July 2020

Gibson Oaks Offsite Pipeline Improvements (For Construction)

PCU Project Number No. 2014.04.30.0

Oracle Project No. 6857014

Polk County Utilities Division

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APPENDIX D - Letter Report dated December 11, 2019 prepared by Madrid Engineering Group, Inc., entitled: “Proposed PW01 Water Main, Lakeland, Florida”.

SECTION 01110

SUMMARY OF WORK
GIBSON OAKS OFF-SITE PIPELINE IMPROVEMENTS PHASE I

PART 1 GENERAL

1.01 GOVERNING PROVISIONS

A. Contractor shall refer to USSM for additional technical specifications requirements. In the event of a conflict, the USSM shall prevail.

B. Contractor shall refer to the General Conditions for contract provisions. In the event the technical specifications and General Conditions conflict, the General Conditions shall prevail.

C. Contractor shall defer to the FDOT latest standards and specifications for roads, drainage, erosion control, sodding, and site restoration requirements.

1.02 SUMMARY

A. Work Under this Contract:
   1. Work included under this contract generally includes but is not limited to the following:
      a. Pipeline and appurtenances – Approximately 32,432 LF of raw and potable water main ranging in diameter from 8-inch to 24-inch.

Pipe Size	Open-Cut Quantity (LF)	Directional Drill Quantity (LF)	Jack and Bore Casing Quantity (LF)
8-inch	34		
10-inch	8		
12-inch	9,087	11,023	
16-inch	3,001	17,874	
24-inch	2,874	418	
30-inch			55

      b. Restoration of driveway, grass and sidewalk associated with pipeline.
      c. Maintenance of traffic associated with pipeline.
      d. Installation of laterals as quantified on drawings.
      e. Demolition and removal of the existing facilities.
      f. All project permitting, site survey and clearing as required.
      g. Develop close out documents and provide surveyed as-built drawings.

1.03 LOCATION OF PROJECT

A. The Work spans a portion of Polk County to provide conveyance of raw water from the existing well at Lake Gibson WPF and the existing facility referred to as Sherwood Lakes to the proposed Gibson Oaks WPF. In addition, there are also new potable water pipeline installations and upsizing to existing potable water pipelines

that will loop the existing system and ensure fire flow in the potable water distribution system. The pipeline routes are located in the road right-of-way and dedicated easements. The closest intersection to the start of the project is Lindale Street and N Socrum Loop Road. The Gibson Oaks WPF is in the middle of the pipeline route and is accessed from Tom Costine Road. The project ends at the back of the Sherwood Lakes WPF.

B. The following roads outline a majority of the pipeline route:
   1. N Socrum Loop Road
   2. Tom Costine Road
   3. Old Polk City Road
   4. Haymarket Drive
   5. Walt Williams Road
   6. Utility easements

1.04 ACTIVITIES BY OTHERS

A. Coordination:
   1. Other phases of construction may begin before this contract is completed which will interface with this work. Additionally, other projects will be constructed adjacent to the Work during the life of this contract. Coordinate your activities with the other contractors to allow orderly and timely completion of all the work.
   2. Lake Gibson High School is located at the beginning of the project. Additional care must be taken when school traffic is heavy for the beginning and ending of the school day.

B. Utilities:
   1. Coordinate the activities of all utility companies with equipment in the construction area with the Contractor's and subcontractors' work.

C. Cutting and Patching:
   1. No cutting and patching of new work will be accepted. All work must be new and continuous in its final form.

1.05 SUBCONTRACTORS

A. Contractor shall not employ any subcontractors against who the County or the Engineer may have reasonable objection. The name, address, and experience of the proposed subcontractors shall be submitted by the Contractor to Engineer for Engineer's review prior to any work being performed by the subcontractor.

1.06 WORKING HOURS

A. Refer to the County Supplementary Conditions.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01120

PRICE AND PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Incidental work

B. Procedures for Measurement

C. Unit Prices

1.02 INCIDENTAL WORK

Incidental Work items are items, specifically identified or not, that are an integral part of the completed project as required under the Contract Documents for which separate payment is not made. These items consist of the following:

A. Bonds, insurance, schedules, shop drawings, warranties, and other required submittals.
B. Permits not obtained by the Owner.
C. Clearing, grubbing, stripping and disposal of vegetation.
D. Transport and disposal of excess material and demolition debris.
E. Dewatering of trenches and other excavations, including all materials, equipment and labor.
F. Utility crossings and minor relocations unless payment is otherwise made under other items.
G. Repair or replacement of existing culverts, underdrains, irrigation systems, drainage facilities, utilities, and other facilities impacted by construction.
H. Dust and erosion control, including the cost for implementing and maintaining controls in accordance with the Stormwater Pollution Prevention Plan for the project.
I. Final grading and final/temporary right-of-way restoration. All materials and Work for right-of-way restoration shall be in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition.
J. Horizontal and vertical survey control and construction staking.
K. Repair and restoration of property, including the removal and replacement of fences, guard rails, curbs, structures, signs, pavement markings, utility poles, mailboxes, and other items impacted by construction. All plants, shrubs, and trees damaged or removed by the Contractor's operations shall be replaced in like kind.
L. Materials, labor, and equipment required to comply with Occupational Safety and Health Administration (OSHA) trench excavation safety standards and the Florida Trench Safety Act.

M. Materials, labor, and equipment necessary to protect the structural integrity of existing paved roadways. Incidental damage to paved roadways, including damage to the existing subbase, base and/or asphaltic concrete pavement outside the limits of excavation and repair identified in the Drawings, shall be restored/repaired at the Contractor's sole expense to the satisfaction of the Owner.
N. Materials, labor, and equipment necessary to protect the integrity and operation of existing utilities. Any damage to existing utilities shall be repaired/replaced at the Contractor's sole expense to the satisfaction of the Owner.
O. Materials, labor, and equipment for temporary sample points and construction water supply, including the cost of the water supplied by the County or other utility.
P. Full compensation for all trench boxes, sheeting, bracing, and shoring in excavations. The nature and extent shall be as described in the Florida Trench Safety Act and OSHA Standard 29 CFR Part 1926.650 Subpart P.
Q. Connections to existing water mains/water distribution systems, including coordinating the connection with the Owner to minimize disruptions to the existing system, unless payment is otherwise made under other items.
R. On-going and final cleanup.
S. Project record documentation, including the provision of "as-built" drawings certified by a registered land surveyor.
T. All other items required for completion of the Contract.

1.03 PROCEDURES FOR MEASUREMENT

A. For lump sum items, payment shall be made based on the lump sum prices set forth in the Bid Proposal based on level of completed work as determined by the accepted Schedule of Values.
B. For field measure unit-price items, payment shall be based on the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.
    1. All units of measurement shall be standard United States convention as applied by the specific items of work by tradition and as interpreted by the Engineer.
    2. After the work is completed and before final payment is made, the Engineer will make final field measurements to determine the quantities of various items of work accepted as the basis for final settlement.

1.04 UNIT PRICES

To be completed at a future date

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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SECTION 01130

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED SECTIONS

None

1.02 SUBMITTALS

A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.

B. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.03 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 PROJECT CONDITIONS

A. Grade pipeline area to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
B. Protect project area from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Coordinate water interruptions with County. Provide a 2 week “look ahead” schedule to County for water interruptions. County will notify residents of interruption of water service based on the Contractor’s schedule.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinated completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner’s activities.

PART 2 – PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 – EXECUTION

3.01 EXECUTION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

3.04 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.

C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

3.05 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.06 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.07 FINAL CLEANING

A. Use cleaning materials that are non-hazardous.

B. Clean site, sweep paved areas, rake clean landscaped surfaces.

C. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.08 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Notify Engineer when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Engineer when work is considered finally complete.

F. As-Built Drawings:

1. As-built drawing information shall be maintained continuously by the Contractor as construction progresses. Contractor shall provide redline markups for the review with the submittal of pay applications. Contractor retains full responsibility to ensure the as-built information is gathered and recorded as outlined in the Contract Documents.

2. Each document shall be labeled "As-Built Drawings" in large printed letters, and shall include the Contractor's name and person's name responsible for maintenance of current data on the as-built drawings.

3. Contractor shall keep accurate record of the location, size, and material for all piping, fittings, and changes in dimensions and other variations between the work actually performed and that are shown on the Contract Documents. The representation of such variations shall conform to standard drafting practices and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the construction.

4. Final alignment, elevations, locations are to be supplied by the Contractor. Elevation data shall be provided at all fittings, valves, and beginning/end of all mains and services. In addition, data shall be provided at all changes in direction. The As-Built drawings shall also include locations of grouted lines. The surveyed points shall consist at a minimum the locations where the abandoned lines were cut, capped, and excavated.

5. No work shall be concealed or buried until the required information is gathered and recorded.

6. As-Built drawings shall be signed and sealed by a professional land surveyor, registered in the State of Florida. Contractor shall submit four (4) signed and sealed hard copies together with an electronic copy. The electronic copy shall be on CD in DWG format and shall include AutoCAD files plus survey coordinate files.

G. Complete items of work determined by Engineer's final inspection.

END OF SECTION

SECTION 01140

COMMUNICATION PLAN
GIBSON OAKS OFF-SITE PIPELINES PROJECT

PART 1 GENERAL

1.01 PURPOSE

A. Provide structured lines of communication between stakeholders and the County throughout the project.

B. Communication with any stakeholders throughout the project shall follow the below-listed procedures.

1.02 POTENTIAL STAKEHOLDERS

A. Stakeholders may include the following (additional stakeholders may be identified during the project). Stakeholders are defined as anyone who may have a vested interest in the project and/or are affect by project conditions.

B. Potential stakeholder list:
   1. Business owners
   2. Residents
   3. Local schools
   4. Other agencies
   5. Special interest groups

1.03 POTENTIAL SCENARIOS ENACTING THE COMMUNICATION PLAN

A. Much of the project work is located adjacent to residential areas throughout Polk County, it is highly likely that there will be potential scenarios throughout the project that will prompt interaction with stakeholders.

B. The following list includes potential scenarios that may include stakeholder interaction and/or communication:
   1. Pipeline break
   2. MOT
   3. Damage to private property
   4. Easement questions or issues
   5. General stakeholder inquiry

1.04 GENERAL GUIDELINES

A. All communication with stakeholders throughout the project shall be directed to the Polk County PM, James Tully. Communication should be kept to a minimum and be polite but concise.

B. Construction personnel shall direct all communication to the Construction Superintendent, who in turn will direct the stakeholder to contact the County PM.

C. Contact information will be distributed at the preconstruction meeting. Any changes in personnel or information should be provided to the County within 24 hours.

1.05 ROLES AND RESPONSIBILITIES

A. The following table outlines the roles and responsibilities of key personnel in the scope of the Communication Plan.

Role	**Name**	**Responsibility**
Contractor Superintendent	TBD	Direct stakeholder interaction to County PM; inform Contractor PM of interaction
Contractor PM	TBD	Contact County PM to report stakeholder interaction
County PM	Gary Basham	Respond to stakeholder, direct to appropriate party if necessary
Consultant PM	Matt O'Connor	Support County with response if necessary

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Procedures for measurement and payment of Work performed on a unit price basis as outlined on the Bid Form.

B. Separate payment will be made only for the items of work described herein and listed on the Bid Form. Any related work not specifically listed, but required for satisfactory completion of the work, shall be considered to be included in the scope of the appropriate listed work items.

C. Unless specifically called out as a separate Pay Item, no separate payment will be made for the following items and the cost of such work shall be included in the applicable Pay Items or work:
   1. Clearing and grubbing
   2. Excavation, including necessary surface improvements removal
   3. Sheeting, shoring and/or dewatering
   4. Backfill materials, except as specified hereinafter
   5. Grading
   6. Clean-up and restoration
   7. Refill materials except as specified hereinafter
   8. Testing and placing system in operation
   9. Protection, repair, and replacement of existing utilities facilities not shown on the plans to be relocated

D. Related sections:
   1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
   2. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.
   3. The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.
      a. Bid Form
      b. PCU General Conditions

1.02 ESTIMATED QUANTITIES

A. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the bids submitted for the Work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished.

Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts thereof, as described in the supplementary conditions.

1.03 TAXES AND PERMITS

A. The Bidder's attention is directed to the fact that the tax laws of the State of Florida, including but not limited to Chapter 212, Florida Statutes, apply to this bid matter and that all applicable taxes and fees shall be deemed to have been included in Bidder's proposal.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement of lump sum items shall be based on the percent of actual completion as determined by the Contractor and agreed upon by the Engineer.

B. Where applicable, work paid at a unit price times number of units measured will be measured by Engineer/Owner in accordance with United States Standard Measures.

C. Measurement of volumes shall be the actual "as-built" volume pertinent to payment items.

D. Payment will start only after material is delivered to the project site and verified by the Construction Manager.

1.05 PAY ITEMS

A. General:
   1. The pay items are included in Bid Form.
   2. Payment procedures as specified in the PCU General Conditions.

B. BID ITEM NO. 1– Mobilization and Demobilization
   1. Description: The work specified in this item consist of the preparatory work and operations in mobilizing for beginning and ending work on the Project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to and from the project site, and for the establishment of temporary offices, buildings, safety equipment, project sign, and first aid supplies, sanitary and other facilities as required by these Specifications, the submittal of all required insurance certificates and bonds, posting of all OSHA required notices and establishment of safety programs at the jobsite, any additional requirements of the Supplementary Conditions, and state and local laws and regulations. The costs of any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall be included in this item. This Bid Item will include mobilization and demobilization for all parts of phases of the total project.
   2. Measurement: The quantity of mobilization to be paid for under this Item shall be measured as one lump sum quantity. Partial payments will be made therefore in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum price for Mobilization/Demobilization
5	25
10	50
35	75
65	90
90	100

3. Payment: The quantities, as determined above, shall be paid for at the contract lump sum price set out in the Bid Proposal, which price and payment constitutes full compensation for all the work described herein.

C. BID ITEM NO. 2 – Erosion and Sedimentation Control
   1. Description: The work consists of all labor, equipment, material, installation, maintenance, replacement and removal of approved erosion control devices from commencement to final acceptance. The pay item for Erosion Control (Lump Sum) shall include all erosion control devices necessary to control erosion on the project unless otherwise specified to be paid for under other items of work.
   2. Measurement: Payment for Erosion Control (Lump Sum) shall be at the Lump Sum price bid. The lump sum erosion Control shall be paid on a pro-rated monthly amount based on contract time.
   3. Payment: Payment will be made at the lump sum price shown in the Bid Form for the Erosion Control, as designated on the plans, and acceptably completed.

D. BID ITEM NO. 3 – PVC Pipe (Open-Cut)
   1. Description: The work consists of furnishing all labor, equipment and materials and installing PVC pipe by open cut or insertion into a casing pipe that has been installed under another Bid Item. The unit price shall include all costs necessary to install the pipe including survey layout; materials; clearing and grubbing; tree removal; root pruning; excavation; backfilling; dewatering; sheeting; bracing; temporary fencing; utility crossings; identification and locating appurtenances; electronic marker balls; clearing of the right-of-way; protection of property; protection, repair and replacement of utilities; protection, repair and replacement of sprinklers; temporary leakage test plugs; temporary blow-offs; pressure testing, and disinfection. Fittings and Surface restoration shall be paid for under separate Bid Items.
   2. Measurement: The quantities of pipe to be paid for under this Item shall be the horizontal length in linear feet of pipe measured along the centerline of the pipe through valves and fittings in place, completed and accepted. Whether a particular pay item is for restrained joint pipe or unrestrained joint pipe is indicated in the proposal.
   3. Payment: Payment will be made at the unit price bid per linear foot of the various pipe sizes for restrained or unrestrained joint pipe.

