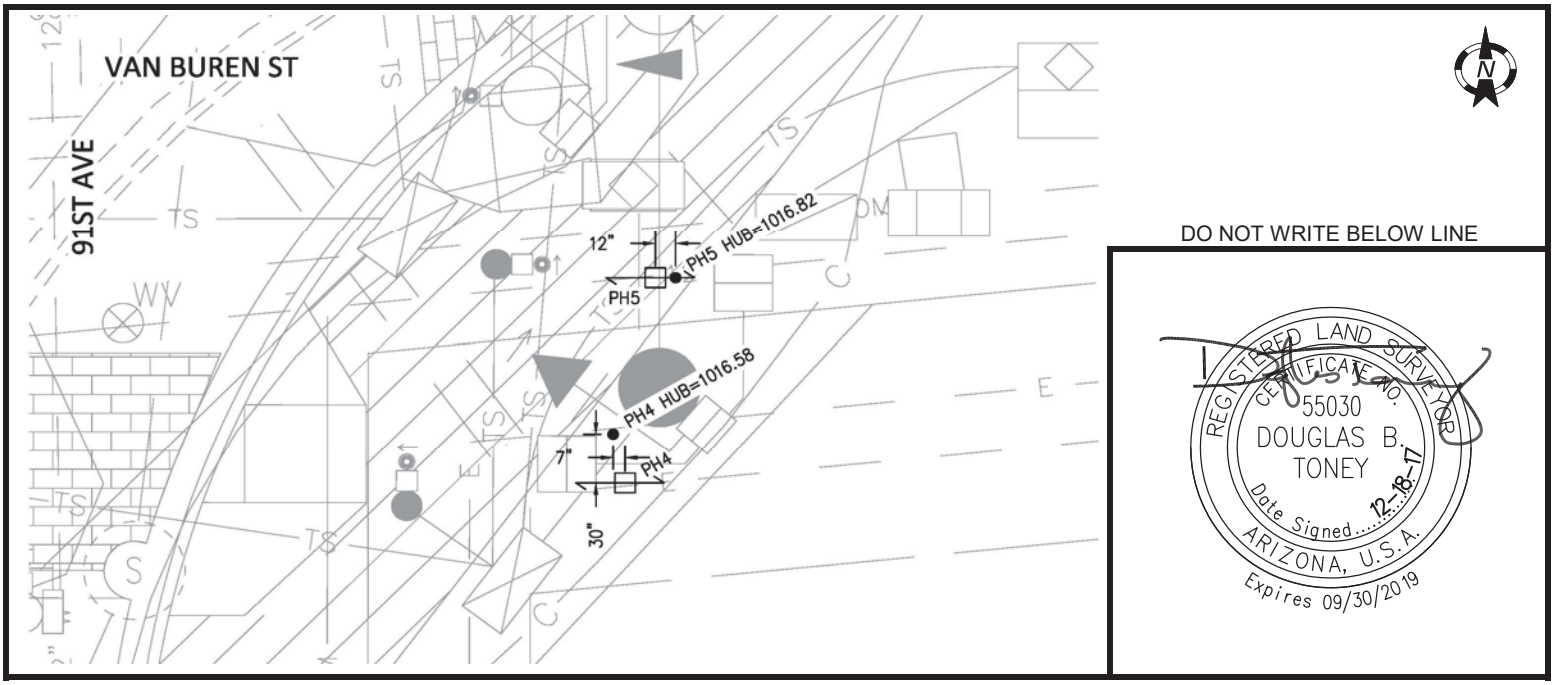
Elev. Bottom of Utility: 1010.36

Facing: East

Ribbon Color: Blue




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 7 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Taylor St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 3" Elec

Station / Offset: 43+02.31 / 41.56 RT | Northing: 892357.05 | Easting: 596872.00 | Elevation: 1018.97

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1018.97 | | | | | Station / Offset: | 43+02.31 / 41.56 RT |
| Rod Reading (HUB - Pothole Crew): | 5.55 | HUB: | 5.55 | T.O.U.: | 12.08 | Northing: | 892357.05 |
| Height of Instrument ( H. I. ): | 1024.52 | G. L.: | 5.76 | B.O.U.: | 12.33 | Easting: | 596872.00 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1024.52 | H. I. : | 1024.52 | H. I. : | 1024.52 |
| (-) Rod Read Top Util. (T.O.U.): | 12.08 | (-) Rod Read Bottom Util. (B.O.U.): | 12.33 | (-) Rod Read Pothole (G.L.): | 5.76 |
| = Elevation Top Utility: | 1012.44 | = Elevation Bottom Utility: | 1012.19 | = Elevation Ground Level: | **1018.76** |

Station / Offset: 43+02.30 / 46.56 RT

Northing: 892357.05

Easting: 596877.00

Actual Field Measurement: 6.32
(Existing Grade to T.O.U.)

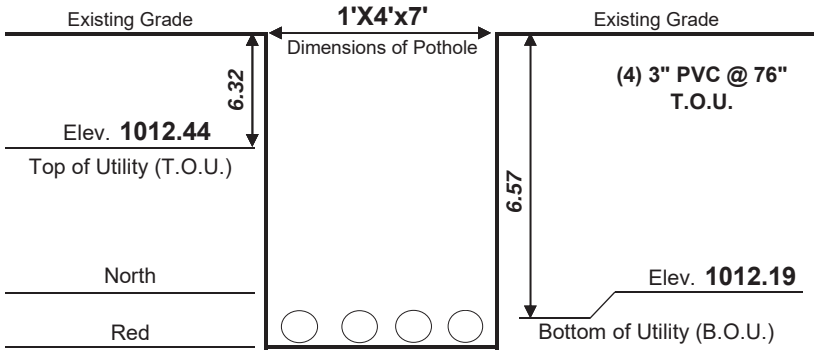
Elev. Top of Utility: 1012.44

Actual Field Measurement: 6.57
(Existing Grade to B.O.U.)

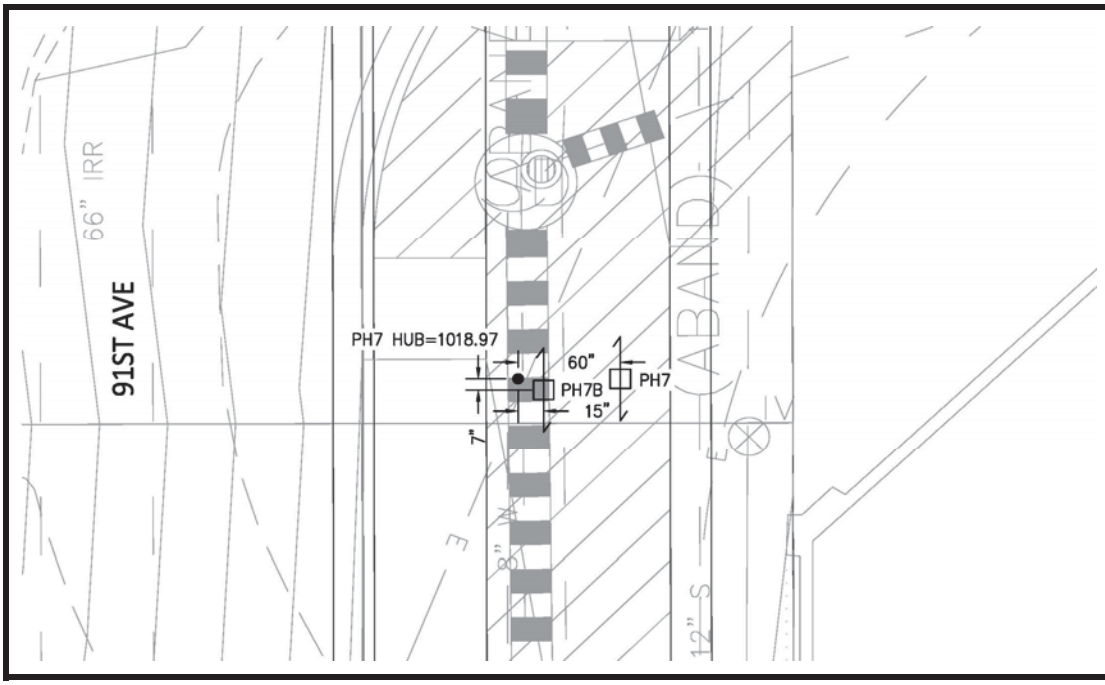
Elev. Bottom of Utility: 1012.19

Facing: North

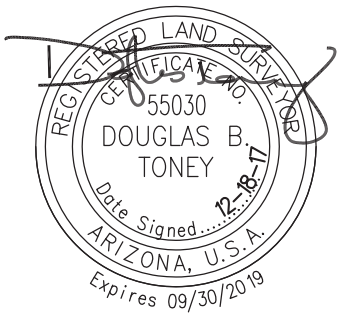
Ribbon Color: Red




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: Came back to location to find power lines.

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 7B | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Taylor St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 24" Storm

Station / Offset: 43+02.31 / 41.56 RT | Northing: 892357.05 | Easting: 596872.00 | Elevation: 1018.97

## Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 1018.97 | Station / Offset: 43+02.31 / 41.56 RT

Rod Reading (HUB - Pothole Crew): 5.33 | HUB: 5.33 | T.O.U.: 9.72 | Northing: 892357.05

Height of Instrument ( H. I. ): 1024.30 | G. L.: 5.35 | B.O.U.: 12.05 | Easting: 596872.00

| | | |
|---|---|---|
| H. I. : 1024.30 | H. I. : 1024.30 | H. I. : 1024.30 |
| (-) Rod Read Top Util. (T.O.U.): 9.72 | (-) Rod Read Bottom Util. (B.O.U.): 12.05 | (-) Rod Read Pothole (G.L.): 5.35 |
| = Elevation Top Utility: 1014.58 | = Elevation Bottom Utility: 1012.25 | = Elevation Ground Level: **1018.95** |

Station / Offset: 43+01.73 / 42.81 RT

Northing: 892356.47

Easting: 596873.25

Actual Field Measurement: 4.37
(Existing Grade to T.O.U.)

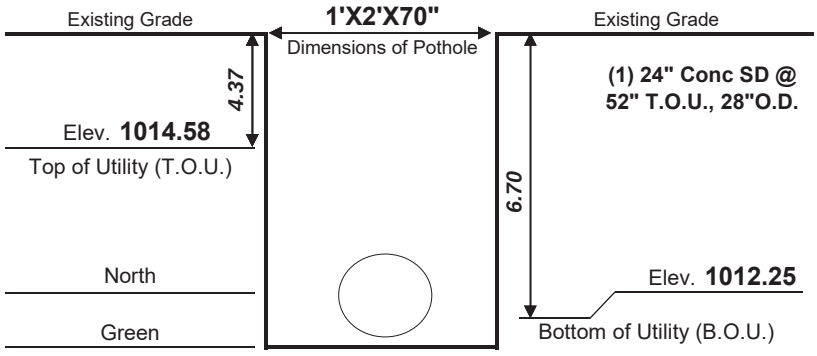
Elev. Top of Utility: 1014.58

Actual Field Measurement: 6.70
(Existing Grade to B.O.U.)

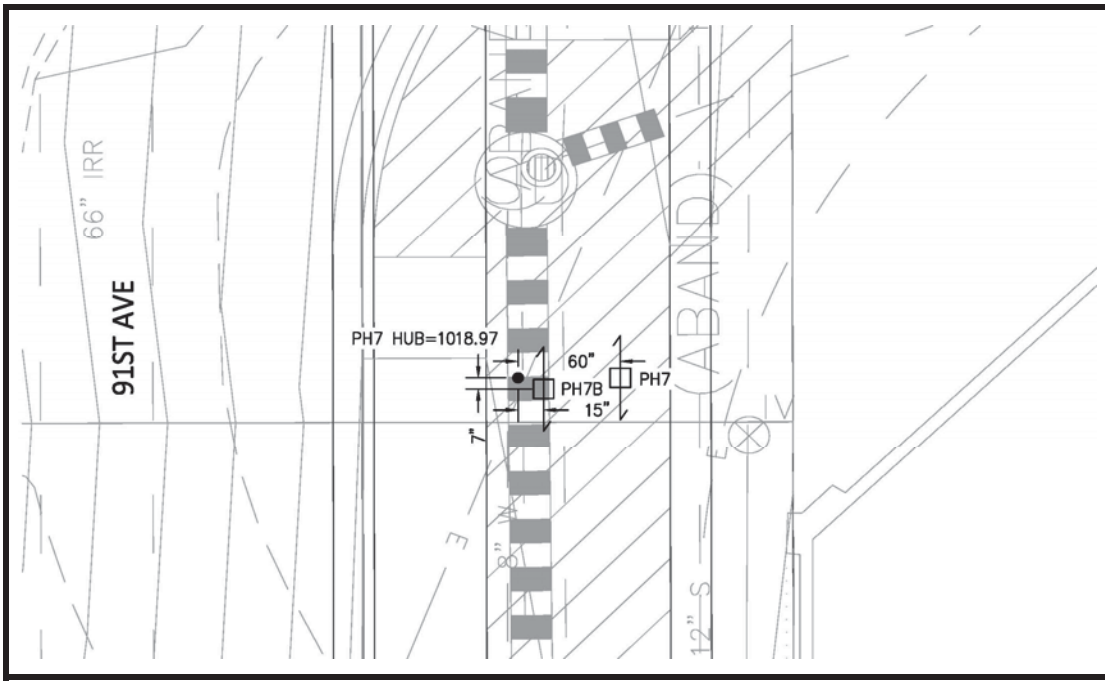
Elev. Bottom of Utility: 1012.25

Facing: North

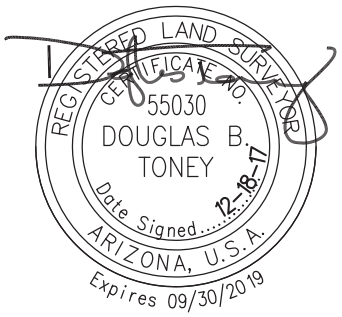
Ribbon Color: Green




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 8 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Taylor St | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 24" Storm

Station / Offset: 43+54.28 / 42.69 RT | Northing: 892409.01 | Easting: 596873.01 | Elevation: 1018.42

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1018.42 | | | | | Station / Offset: | 43+54.28 / 42.69 RT |
| Rod Reading (HUB - Pothole Crew): | 6.17 | HUB: | 6.17 | T.O.U.: | 8.78 | Northing: | 892409.01 |
| Height of Instrument ( H. I. ): | 1024.59 | G. L.: | 6.07 | B.O.U.: | 11.11 | Easting: | 596873.01 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1024.59 | H. I. : | 1024.59 | H. I. : | 1024.59 |
| (-) Rod Read Top Util. (T.O.U.): | 8.78 | (-) Rod Read Bottom Util. (B.O.U.): | 11.11 | (-) Rod Read Pothole (G.L.): | 6.07 |
| = Elevation Top Utility: | 1015.81 | = Elevation Bottom Utility: | 1013.48 | = Elevation Ground Level: | **1018.52** |

Station / Offset: 43+61.94 / 43.71 RT

Northing: 892416.68

Easting: 596874.01

Actual Field Measurement: 2.71
(Existing Grade to T.O.U.)

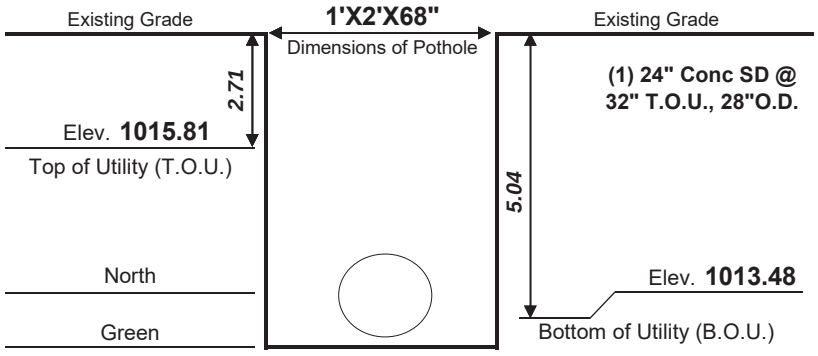
Elev. Top of Utility: 1015.81

Actual Field Measurement: 5.04
(Existing Grade to B.O.U.)

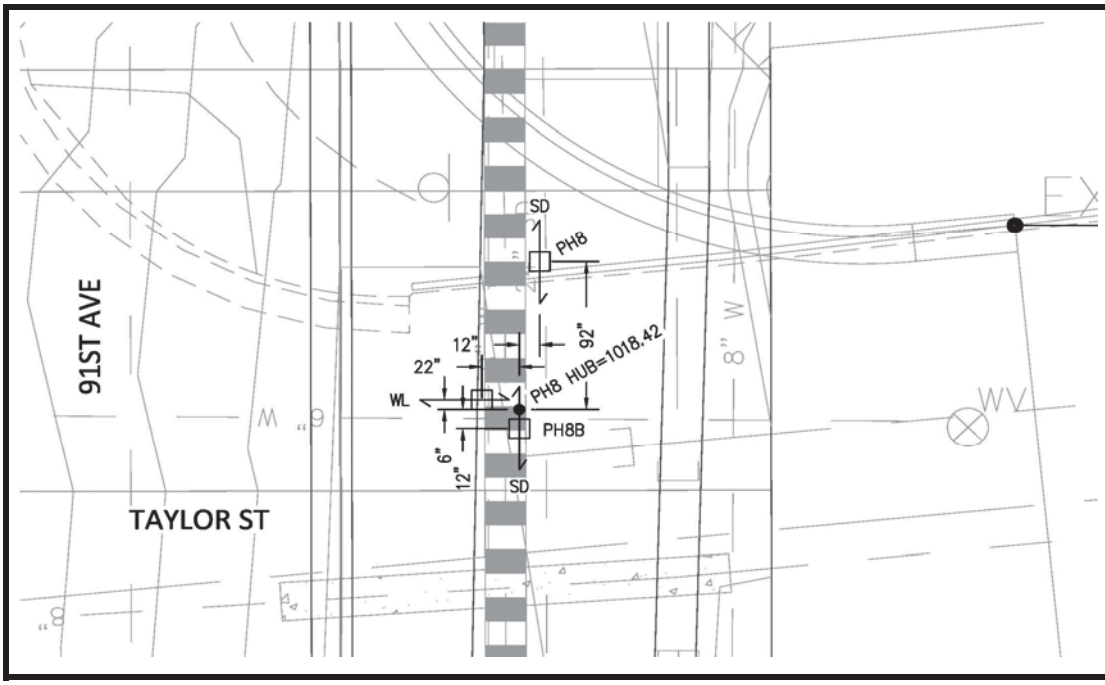
Elev. Bottom of Utility: 1013.48

Facing: North

Ribbon Color: Green

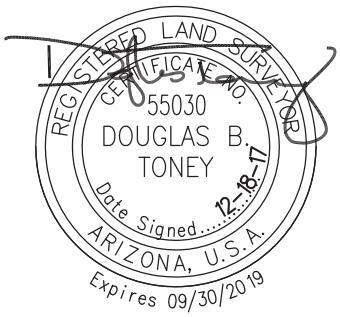



## Location Plan - Not to Scale





DO NOT WRITE BELOW LINE




Remarks: Made pothole in dirt. No lane closure.

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 8B | Date Dug: 12/5/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 6" Water

Station / Offset: 43+54.28 / 42.69 RT | Northing: 892409.01 | Easting: 596873.01 | Elevation: 1018.42

## Benchmark Elevation Verification

| | | | | | |
|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1018.42 | | T.O.U. SD: 8.54 | Station / Offset: | 43+54.28 / 42.69 RT |
| Rod Reading (HUB - Pothole Crew): | 5.78 | HUB: 5.78 | T.O.U. WL: 13.79 | Northing: | 892409.01 |
| Height of Instrument ( H. I. ): | 1024.20 | G. L.: 5.73 | B.O.U.: 14.29 | Easting: | 596873.01 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1024.20 | H. I. : | 1024.20 | H. I. : | 1024.20 |
| (-) Rod Read Top Util. (T.O.U.): | 13.79 | (-) Rod Read Bottom Util. (B.O.U.): | 14.29 | (-) Rod Read Pothole (G.L.): | 5.73 |
| = Elevation Top Utility: | 1010.41 | = Elevation Bottom Utility: | 1009.91 | = Elevation Ground Level: | **1018.47** |

Station / Offset: 43+53.28 / 42.69 RT

Northing: 892408.01

Easting: 596873.01

Actual Field Measurement: 8.06
(Existing Grade to T.O.U.)

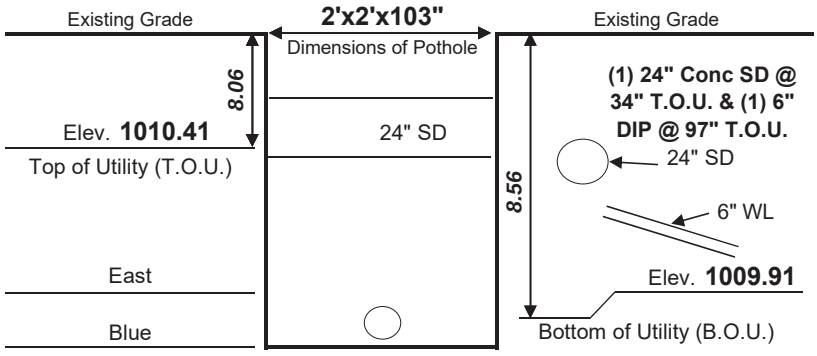
Elev. Top of Utility: 1010.41

Actual Field Measurement: 8.56
(Existing Grade to B.O.U.)

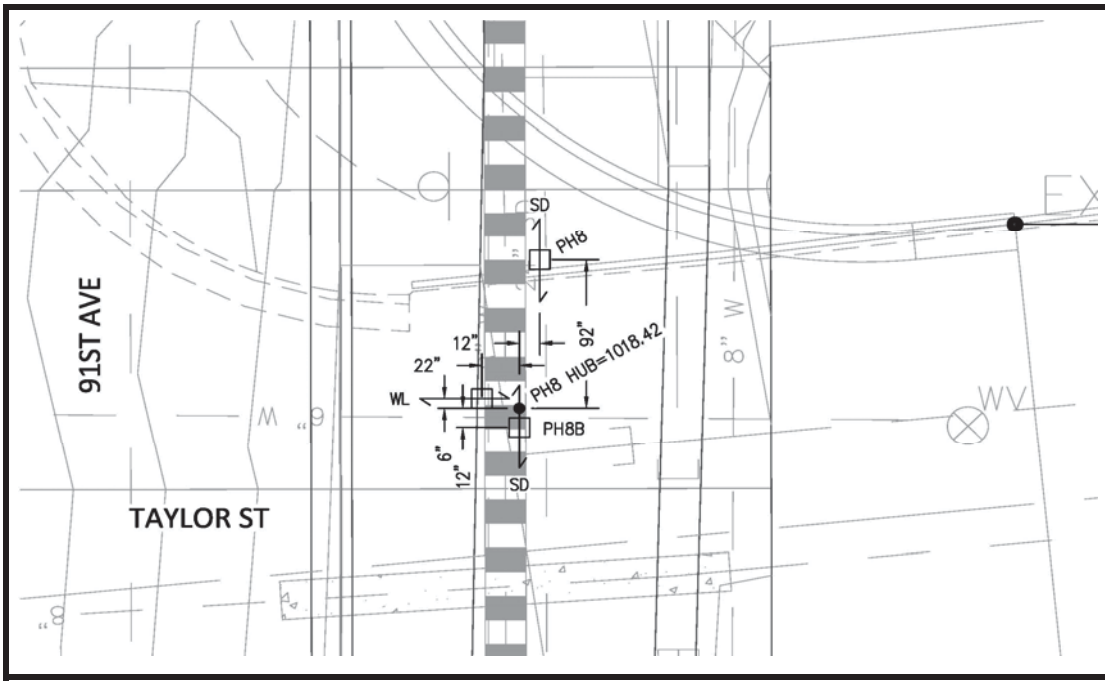
Elev. Bottom of Utility: 1009.91

Facing: East

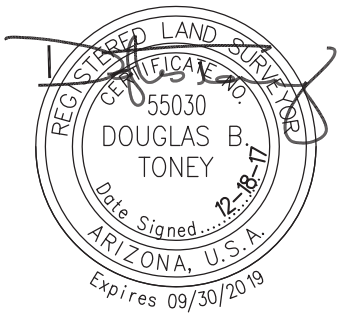
Ribbon Color: Blue




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: Measured highest point of WL, looked to be on a 45° angle going up under SD. Made two holes to locate.