E. BID ITEM NO. 4 – Valves
   1. Description: The work consists of furnishing all labor, equipment and materials to install valves as shown, specified and directed. The unit price shall include the cost of the jointing materials, including rings, bolts and gaskets, polywrap, filter fabric, installation costs, roadway box, concrete support and concrete valve box pad with bronze disc, where required, operator extension stems so nuts are no more than 3 feet below surrounding grade, and dewatering.

2. Measurement: The quantities of valves to be paid for under these Items shall be the number of each measured in place, completed and accepted
3. Payment: Payment will be made at the unit price bid for each type valve of the various sizes.

F. BID ITEM NO. 5 – Ductile Iron Fittings
1. Description: Furnishing all labor, equipment and materials and installing ductile iron fittings and not included in other items. The unit price shall cover the cost of furnishing the fittings, bends and sleeves, cement lining, transportation, jointing materials, glands, bolts, gaskets, and polyethylene wrap. All fittings shall be installed with restrainers.
2. Measurement: The quantities of fittings to be paid for under these Items shall be the number of each measured in place, completed and accepted
3. Payment: Payment will be made at the unit price bid for each type fitting of the various sizes.

G. BID ITEM NO. 6 – Disconnect and Permanent Plug Existing Potable Water Mains
1. Work Includes: The work consists of furnishing all labor, equipment and materials to cut and permanently plug existing potable water mains. The unit price shall include, all nuts, bolts, gaskets, restrained joint plugs or caps, notification of shutdown to customers, cutting existing pipe, groundwater removal, dewatering pipe contents, polywrap, coordination with Polk County Utilities to operate existing valves and all other operations required to disconnect and plug the potable water mains. The cost of grouting an out of service main, line stops and removal of appurtenances from out of service mains, if required, will be paid for under separate Bid Items. All work required to physically plug the mains placed out of service from remaining active potable water mains shall be included.
2. Measurement: The quantity of disconnect and permanent plug existing potable water mains to be paid for under this Item shall be the number of each measured in place, completed and accepted.
3. Payment: Payment will be made at the unit price bid for each size listed in the Bid Form.

H. BID ITEM NO. 7 – 10-inch Line Stop
1. Description: The work consists of furnishing all labor, equipment, line stop assemblies, and materials required for installation of and performing the 10-inch line stop. The unit price shall include all nipples, valves, piping, fittings, taps, dewatering, etc. as called for on the Drawings. All relevant submittals and supervision (when line stops are in service) of the line stops are included within the bid item. Surface restoration shall be paid for under separate Bid Items.
2. Measurement: The quantity of the 10-Inch Line Stop to be paid for under this item shall be measured as one lump sum.
3. Payment: Payment will be made at the lump sum price shown in the Bid Form for the 10-Inch Line Stop, as designated on the plans, and acceptably completed.

I. BID ITEM NO. 8 – Taps
1. Description: The work consists of furnishing all labor, equipment and materials, including tapping sleeve, tapping valve, valve box, polywrap, shoring if required,dewatering and performing taps on existing PVC, C.I. and D.I. mains. A pressure test of the completed installations is required.

2. Measurement: The quantities of taps to be paid for under this Item shall be the actual number of each size measured in place, completed and accepted.
3. Payment: Payment will be made at the unit price bid for each size of tap listed in the Bid Form.

J. BID ITEM NO. 9 – Water Services for Existing Residential Meters
1. Description: The work consists of furnishing all labor, equipment and materials and installing Long and Short Water Services (Single and Double). The unit price shall include coordination with Polk County Utilities for connecting to existing meters, all nipples, valves, fittings, saddles, taps, polywrap if required, tubing, dewatering, etc. as called for on the Drawings. Surface restoration shall be paid for under separate Bid Items.
2. Measurement: The quantities of water services to be paid for under this Item shall be the actual number of the respective water service measured in place, completed and accepted.
3. Payment: Payment will be made at the unit price bid for each water service.

K. BID ITEM NO. 10 – Temporary Sample Points for Raw and Potable Water Mains
1. Description: The work consists of furnishing all labor, equipment, materials, installation, maintenance, replacement and removal of Temporary Sample Points on the raw and potable water piping. The unit price shall include water sampling, water testing, all nipples, valves, fittings, saddles, taps, polywrap if required, tubing, dewatering, etc. as called for on the Drawings. Surface restoration shall be paid for under separate Bid Items.
2. Measurement: The quantities of Temporary Sample Points to be paid for under this Item shall be the actual number of the respective Temporary Sample Points measured in place, completed.
3. Payment: Payment will be made at the unit price bid for each water service.

L. BID ITEM NO. 11 – Fire Hydrant Assembly, Complete
1. Description: The work consists of furnishing all labor, equipment and materials to install Fire Hydrant Assemblies as shown, specified and directed. The unit price shall include the cost of the fittings, isolation valve, sample port assembly, piping, jointing materials, including rings, bolts and gaskets, polywrap, filter fabric, curb and pavement markers, installation costs, roadway box, concrete support and concrete valve box pad with bronze disc, where required, operator extension stems so nuts are no more than 3 feet below surrounding grade, and dewatering. The work includes connecting to the Tee fitting on the main pipeline. The Tee fitting to the main pipeline will be paid under a separate Bid Item.
2. Measurement: The quantities of Fire Hydrant Assemblies to be paid for under these Items shall be the number of each measured in place, completed and accepted
3. Payment: Payment will be made at the unit price bid for each Fire Hydrant Assembly.

M. BID ITEM NO. 12 – Air Release Systems
1. Description: The work consists of furnishing all labor, equipment and materials and installing air release systems. The unit price shall include all nipples, valves, fittings, taps, polywrap if required, valve chamber (manhole with frame and cover), above ground enclosure, piping, bollards if shown or specified,

dewatering, etc. as called for on the Drawings. Surface restoration shall be paid for under separate Bid Items.

2. Measurement: The quantities of air release systems to be paid for under this Item shall be the actual number of the respective air release assemblies measured in place, completed and accepted.
3. Payment: Payment will be made at the unit price bid for each air release assembly.

N. BID ITEM NO. 13 - Abandonment of Potable Water Mains Placed Out of Service

1. Description: Payment shall be full compensation for coordination with Polk County Utilities for operation of existing valves to depressurize the mains; removal of all valve boxes, fire hydrants, blow offs and air release valves from pipe placed out of service, protection of adjacent pipe to remain, removal and disposal of certain pipe as shown, specified or required, excavation, backfilling, dewatering, sheeting, shoring and bracing, and all work required to physically abandon the mains placed out of service from remaining active water mains shall be included. This work includes furnishing and installing grout, flowable fill material or slurry inside existing pipelines as shown, specified and as directed by the Engineer. The work includes cutting open pipe for fill placement and placement of grout tubes. Grout shall have a maximum 28-day compressive strength of 100 psi and be submitted for approval. Flowable fill conforming to FDOT Standard Specification Section 121 for excavatable flowable fill is acceptable, however, mixes with less fine aggregate and more admixtures to increase pump ability will also be considered. All work associated with plugging shall be paid under a separate pay item.
2. Measurement: The quantity of Abandonment of Potable Water Mains Placed Out of Service to be paid for under this item shall be measured as linear feet of water main abandoned.
3. Payment: Payment will be made at unit price of linear feet of Potable Water Main abandoned.

O. BID ITEM NO. 14 – H.D.P.E Raw or Potable Water Main by HDD

1. Description: The work consists of furnishing all labor, equipment and materials, and fusing and installing H.D.P.E. Raw or Potable Water Main by HDD. The unit price shall include all costs necessary to install the pipe including survey layout; materials, including HDPE Flange adapters; clearing and grubbing; tree removal; root pruning; excavation; backfilling; dewatering; cutting and removal of pavement and other surface improvements including sidewalks, driveways, etc; sheeting; bracing; utility crossings; guidance system, HDD plan submittal, clearing of the right-of-way; protection of property; protection, repair and replacement of utilities; protection, repair and replacement of sprinklers; temporary leakage test plugs; temporary blow-offs; pressure testing; and disinfection.
2. Measurement: The quantities of HDD pipe to be paid for under this Item shall be the horizontal length within the limits as shown on the plans installed and approved. If additional length is installed for the Contractor’s convenience, such additional length shall be measured for payment under the appropriate pay item for adjacent pipe installed in open cut trench.
3. Payment: Payment will be made at the unit price bid per linear foot of the various pipe sizes.

P. BID ITEM NO. 15 – Jack and Bore 30” Steel Casing and Carrier Pipe
   1. Description: The work consists of furnishing all labor, equipment and materials for the installation of casing and carrier pipes by the method of boring and jacking. The unit price shall include all costs necessary to install the casing and carrier pipe including survey layout, clearing and grubbing, tree removal, root pruning, dewatering, excavation of jacking and receiving pits, backfilling, sheeting, shoring, bracing, casing pipe, carrier pipe, joint restraints, casing spacers, end plugs, reaction blocks, braces, and barricades.
   2. Measurement: The quantities of jack and bore casing to be paid for under this Item shall be the horizontal length within the limits as shown on the plans installed and approved. If additional length is installed for the Contractor’s convenience, such additional length shall be measured for payment under the appropriate pay item for adjacent pipe installed in open cut trench.
   3. Payment will be made at the unit price bid per linear foot of the installed casing.

Q. BID ITEM NO. 16 – Asphalt Pavement Removal and Replacement
   1. Description: The work consists of all labor, equipment, and material necessary for saw cutting, removing and disposing of existing roadway or driveway material, furnishing and installing subbase material or placing excavatable flowable fill, base, and asphalt material in accordance with the FDOT standards, installing any necessary sealer or tack coat, furnishing and installing pavement markings to match existing, repair or replacement of damaged curb and gutter, and all other incidental items of Work not paid for under other items. All areas of this item disturbed due to the Contractor’s operations which are not along the center line of the pipe construction shall also be satisfactorily repaired at no additional cost to the Owner. All materials and Work shall be in accordance with FDOT Standard Specification for Road and Bridge Construction, latest edition and Polk County Transportation.
   2. Measurement: The quantity to be measured for payment shall be the area in square feet of pavement removed and replaced within the payment limits shown and described, completed and accepted.
   3. Payment: Payment will be made based on the contract unit price per square feet.

R. BID ITEM NO. 17 – Asphalt Pavement Mill and Resurface
   1. Description: The work consists of all labor, equipment, and material specified for the milling of the existing asphalt including hauling off, and stockpiling or otherwise disposing of the milled material. Milling shall conform to FDOT Standard Specification Section 327.
   2. Measurement: The quantity to be measured for payment shall be the area in square feet of milling completed and accepted.
   3. Payment: Payment will be made at the contract unit price per square feet.

S. BID ITEM NO. 18 – Dirt or Gravel Driveway Restoration
   1. Description: The work consists of all labor, equipment and materials for the construction of 6-inch thick compacted dirt driveway as shown, specified and directed. The unit price includes restoring dirt driveways in kind utilizing existing material or stabilizing, if necessary, to achieve the specified LBR rating. Dirt driveways with no shell or gravel present shall be installed to have a minimum LBR of 40. Dirt driveways with shell, gravel, or crushed asphalt or concrete mixed in shall be installed to have a minimum LBR of 100.

2. Measurement: The quantity to be measured for payment under this Bid Item will be the area in square feet of dirt driveway placed in the work within the payment limits for surface restoration shown or as directed by the Engineer.
3. Payment: Payment will be made at the contract unit price per square feet.

T. BID ITEM NO. 19 - Concrete Sidewalk Removal and Replacement
1. Description: The work consists of all labor, equipment and materials for the removal, disposal, and construction of concrete sidewalk as shown in the Contract drawings.
2. Measurement: The quantity to be measured for payment under this Bid Item will be the area in square feet of such concrete sidewalk placed in the work within the payment limits for surface restoration shown or as directed by the Engineer.
3. Payment: Payment will be made at the contract unit price per square feet.

U. BID ITEM NO. 20 – Concrete Driveway
1. Description: The work consists of all labor, equipment and materials for the construction of 6-inch thick concrete driveway, as directed by the Engineer.
2. Measurement: The quantity to be measured for payment under this Bid Item will be the area in square feet of such 6-inch thick concrete driveway placed in the work within the payment limits for surface restoration shown or as directed by the Engineer.
3. Payment: Payment will be made at the contract unit price per square feet.

V. BID ITEM NO. 21 – Asphalt Driveway
1. Description: The work consists of all labor, equipment and materials for the construction of asphalt driveway, as directed by the Engineer.
2. Measurement: The quantity to be measured for payment under this Bid Item will be the area in square feet of such asphalt driveway placed in the work within the payment limits for surface restoration shown or as directed by the Engineer.
3. Payment: Payment will be made at the contract unit price per square feet.

W. BID ITEM NO. 22 – Sodding
1. Description: The work consists of furnishing all labor, equipment and materials and placing, rolling and watering grass sod complete in place regardless of grass type (St. Augustine/Bahia).
2. Measurement: The quantity of sod to be measured for payment will be the number of square feet of acceptable sod measured in place within the payment limits for surface restoration shown and as directed by the Engineer.
3. Payment: Payment shall be made at the unit price bid per square feet.

X. BID ITEM NO. 23 – Seed and Mulch
1. Description: The work consists of furnishing all labor, equipment and materials and handling, placing, and watering seed and mulch complete in place regardless of grass type (Bermuda/Bahia).
2. Measurement: The quantity of seed and mulch to be measured for payment will be the number of square feet of acceptable seed and mulch measured in place within the payment limits for surface restoration shown and as directed by the Engineer.
3. Payment: Payment shall be made at the unit price bid per square feet.

Y. BID ITEM NO. 24 - Maintenance of Traffic

1. Description: Work shall include furnishing all labor, materials and equipment required to implement the MOT plan and to cover the required work from commencement to final closeout. The work includes all items of work necessary for complete maintenance of traffic including, but not limited to, traffic control devices, warning devices, safety devices, barricading, signing, lighting, removal of existing pavement markings, installation and removal of temporary pavement striping (paint), markings and reflective markers, traffic signal relocation and adjustments for MOT phasing, and all materials and construction necessary to create temporary connections for street, driveways and pedestrian traffic. The pay item for "Maintenance of Traffic" shall include all work necessary for maintenance of vehicular traffic and pedestrian traffic, unless otherwise specified to be paid under other bid items.
2. Measurement: Payment will be made at the lump sum price shown in the Bid Form for Maintenance of Traffic as shown on the plans, specified, and required for construction activities.
3. Payment: Payment will be made in accordance with the following schedule.

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum price for Maintenance of Traffic
10	25
35	50
65	75
90	100

Z. BID ITEM NO. 25 – Relocation of 8-inch Potable Water Main

1. Description: The work described in this Bid Item is only to be performed upon the written direction of the Utilities Director. Otherwise the 8-inch potable water main is to be protected in place as covered by other bid items. The work covered by this item consists of the relocation of the 8-inch water main at the southeast corner of the intersection of North Socrum Loop Road and Tom Costine Road to be installed outside of the proposed 12-inch raw water main as it turns the corner from North Socrum Loop Road onto Tom Costine road. The contractor shall isolate the potable water main using the valve at STA 40+59 on Socrum Loop and the next valve east of the intersection which is located inside the Glenridge subdivision. The contractor shall disconnect and remove the 45-degree elbow at STA 40+79 on North Socrum Loop Road and the 45-degree elbow at STA 58+53 on Tom Costine Road. The Contractor shall install new 8-inch PVC, AWWA C-900, DR 18, Restrained, parallel to the proposed 12-inch raw water main and to the west and north of the proposed raw water main between the locations of the two 45-degree elbows mentioned above. A 90-degree bend shall be installed at the intersection for the 8-inch potable water main to make the turn from North Socrum Loop Road to Tom Costine Road. The unit price shall include all costs necessary to install the pipe including survey layout; materials; additional clearing and grubbing; excavation; backfilling; dewatering; cutting and removal of pavement; removal of the existing 8-inch potable water main necessary to install new pipe; sheeting; bracing; utility crossings; identification and locating appurtenances; electronic marker balls; clearing of the right-of-way; protection of property; protection, repair and replacement of utilities; protection, repair and replacement of sprinklers; temporary leakage test plugs; temporary blow-offs; pressure testing, and disinfection. The unit price also includes all fittings,

including bends, sleeves/closures to tie into the existing potable water main, tees and outlets. Any additional surface restoration required by this work shall be included in the unit price.

2. Measurement: Payment will be made at the lump sum price shown in the Bid Form for the Relocation of the 8-inch Potable Water Main installed completed and accepted.
3. Payment: Payment will be made at the lump sum price shown in the Bid Form for the Relocation of 8-inch Potable Water Main.

AA. BID ITEM NO. 26 – Gopher Tortoise Survey

1. Description: The work covered by this item consists of the survey by a FWC permitted agent of the proposed disturbed areas for the presence of gopher tortoise burrows in accordance with State of Florida rules and guidelines. The work shall include but is not limited to travel to the project site, onsite inspection, and hardcopy report with map of the survey results. Multiple trips to the project site are included in this Bid Item if necessary, to ensure the 90 day limit on the inspection is not expired prior to construction. All work shall conform to Section 01352.
2. Measurement: Payment will be made at the lump sum price shown in the Bid Form for the Gopher Tortoise Survey.
3. Payment: Payment will be made at the lump sum price shown in the Bid Form for the Gopher Tortoise Survey.

BB. BID ITEM NO. 27 – Contingency for Gopher Tortoise Permitting and Relocation

1. Description: The work covered by this item consists of all work, materials, and equipment necessary to permit and relocate Gopher Tortoises in accordance with State of Florida laws, rules and guidelines. All work shall conform to Section 01352.
2. Measurement: The quantities of unspecified work to be paid under this item shall be measured in units of pay for work in place, completed and accepted. The value of a unit shall be Twenty thousand and 00/100 Dollars ($20,000.00).
3. Description: The Owner has calculated this item on the Bid Form and has established the item total to be used in calculating the total Base Bid. This item will be treated as an allowance, against which the Owner, at his discretion, may direct work not shown on the plans, or require other additional work which falls within the general scope of work for the project, as approved in writing from the Owner. Each dollar of cost for the additional work will be considered one unit. The final project change order shall include all additional costs approved under the contingency. This item is for contingency if required during the course of the project to facilitate the project, and will be paid only after written authorization to include the item in the progress payments.

CC. BID ITEM NO. 28 – Contingency for Utility Relocations

1. Description: The work covered by this item consists of unforeseen utility relocation work that is not included in other bid items but necessary for accomplishing the work and shall apply only to extra work or additional items over and above those specified or shown on the plans. The cost of this additional work shall be agreed upon in writing and approved by the Director of Utilities or their authorized representative prior to starting this additional work. The value of the work shall be based on unit prices or similar bid items called for in the proposal.

2. Measurement: The quantities of unspecified work to be paid under this item shall be measured in units of pay for work in place, completed and accepted. The value of a unit shall be Fifty thousand and 00/100 Dollars ($50,000.00).
3. Payment: The Owner has calculated this item on the Bid Form and has established the item total to be used in calculating the total Base Bid. This item will be treated as an allowance, against which the Owner, at his discretion, may direct work not shown on the plans, or require other additional work which falls within the general scope of work for the project, as approved in writing from the Owner. Each dollar of cost for the additional work will be considered one unit. The final project change order shall include all additional costs approved under the contingency. This item is for contingency if required during the course of the project to facilitate the project, and will be paid only after written authorization to include the item in the progress payments.

DD. BID ITEM NO. 29 – Contingency for Unforeseen Subsurface Conditions
1. Description: The work covered by this item consists of unforeseen items of work that is not included in other bid items but necessary for accomplishing the work and shall apply only to extra work or additional items over and above those specified or shown on the plans, including additional sidewalk repair and placement, utility repair and replacement, in-field adjustments, and any other condition affecting the work if the work were continued. The cost of this additional work shall be agreed upon in writing and approved by the Director of Utilities or their authorized representative prior to starting this additional work. The value of the work shall be based on unit prices or similar bid items called for in the proposal.
2. Measurement: The quantities of unspecified work to be paid under this item shall be measured in units of pay for work in place, completed and accepted. The value of a unit shall be One hundred thousand and 00/100 Dollars ($100,000.00).
3. Payment: The Owner has calculated this item on the Bid Form and has established the item total to be used in calculating the total Base Bid. This item will be treated as an allowance, against which the Owner, at his discretion, may direct work not shown on the plans, or require other additional work which falls within the general scope of work for the project, as approved in writing from the Owner. Each dollar of cost for the additional work will be considered one unit. The final project change order shall include all additional costs approved under the contingency. This item is for contingency if required during the course of the project to facilitate the project, and will be paid only after written authorization to include the item in the progress payments.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

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SECTION 01352

GOPHER TORTOISE RELOCATION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes requirements for completing relocation activities for the protected Gopher Tortoise in compliance with mandated guidelines to allow for the commencement of construction.

1.02 REFERENCES

A. Chapter 68A-27.003 Florida Administrative Code, Florida Endangered and Threatened Species List; Prohibitions

B. Gopher Tortoise Permitting Guidelines (Guidelines), *Gopherus polyphemus*, April 2008 (Revised January 2017), Florida Fish and Wildlife Conservation Commission (FWC), Tallahassee, Florida

1.03 SUBMITTALS

A. Results of 100% Gopher Tortoise survey

B. Gopher Tortoise Permit Application
   1. To be completed and submitted on FWC permitting website.
   2. Appropriate permit will be determined based on actual number of burrows to be excavated, as determined by the 100% Gopher Tortoise survey. Survey shall cover 25 feet outside of the construction area.
   3. Requires multiple maps depicting the following:
      a. Project location
      b. Land use
      c. Gopher Tortoise burrow locations
      d. NRCS soils
      e. Gopher Tortoise survey transects.
   4. Requires site plan set.

C. After-Action Report
   1. To be completed and submitted on FWC permitting website.

1.04 QUALIFICATIONS OF PERSONNEL

A. FWC permitted agent (Agent) to survey, excavate, and relocate Gopher Tortoises on the site prior to construction and install site containment in accordance with Guidelines.

B. Backhoe operator (Operator) who will be listed as an assistant of the Agent on the permit. The Agent will be responsible for all activities performed by the Operator and ensuring that all Operator activities are performed in compliance with the Guidelines.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.01 FWC Permitting Process

A. Permit Application:
   1. Agent will complete a 100% Gopher Tortoise survey in compliance with the Guidelines.
   2. Determine appropriate excavation methods (mechanical excavation, hand shovel excavation, or bucket trap) for each Gopher Tortoise burrow requiring excavation.
   3. Identify appropriate recipient site for relocated Gopher Tortoises.
   4. Prepare and submit appropriate FWC permit application on FWC permitting website (all permitting fees are to be paid by the Contractor).
   5. Receive permit from FWC (FWC may take up to 45 days to issue permit) and provide FWC with local government approval of the permitted work.

B. Completion of Permitted Activities:
   1. Agent will excavate Gopher Tortoise burrows as stipulated in the permit (may require coordination with adjacent landowners). If excavation cannot be completed within 90 days of the 100% survey, an updated 100% survey will need to be performed (per Guidelines).
   2. Coordinate excavation work with FWC as needed.
   3. Agent will relocate the excavated Gopher Tortoises to the recipient site specified in the permit application (recipient site fees are to be paid by the Contractor).
   4. Prepare and submit After-Action Report on FWC permitting website.
   5. Agent will confirm that all Gopher Tortoise burrows which would have been impacted have been excavated, backfilled, and the resident Gopher Tortoise has been relocated. Upon completion of this, the Agent will confirm with the Construction Contractor that the project site is ready for construction activities to commence.

C. Construction Support
   1. If bucket traps are used, construction must not occur within 25 feet of the burrow(s) until the burrow has been closed by the Agent and an After-Action Report has been submitted for the burrow(s).

END OF SECTION

CHAPTER 1

GENERAL INFORMATION

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CHAPTER 1 GENERAL INFORMATION Section 110

Introduction

PART 1 – AUTHORITY

This MANUAL has been approved by the COUNTY and accepted as an official document of the COUNTY. The MANUAL shall be enforced and no part thereof shall be altered without following the procedure contained with in the Section entitled "Reference Manual Revision Procedure" as established within the Polk County Utilities Code.

PART 2 – JURISDICTION

This MANUAL shall apply to:

A. All privately constructed development projects containing water, wastewater, and reclaimed water utility systems that will be dedicated to the COUNTY for ownership, operation, and maintenance;

B. All privately constructed development projects subject to the jurisdiction of the LAND DEVELOPMENT CODE that are proposed to contain water, wastewater, and/or reclaimed water utility systems which are not proposed to be part of a municipality's water and wastewater utility system; and

C. All Polk County Utilities (PCU) Community Investment Program projects, including rehabilitation and replacement projects.

PART 3 – PURPOSE

A. This Utilities Standards and Specifications Manual (MANUAL) establishes minimum design standards, construction specifications, submittal requirements, and approval or acceptance procedures for potable water, wastewater, and reclaimed water systems.

B. It is not intended that this MANUAL address every situation that may arise. The application of engineering/surveying principles, construction techniques, and judgment, combined with information contained in this MANUAL are necessary to complete PCU projects and protect the safety, health, and welfare of the public. The approval of plans by PCU shall not relieve the ENGINEER or DEVELOPER from required compliance with the provisions of this MANUAL, unless a specific written approval is received from PCU. All appeals shall be processed in accordance with the Section entitled "Appeal Process" as specified in the Polk County Utilities Code.

C. This MANUAL shall be updated as required in accordance with the Section entitled "Reference Manual Revision Procedure" as established within the Polk County Utilities Code to address revisions and improvements, such as design criteria, construction techniques, materials, standard drawings, and updated procedures for submittals. PCU shall utilize a web page, accessed through the PCU website, for posting the latest MANUAL revisions.

PART 4 – ORGANIZATION

This MANUAL is presented in six chapters. A summary of the chapters is provided below to facilitate the use of this MANUAL.

A. Chapter 1 – General Information

B. Chapter 2 – Development Coordination

C. Chapter 3 – General Requirements

D. Chapter 4 – Water

E. Chapter 5 – Wastewater

F. Chapter 6 – Reclaimed Water

PART 5 – CLARIFICATION IN THE USE OF CHAPTERS 2, 3, 4, 5, AND 6

A. Chapter 2 "Development Coordination", Chapter 3 "General Requirements", Chapter 4 "Water", Chapter 5 "Wastewater", and Chapter 6 "Reclaimed Water" are provided as minimum criteria to assist a consulting ENGINEER in the development of the design documents. This MANUAL shall not be used as a substitute for actual design.

B. The applicable STANDARD DRAWINGS shall be used as presented. PCU may accept modifications on a limited case-by-case basis only if a modification is deemed by PCU to be of a benefit to PCU.

PART 6 – INFORMATION PROVIDED BY PCU

All information provided by PCU, at any time, shall not be used for the design or construction of any building, development, or other improvements without field verification, including the use of ground penetrating radar and/or soft dig verification methods, by the DEVELOPER, the ENGINEER, or the CONTRACTOR. The recipient's reliance, at any time, upon maps, data, or other record information provided by PCU shall be solely at his or her risk. PCU shall have no actual or implied liability for incorrect drawings, record drawings, or other materials that the recipient reviews and/or utilizes in preparation of making business or personal decisions.

PART 7 – INTERPRETATION OF THE MANUAL

The PCU interpretation of the MANUAL shall be binding and controlling for any portion of the MANUAL, differences between Sections, or a controlling supplemental specification such as federal, state, or COUNTY regulations.

PART 8 – POLK COUNTY UTILITIES WEB ACCESS

A. The PCU web page will be accessed through the County's web site at:

http://www.polk-county.net/utilities.aspx.

B. PCU will make this MANUAL available for download from the web page and will provide copies of this MANUAL in digital form upon request. Questions regarding this MANUAL should be emailed to the Utilities Code Committee at:

utilitiescodecommittee@polk-county.net.

Abbreviations

The following is a listing of primary abbreviations used in this MANUAL.

A

AASHTO	American Association of State Highway and Transportation Officials
AC	asbestos cement pipe
AC	alternating current
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AMCA	Air Conditioning and Mechanical Contractors Association
amp	ampere
ANSI	American National Standards Institute Inc
APWA	American Public Works Association
ARV	air release valve
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association

B

BLDG	building
BM	benchmark
BT	buried telephone cable

C

CCTV	closed circuit television
CD-R	compact disc-read only
cfm	cubic feet per minute
CGB	circuit group blocking message
CIP	cast iron pipe or Community Investment Program
CIPP	cured in place pipe
CLF	chain link fence
CMP	corrugated metal pipe
CMU	concrete masonry unit
CO	clean out
CONC	concrete
CPU	central processing unit
CSA	Canada Standards Association
CTU	central telemetry unit

D

dbs	decibels
DC	direct current
DCCA	Directional Crossing Contractors Association
deg	degree
dia	diameter

Abbreviations

DIP	ductile iron pipe
DIPRA	Ductile Iron Pipe Research Association
dpi	dots per inch
DR	Dimension Ratio
DRI	Development of Regional Impact
DVD	digital video disc/digital versatile disc
DW	driveway
dwg	AutoCAD file format
dxf	data exchange file

E

EOP	edge of pavement
EPA	United States Environmental Protection Agency
EPROM	erasable programmable read-only memory
ERC	Equivalent Residential Connection
ERU	Equivalent Residential Unit

F

FAC	Florida Administrative Code
FCC	Federal Communications Commission
FCCCHR	Foundation for Cross Connection Control and Hydraulic Research of the University of Southern California
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health / Polk County Health Department
FDOT	Florida Department of Transportation
FH	fire hydrant
FIFO	“first-in”, “first-out” memory or field inspection field office
FIG	figure
FIP	female iron pipe
FLG	flange
FM	forcemain
FOC	fiber optic cable
fps	feet per second
FS	Florida Statute
ft	foot
ft-lb	foot-pound

G

GIS	Geographic Information System
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
GSP	galvanized steel pipe

Abbreviations

H

HARN	Horizontal Accuracy Reference Network
HDD	horizontal directional drilling
HDPE	high-density polyethylene
HMI	human machine interface
HORIZ	horizontal

K

Kv	kilovolt
KVA	kilovolt-ampere
Kw	kilowatts

I

ID	identification number
ID	inside diameter
IEEE	Institute of Electrical and Electronics Engineers
I/O	input/output
IPS	iron pipe size
ISA	Instrument Society of America
ISO	International Standards Organization

L

LCD	liquid crystal display
LF	linear feet
LPA	Planning Commission (Local Planning Agency)

M

ma	milliamps
MAX	maximum
MGD	millions gallons per day
MH	manhole
MHF&C	manhole frame and cover
MHz	megahertz
mil	millionths
MJ	mechanical joint
mpd	minutes per day
MPEG	digital video file format
ms	millisecond
MSDS	Material Safety Data Sheets

N

NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NCPI	National Clay Pipe Institute
NEC	National Electrical Code

Abbreviations

NUCA	National Underground Contractors Association
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NPT	National Pipe Thread
NSF	National Sanitation Test Laboratory Association

O

OC	on center
OD	outside diameter
ODBC	open database connectivity
OS&Y	outside screw and yoke
OSHA	Federal Occupational Safety and Health Administration

P

PACP	Pipeline Assessment Certification Program
PCCP	pre-stressed concrete cylinder pipe
PD	Planned Development
PDF	Adobe Acrobat file format
PL	property line
PLC	programmable logical controller
ppb	parts per billion
ppm	parts per million
PRV	pressure regulating or reducing valve
psf	pounds per square foot
psi	pounds per square inch
PSP	Preliminary Subdivision Plan
PVC	polyvinylchoride pipe

R

RAM	random access memory
REQ'D	required
RJ	restrained joint
ROW	right-of-way
RTK	real-time kinematic
RTD	real-time differential
RTU	radio telemetry unit

S

SCADA	Supervisory Control and Data Aquisition
SSO	sanitary sewer overflow
SQ	square
SS	stainless steel

Abbreviations

T

TBM	temporary benchmark
TCP/IP	transmission control protocol/internet protocol
THW	thermoplastic heat and water-resistant insulated wire (UL)
THWN	thermoplastic heat and water-resistant nylon coated wire (UL)
tif	tagged image file format
TVSS	transient voltage surge suppressor
TYP	typical

U

UL	Underwriters Laboratories Inc
USGS	United States Geological Survey
UV	ultraviolet light

V

VAC	volt-alternating current
VCP	vitrified clay pipe
VDC	volt-direct current
VFD	variable frequency drive

W

WM	water main
WSF	wood stockade fence
WWF	welded wire fabric

Y

yd	yard

CHAPTER 1 GENERAL INFORMATION Section 112

Definitions

Except where specific definitions are used within a specific MANUAL section, the following terms, phrases, words and their derivation shall have the meaning given herein when consistent with the context in which they are used. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. **The word "shall" is mandatory, and the word "may" is permissive.**

AASHTO: American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall mean latest edition.