Was requested utility found? Yes | Soil Type: AB | Paving Thickness & Type: 4" Asphalt

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. 7289 P | Cust. Job No. | Test Hole No. 9 | Date Dug: 12/6/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" Elec

Station / Offset: 44+66.40 / 32.10 LT | Northing: 892520.97 | Easting: 596797.97 | Elevation: 1018.14

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1018.14 | | | | | Station / Offset: | 44+66.40 / 32.10 LT |
| Rod Reading (HUB - Pothole Crew): | 5.81 | HUB: | 5.81 | T.O.U.: | 8.54 | Northing: | 892520.97 |
| Height of Instrument ( H. I. ): | 1023.95 | G. L.: | 5.83 | B.O.U.: | 8.71 | Easting: | 596797.97 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1023.95 | H. I. : | 1023.95 | H. I. : | 1023.95 |
| (-) Rod Read Top Util. (T.O.U.): | 8.54 | (-) Rod Read Bottom Util. (B.O.U.): | 8.71 | (-) Rod Read Pothole (G.L.): | 5.83 |
| = Elevation Top Utility: | 1015.41 | = Elevation Bottom Utility: | 1015.24 | = Elevation Ground Level: | **1018.12** |

Station / Offset: 44+66.40 / 30.10 LT

Northing: 892520.97

Easting: 596799.97

Actual Field Measurement: 2.71
(Existing Grade to T.O.U.)

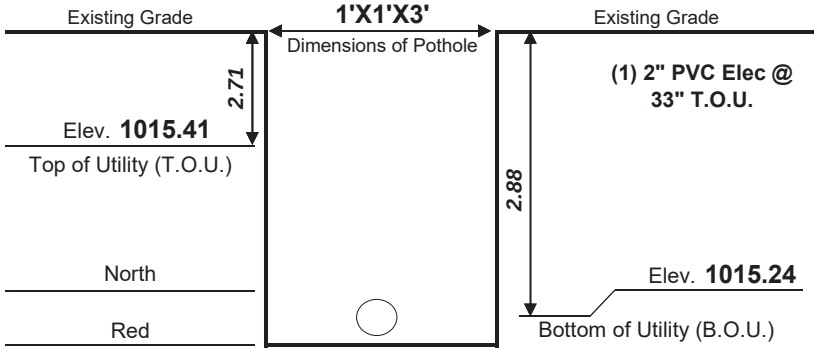
Elev. Top of Utility: 1015.41

Actual Field Measurement: 2.88
(Existing Grade to B.O.U.)

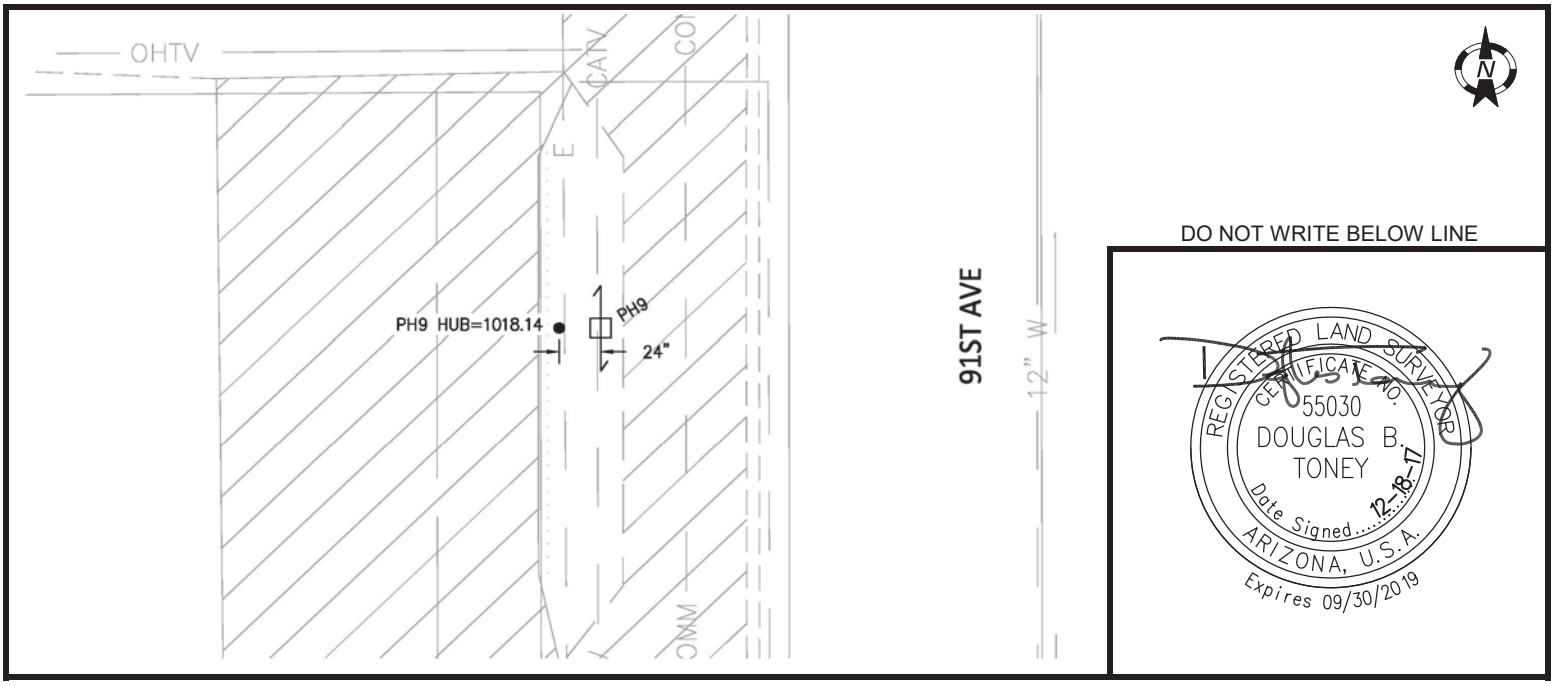
Elev. Bottom of Utility: 1015.24

Facing: North

Ribbon Color: Red




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
55030
DOUGLAS B.
TONEY
Date Signed 12-18-17
ARIZONA, U.S.A.
Expires 09/30/2019

Remarks: Made pothole in dirt. No lane closure.

Was requested utility found? Yes | Soil Type: Loam/Asphalt | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 11 | Date Dug: 12/6/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" Elec

Station / Offset: 50+85.42 / 30.72 LT | Northing: 893139.99 | Easting: 596797.97 | Elevation: 1019.22

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1019.22 | | | | | Station / Offset: | 50+85.42 / 30.72 LT |
| Rod Reading (HUB - Pothole Crew): | 5.31 | HUB: | 5.31 | T.O.U.: | 8.59 | Northing: | 893139.99 |
| Height of Instrument ( H. I. ): | 1024.53 | G. L.: | 5.34 | B.O.U.: | 8.76 | Easting: | 596797.97 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1024.53 | H. I. : | 1024.53 | H. I. : | 1024.53 |
| (-) Rod Read Top Util. (T.O.U.): | 8.59 | (-) Rod Read Bottom Util. (B.O.U.): | 8.76 | (-) Rod Read Pothole (G.L.): | 5.34 |
| = Elevation Top Utility: | 1015.94 | = Elevation Bottom Utility: | 1015.77 | = Elevation Ground Level: | **1019.19** |

Station / Offset: 50+85.42 / 32.72 LT

Northing: 893139.99

Easting: 596795.97

Actual Field Measurement: 3.25
(Existing Grade to T.O.U.)

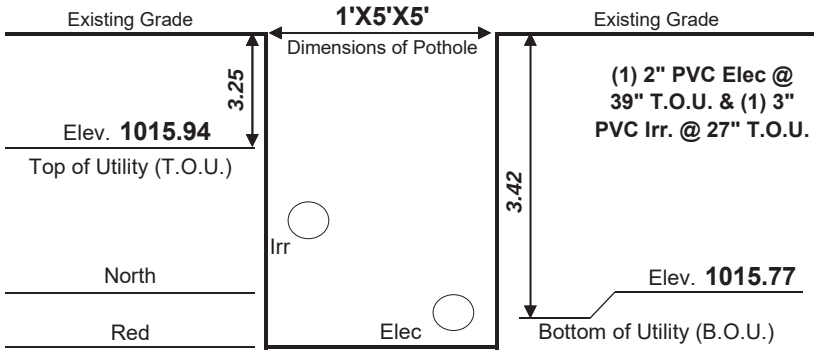
Elev. Top of Utility: 1015.94

Actual Field Measurement: 3.42
(Existing Grade to B.O.U.)

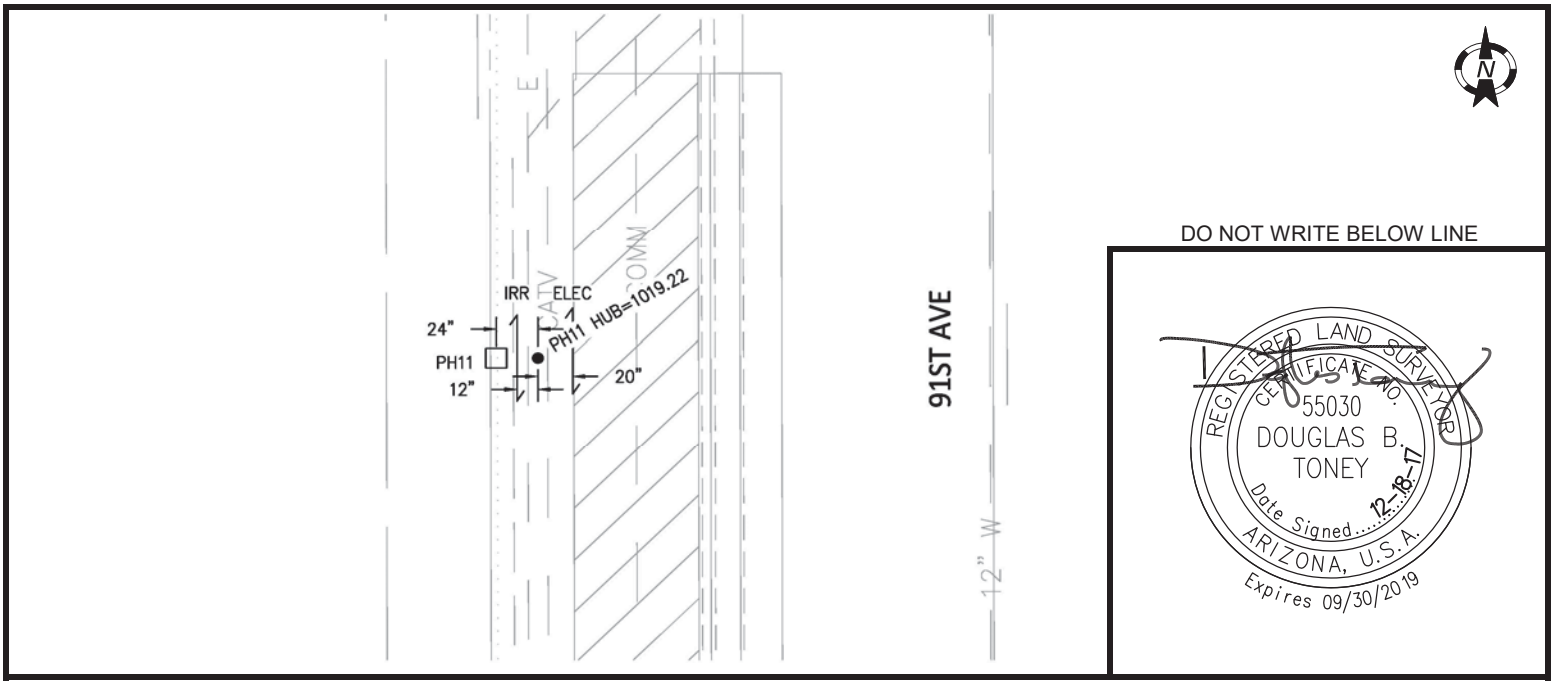
Elev. Bottom of Utility: 1015.77

Facing: North

Ribbon Color: Red




## Location Plan - Not to Scale




Remarks: Could not locate CATV or Comm. Too far back under sidewalk.

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 12 | Date Dug: 12/6/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 4" Comm

Station / Offset: 51+87.43 / 36.45 LT | Northing: 893241.99 | Easting: 596792.02 | Elevation: 1019.24

## Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 1019.24 | Station / Offset: 51+87.43 / 36.45 LT

Rod Reading (HUB - Pothole Crew): 5.36 | HUB: 5.36 | T.O.U.: 12.93 | Northing: 893241.99

Height of Instrument ( H. I. ): 1024.60 | G. L.: 5.21 | B.O.U.: 15.10 | Easting: 596792.02

| | | |
|---|---|---|
| H. I. : 1024.60 | H. I. : 1024.60 | H. I. : 1024.60 |
| (-) Rod Read Top Util. (T.O.U.): 12.93 | (-) Rod Read Bottom Util. (B.O.U.): 15.10 | (-) Rod Read Pothole (G.L.): 5.21 |
| = Elevation Top Utility: 1011.67 | = Elevation Bottom Utility: 1009.50 | = Elevation Ground Level: **1019.39** |

Station / Offset: 51+95.43 / 38.10 LT

Northing: 893249.99

Easting: 596790.35

Actual Field Measurement: 7.72
(Existing Grade to T.O.U.)

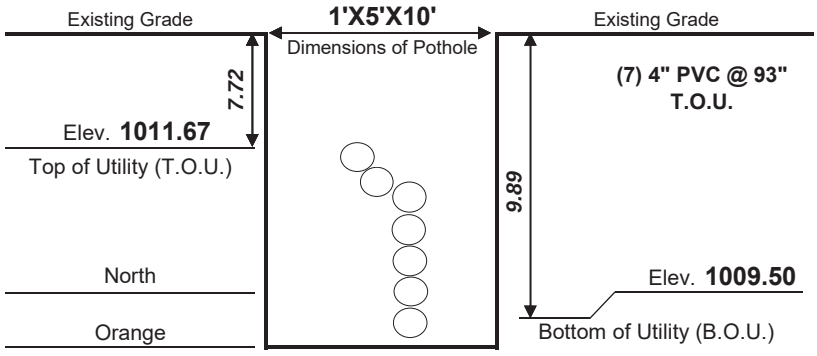
Elev. Top of Utility: 1011.67

Actual Field Measurement: 9.89
(Existing Grade to B.O.U.)

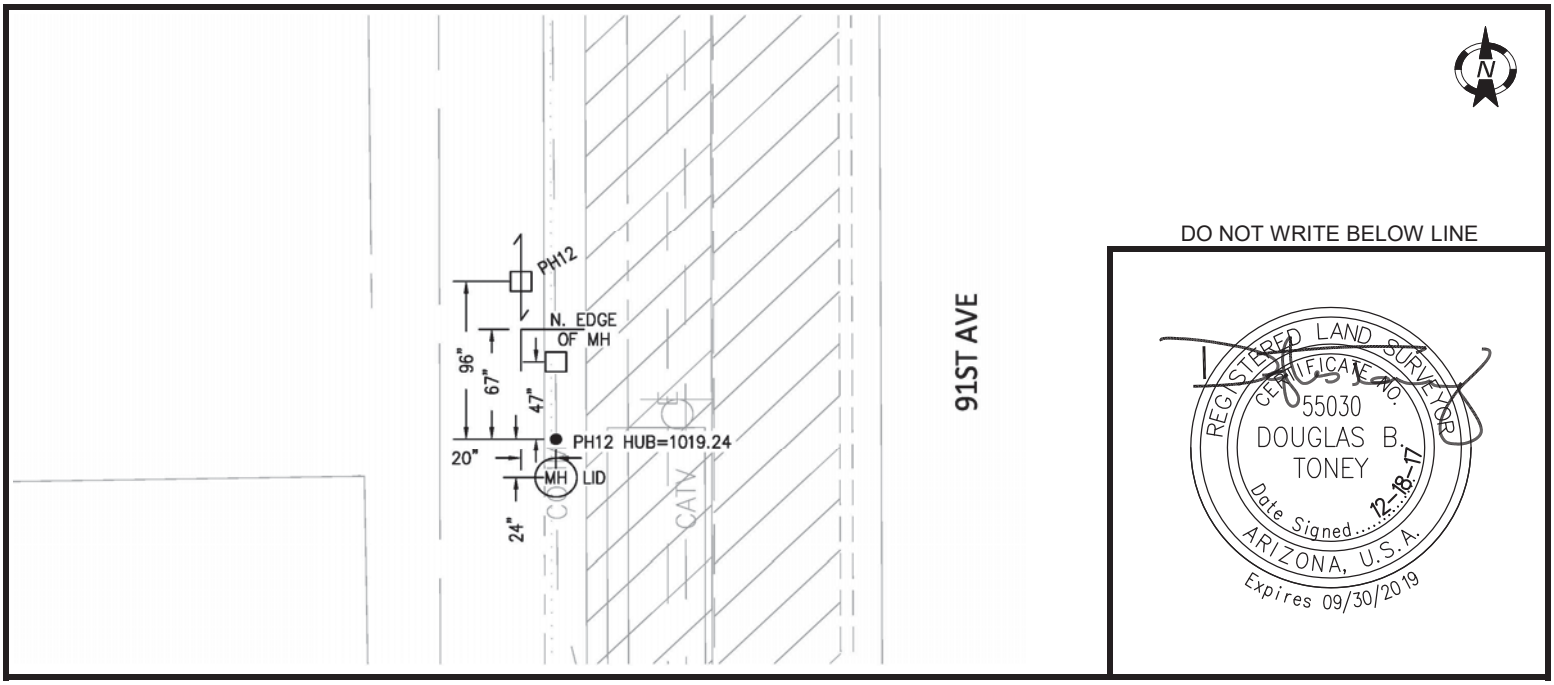
Elev. Bottom of Utility: 1009.50

Facing: North

Ribbon Color: Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: Had to move PH due to MH being in ground. Top of MH @ 41"

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. | 7289 P | Cust. Job No. | | Test Hole No. | 13 | Date Dug: | 12/4/17 |
| Project Name: | 91st Avenue Widening | | | | |
| Checked by: | Curtis | | | Crew Members: | Kai-Nathan |
| General Location: | 91st Ave & Lillian Ln | | | General: | Dibble Eng. |

## Anticipated Utility Information

Size / Type: 2" DBC & 1" DBC Comm

Station / Offset: 52+41.25 / 44.64 RT  Northing: 893295.99  Easting: 596872.99  Elevation: 1019.85

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1019.85 | | | T.O.U. 2": | 8.59 | Station / Offset: | 52+41.25 / 44.64 RT |
| Rod Reading (HUB - Pothole Crew): | 5.73 | HUB: | 5.73 | T.O.U. 1": | 8.53 | Northing: | 893295.99 |
| Height of Instrument ( H. I. ): | 1025.58 | G. L.: | 5.77 | B.O.U.: | 8.70 | Easting: | 596872.99 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.58 | H. I. : | 1025.58 | H. I. : | 1025.58 |
| (-) Rod Read Top Util. (T.O.U.): | 8.53 | (-) Rod Read Bottom Util. (B.O.U.): | 8.70 | (-) Rod Read Pothole (G.L.): | 5.77 |
| = Elevation Top Utility: | 1017.05 | = Elevation Bottom Utility: | 1016.88 | = Elevation Ground Level: | **1019.81** |

Station / Offset: 52+42.25 / 45.72 RT

Northing: 893296.99

Easting: 596874.07

Actual Field Measurement: 2.76
(Existing Grade to T.O.U.)

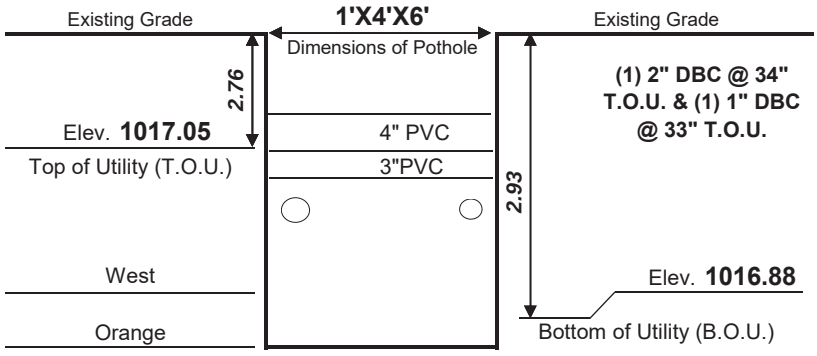
Elev. Top of Utility: 1017.05

Actual Field Measurement: 2.93
(Existing Grade to B.O.U.)

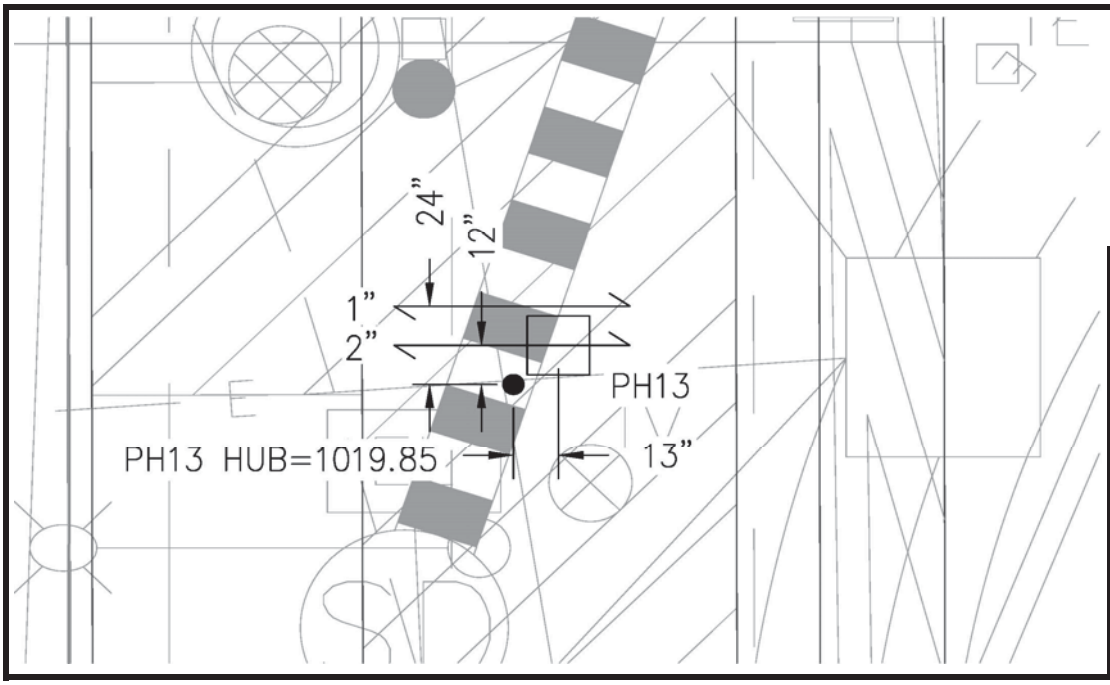
Elev. Bottom of Utility: 1016.88

Facing: West

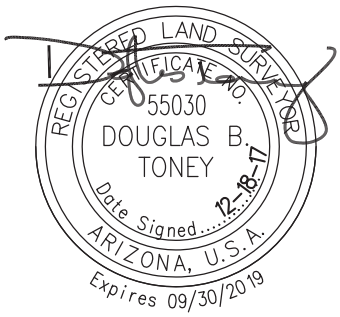
Ribbon Color: Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes  Soil Type: Loam  Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 13-1 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Lillian Ln | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 3" & 4" Unknown