ANSI: American National Standards Institute. Any reference to ANSI standards shall mean latest edition.

ARCHITECT: Architect registered with the State of Florida Department of Business and Professional Regulation to provide professional architectural services.

ASTM: American Society for Testing Materials. Any reference to ASTM standards shall mean latest edition.

AS-BUILT SURVEY: Field measurements of vertical and horizontal dimensions of constructed improvements certified by a SURVEYOR so that the constructed facilities can be delineated in such a way that the location of the construction may be compared with the construction PLANS.

AWWA: American Water Works Association. Any reference to AWWA Standards shall mean latest edition.

BOUNDARY AND TOPOGRAPHICAL SURVEY: Boundary and topographical survey, map and report certified by a SURVEYOR that meets the requirements of Chapter 61G17-6 'Minimum Technical Standards', FAC.

CIP: PCU Community Investment Program projects.

COUNTY: Polk County Board of County Commissioners, Polk County, Florida.

COUNTY SURVEYOR: The County staff member, licensed by the State of Florida as a professional surveyor and mapper pursuant to Chapter 472, F.S., who is responsible for reviewing surveys within the County.

CONTRACTOR: Person, firm, or corporation with whom the contract for work has been made for the OWNER, the DEVELOPER or PCU.

CROSS CONNECTION CONTROL ASSEMBLY: An assembly that has been manufactured in full conformance with AWWA Standards and meets the laboratory and field performance specifications of the FCCCHR. Cross Connection Control Assemblies shall also comply with the

requirements of Rule 62-555 F.A.C.

COMMUNITY INVESTMENT PLAN (CIP): County documents that identify improvements to the PCU Water Systems, Wastewater Systems, and Reclaimed Water Systems that will be funded and constructed as identified within the current 5 year Master Plan for each PCU Regional Utility Service Area's water, wastewater, and reclaimed water system.

DEVELOPER: Person, firm, or corporation engaged in developing or improving real estate for use or occupancy.

DEVELOPMENT: Any improvement of real estate for use or occupancy**.**

DIGITAL UTILITY PLAN: For approvable construction projects, a digital utility plan of the affected construction area shall be submitted in encompassing digital file(s) for importing into PCU's GIS. The digital file includes existing, new or altered structures in the work area, geodetic control and survey data.

DIRECTOR: The person who is responsible for the day to day administration and management of Polk County Utilities.

ELEVATIONS: Vertical elevations based on the North American Vertical Datum 1988 (NAVD 88).

ENGINEER: An individual currently licensed to practice engineering in the State of Florida.

EQUIVALENT RESIDENTIAL CONNECTION (ERC): The water demand and sewage generation value (gpd) for a standard detached single family dwelling.

FAC: Florida Administrative Code.

FDEP: Florida Department of Environmental Protection.

FDOT: Florida Department of Transportation.

FIRE DEPARTMENT: The Polk County Public Safety Department.

FIRE FLOW: The amount of water measured in gallons per minute at a minimum residual pressure of 20 p.s.i that is required to provide adequate fire suppression in accordance with standards established by the FIRE DEPARTMENT.

FS: The Statutes of the State of Florida.

INSPECTOR: A County employee or consultant that is qualified and authorized to perform

inspections on behalf of PCU.

LAND DEVELOPMENT CODE: The Polk County Land Development Code.

MANUAL: The Polk County Utilities Standards and Specifications Manual.

MASTER METER ASSEMBLY: An above ground installation containing a dual body meter assembly, a certified cross connection control assembly, concrete pad, SCADA, piping, valves, and related components.

MASTER PLAN: For projects to be constructed in multiple phases, a master plan for water, wastewater and/or reclaimed water is required. The master plan consists of a utility system layout superimposed on a topographic map, calculations for potable water demand, reclaimed water demand and wastewater flow, as well as a pipe network analysis for flow and pressure distribution.

NEMA: National Electrical Manufacturers Association. Any reference to NEMA Standards shall be the latest edition.

NORMAL WORKING DAY: Monday through Friday, excluding COUNTY holidays.

NORMAL WORKING HOURS: Hours are between the hours of 7:30 a.m. to 6:30 p.m. of a NORMAL WORKING DAY.

NSF: National Sanitation Test Laboratory Foundation. Any reference to NSF Standards shall be the latest edition.

OWNER: Person, firm, corporation, or governmental unit holding right of possession of the real estate upon which construction is to take place.

POLK COUNTY UTILITIES (PCU): The Polk County entity which has the responsibility of administering, operating, and maintaining the PCU Utility Systems.

PLANS: Drawings prepared by an ENGINEER or ARCHITECT to show the proposed and, when the County approved review process is completed, the PCU approved improvements that are to be constructed.

PRIVATE SYSTEMS: Utility systems that are not to be owned, operated, or maintained by PCU.

PUBLIC WORKS: Infrastructure Management Department of the Polk County Board of County Commissioners, Polk County, Florida.

RECLAIMED WATER REGULATIONS: In accordance with the Reference Manual 6(D), Reclaimed Water Policy Manual", Polk County Utilities Code.

Definitions

RECLAIMED WATER SYSTEM: Reclaimed water transmission and distribution piping, pump stations, augmentation wells, fittings, valves, services, meters and miscellaneous related appurtenances.

RECORD DRAWINGS: Plans certificated by the ENGINEER that accurately depict the horizontal and vertical locations of all installed utility system components involved in the completed WORK.

REFERENCE MANUAL 6(A): The Polk County Utilities Administration Manual, adopted by reference herein.

REFERENCE MANUAL 6(B): This Manual, the Polk County Utilities Standards and Specifications Manual, adopted by reference herein.

REFERENCE MANUAL 6(C): The Polk County Utilities Cross-Connection Control Policy Manual, adopted by reference herein.

REFERENCE MANUAL 6(D): The Polk County Utilities Reclaimed Water Policy Manual, adopted by reference herein.

REFERENCE MANUAL 6(E): The Polk County Industrial Wastewater Pre-Treatment Policy Manual, adopted by reference herein.

REFERENCE MANUAL 6(F): The Polk County Utilities Water Conservation Policy Manual, adopted by reference herein.

REFERENCE MANUAL 6(G): The Polk County Utilities Fats, Oils, and Grease Policy Manual, adopted by reference herein.

REGIONAL UTILITY SERVICE AREA (RUSA): An established area for the purpose of planning and the provision of utility service to existing and future PCU customers.

REGISTERED HOLDERS: Users of the MANUAL that have provided current email information to the STANDARDS COMMITTEE so they may be notified of pending revisions to the MANUAL.

UTILITY PERMIT: Regulations, as established by the Polk County Board of County Commissioners, for the governance of the County's public rights-of-way and easements.

SAMPLES: Physical examples of materials, equipment, or workmanship that are representative of some portion of the WORK and which establish the standards by which such portion of the WORK will be judged.

Definitions

SHOP DRAWINGS: All drawings, diagrams, illustrations, schedules, and other data or information, which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the WORK.

SPECIFIC PURPOSE SURVEY: Survey, map, and report certified by a SURVEYOR of an easement with water, wastewater, and/or reclaimed water pipes maintained by PCU and meets the requirements of Chapter 61G17-6 'Minimum Technical Standards', FAC. The report shall describe the locations where the pipe centerline was not constructed within two feet of the centerline of the easement.

STANDARD DRAWINGS: Detailed drawings contained in this MANUAL related to water, wastewater and reclaimed water system materials and installation.

STANDARD FDOT SPECIFICATIONS: State of Florida Department of Transportation, Standard Specification for Road and Bridge Construction.

SUBCONTRACTOR: An individual or entity having a direct contract with CONTRACTOR or with any other subcontractor for the performance of a part of the WORK.

SURVEYOR: An individual currently licensed to practice surveying and mapping in the State of Florida.

TRAFFIC CONTROL AND SAFE PRACTICES MANUAL: Florida Department of Transportation Manual on Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operation and the Manual of Uniform Traffic Control Devices (MUTCD).

UTILITIES CODE COMMITTEE: Comprised of the Utilities Capital Projects Manager, Utilities Customer Services Manager, Utilities Operations and Maintenance Manager, and one representative each from the County Engineer and County Purchasing Sections. The Utilities Director shall not serve on the Utilities Code Committee.

UTILITY ACCOMMODATION GUIDE: State of Florida Department of Transportation Utility Accommodation Guide, latest edition.

UTILITY ASSET: Any component of a potable water, reclaimed water, or wastewater system, including, but not limited to, permits, easements, and fee simple properties.

WASTEWATER SYSTEM: Wastewater transmission pipes including gravity sewers and force mains, wastewater pump stations, fittings, valves, service laterals and miscellaneous related appurtenances.

WATER SYSTEM: Water transmission and distribution pipes, water pump stations, fittings, valves, hydrants, services, meters and miscellaneous related appurtenances.

Definitions

WORK: Labor, materials, equipment, supplies, services and other items necessary for the execution, completion and fulfillment of the approved PLANS.

CHAPTER 1 GENERAL INFORMATION Section 113

Approval Process for New Products

PART 1 - GENERAL

A. The UTILITIES CODE COMMITTEE shall evaluate new and existing products and materials for efficient and economical utilization. The UTILITIES CODE COMMITTEE is charged with the development of a fair and reasonable methodology to systematically evaluate utility products for use through research and/or field evaluation.

B. It is the intent of PCU to review and update each "Approved Materials Checklist" as appropriate to ensure efficient operation of the services and facilities under the jurisdiction of the MANUAL. Products in use are subject to ongoing consideration and evaluation by the UTILITIES CODE COMMITTEE. When changes, deletions, or additions become necessary and are approved, each "Approved Materials Checklist" will be revised. Questions concerning each "Approved Materials Checklist" may be addressed to the UTILITIES CODE COMMITTEE web site.

C. The approval process for adding materials to each "Approved Materials Checklist" requires the product and equipment manufacturers to submit a written request to be considered on the list. The UTILITIES CODE COMMITTEE shall evaluate new and existing products for efficient and economical utilization within the PCU system. PCU may approve a demonstration project with specific conditions and timelines and may request the supplier provide the product at no charge to PCU for testing.

D. Issues regarding accepted products shall be submitted to the UTILITIES CODE COMMITTEE for review. Such review may lead to a recommendation to rescind approval. The UTILITIES CODE COMMITTEE shall inform the supplier/manufacturer of the reasons for removal from each "Approved Materials Checklist".

PART 2 SUBMITTALS

A. General:

Product and equipment manufacturers shall submit a request for consideration to the MANUAL web site. If the submittal is acceptable, the UTILITIES CODE COMMITTEE will evaluate the product. Products may be requested for testing or field evaluation. Following review of the submittal, the UTILITIES CODE COMMITTEE may request a presentation by the manufacturer at a regularly scheduled committee meeting to demonstrate the product or provide additional information. Procedures for testing or evaluation shall be as agreed upon between the supplier and the UTILITIES CODE COMMITTEE. Results will become a part of the product file and will be made available to the supplier upon request. PCU will periodically update a database of all testing locations, time of test, and results. From this information, the UTILITIES CODE COMMITTEE will recommend approval or denial of the product(s). A majority vote by the UTILITIES CODE COMMITTEE is required to accept any new product. The UTILITIES CODE COMMITTEE will advise the supplier of the decision regarding the product. The newly accepted product will be added to the applicable "Approved Materials Checklist". As the

"Approved Materials Checklists" are part of the Utilities Standards and Specifications Manual, this Manual shall be revised in accordance with the Reference Manual Revision Procedure as specified in the Enacting Ordinance.

B. Submittal Requirements:

1. Provide a product description, the technical specifications and catalog information including applicable part number or series number that approval is requested on.
2. List all applicable product standards (AWWA, ASTM, ANSI, NFPA and others) and related manufacturer's certifications.
3. Test results showing compliance with applicable standards, including independent laboratory test results, if necessary.
4. Provide the manufacturer's installation procedures for the particular product.
5. Provide the product availability, delivery time and manufacturer's location and local representative availability.
6. Maintenance requirements, special equipment and procedures and recommended maintenance schedules.
7. Product references (municipal or public users) shall include user's name, address and telephone number, product application and number of years in use, and name and telephone number of a contact person having knowledge of the particular usage.
8. Provide the material safety data sheet (MSDS), if applicable.
9. Provide recent product revisions or improvements.
10. Explanation of how the product benefits PCU in terms of prolonged service life, reduced maintenance, reduced life-cycle cost and other relevant aspects.

CHAPTER 3

GENERAL REQUIREMENTS

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CHAPTER 3 GENERAL REQUIREMENTS Section 310

General Standards and Specifications

PART 1 - GENERAL STANDARDS

A. This Section specifies the general design standards the DEVELOPER and ENGINEER shall comply with regarding any proposed project.

B. Design and Plan Review:

The design of potable water, wastewater and reclaimed water improvements shall be in compliance with this MANUAL. PLANS will be reviewed and approved by PCU as part of the subdivision or commercial site plan review process as specified by the LAND DEVELOPMENT CODE.

C. Compliance with Other Regulatory Requirements:

It shall be the responsibility of the DEVELOPER to obtain and comply with all applicable federal, state, and local regulatory permits.

D. The DEVELOPER shall be financially responsible for any designs that require modification to or may adversely affect any portion of PCU's potable water, wastewater, and reclaimed water infrastructure.

PART 2 - GENERAL SPECIFICATIONS

2.01 GENERAL

A. This Section specifies the general conditions the CONTRACTOR shall comply with regarding the construction site.

B. Where PCU funds are being utilized, the CONTRACTOR shall have the project's limits of construction professionally color videoed using a DVD recording format prior to the start of any construction activities and immediately upon completion.

C. All materials and products utilized as part of the approved WORK for all proposed water, wastewater, and reclaimed water improvements shall be in accordance with the "Approved Meters List", the "Approved Cross Connection Control Assemblies List", and the applicable "Approved Materials Checklist".