Station / Offset: 52+41.25 / 44.64 RT | Northing: 893295.99 | Easting: 596872.99 | Elevation: 1019.85

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1019.85 | | | | | Station / Offset: | 52+41.25 / 44.64 RT |
| Rod Reading (HUB - Pothole Crew): | 5.73 | HUB: | 5.73 | T.O.U.: | 8.36 | Northing: | 893295.99 |
| Height of Instrument ( H. I. ): | 1025.58 | G. L.: | 5.77 | B.O.U.: | 8.94 | Easting: | 596872.99 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.58 | H. I. : | 1025.58 | H. I. : | 1025.58 |
| (-) Rod Read Top Util. (T.O.U.): | 8.36 | (-) Rod Read Bottom Util. (B.O.U.): | 8.94 | (-) Rod Read Pothole (G.L.): | 5.77 |
| = Elevation Top Utility: | 1017.22 | = Elevation Bottom Utility: | 1016.64 | = Elevation Ground Level: | **1019.81** |

Station / Offset: 52+42.58 / 46.22 RT

Northing: 893297.32

Easting: 596874.57

Actual Field Measurement: 2.59
(Existing Grade to T.O.U.)

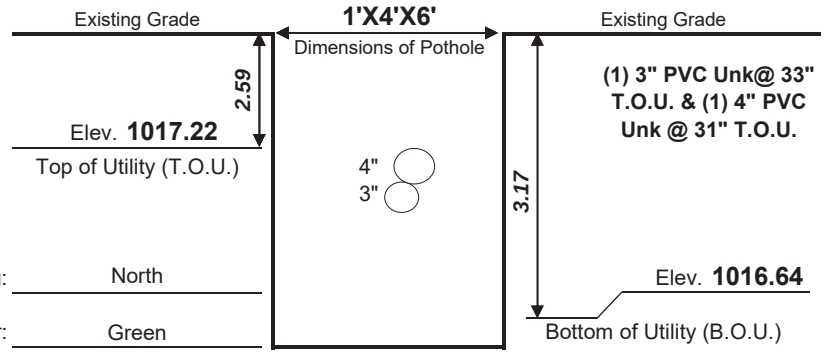
Elev. Top of Utility: 1017.22

Actual Field Measurement: 3.17
(Existing Grade to B.O.U.)

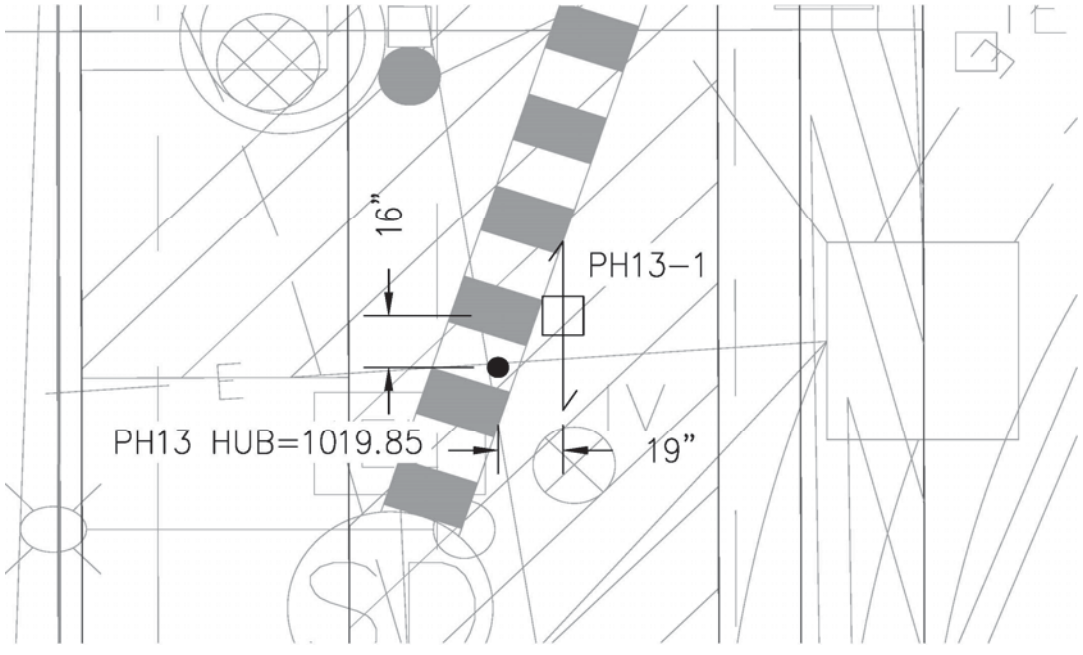
Elev. Bottom of Utility: 1016.64

Facing: North

Ribbon Color: Green

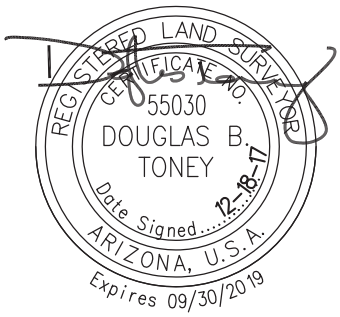



## Location Plan - Not to Scale





DO NOT WRITE BELOW LINE




Remarks: Found in same hole as PH13. Unmarked, but marked 30' North

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 14 | Date Dug: 12/4/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave & Lillian Ln | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 3" & 4" Comm

Station / Offset: 52+71.24 / 53.71 RT | Northing: 893326.00 | Easting: 596881.99 | Elevation: 1019.44

## Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 1019.44 | Station / Offset: 52+71.24 / 53.71 RT

Rod Reading (HUB - Pothole Crew): 6.02 | HUB: 6.02 | T.O.U.: 8.73 | Northing: 893326.00

Height of Instrument ( H. I. ): 1025.46 | G. L.: 6.01 | B.O.U.: 9.06 | Easting: 596881.99

| H. I. : | 1025.46 | H. I. : | 1025.46 | H. I. : | 1025.46 |
|---|---|---|---|---|---|
| (-) Rod Read Top Util. (T.O.U.): | 8.73 | (-) Rod Read Bottom Util. (B.O.U.): | 9.06 | (-) Rod Read Pothole (G.L.): | 6.01 |
| = Elevation Top Utility: | 1016.73 | = Elevation Bottom Utility: | 1016.40 | = Elevation Ground Level: | **1019.45** |

Station / Offset: 52+71.26 / 46.46 RT

Northing: 893326.00

Easting: 596874.74

Actual Field Measurement: 2.72
(Existing Grade to T.O.U.)

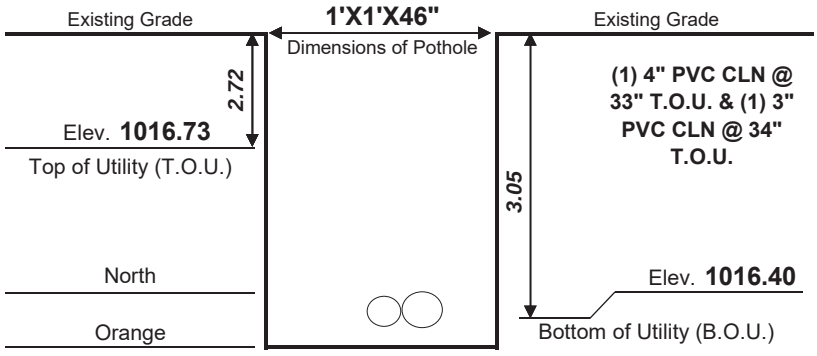
Elev. Top of Utility: 1016.73

Actual Field Measurement: 3.05
(Existing Grade to B.O.U.)

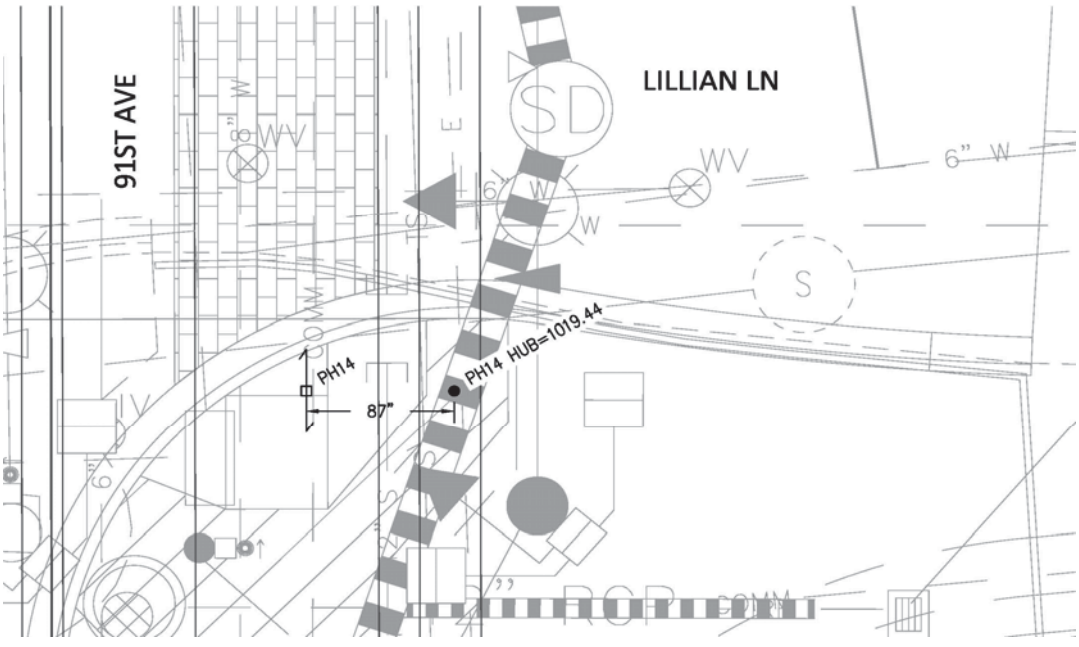
Elev. Bottom of Utility: 1016.40

Facing: North

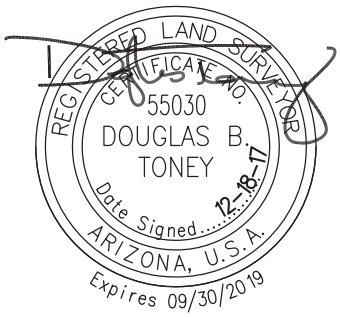
Ribbon Color: Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: Found in same hole as PH13. Unmarked, but marked 30' North

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 15 | Date Dug: 12/6/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 24" Irr

Station / Offset: 53+58.25 / 43.94 RT | Northing: 893412.99 | Easting: 596872.03 | Elevation: 1020.32

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1020.32 | | | | | Station / Offset: | 53+58.25 / 43.94 RT |
| Rod Reading (HUB - Pothole Crew): | 5.38 | HUB: | 5.38 | T.O.U.: | 6.99 | Northing: | 893412.99 |
| Height of Instrument ( H. I. ): | 1025.70 | G. L.: | 5.47 | B.O.U.: | 8.99 | Easting: | 596872.03 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.70 | H. I. : | 1025.70 | H. I. : | 1025.70 |
| (-) Rod Read Top Util. (T.O.U.): | 6.99 | (-) Rod Read Bottom Util. (B.O.U.): | 8.99 | (-) Rod Read Pothole (G.L.): | 5.47 |
| = Elevation Top Utility: | 1018.71 | = Elevation Bottom Utility: | 1016.71 | = Elevation Ground Level: | **1020.23** |

Station / Offset: 53+58.25 / 44.61 RT

Northing: 893412.99

Easting: 596872.70

Actual Field Measurement: 1.52
(Existing Grade to T.O.U.)

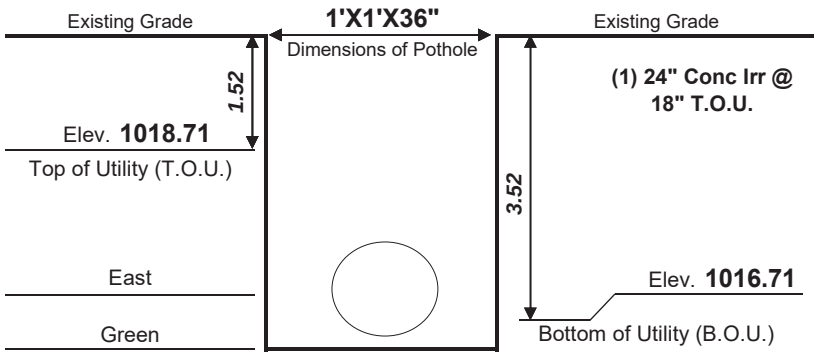
Elev. Top of Utility: 1018.71

Actual Field Measurement: 3.52
(Existing Grade to B.O.U.)

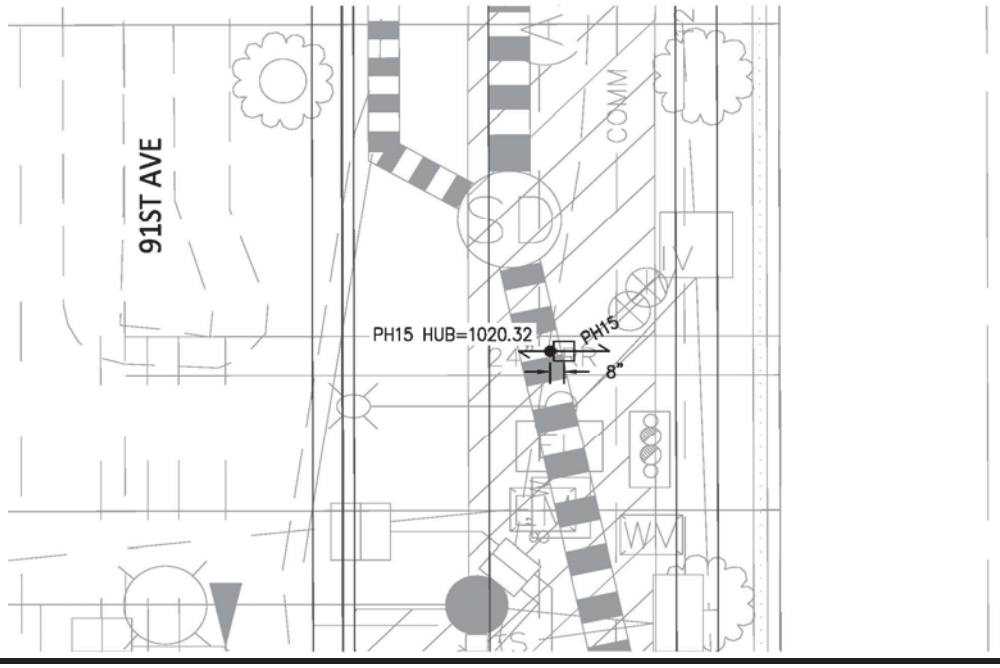
Elev. Bottom of Utility: 1016.71

Facing: East

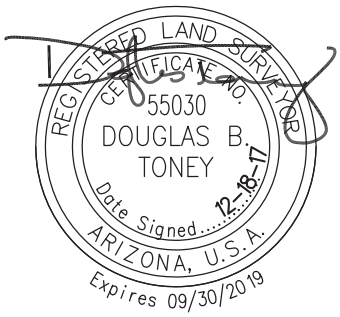
Ribbon Color: Green




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 16 | Date Dug: 12/5/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" Elec

Station / Offset: 55+62.40 / 31.64 LT | Northing: 893616.97 | Easting: 596796.00 | Elevation: 1019.64

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1019.64 | | | | | Station / Offset: | 55+62.40 / 31.64 LT |
| Rod Reading (HUB - Pothole Crew): | 5.52 | HUB: | 5.52 | T.O.U.: | 8.08 | Northing: | 893616.97 |
| Height of Instrument ( H. I. ): | 1025.16 | G. L.: | 5.58 | B.O.U.: | 8.25 | Easting: | 596796.00 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.16 | H. I. : | 1025.16 | H. I. : | 1025.16 |
| (-) Rod Read Top Util. (T.O.U.): | 8.08 | (-) Rod Read Bottom Util. (B.O.U.): | 8.25 | (-) Rod Read Pothole (G.L.): | 5.58 |
| = Elevation Top Utility: | 1017.08 | = Elevation Bottom Utility: | 1016.91 | = Elevation Ground Level: | **1019.58** |

Station / Offset: 55+63.48 / 29.39 LT

Northing: 893618.05

Easting: 596798.25

Actual Field Measurement: 2.50
(Existing Grade to T.O.U.)

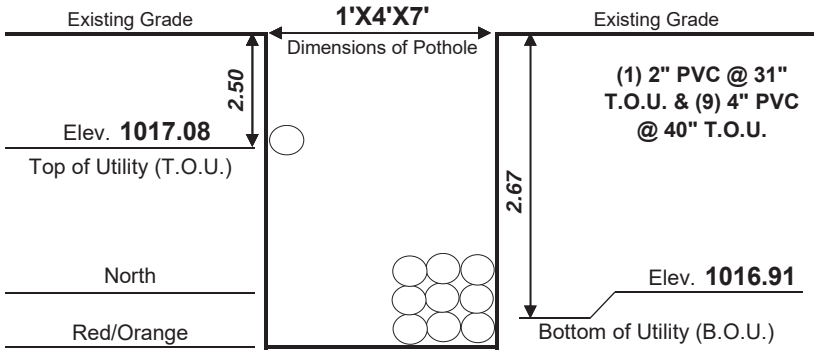
Elev. Top of Utility: 1017.08

Actual Field Measurement: 2.67
(Existing Grade to B.O.U.)

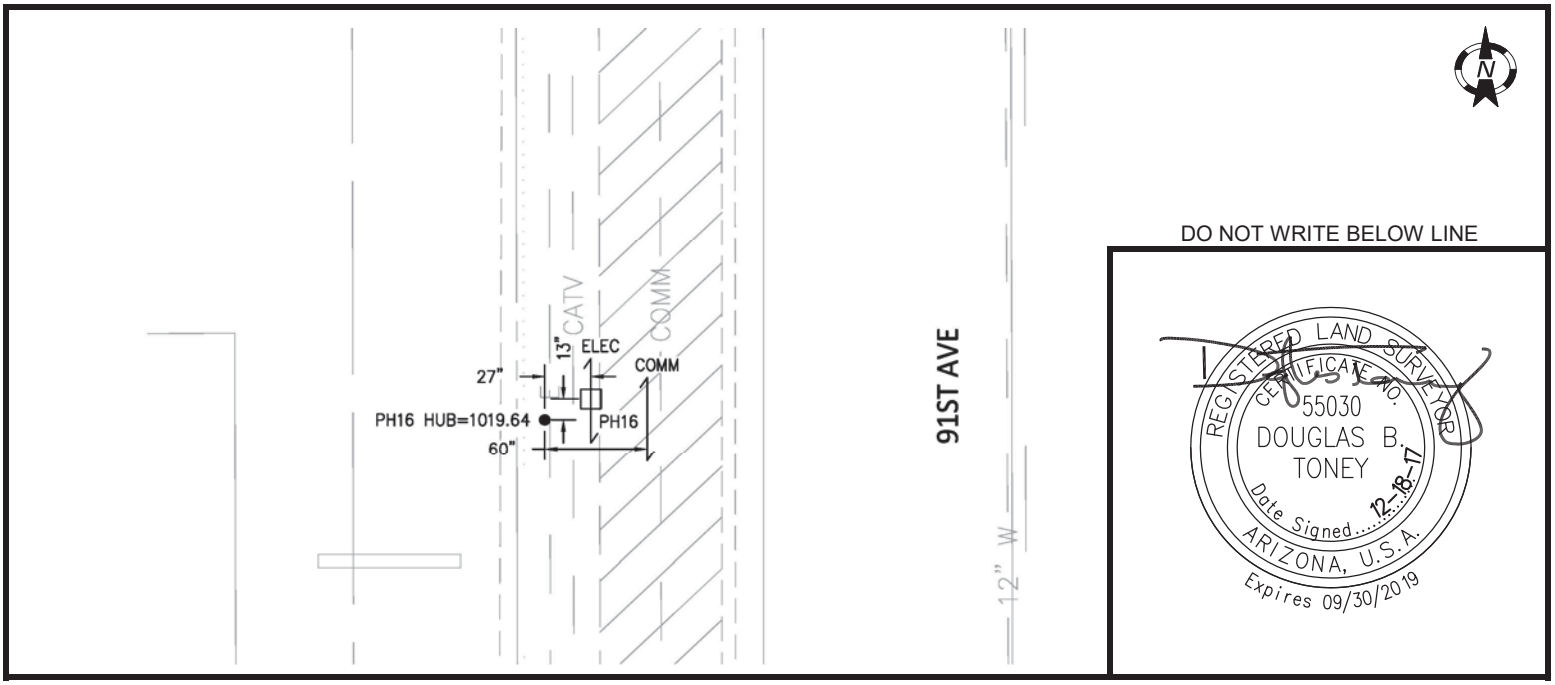
Elev. Bottom of Utility: 1016.91

Facing: North

Ribbon Color: Red/Orange




## Location Plan - Not to Scale




Remarks: Found 5 of maybe 9 conduit. Comm lines were under curb. No CATV, no bluestake.

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. | 7289 P | Cust. Job No. | | Test Hole No. 17 | Date Dug: 12/5/17 |
| Project Name: | 91st Avenue Widening | | | | |
| Checked by: | Curtis | | | Crew Members: | Kai-Nathan |
| General Location: | 91st Ave | | | General: | Dibble Eng. |

## Anticipated Utility Information

Size / Type: 1"/2"/4" CATV,Comm,Elec

Station / Offset: 57+53.37 / 30.20 LT  Northing: 893807.94  Easting: 596797.01  Elevation: 1020.29

## Benchmark Elevation Verification

| | | | | | |
|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1020.29 | | T.O.U. CATV: 6.47 | Station / Offset: | 57+53.37 / 30.20 LT |
| Rod Reading (HUB - Pothole Crew): | 4.93 | HUB: 4.93 | T.O.U. Elec: 7.69 | Northing: | 893807.94 |
| Height of Instrument ( H. I. ): | 1025.22 | G. L.: 5.15 | B.O.U.: 7.86 | Easting: | 596797.01 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.22 | H. I. : | 1025.22 | H. I. : | 1025.22 |
| (-) Rod Read Top Util. (T.O.U.): | 7.69 | (-) Rod Read Bottom Util. (B.O.U.): | 7.86 | (-) Rod Read Pothole (G.L.): | 5.15 |
| = Elevation Top Utility: | 1017.53 | = Elevation Bottom Utility: | 1017.36 | = Elevation Ground Level: | **1020.07** |

Station / Offset: 57+27.19 / 29.26 LT

Northing: 893781.77

Easting: 596798.01

Actual Field Measurement: 2.54
(Existing Grade to T.O.U.)