2.02 GRADES, SURVEY LINES, AND PROTECTION OF MONUMENTS

A. Grade:

1. All WORK shall be constructed in accordance with the lines and grades shown on the PLANS. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

2. Benchmarks and base line controlling points shall be established prior to beginning

work. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the WORK as possible. The CONTRACTOR shall also place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. CONTRACTOR shall remove any obstructions placed contrary to this provision.

B. Surveys:

1. The CONTRACTOR shall furnish and maintain stakes and other such materials, and give such assistance, including qualified helpers, for setting reference marks to the satisfaction of PCU and the ENGINEER.

2. The CONTRACTOR shall check such reference marks by such means as he may deem necessary and, before using this, shall call PCU's attention to any inaccuracies.

3. The CONTRACTOR shall, at his own expense, establish all working or construction lines and grades as required from the reference marks, and shall be solely responsible for the accuracy thereof.

C. Monument Preservation:

Property corners and survey monuments shall be preserved using care not to disturb or destroy them. If a property corner or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or required to be disturbed or destroyed by the construction WORK, said property corner or survey monument shall be restored by a SURVEYOR. All costs for this work shall be paid for by the CONTRACTOR.

2.03 UTILITY COORDINATION

A. Location of Utilities:

The CONTRACTOR shall ensure that all existing utilities in the areas of WORK are located in accordance with Sunshine State One Call regulations, Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act". The CONTRACTOR is responsible for subsurface verification of all existing utilities prior to construction. The CONTRACTOR shall utilize due care at all times when performing excavations as utility locates are not exact in nature.

1. The CONTRACTOR shall comply with Chapter 556, F.S., "Underground Facility Damage Prevention and Safety Act", Chapter 553, F.S., "Florida Trench Safety Act, Part IV", Chapter 368, F.S., "Florida Gas Safety Law, Part 1", and OSHA Standard 1926.651.

2. The CONTRACTOR shall take all reasonable precautions against damage to

existing utilities. However, in the event of damage to an existing utility, the CONTRACTOR shall immediately notify the responsible official of the organization operating the interrupted utility. The CONTRACTOR shall lend all possible assistance in restoring services and shall assume all cost, charges, or claims connected with the interruption and repair of such services, as determined by Florida Statutes.

3. PCU may elect to facilitate the repair to its facilities with PCU forces. The CONTRACTOR shall reimburse PCU for all repair costs should the CONTRACTOR not act in a timely manner or is found to be neglible.

4. The CONTRACTOR shall not operate PCU valves.

5. All information received by the ENGINEER and CONTRACTOR through the review of PCU record drawings and project files shall not be relied upon by the CONTRACTOR without field verification.

B. Deviations Occasioned by Structures or Utilities:

Wherever obstructions are encountered during the progress of the WORK and interfere to such an extent that an alteration in the PLANS is required, PCU shall have the authority to order a deviation from the line and grade or arrange with the OWNERs of the structures for the removal, relocation or reconstruction of the obstructions. Where gas, water, telephone, electrical, hot water, steam or other existing utilities are an impediment to the vertical or horizontal alignment of a proposed main, PCU shall have the authority to order a change in grade or alignment of the proposed main. PCU shall have the authority to direct the CONTRACTOR to coordinate with all utilities and other users of the right-of-way to facilitate appropriate conflict resolutions. If a change in line or grade of a wastewater gravity main is necessary, PCU may require the installation of additional manholes to maintain the integrity of the wastewater collection system.

C. Subsurface Exploration:

The CONTRACTOR shall make such subsurface explorations as necessary to perform the WORK utilizing pot-holing, ground penetrating radar, soft digging, etc.

D. Test Pits:

Test pits for the purpose of locating underground pipeline, utilities, or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to PCU. The costs for such test pits shall be borne by the CONTRACTOR.

2.04 MAINTENANCE OF TRAFFIC AND CLOSING OF STREETS

A. The requirements of the COUNTY, City, or FDOT, as appropriate, regarding maintenance of traffic and non-emergency road closures shall be adhered to in addition to the requirements as outlined below.

B. The CONTRACTOR shall carry on the WORK in a manner that will cause a minimum of interruption to traffic. Where traffic must cross open trenches, the CONTRACTOR shall provide suitable bridges at street intersections and driveways. The CONTRACTOR shall post suitable signs indicating that a street is closed with necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets, the CONTRACTOR shall notify and obtain the approval of responsible authorities and PCU.

C. Unless permission to temporarily close a street is received in writing from the proper authority (COUNTY, City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the CONTRACTOR's operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to PCU.

D. Detours around construction will be subject to the approval of the authority having jurisdiction and PCU. Where detours are permitted, the CONTRACTOR shall provide all necessary barricades and signs as required to divert the flow of traffic. The CONTRACTOR shall expedite construction operations while traffic is detoured. Time periods when traffic is being detoured will be established by COUNTY, FDOT or prevailing authority.

2.05 PROTECTION OF PUBLIC AND PROPERTY

A. Barricades, Guards and Safety Provisions:

1. The CONTRACTOR shall be solely responsible for adhering to the rules and regulations of OSHA and appropriate authorities regarding safety provisions. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, lights and guards as required shall be placed and maintained by the CONTRACTOR at his expense during the progress of the WORK and until it is safe for traffic to use the roads and streets. Material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor.

2. Signage and barricades shall be placed in accordance with the ENGINEER's Maintenance of Traffic Plan which shall comply with the provisions of Section 600 of the FDOT Design Manual, as a minimum.

3. During construction, pedestrian corridors shall be maintained in a safe, passable,

and stabilized manner. Measures utilized shall include, but not be limited to, boardwalks or stabilized pathways. The CONTRACTOR shall be solely responsible for coordination with the School Board for potential construction impacts to schools and school crossings. Closure of any sidewalks and/or school crossings near schools shall require coordination with the School Board and written authorization from PCU if construction is conducted when schools are in session.

B. Protection of Utility Structures:

Temporary support, adequate protection and maintenance of all underground and surface utility structures including drains, sewers, manholes, hydrants, valves, valve covers, power poles and miscellaneous other utility structures encountered in the progress of the WORK shall be furnished by the CONTRACTOR at his expense. Any such structures that may have been disturbed shall be restored upon completion of the WORK. PCU's valves, hydrants, manholes, and other appurtenances shall be made accessible to PCU's personnel during all phases of construction.

C. Open Excavation:

All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The CONTRACTOR shall, at his own expense, provide suitable and safe bridges with handrails and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions, but shall be limited to 300 linear feet unless otherwise approved by PCU. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, PCU may require special construction procedures such as limiting the length of open trench, fencing, prohibiting excavated material in the street and requiring that the trench shall not remain open overnight. The CONTRACTOR shall take precautions to prevent injury to the public due to open trenches. All trenches excavated material, equipment or other obstacles that could be dangerous to the public shall be barricaded and well lighted at night. OSHA Regulations shall apply to all open excavations.

D. Protection of Trees and Shrubs:

The CONTRACTOR, at his expense, shall protect all trees and shrubs not shown to be removed on the PLANS, in accordance with COUNTY regulations. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the CONTRACTOR or his employees shall be replaced in accordance with COUNTY regulations at the sole expense of the CONTRACTOR.

E. Protection of Lawn Areas:

Lawn areas shall be left in as good or better condition as before starting of the WORK. Where sod is to be removed it shall be carefully restored with new sod of the same type.

F. Restoration of Fences:

Any fence, or part thereof, that is damaged or removed during the course of the WORK shall be replaced or repaired by the CONTRACTOR and shall be left in as good a condition as before the starting of the WORK. The manner in which the fence is repaired or replaced and the materials used shall be subject to the approval of PCU.

G. Protection Against Siltation and Bank Erosion:

The CONTRACTOR shall follow federal, state and local permit requirements.

2.06 ACCESS TO PUBLIC SERVICES

A. Neither the materials excavated nor the materials or equipment used in the construction of the WORK shall be so placed as to prevent free access to public services. All excavated material shall be piled in a safe manner that will not endanger the WORK and that will avoid obstructing streets, sidewalks and driveways. Excavated material suitable for backfilling shall be stockpiled separately on the site. No material shall be placed closer than two feet from the edge of an excavation. Fire hydrants, valve pit covers, valve boxes, curb stop boxes or other utility controls shall be left unobstructed, staked with silt fencing to properly identify, and remain accessible during construction. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural watercourses shall not be obstructed or polluted. Surplus material and excavated material unsuitable for backfilling shall be transported and disposed of off the site in disposal areas obtained by the CONTRACTOR.

2.07 PUBLIC NUISANCE

A. The CONTRACTOR shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands or excessive noise or dust. The CONTRACTOR shall eliminate noise to as great an extent as practicable at all times.

2.08 CONSTRUCTION HOURS

WORK shall be performed during NORMAL WORKING HOURS unless written authorization has been granted by PCU. The CONTRACTOR shall reimburse PCU for overtime pay resulting from inspection activities conducted after NORMAL WORKING HOURS. Prior to the start of any WORK, written notification shall be provided to PCU a minimum of two NORMAL WORKING DAYs.

2.09 CONSTRUCTION IN EASEMENTS AND RIGHTS-OF-WAY

A. Construction within Easements:

1. In easements across private property, the CONTRACTOR shall confine all operations within the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in easements will require protection during construction. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement.

2. In general, the easement area is intended to provide reasonable access and working area for efficient operation by the CONTRACTOR. Where easement space for efficient operation is not provided, the CONTRACTOR shall be responsible for organizing his operations to perform within the restrictions shown on the PLANS.

B. Construction in FDOT Right-of-Way:

The CONTRACTOR shall strictly adhere to the requirements of the FDOT permit conditions where construction work is in a right-of-way under the jurisdiction of the State of Florida and shall take care to avoid any unreasonable traffic conflicts due to the WORK in road right-of-way.

C. Construction in COUNTY Right-of-Way:

WORK performed within a COUNTY maintained public right-of-way or easement shall be governed by the COUNTY UTILITY PERMIT.

2.10 SUSPENSION OF WORK DUE TO WEATHER

During inclement weather, all WORK shall be suspended which might be damaged or rendered inferior by such weather conditions. The WORK shall be suitably covered, protected and/or backfilled to protect the WORK and public from damage or injury.

2.11 USE OF CHEMICALS

Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must indicate approval of either United States Environmental Protection Agency, National Safety Foundation, or United States Department of Agriculture. Use of such chemicals and disposal of residues shall be in strict conformance with label instructions. Material Safety Data Sheets (MSDS) for chemicals used during project construction shall be submitted to PCU for approval and then located within the construction trailer or with the project superintendent throughout the construction period.

2.12 COOPERATION WITH OTHER CONTRACTORS AND FORCES

During construction progress, it may be necessary for other contractors and persons employed by PCU to work in or about the site. The CONTRACTOR shall not impede or interfere with the work of such other contractors and shall cooperate with the other contractor(s) for proper prosecution of the work.

2.13 CLEANING

A. During Construction:

During construction the CONTRACTOR shall, at all times, keep the construction site and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of PCU, such material, debris, or rubbish constitutes a nuisance or is objectionable.

B. Final Cleaning:

At the conclusion of the WORK, all tools, temporary structures and materials belonging to the CONTRACTOR shall be promptly taken away. The CONTRACTOR shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

2.14 SALVAGE

Any existing PCU owned equipment or material which is removed or replaced as a result of construction, may be designated as salvage by PCU, and if so, shall be carefully excavated if necessary and delivered to PCU at a location designated by PCU.

Site Preparations, Surface Removal, and Restoration Specifications

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. This Section covers clearing, grubbing, and stripping of the construction sites. The CONTRACTOR shall clear and grub all of the area within the limits of construction as shown on the PLANS and approved by PCU prior to the beginning any WORK. All site WORK shall conform to the applicable COUNTY site clearing ordinance and landscaping and tree ordinances.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

A. Clearing:

The surface of the ground for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish, and all other objectionable obstructions resting on or protruding through the surface of the ground. Clearing operations shall be conducted so as to prevent damage to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

Trees and shrubs that are designated to remain shall be protected as specified in the Section entitled “General Standards and Specifications”.

B. Grubbing:

Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris resting on, under, or protruding through the surface of the ground. Such deleterious materials shall be removed up to one foot below the bottom or the perimeter of any slab or structure. Water, wastewater, or reclaimed water mains shall not be installed within one foot of such deleterious materials. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

C. Disposal of Cleared and Grubbed Material:

The CONTRACTOR shall, at his expense, dispose of all material and debris from the clearing and grubbing operation in accordance with all STATE, COUNTY, and local regulations.

3.02 STRIPPING OF TOPSOIL WITHIN A COUNTY EASEMENT OR RIGHT-OF-WAY

A. In areas so designated, topsoil shall be stripped and stockpiled. Stockpiled topsoil shall

be protected until it is placed as specified. The CONTRACTOR, at the discretion of PCU, shall dispose of any remaining topsoil after all WORK is in place.

3.03 DUST CONTROL

A. The CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. The CONTRACTOR shall use dust control methods and materials approved by PCU.

3.04 SURFACE REMOVAL

A. The CONTRACTOR shall remove the surface materials along the proposed pipe lines, as indicated on the PLANS, only to such widths as will permit a trench to be excavated which will afford sufficient room for efficient and proper construction. Pavement removal shall be saw cut with straight lines prior to excavation. All applicable COUNTY and FDOT regulations shall be followed. Where sidewalks, driveways, pavements and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. All fractured, broken or disturbed surfaces shall be restored to their original or better condition prior to completion of the WORK.

3.05 RESTORATION

A. Restoration of all surfaces including road subbase, soil cement, limerock base, asphaltic concrete surface, portland cement concrete pavement and driveways, sidewalks, concrete curbs, existing walls, fences, and irrigation systems shall be in strict accordance with applicable requirements of the LAND DEVELOPMENT CODE and STANDARD FDOT SPECIFICATIONS. In addition, the CONTRACTOR shall restore all storm drains, culverts, inlets and storm manholes to equal or better condition in accordance with applicable road construction specifications.

B. All sodding, landscaping, grassing, and mulching shall be done as specified in the LAND DEVELOPMENT CODE and STANDARD FDOT SPECIFICATIONS. Solid sodding shall be placed on all slopes steeper than four to one, within 10 feet of all proposed structures, the two (2) feet directly adjacent to the edge of pavement or back of curb along a roadway, and where existing sod is removed or disturbed by the WORK.

Excavations, Backfill, Compaction, and Grading Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section covers excavation, backfill, fill, and grading associated with utility trench and structural construction. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, compaction, grading and slope protection required to complete the WORK.

1.02 SOIL BORINGS AND SUBSURFACE INVESTIGATIONS

A. The CONTRACTOR shall examine the site and undertake subsurface investigations including soil borings, pot holing, and the use of ground penetrating radar before commencing the WORK. PCU will not be responsible for presumed or existing soil conditions in the WORK area.

1.03 EXISTING UTILITIES

A. The CONTRACTOR shall ensure that all existing utilities in the areas of WORK are located in accordance with Sunshine State One Call regulations, Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act". The CONTRACTOR is responsible for subsurface verification of all existing utilities prior to construction. The CONTRACTOR shall utilize due care at all times when performing excavations as utility locates are not exact in nature.

B. If utilities are to remain in place, the CONTRACTOR shall provide adequate means of protection.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, the CONTRACTOR shall be responsible for resolving the utility conflicts to PCU's satisfaction.

D. All costs for repairing damages to properly located PCU infrastructure or other utilities shall be the CONTRACTOR's responsibility in accordance with Florida Statutes Chapter 556, "Underground Facility Damage Prevention and Safety Act".

E. PCU shall not be responsible for uncharted or incorrectly charted water, wastewater, and reclaimed water mains or other utilities as RECORD DRAWINGS are not to be considered totally representative of subsurface conditions or existing infrastructure.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

Materials for use as bedding and backfill, whether in-situ or borrow, shall be as described under this Section. The CONTRACTOR shall, upon request by PCU, make an appropriate sample of this material available for testing by PCU or its designated representative.

B. Structural Fill:

Materials for structural fill shall be bedding rock or select common fill as specified herein or other suitable material as approved by PCU.

C. Common Fill:

1. Common fill shall consist of mineral soil, substantially free of clay, organic material, muck, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger 3-1/2 inches in any dimension in the top 12 inches or six inches in any dimension in the balance of fill area. Common fill shall not contain asphalt, broken concrete, masonry, rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Additional common fill shall be in accordance with FDOT specifications, unless finer material is approved for use in a specific location by PCU.

2. Material falling within the above specifications that is encountered during the excavation may be stored in segregated stockpiles for reuse. Material that is not suitable for backfill shall be disposed as unsuitable materials.

D. Select Common Fill:

Select common fill shall be in accordance with FDOT specifications.

E. Bedding Rock:

Bedding rock shall conform to FDOT No. 57 aggregate.

PART 3 - EXECUTION

3.01 DEWATERING, DRAINAGE, AND FLOTATION

A. General:

The CONTRACTOR shall excavate, construct and place all pipelines, concrete work, fill and bedding rock, in-the-dry. In addition, the CONTRACTOR shall not make the final 24 inches of excavation until the water level is a minimum of one foot below proposed bottom of excavation. For purposes of these specifications, "in-the-dry" is defined to be within two percent of the optimum moisture content of the soil. PCU reserves the right to ask the CONTRACTOR to demonstrate that the water level is a minimum of one foot below proposed bottom of excavation before allowing the construction to proceed.

1. Discharge water shall be clear, with no visible soil particles. Discharge from dewatering shall be disposed of in such a manner that it will not interfere with the normal drainage of the area in which the WORK is being performed, create a public nuisance or form ponding. The operation shall not cause damage to any portion of the WORK completed, in progress, to the surface of streets or to private property. The dewatering operation shall comply with the requirements of National Pollutant Discharge Elimination System (NPDES) and other state and COUNTY regulatory

agencies. Additionally, the CONTRACTOR shall obtain proper right of entry where private property will be involved.

2. Dewatering shall be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
3. The CONTRACTOR shall furnish all materials and equipment and perform all WORK required to install and maintain the drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
4. During backfilling and construction, water levels may be required to be measured in observation wells if found necessary by PCU. Observation wells shall be located as directed by PCU.
5. Continuous pumping will be required as long as water levels are required to be below natural levels.

3.02 EXCAVATION

A. General:

Excavation consists of removal, storage and disposal of material encountered when establishing required grade elevations.

1. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of PCU. Unauthorized excavation, as well as remedial work directed by PCU shall be at the CONTRACTOR's expense. Remedial work shall be performed as directed by PCU.
2. If the sub-grade is unsuitable, the CONTRACTOR shall remove and replace all unsuitable material below the pipe with selected common fill or bedding rock that shall be compacted to a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.
3. If the CONTRACTOR excavates below grade, then the CONTRACTOR shall refill the excavation using select common fill or bedding rock.
4. Slope sides of excavations shall comply with local codes, ordinances, and with OSHA requirements. The CONTRACTOR shall shore and brace or use a trench box where sloping is not possible due to space restrictions or stability of the material excavated. Sides and slopes shall be maintained in a safe condition until completion of backfilling.
5. The CONTRACTOR shall stockpile satisfactory excavated materials at a location approved by PCU until required for backfill or fill.

6. Soil materials containing top soils and associated materials shall be located away from the edge of any excavations.
7. No excavated materials shall be placed within 2 feet of the edge of any excavations.

B. Excavations for Structures:

All such excavations shall conform to the elevations and dimensions shown on drawing within a tolerance of plus or minus 0.10 feet.

C. Trench Excavation:

Excavation for trenches required for the installation of utility pipes shall be made to the depths indicated on the approved PLANS to provide suitable room for laying the size and type of pipe specified.

1. Excavations shall not exceed normal trench width as specified in the STANDARD DRAWINGS. Any excavation that exceeds the normal trench width shall require special backfill requirements as determined by PCU.
2. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade in such a manner that will give a shaped bottom, true to grade, so that pipe can be evenly supported on undisturbed material, as specified in the STANDARD DRAWINGS. Bell holes shall be made as required.

3.03 SHORING

A. General:

Shoring, that meets OSHA standards, shall be utilized to prevent soil movement that could in any way diminish the width of the excavation. All adjacent structures, existing piping and/or foundation material shall be protected from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. Miscellaneous Requirements:

Unless otherwise approved or indicated on the approved PLANS, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specially adapted to that purpose, by watering or otherwise as may be directed.

3.04 BEDDING AND BACKFILL

A. General:

Material placed in fill areas under and around structures and pipelines shall be deposited within the lines and to the grades shown on the approved PLANS making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces that have been inspected and approved by PCU.

1. Fill shall be brought up in uniform 6-inch compacted maximum level lifts starting

with the deepest portion of the fill up to 12 inches above the top of pipe with the remaining fill to be placed in accordance with the requirements of the Agency having jurisdiction over the location at which the WORK is performed. As a minimum, the CONTRACTOR shall follow FDOT Standard Specifications for Roads and Bridge Construction Section 125 "Excavation for Structures and Pipe" (latest edition) when working within COUNTY rights-of-way and easements.

2. Fill shall be placed and spread in layers by an approved method. Prior to the process of placing and spreading, all materials not meeting those specified under this Section, shall be removed from the fill areas.
3. Fill materials shall be placed and compacted "in-the-dry". The CONTRACTOR shall dewater excavated areas as required to perform the WORK and in such manner as to preserve the undisturbed state of the natural inorganic soils. Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials. When existing ground surface has a density less than that specified under this Section for the particular area classification, the CONTRACTOR shall break up the ground surface, pulverize, moisture-condition to the optimum moisture content and compact to required depth and percentage of maximum density.
4. The CONTRACTOR shall moisture condition soils for proper compaction. Material that is too wet shall be replaced.
5. The entire surface of the WORK shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section.

B. Bedding and Backfill for Structures:

Bedding rock shall be used for bedding under all structures, as indicated on the STANDARD DRAWINGS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed. Select common fill shall be used as backfill against the exterior walls of the structures. Fill shall be compacted sufficiently in accordance with this Section.

1. Backfilling shall be carried up evenly on all walls of an individual structure. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.
2. In locations where pipes pass through structure walls, the CONTRACTOR shall take precautions to consolidate the fill up to the spring line of all portions of the pipe that extend beyond the structure. Select common fill in such areas shall be placed in accordance with the requirements of the entity have jurisdiction over the location at which the WORK is being performed.
3. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the approved PLANS. No soft spots or uncompacted areas will be allowed in the WORK.
4. Temporary bracing shall be provided as required during construction of all

structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

C. Bedding and Backfill for Pipes:

Bedding for pipe shall be as shown on the approved PLANS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

1. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected. All backfilling shall be prosecuted expeditiously and as detailed on the STANDARD DRAWINGS.
2. Any space remaining between the pipe and sides of the trench shall be carefully backfilled, spread by hand, or approved mechanical device and thoroughly compacted evenly on both sides of the pipe with a tamper as fast as placed to a level of one foot above the top of the pipe in lifts with a minimum compacted thickness as specified by the entity having jurisdiction over the location at which the WORK is performed.
3. The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted in accordance with the requirements of the entity having jurisdiction over the location at which the WORK is performed.
4. Compaction shall be in accordance with this Section and the STANDARD DRAWINGS.

D. Flowable Fill:

Where roadways and other improved sections are required to be open cut, the use of excavatable flowable fill may be required by PCU in lieu of soil backfill should time be of the essence. Accelerators and other additives shall be permitted as deemed necessary by the CONTRACTOR with the approval of PCU.

The flowable fill design mix shall be in accordance with FDOT specifications for excavatable flowable fill.

Should the entity having jurisdiction over the WORK require a different design mix than that specified in this MANUAL, the CONTRACTOR shall notify PCU of this requirement prior to its use.

3.05 COMPACTION

A. General:

The CONTRACTOR shall control soil compaction during construction to provide the percentage of maximum density specified. When utility work is conducted within FDOT, County, or municipal right-of-way, the more stringent minimum density standards shall apply.

B. Percentage of Maximum Density Requirements:

1) When a pipe or structure is placed under or within six feet of an improved or paved surface, fill or undisturbed soil from the bottom of the pipe trench to one foot above the pipe and then to the finished grade elevation shall be compacted to a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.

2) For areas not within six feet of an improved or paved surface, a minimum density of 95 percent of the maximum dry density based on AASHTO T-180 shall be obtained.

C. Compaction Tests:

One compaction test location shall be required for each 300 linear feet of pipe and for every l00 square feet of backfill around structures as a minimum. PCU may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests shall be in conformance with the following schedule.

1. One test at the spring line of the pipe.
2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for pipes 24 inches and larger.
3. One test at an elevation of one foot above the top of the pipe.
4. One test for each two feet of backfill placed from one foot above the top of the pipe to finished grade elevation.
5. Tests shall be staggered around each manhole and lift station's wet well and valve vault within three feet of each structure's outside perimeter in accordance with the following schedule.
   i. First test shall be one foot above the structure base; and
   ii. Second test shall be two feet above first test
   iii. Subsequent tests shall be every two feet up to finished subgrade.
6. One test under the center of each lift station wet well base. Compaction shall have a minimum density of 100 percent of the maximum dry density as determined by AASHTO T-99.
7. The CONTRACTOR shall provide additional compaction and testing prior to commencing further construction if the ENGINEER's testing reports and inspection indicate that the fill that has been placed is below specified density.

3.06 GRADING

A. All areas within the limits of construction, including transition areas, shall be uniformly graded to produce a smooth uniform surface. Areas adjacent to structures or paved surfaces shall be graded to provide positive drainage away from structures and pavement. Ponding shall be prevented. After grading, the area shall be compacted to the specified depth and percentage of maximum density, and outlined in this Section.

B. No grading shall be done in areas where there are existing pipelines that may be

uncovered or damaged until such lines have been relocated.

3.07 MAINTENANCE

C. The CONTRACTOR shall protect newly graded areas from traffic and erosion and keep them free of trash and debris. The CONTRACTOR shall repair and reestablish grades in settled, eroded, and rutted areas.

3.08 INSPECTION AND QUALITY ASSURANCE

A. Inspection:

The CONTRACTOR shall examine the areas and conditions under which excavating, filling, and grading are to be performed and not proceed with the WORK until unsatisfactory conditions have been corrected.

1. The CONTRACTOR shall examine existing grade prior to commencement of WORK and report to PCU if elevations of existing grade vary from elevations shown on approved PLANS.

B. Quality Assurance:

All WORK shall be performed in compliance with applicable requirements of governing authorities having jurisdiction.

1. The CONTRACTOR, at his expense, shall engage soil testing and inspection services for quality control testing during earthwork operations.
2. Quality control testing shall be performed during construction to ensure compliance with these specifications. The CONTRACTOR shall assist the testing service as necessary. The CONTRACTOR shall allow the testing service to inspect and approve fill materials and fill layers before further construction is performed. The CONTRACTOR shall give copies of all test results in a report form to PCU to demonstrate compliance with compaction requirements stipulated in this Section.

CHAPTER 3 GENERAL REQUIREMENTS Section 313

Installation of Pipe Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications cover the pipe installation for potable water mains, wastewater force mains, reclaimed water mains and wastewater gravity mains.

B. The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of project completion. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

1.02 PIPE STORAGE AND HANDLING

A. Pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of PCU or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of PCU, is damaged beyond repair by the CONTRACTOR shall be removed from the site of the WORK and replaced with another unit.

B. When applicable, joint gaskets shall be stored in a clean, dark, and dry location until immediately before use.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS AND APPURTENANCES

A. Potable Water Mains:

Refer to the Section entitled “Potable Water System Standards and Specifications”.

B. Raw Water Mains:

Refer to the Section entitled “Raw Water System Standards and Specifications”.

C. Gravity Wastewater Mains:

Refer to the Section entitled “Gravity Wastewater System Standards and Specifications”.

D. Wastewater Force Mains:

Refer to the Section entitled "Wastewater Pipes, Valves, and Appurtenances Specifications".

E. Reclaimed Water Mains:

Refer to the Section entitled "Reclaimed Water System Standards and Specifications".

PART 3 - EXECUTION

3.01 SURVEY LINE AND GRADE

A. Pressure Mains:

Pipe shall be laid to the lines and grades shown on the PLANS. The CONTRACTOR shall utilize line and grade stakes at intervals sufficient to insure that construction is accomplished at the designed line and grade, including all valve locations, jack and bores beginning and ending points, directional bore beginning and ending points, air release valves, and at all line and/or grade change locations. The CONTRACTOR shall provide temporary bench marks at a maximum of 1,000-foot intervals. The minimum pipe cover shall be 36 inches below the finished grade surface or 36 inches below the elevation of the edge of pavement of the road surface whichever is greater.

B. Gravity Mains:

The CONTRACTOR shall set temporary bench marks at sufficient intervals to insure that construction is accomplished at the designed line and grade. The CONTRACTOR shall constantly check line and grade of the pipe by laser beam method. In the event line and grade do not meet specified limits described hereinafter, the WORK shall be immediately stopped, PCU notified and the cause remedied before proceeding with the WORK.

3.02 PIPE PREPARATION AND HANDLING

A. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation of connected pipe greater than one inch. The CONTRACTOR shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.

B. Proper implements, tools and facilities shall be used for the safe and proper protection of the WORK. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.

3.03 PIPE INSTALLATION

A. Trench Preparation and Pipe Bedding:

Refer to the Section entitled "Excavation, Backfill, Compaction, and Grading Specifications" and the STANDARD DRAWINGS.

B. Trench Dewatering and Drainage Control

Refer to the Section entitled "Excavation, Backfill, Compaction and Grading Specifications". CONTRACTOR shall prevent water from entering trench during excavation and pipe-laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

C. Pipe Laying in Trench:

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. At times when pipe is laying is not in progress; the open ends of the pipe shall be closed by a means approved by PCU to ensure cleanliness inside the pipe. The color stripe shall be viewed from the top when installed.

D. Locating Wire:

Locating wire for electronically locating the pipe after it is buried shall be securely attached along the entire length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. The locating wire shall be attached to the pipe with nylon wire tires or by other means approved by PCU, as shown in the STANDARD DRAWINGS. The wire itself shall be 14-gauge single strand solid core copper wire with non-metallic insulation, except that HDPE pipe installed by directional bore shall utilize two insulated 14 gauge locating wires or one single insulated 10 gauge wire specifically designed for directional bored installation. The insulation shall be color coded for the type of pipe being installed. Continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using waterproof wire connectors approved for underground applications as listed in the Florida Electrical Code. The wire shall extend to the surface and be connected to a test station box at valve locations, as shown in the STANDARD DRAWINGS.

E. Pipe Identification:

All pipes shall be identified in accordance with the STANDARD DRAWINGS.

F. PVC Pipe Installation:

PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe", AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer. At no time shall the bell end be allowed to go passed the "insertion line". A gap between the end of the spigot and the adjoining pipe is necessary to allow for expansion and contraction.

G. Ductile Iron Pipe Installation:

Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA Manual M-42.

H. HDPE pipe installation:

HPDE pipe installation shall follow the methods described in the most recent revision of the "Plastic Pipe Institute Handbook".

I. Installation of Pipes on Curves:

1. Long radius curves, either horizontal or vertical, may be installed with standard pipe by deflections at the joints. Maximum deflections at pipe joints, fittings and laying radius for the various pipe lengths shall not exceed the pipe manufacturer's recommendation.