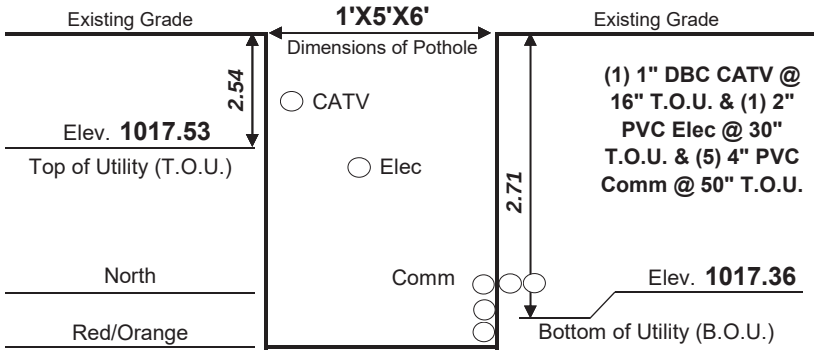
Elev. Top of Utility: 1017.53

Actual Field Measurement: 2.71
(Existing Grade to B.O.U.)

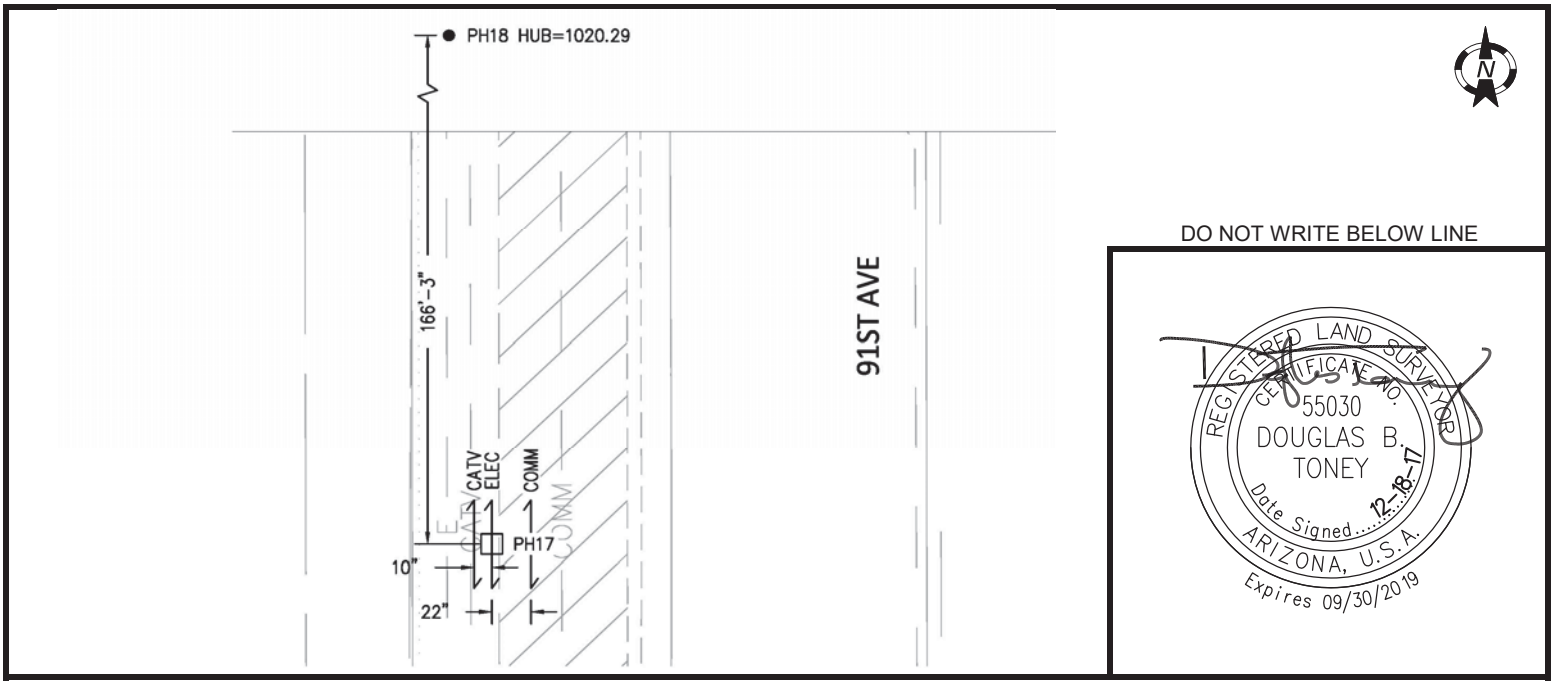
Elev. Bottom of Utility: 1017.36

Facing: North

Ribbon Color: Red/Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: PH 17 hub lost, used hub for PH 18. Found CATV in PH 17, lost it in PH 16. CATV comes off pole, heads east and turns south.

Was requested utility found? Yes  Soil Type: Loam  Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 18 | Date Dug: 12/5/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 2" Elec

Station / Offset: 58+93.45 / 30.91 LT | Northing: 893948.02 | Easting: 596795.99 | Elevation: 1020.29

## Benchmark Elevation Verification

| | | | | | |
|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1020.29 | | T.O.U. Irr: | 6.47 | Station / Offset: 58+93.45 / 30.91 LT |
| Rod Reading (HUB - Pothole Crew): | 5.35 | HUB: 5.35 | T.O.U. Elec: | 8.19 | Northing: 893948.02 |
| Height of Instrument ( H. I. ): | 1025.64 | G. L.: 5.37 | B.O.U.: | 8.36 | Easting: 596795.99 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1025.64 | H. I. : | 1025.64 | H. I. : | 1025.64 |
| (-) Rod Read Top Util. (T.O.U.): | 8.19 | (-) Rod Read Bottom Util. (B.O.U.): | 8.36 | (-) Rod Read Pothole (G.L.): | 5.37 |
| = Elevation Top Utility: | 1017.45 | = Elevation Bottom Utility: | 1017.28 | = Elevation Ground Level: | **1020.27** |

Station / Offset: 58+95.78 / 30.90 LT

Northing: 893950.35

Easting: 596795.99

Actual Field Measurement: 2.82
(Existing Grade to T.O.U.)

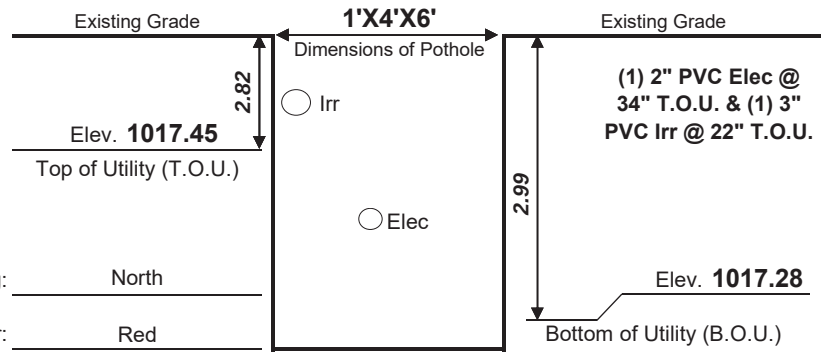
Elev. Top of Utility: 1017.45

Actual Field Measurement: 2.99
(Existing Grade to B.O.U.)

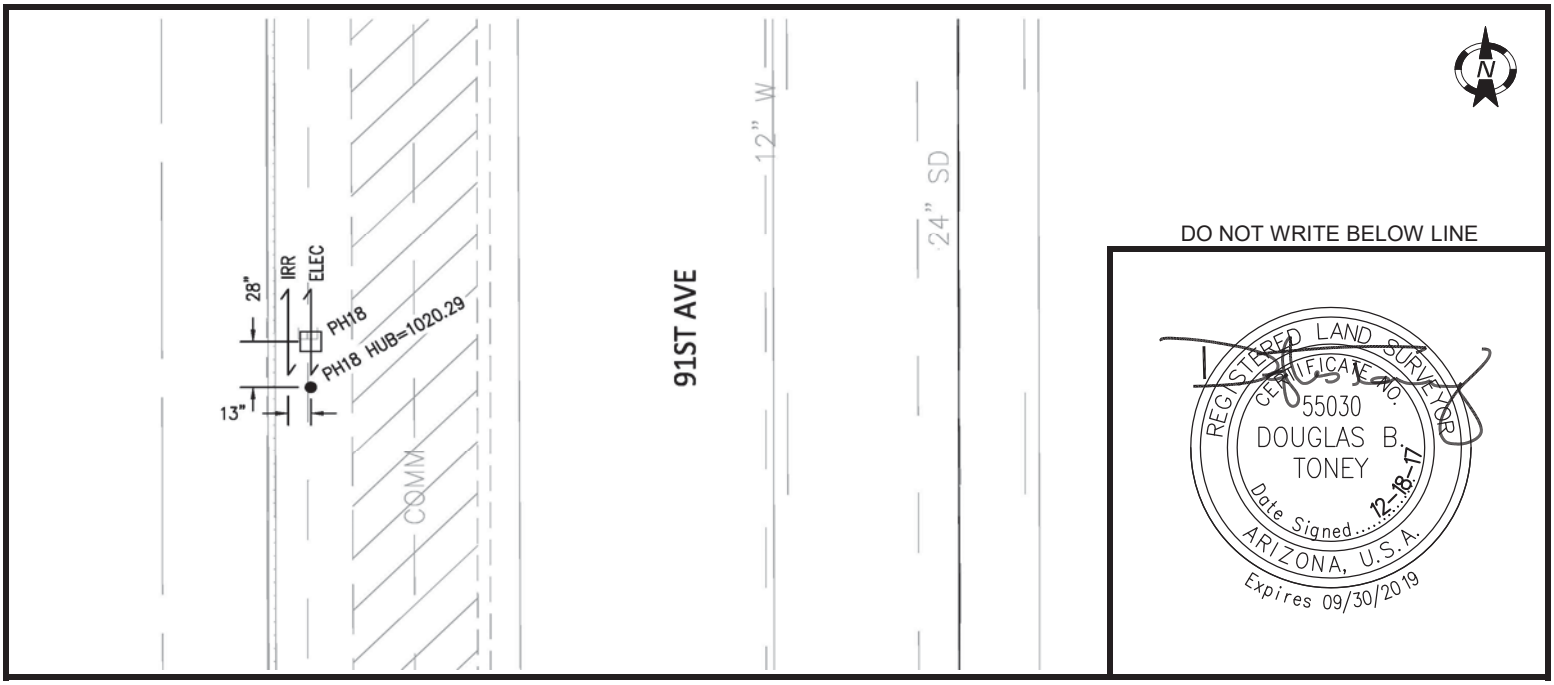
Elev. Bottom of Utility: 1017.28

Facing: North

Ribbon Color: Red




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: No CATV on asbuilt, no bluestake marks

Was requested utility found? Yes | Soil Type: Loam | Paving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 19 | Date Dug: 12/6/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Ricky

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 3" Elec

Station / Offset: 60+05.23 / 42.38 RT | Northing: 894059.96 | Easting: 596869.03 | Elevation: 1021.10

## Benchmark Elevation Verification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Elev. B. M. (Survey Crew): | 1021.10 | | | | | Station / Offset: | 60+05.23 / 42.38 RT |
| Rod Reading (HUB - Pothole Crew): | 5.18 | HUB: | 5.18 | T.O.U.: | 12.24 | Northing: | 894059.96 |
| Height of Instrument ( H. I. ): | 1026.28 | G. L.: | 5.68 | B.O.U.: | 12.74 | Easting: | 596869.03 |

| | | | | | |
|---|---|---|---|---|---|
| H. I. : | 1026.28 | H. I. : | 1026.28 | H. I. : | 1026.28 |
| (-) Rod Read Top Util. (T.O.U.): | 12.24 | (-) Rod Read Bottom Util. (B.O.U.): | 12.74 | (-) Rod Read Pothole (G.L.): | 5.68 |
| = Elevation Top Utility: | 1014.04 | = Elevation Bottom Utility: | 1013.54 | = Elevation Ground Level: | **1020.60** |

Station / Offset: 60+06.49 / 37.39 RT

Northing: 894061.21

Easting: 596864.03

Actual Field Measurement: 6.56
(Existing Grade to T.O.U.)