2. No deflection or bending is allowed in PVC pipe. Alignment change shall be made only with fittings.

3.04 INSTALLATION OF APPURTENANCES:

A. Appurtenances:

Valves, fire hydrant assemblies, blow-off assemblies, line markers, and combination air and vacuum release valve assemblies are to be installed at the locations shown on the plans and as shown in the STANDARD DRAWINGS. Valves and fire hydrant assemblies shall be restrained to the pipeline they are connected to. In addition, the pipeline shall be restrained as required by the use of approved materials from manufacturers listed in the appropriate "Approved Materials Checklist". The distance of pipeline restraint shall not be less than shown in the STANDARD DRAWINGS.

B. Service Lines:

Service lines shall be installed to service intended properties as shown on the PLANS and in the manor as shown in the STANDARD DRAWINGS.

C. Valve Boxes:

Valve boxes in non-paved areas shall be installed with a valve collar as shown in the STANDARD DRAWINGS.

D. Fittings:

When fittings are required to be restrained along a pressure pipeline, both the pipe and fitting shall be restrained by the use of approved materials from manufacturers listed in the appropriate "Approved Materials Checklist". The distance of pipeline restraint shall be not less than as shown in the STANDARD DRAWINGS.

E. Pressure and Non-Pressure Connections:

Any connection to the existing piping system shall be scheduled in accordance with this MANUAL.

3.05 SUBAQUEOUS CROSSINGS

A. The preferred method of crossing bodies of waters is subaqueous means. PCU may approve other construction means or methods addressing special conditions.

B. A minimum cover of three feet shall be maintained over the pipe. HDPE, Fusible or restrained joint PVC, or restrained joint ductile iron pipe shall be used. Pipe joints shall not be located under the bottom of a swale or ditch. Where the swale or ditch bottom width requires the placement of a pipe joint under it, the carrier pipe shall be placed with a steel casing in a manner that conforms to that used in jack and bore installations. Subaqueous pipe crossings of swales and ditches shall require a protective four inch thick reinforced concrete slab to be installed above the pipe but beneath the bottom of bottom of the swale or ditch as shown in the STANDARD DRAWINGS.

C. Valves shall be provided at both ends of the water crossings so that the section can be isolated for testing or repair. The valves shall be easily accessible and installed, as shown in the STANDARD DRAWINGS, at locations not subject to flooding.

D. Air release valves shall be installed as shown in the STANDARD DRAWINGS at the upstream high point prior to the subaqueous crossing. Valves shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be in stalled in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass. The end of the air release

valve discharge pipe shall be a minimum of 12 inches above finish grade and installed as shown on the STANDARD DRAWINGS.

E. It shall be the responsibility of the DEVELOPER to obtain all applicable regulatory permits, including dredge and fill permits to perform the WORK.

CHAPTER 3 GENERAL REQUIREMENTS Section 314

Directional Drilling Standards and Specifications

PART 1 - GENERAL

A. Horizontal directional drilling is a method of installation commonly referred to as directional drilling or guided horizontal boring.

PART 2 - UTILIZATION

A. Directional drilling shall be allowed for pressurized mains.

B. Directional drilling of force mains shall be restricted and require specific approval by PCU on a case by case basis.

C. If a minimum slope of 1.00 percent is maintained, directional drilling may be utilized for gravity main installation on a case by case basis as approved by PCU.

D. DI pipe shall only be utilized for water and reclaimed water mains.

E. Directional drilling of HDPE pipe and Fusible PVC shall be limited to wetlands, canal crossings, and perpendicular roadway crossings as approved by PCU.

F. Longitudinal alignment installations along roadways may be considered by PCU on a case by case basis as approved by PCU.

PART 3 - DESIGN

A. Horizontal alignment shall be as shown on the PLANS. The pipe shall have a minimum 36 inches of cover.

B. The maximum depth shall be as shallow as physically possible while complying with all regulatory and manufacturers requirements. In no case, shall the minimum clearance from existing or, under special circumstances, proposed utilities to be crossed be less than 18 inches.

C. Pipe diameter sizes for horizontal directional drill installations shall be in accordance with this MANUAL.

D. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.

E. For sub-aqueous crossings, a minimum cover of five feet shall be maintained over the pipe.

F. The use of separate couplings to join sections of HDPE pipe shall be restricted to non-paved areas and depths of less than 6 feet below finish grade.

G. Compound curvatures may be used, but shall not exceed the maximum deflections, as set forth by the pipe manufacturer or AWWA Standards, whichever is more stringent.

H. Entry angle shall not exceed 15 degrees. Exit angle shall not exceed 12 degrees to facilitate pullback.

I. A geotechnical subsurface report certified by an ENGINEER shall be provided to PCU, when required.

J. When HDPE and Fusible PVC pipe connects to either push-on joint DI or PVC pipes, the DI or PVC pipes shall be restrained on either side of the point of connection with the HDPE section of pipe as specified in the applicable Restrained Pipe Table in the STANDARD DRAWINGS.

PART 4 - INSTALLATION

4.01 SCOPE OF WORK

The WORK specified in this Section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This WORK shall include all piping services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities, and environmental protection and restoration.

4.02 QUALITY ASSURANCE

A. Qualifications:

1. Directional drilling CONTRACTOR (or SUBCONTRACTOR) shall have demonstrated experience constructing water, wastewater, or reclaimed water experience to include pipelines of the same or larger diameter and the same or greater lengths. All pipe and appurtenances of similar type and material shall be furnished by a single manufacturer.

2. The CONTRACTOR's operations shall be in conformance with the Directional Crossing Contractors Association (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

B. Jurisdiction:

For crossings under roadways or other installations within rights-of-way and easements under the jurisdiction of the COUNTY or other entity, the

CONTRACTOR shall comply with regulations of the agency with said authority. State highway casing installations shall conform to the FDOT, "Utility Accommodation Guide".

C. The CONTRACTOR shall verify existing utility location prior to constructing drilling and receiving pits.

D. Subaqueous crossings shall also adhere to the requirements of the Section entitled "Installation of Pipe Specifications".

E. Locating wire shall be installed along the length of all directional drill mains. Two insulated 14 gauge locating wires or one single insulated 10 gauge wire specifically designed for locating directional bored mains shall be utilized. The insulation of the wire shall be color coded for the type of pipe being installed. Continuous continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using waterproof wire connectors approved for underground applications as listed in the Florida Electrical Code. The wire shall extend to the surface and be connected to a test station box at valve locations, as shown in the STANDARD DRAWINGS.

PART 5 - PRODUCTS

5.01 GENERAL

A. The directional drilling equipment shall consist of the following:

a. A directional drilling rig of sufficient capacity to perform the bore and pull-back the pipe;

b. A drilling fluid mixing, delivery and recovery system of sufficient capacity to complete the crossing;

c. A drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused;

d. A magnetic guidance system to accurately guide boring operations,

e. A vacuum truck of sufficient capacity to handle the drilling fluid volume, if required; and

f. Trained and competent personnel to operate the system.

B. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in proper working order.

5.02 DRILLING SYSTEM

A. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations. The rig shall be grounded during drilling and pullback operations. There shall be a system to detect electrical current from the drilling string and an audible alarm that automatically sounds when an electrical current is detected.

5.03 PIPE

A. Pipe shall be restrained joint or fusible PVC pipe, HDPE pipe with ductile iron pipe outside diameters in accordance with AWWA C900, C905, or C906 respectively, or restrained joint DI pipe. The dimension ratio shall be verified by the CONTRACTOR based on the pipe, joint and material pull strength required for the directional drilling.

B. PVC Pipe

1. PVC restrained joint and Fusible PVC pipe shall have maximum dimension ratios equal to the following table.

Table 314-1. Maximum Dimension Ratios for PVC Pipe.

Type of Pipe System	Maximum Dimension Ratio
Wastewater	25 (4”-12”), 25 (16”+)
Reclaimed Water	18 (4”-12”), 25 (16”+)
Water	18 (4”-12”), 25 (16”+)

2. PVC pipe shall meet the requirements of AWWA C900 (C905 or C909). The pipe shall either be fused jointed or joined using separate couplings that have beveled edges, built-in sealing gaskets and restraining grooves or steel ring-and-pin gasketed joints. The restraining splines shall be square and made from Nylon 101. Pipe and couplings shall be Underwriters Laboratory and Factory Mutual approved.

3. Installation Curvature: The pipeline curvature shall not have a radius less than as shown in Table 314-2.

Table 314-2. PVC Pipe Deflection Information.

Pipe Diameter (inches)	Minimum Radius of Curvature (feet)	Offset per 20-ft Length (inches)	Deflection per 20-ft Length (degrees)
4	133	17.25	8.6
6	200	12.00	5.7
8	266	9.00	4.3
10	333	6.75	3.5
12	400	6.00	2.9
16	532	4.50	1.5

Note: Deflections for pipe diameters larger than 16" shall be in accordance with the pipe manufacturer's recommendations.

C. HDPE Pipe

1. HDPE pipe and related fittings shall be made with prime virgin resins exhibiting a minimum cell classification as defined in ASTM D3350 and meeting the PE 3408/PE 4710 code designation with maximum dimension ratios equal to the following.

Table 314-3. Maximum Dimension Ratios for HDPE Pipe.

Type of Pipe System	Maximum Dimension Ratio
Wastewater	11
Reclaimed Water	11
Water	11

2. HDPE pipe 4-inch and larger nominal diameter shall be joined by means of zero leak-rate butt (thermal heat) fusion welds and/or approved flanged joints. Joints shall provide axial pullout resistance. Pipe shall meet the requirements of ANSI/AWWA C906, and have an outside diameter dimension of ductile iron pipe. Flanged joints shall not be used below finished grade for horizontal

directional drilling applications. The use of separate couplings to join sections of HDPE pipe shall be restricted to non-paved areas and depths of less than 6 feet below finish grade.

3. HDPE pipe shall have been continuously marked by the manufacturer with permanent printing indicating at a minimum the following.

   a. Nominal size (inches);

   b. Dimension ratio (DR);

   c. Pressure rating (psi);

   d. Trade name;

   e. Material classification (PE 3408/ PE 4710);

   f. Plant, extruder and operator codes;

   g. Resin supplier code;

   h. Date produced; and

   i. HDPE pipe used for portable water mains shall bear the NSF Seal of Approval.

4. HDPE pipe shall be black in color with permanent colored stripes extruded into the pipe along its entire length, a single painted stripe along its entire length, or shall be one solid color, per the applicable service.

Table 314-4. Pipe Color.

Pipe Use	**Color Coding**
Potable Water	Blue
Wastewater	Green
Reclaimed Water	Purple

5. Installation Curvature:

   The pipeline curvature shall not have a radius less than as shown in Table 314-5.

   Table 314-5. HDPE Pipe Deflection Information.

Pipe Diameter (inches)	Minimum Radius of Curvature (feet)	Offset per 20-ft Length (inches)
4	23	9.3
6	34	6.1
8	44	4.6
10	56	3.5
12	67	3.0
16	88	2.3

Note: Deflections for pipe diameters larger than 16" shall be in accordance with the pipe manufacturer's recommendations.

D. Ductile Iron Pipe

1. DI restrained joint pipe shall be Class 350, have appropriate joints specified for directional drill applications, and be in accordance with the recommendations set forth in American Cast Iron Pipe Company's "Guidelines for use Ductile Iron Pipe for Horizontal Directional Drilling applications".

5.04 DRILLING FLUIDS

A. Drilling fluids shall consist of a mixture of potable water and gel-forming colloidal material, such as bentonite or a polymer surfactant mixture producing slurry of custard-like consistency.

PART 6 - EXECUTION

6.01 PERSONNEL REQUIREMENTS

A. Responsible representatives of the CONTRACTOR and SUBCONTRACTOR(s) shall be present at all times during directional drilling operations. A responsible representative as specified herein is defined as a person experienced in the type of WORK being performed and who has the authority to represent the CONTRACTOR

in a routine decision making capacity concerning the manner and method of carrying out the WORK.

B. The CONTRACTOR and SUBCONTRACTOR(s) shall have sufficient number of competent workers on the project at all times to ensure the utility placement is made in a timely, satisfactory manner. Adequate personnel for carrying out all phases of the directional drilling operation (where applicable: tunneling system operators, operator for removing spoil material, and laborers as necessary for various related tasks) must be on the job site at the beginning of WORK. A competent and experienced supervisor representing the CONTRACTOR or SUBCONTRACTOR that is thoroughly familiar with the equipment and type of WORK to be performed, must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the project site during the directional drilling operation.

C. The equipment operator of the directional drilling machine shall provide written proof to PCU of sufficient training on and shall be certified to operate the machinery that is being used on the project.

D. Prior to beginning WORK and if required by PCU, the CONTRACTOR must submit a WORK plan to PCU detailing the procedure and schedule to be used to execute the project. The WORK plan should include the following.

a. A description of all equipment to be used;

b. Down-hole tools;

c. A list of personnel and their qualifications and experience;

d. List of SUBCONTRACTORs;

e. A schedule WORK activity;

f. A safety plan, traffic control plan (if applicable);

g. An environmental protection plan and;

h. Contingency PLANS for possible problems.

E. WORK plan must be comprehensive, realistic, and based on actual working conditions for this particular project. Plan must document the requirements to complete the project.

F. Equipment:

1. If required by PCU, the CONTRACTOR will submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Equipment shall include but not be limited to the following.

   a. Drilling rig;

   b. Mud system;

   c. Mud motors (if applicable);

   d. Down-hole tools;

   e. Guidance system and;

   f. Rig safety systems.

2. If required by PCU, calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that the CONTRACTOR intends to use or might use shall be submitted.

6.02 COORDINATION OF THE WORK

A. The CONTRACTOR shall notify PCU at least three days in advance of starting WORK.

B. The CONTRACTOR and PCU shall select a mutually convenient time for the crossing operation to begin in order to avoid schedule conflicts.

C. The actual crossing operation shall not begin until PCU is present at the project site and agrees that proper preparations for the crossing have been made. PCU's approval for beginning the crossing shall in no way relieve the CONTRACTOR from the ultimate responsibility for the completion of the WORK.

6.03 PROCEDURE

A. The installation of appropriate safety and warning devices in accordance with the "FDOT Manual on Traffic Control and Safe Practices" shall be completed prior to beginning WORK.

6.04 INSTALLATION

A. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud will be disposed of off-site in accordance with local, state and federal requirements and/or permit conditions.

1. No other chemicals or polymer surfactant shall be used in the drilling fluid without written consent of PCU and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.

B. Pilot Hole:

Pilot hole shall be drilled on bore path with no deviations greater than two percent of depth over a length of 100 feet. In the event that pilot does deviate from bore path more than two percent of depth in 100 feet, the CONTRACTOR will notify ENGINEER. The ENGINEER may require the CONTRACTOR to pull-back and re-drill from the location along bore path before the deviation.

C. Reaming:

Upon successful completion of pilot hole, the CONTRACTOR will ream borehole to a minimum of 25 percent greater than outside diameter of pipe using the appropriate tools. CONTRACTOR will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

D. Pullback:

After successfully reaming borehole to the required diameter, CONTRACTOR will put the pipe through the borehole. In front of the pipe will be a swivel and barrel reamer to compact bore hole walls. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into borehole. During pullback operations, the CONTRACTOR shall not apply more than the maximum safe pipe pull pressure at any time. A break away head rated at the maximum safe pull pressure shall be utilized.

E. The CONTRACTOR shall submit any proposed deviations from the design bore path with SHOP DRAWINGS.

F. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe.

G. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until PCU and ENGINEER have been consulted.