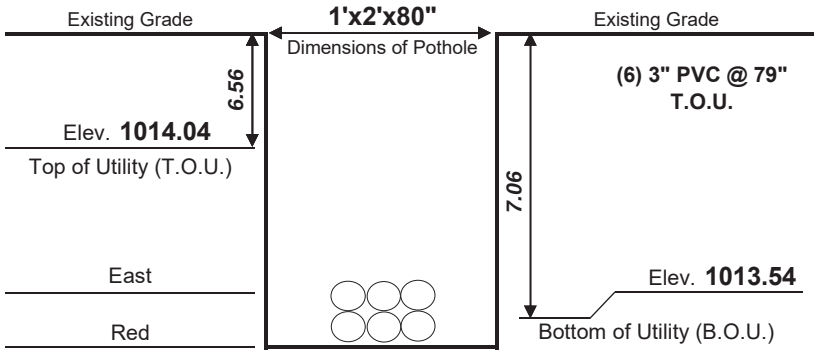
Elev. Top of Utility: 1014.04

Actual Field Measurement: 7.06
(Existing Grade to B.O.U.)

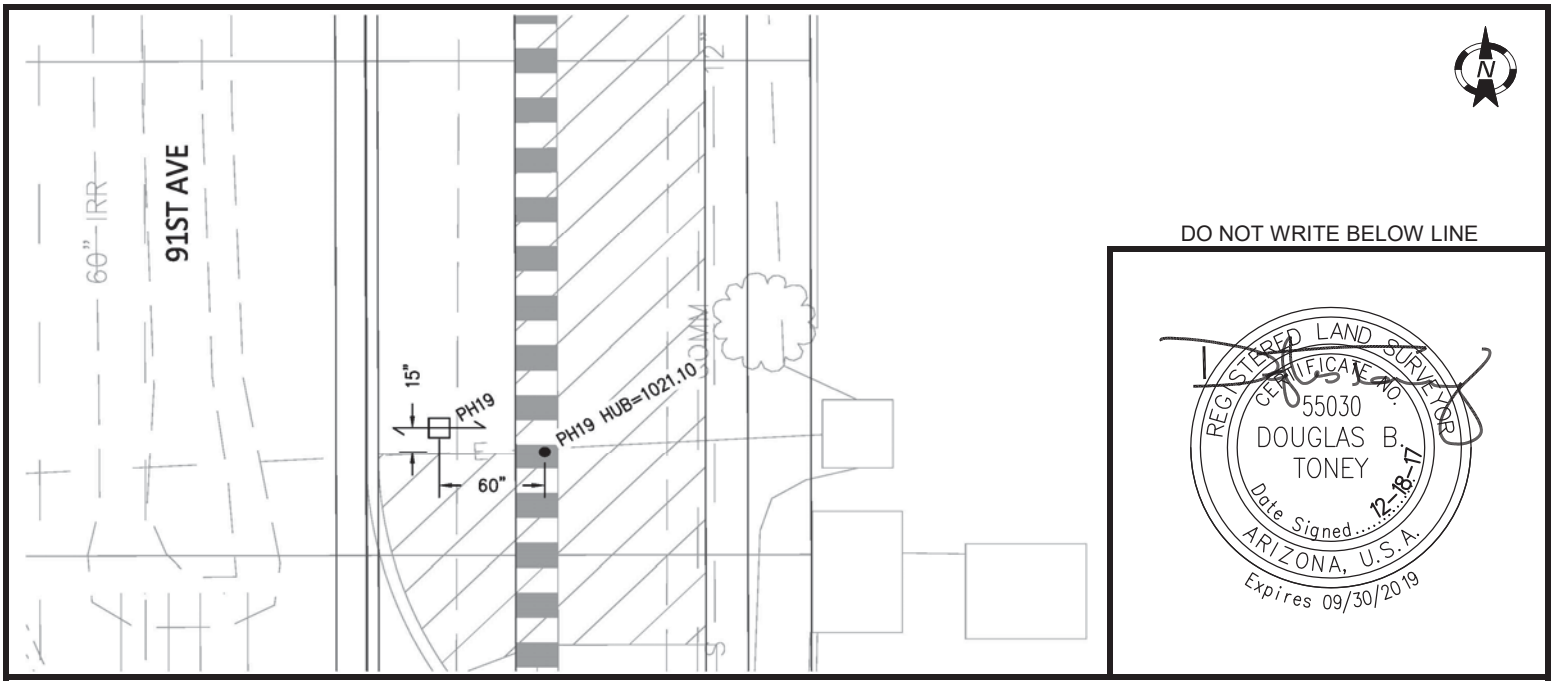
Elev. Bottom of Utility: 1013.54

Facing: East

Ribbon Color: Red




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE




Remarks: Hub on sidewalk

Was requested utility found? Yes | Soil Type: Compacted Loam | ıving Thickness & Type: 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. 7289 P | Cust. Job No. | Test Hole No. 20 | Date Dug: 12/5/17

Project Name: 91st Avenue Widening

Checked by: Curtis | Crew Members: Kai-Nathan

General Location: 91st Ave | General: Dibble Eng.

## Anticipated Utility Information

Size / Type: 3" & 4" Comm

Station / Offset: 61+28.40 / 29.27 LT | Northing: 894182.97 | Easting: 596797.11 | Elevation: 1020.09

## Benchmark Elevation Verification

Elev. B. M. (Survey Crew): 1020.09 | Station / Offset: 61+28.40 / 29.27 LT

Rod Reading (HUB - Pothole Crew): 4.96 | HUB: 4.96 | T.O.U.: 7.18 | Northing: 894182.97

Height of Instrument ( H. I. ): 1025.05 | G. L.: 4.91 | B.O.U.: 7.51 | Easting: 596797.11

| H. I. : | 1025.05 | H. I. : | 1025.05 | H. I. : | 1025.05 |
|---|---|---|---|---|---|
| (-) Rod Read Top Util. (T.O.U.): | 7.18 | (-) Rod Read Bottom Util. (B.O.U.): | 7.51 | (-) Rod Read Pothole (G.L.): | 4.91 |
| = Elevation Top Utility: | 1017.87 | = Elevation Bottom Utility: | 1017.54 | = Elevation Ground Level: | **1020.14** |

Station / Offset: 61+28.39 / 27.52 LT

Northing: 894182.97

Easting: 596798.86

Actual Field Measurement: 2.27
(Existing Grade to T.O.U.)

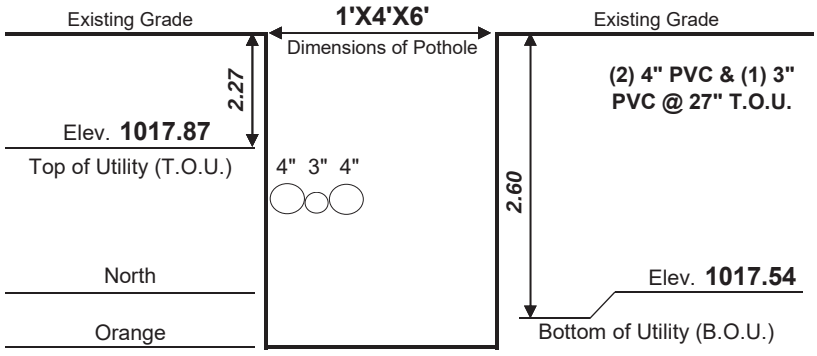
Elev. Top of Utility: 1017.87

Actual Field Measurement: 2.60
(Existing Grade to B.O.U.)

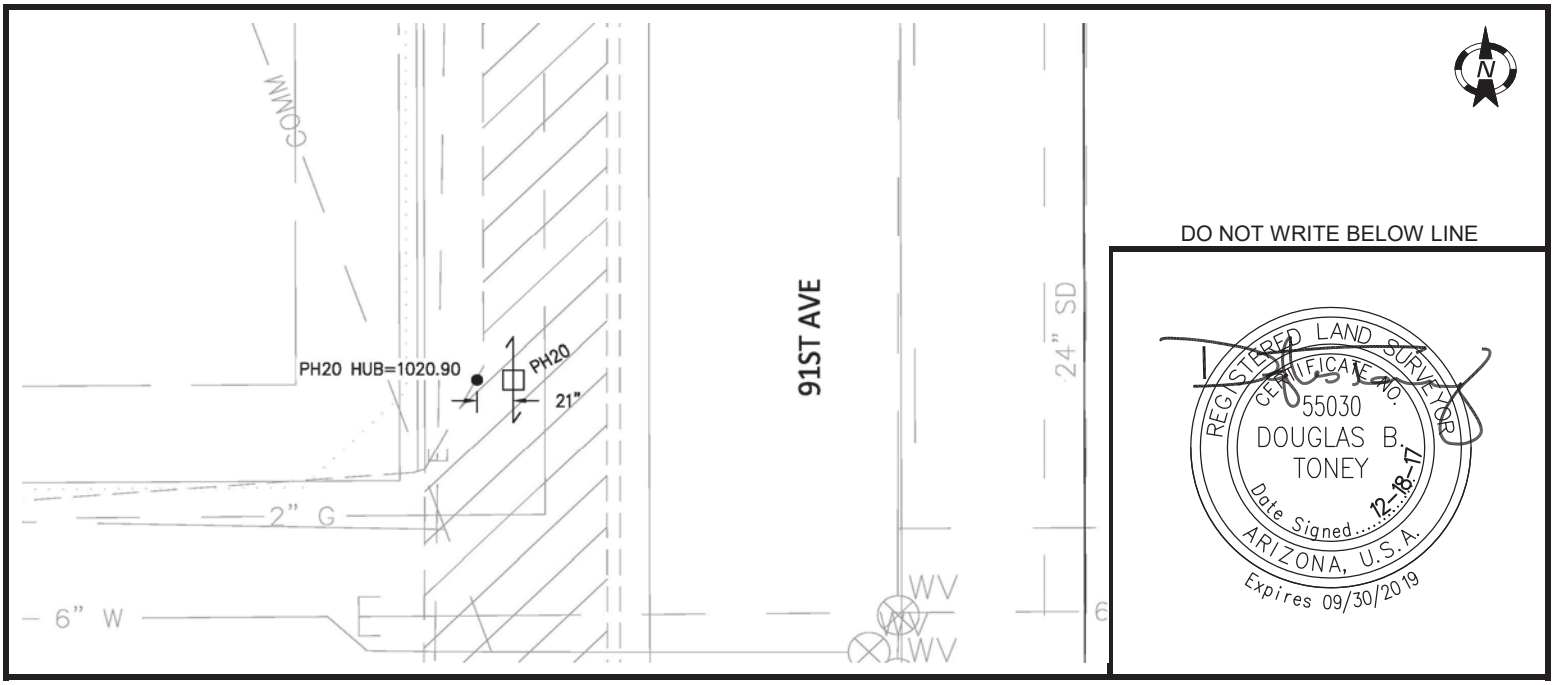
Elev. Bottom of Utility: 1017.54

Facing: North

Ribbon Color: Orange




## Location Plan - Not to Scale




DO NOT WRITE BELOW LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
55030
DOUGLAS B.
TONEY
Date Signed 12-18-17
ARIZONA, U.S.A.
Expires 09/30/2019

Remarks

Was requested utility found? Yes | Soil Type: Compacted Loam | ıving Thickness & Type: 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