H. The pipe shall be pulled back through the borehole using the wet insertion construction technique.

I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

J. A continuous location log of all drilling activities shall be maintained by the equipment operator and produced for PCU review upon request. A legible copy of the log shall be provided to PCU upon completion of the directional drilling operation. Horizontal and vertical locations shall be noted every 25 feet.

K. When HDPE pipe is to be connected to PVC or DI Pipe, mechanical joint adapters shall be utilized.

L. When HDPE or Fusible PVC pipe connects to either push-on joint DI or PVC pipes, the DI or PVC pipes shall be restrained on either side of the HDPE section of pipe as specified under the heading entitled Point of Connection with HDPE Pipe in the applicable Restrained Pipe Table in the STANDARD DRAWINGS.

6.05 FIELD TESTING

A. PVC Pipe:

The CONTRACTOR shall perform hydrostatic testing for leakage following installation in accordance with the applicable testing and inspection sections of this MANUAL.

B. HDPE Pipe:

The CONTRACTOR shall perform hydrostatic testing for leakage following installation in accordance with the applicable testing and inspection sections of this MANUAL.

C. Ductile Iron Pipe

1. The CONTRACTOR shall test all installed DI pipe in accordance with AWWA C600. Pressure Testing:

The test pressure for installed pipes shall be 150 psi for water and reclaimed water and 150 psi for wastewater.

Jack and Bore Standards and Specifications

PART 1 - GENERAL

A. Jack and boring is a method of pipe installation that includes the traditional jack and bore and micro tunneling processes.

PART 2 - UTILIZATION

A. Jack and bore shall be allowed for pressurized mains. The installation of gravity mains by the jack and bore method may be allowed by PCU on a case by case basis.

PART 3 - DESIGN

A. The casing shall have a minimum 36 inches of cover.

B. The maximum depth shall be as shallow as physically possible while complying with all regulatory and manufacturers requirements. In no case, shall the minimum clearance from existing or, under special circumstances, proposed utilities to be crossed be less than 18 inches.

C. A geotechnical subsurface report certified by an ENGINEER shall be provided to PCU if required.

PART 4 - MINIMUM CASING DIAMETER

A. The minimum casing diameter and wall thickness shall be in accordance with Table 315.1 below.

Table 315-1. Casing Pipe Minimal Nominal Diameter and Wall Thickness.

Carrier Pipe Nominal Diameter (in.)	Casing Outside Diameter (in.)	Casing Wall Thickness (in.)
4	12	.250"
6	16	.250"
8	18	.250"
10	20	.250"
12	24	.250"
16	30	.312"
20	36	.375"
24	42	.500"
30	48	.500"
36	54	.500"
42	60	.500"

PART 5 - CONSTRUCTION

5.01 SCOPE OF WORK

A. The installation of casing and carrier pipes by the method of boring and jacking shall be covered by these specifications. The overall scope of WORK shall include, but not be limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, casing spacers, coatings, location signs as required, installing the carrier pipe, and miscellaneous appurtenances to complete the entire WORK as shown on the STANDARD DRAWINGS and restoration. Applicable provisions of this MANUAL shall apply concurrently. Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the PLANS.

5.02 QUALITY ASSURANCE

A. Jurisdiction:

For crossings under roadways or other installations within rights-of-way and easements under the jurisdiction of the COUNTY or other entity, the CONTRACTOR shall comply with regulations of the agency with said authority. State highway casing installations shall conform to the FDOT "Utility Accommodation Guide".

B. The CONTRACTOR shall verify existing utility locations prior to constructing drilling and receiving pits.

C. Subaqueous jack and bore crossings shall also adhere to the requirements contained within the Section entitled "Installation of Pipe Specifications".

PART 6 - PRODUCTS

6.01 PIPE MATERIAL

A. Steel Casing:

Steel casings shall be new over the entire length and conform to the requirements of ASTM Designation A139 (straight seam pipe only) Grade "B" with minimum yield strength of 35,000 psi. The casing pipes shall have the minimum nominal diameter and wall thickness as shown in Table 315-1.

The sections of steel casing shall be shop and field welded in accordance with the applicable portions of AWWA C206 and American Welding Society (AWS) D7.0 for field welded pipe joints. Welds shall be complete penetration, single-bevel groove type joints. Welds shall be airtight and continuous over the entire circumference of the pipe and shall not increase the outside pipe diameter by more than 3/4-inch.

The CONTRACTOR shall wire brush the welded joints and paint with an approved material.

B. Carrier Pipe:

The carrier pipe shall be as specified in Chapters 4, 5, and 6 of this MANUAL, as applicable. Restrained joints shall be utilized on all PVC and DI pipe joints within the casing.

C. Carrier Pipe Spacers:

1. Stainless Steel Casing Spacers:

Carrier pipes, inside of steel casing pipes, shall be supported by casing spacers at no more than 10 feet between spacers with no less than two casing spacers equally spaced along each section of carrier pipe. Each spacer shall be 8-inches wide for carrier pipes up to 12-inches in diameter and 12 inches wide for 16-inch to 30-inch in diameter carrier pipes. The spacer shall be manufactured of 14-gauge Type 304 stainless steel, as a minimum. All nuts and bolts shall be corrosion resistant and compatible with the respective steel band. Each spacer shall have a minimum of four runner supports manufactured of a high molecular weight polymer plastic. The runner supports shall be of adequate height to position the carrier pipe in the center of casing with a minimum top clearance of 1/2-inch. Between each spacer and runner, there shall be a stainless steel riser. All casing spacers larger than 36-inch diameter (carrier pipe) shall be factory designed, taking in consideration the weight of the carrier pipe filled with water. All calculations and drawings shall be submitted to PCU for review.

2. HDPE Casing Spacers:

Casing spacers made of HDPE shall fasten tightly onto the carrier pipe so that the spacers do not move during installation. Casing spacers will be spaced no more than 6-1/2 feet apart with double spacers on each end of the casing. The casing spacers will provide a minimum safety factor of two to one to support the service load. Spacers shall have a minimum height that clears the pipe bell. Casing spacers shall be projection type totally non-metallic spacers constructed of preformed sections of high-density polyethylene.

D. Casing End Plugs:

After the carrier pipe has been tested, eight inch thick brick and mortar masonry casing end plugs shall be used to completely close both openings on either side of the casing in accordance with the STANDARD DRAWINGS. Plugs shall be suitable for restraining a saturated earth load at the casing's installed depth. A weep hole shall be installed near the bottom of each plug.

PART 7 - GENERAL

7.01 INSPECTION

A. Casing pipe to be installed may be inspected for compliance with this MANUAL by an independent laboratory selected and paid for by PCU. The manufacturer's cooperation shall be required in these inspections.

B. All casing pipe shall be subjected to a careful inspection prior to being installed. If the pipe fails to meet the specifications it shall be removed and replaced with a satisfactory replacement at no additional expense to PCU.

7.02 PIPE HANDLING

A. Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. Pipe shall not be dropped. All pipes shall be examined before lying and no piece shall be installed which is found to be defective. Any damage to the pipe or coatings shall be repaired or replaced to the satisfaction of PCU.

7.03 INSTALLATION

A. WORK Coordination:

It shall be the CONTRACTOR's responsibility to perform the boring and jacking work in strict conformance with the requirements of the agency in whose right of way or easement the WORK is being performed. Any special requirements of the agency such as insurance, flagmen, etc., shall be strictly adhered to during the performance of WORK. The special requirements shall be performed by the CONTRACTOR at no additional cost to PCU.

B. Dewatering:

Dewatering through the casing during construction shall not be permitted. PCU shall approve all dewatering methods before construction work begins.

C. Carrier Pipe Support:

The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. The load of the carrier pipes shall be distributed along the casing spacers. Casing spacers shall be as specified in the appropriate "Approved Materials Checklist".

D. Jacking Pits:

Excavation adjacent to the roads shall be performed in a manner to adequately support the roads. Bracing, shoring, sheeting or other supports shall be installed as needed. The CONTRACTOR shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions that might cause the casing to "freeze" in place. Upon completion of jacking operations, the reaction blocks, braces and all other associated construction materials shall be completely removed from the site. Appropriate barricades will be provided if pits are open overnight. Excavation shall be completely enclosed with barricades.

E. Maintaining Line and Grade:

Correct line and grade shall be maintained.

F. Removal of Excavated Material from Casing:

Earth within the casing shall not be removed too close to the cutting edge in order to prevent the formation of voids outside the casing. If voids are formed, they shall be satisfactorily filled with grout by pumping.

F. Cleaning of Casing Interior:

After completion of jacking, the CONTRACTOR shall clean the interior of the casing of all excess material.

CHAPTER 3 GENERAL REQUIREMENTS Section 317

System Connections Specifications

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Connections shall be made in accordance with this Section. Mains shall be tapped in such a manner as to avoid disturbance or disruption to the operation of the main in service and to protect the potable water supply from contamination. PCU shall operate all valves on existing mains.

PART 2 - PRODUCTS

2.01 TAPPING SLEEVES AND VALVES

A. General:

Tapping sleeves shall be mechanical joint sleeves. Refer to the appropriate "Approved Materials Checklist", for all sleeves, valves, and appurtenances.

B. Mechanical Joint Sleeves:

Sleeves shall be cast of gray-iron or ductile-iron and have an outlet flange with the dimensions of the Class 125 flanges shown in ANSI B16.1 and properly recessed for tapping valve. Glands shall be gray-iron or ductile iron. Gaskets shall be vulcanized natural or synthetic rubber. Bolts and nuts shall comply with ANSI/AWWA C111/ANSI A21.11. Sleeves shall be capable of withstanding a 200 psi working pressure.

C. Fabricated Mechanical Joint Tapping Sleeves:

Sleeves shall be of split mechanical joint design with separate end and side gaskets. Sleeves shall be fabricated of high strength steel, meeting ASTM A283 Grade C or ASTM A-36. Outlet flange shall meet AWWA C-207, Class "D" ANSI l50 pound drilling requirements and be properly recessed for the tapping valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have manufacturer applied fusion bonded epoxy coating, minimum l2 mil thickness.

D. Tapping Valves:

Tapping valves shall meet the requirements of Chapters 4, 5, and 6 except that units shall be flanged mechanical joint ends. Valves shall be compatible with tapping sleeves as specified above and specifically designed for pressure connection operations.

PART 3 - EXECUTION

3.01 NOTIFICATION AND CONNECTION TO EXISTING MAINS

A. The CONTRACTOR shall make a formal request to PCU in accordance with its current policy to schedule a connection to any existing main. The request shall be made a minimum of five NORMAL WORKING DAYS prior to the proposed tie-in to the existing main. In this request, the CONTRACTOR shall provide the following information.

1. Points of connection, fittings to be used and method of flushing and disinfection if applicable.
2. Estimated construction time for said connections.
3. Identify pressure and non-pressure connections

B. Connections shall only be made on the agreed upon date and time. If the CONTRACTOR does not perform the work in the agreed upon manner or schedule, the CONTRACTOR shall be required to reschedule the said connection by following the procedure outlined above.

C. Unless specifically approved in writing by PCU, connections shall only be attempted to an existing PCU main from Monday through Thursday. No connections shall be attempted on or the day before a COUNTY holiday.

3.02 INSTALLATION

A. General:

The CONTRACTOR shall furnish and install the tapping sleeves and valves to existing mains. Taps shall not be permitted for single user connections on transmission mains 30 inches or larger.

B. Excavation, Backfill, Compaction and Grading:

The applicable provisions of the Section entitled “Excavation, Backfill, Compaction, and Grading” shall apply.

C. Pressure Connections:

Sufficient length of main shall be exposed to allow for installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping sleeve, valve and machinery. Any damage to the main due to improper or insufficient supports will be repaired at the CONTRACTOR’s expense.

1. Prior to the tap, the CONTRACTOR shall assemble all materials, tools, equipment, labor, and supervision necessary to make the connection. The CONTRACTOR shall pre-position sufficient pipe sections, fittings, and equipment onsite that match the existing infrastructure being tapped.
2. The CONTRACTOR shall excavate a dry and safe working area pit of sufficient size to enable the necessary WORK.
3. The inside of the tapping sleeve and valve, the outside of the main and the tapping machine shall be cleaned and swabbed or sprayed with one percent liquid chlorine solution prior to beginning installation for water system pressure connections and must comply with AWWA C-651-99 or most current version.
4. After the tapping sleeve has been mounted on the main, the tapping valve shall be bolted to the outlet flange, making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested under the

observation of PCU personnel to 150 psi for a 30-minute duration to ensure that no leakage will occur.

5. For pressure connections 4-inch through 20-inch installations, the minimum diameter cut shall be 1/2 inch less than the nominal diameter of the pipe to be attached. For larger taps, the allowable minimum diameter shall be two to three inches less than the nominal diameter of the pipe being attached. After the tapping procedure is complete, the CONTRACTOR shall submit the coupon to PCU.
6. The tapping valve shall be placed vertically for pressure connections to wastewater force mains.
7. Adequate restrained joint fittings shall be provided to prevent movement of the installation when test pressure is applied. Provisions in the "STANDARD DRAWINGS" shall apply.
8. The CONTRACTOR shall be responsible for properly backfilling the work area pit after the WORK is completed.

D. Non- Pressure Dry Connections:

When service must be interrupted to existing potable water customers during an addition of appurtenances the following shall apply.

1. The CONTRACTOR shall provide five NORMAL WORKING DAYS notice to PCU.
2. No customer shall be without service for more than six hours, unless specifically approved in advance by PCU. This accommodation to customers may include scheduling before and/or after NORMAL WORKING HOURS.
3. The CONTRACTOR shall be ready to proceed by pre-assembling as much material as possible at the site to minimize the length of service interruption.
4. Needed pipe restraints must be installed prior to the initiation of the shut-down of water.
5. The excavation shall be opened and needed site preparations shall be completed before the initiation of the connection WORK.
6. PCU shall postpone a service cut-off if the CONTRACTOR is not ready to proceed at the scheduled time.
7. Only PCU personnel shall operate the valves needed to perform the shut-down on the existing system.

CHAPTER 3 GENERAL REQUIREMENTS Section 318

Field Testing and Inspection Procedures

PART 1 GENERAL

A. The CONTRACTOR shall schedule each required inspection from the PCU Inspector.

B. PCU will notify the CONTRACTOR of utilities deficiencies or acceptance in accordance with the schedule of notification provided in Table 318-1 below.

Table 318-1. PCU Schedule of Notification of Inspections

Service	Type of Inspection	Timeframe (NORMAL WORKING DAYs)
Water	Wire Continuity for Pressurized Mains	5
Water	Walk Through for Subdivisions	5
Water	Cross Connection Control	5
Wastewater	CCTV Data Review	7
Wastewater	Wire Continuity for Pressurized Mains	5
Wastewater	Walk Through for Subdivisions	5
Wastewater	Informal Lift Station Start Up	2
Wastewater	Formal Lift Station Start Up	5
Reclaimed Water	Wire Continuity for Pressurized Mains	5
Reclaimed Water	Walk Through for Subdivisions	5
Reclaimed Water	Cross Connection Control	5

C. If there are any deficiencies or the system is not ready for inspection, as determined by PCU, the CONTRACTOR shall request a re-inspection which will restart the inspection period, as noted above.

D. If more than two inspections are required, the CONTRACTOR shall be subject to being charged additional fees for re-inspection as specified by a separate Resolution adopted by the COUNTY.

CHAPTER 3 GENERAL REQUIREMENTS Section 350

STANDARD DRAWINGS

GR-01	Bedding and Trenching - Type A
GR-02	Bedding and Trenching - Type B
GR-03	Subaqueous Crossing (Typical)
GR-04	Restrained Pipe Table
GR-05	Thrust Collar
GR-06	Bore and Jack
GR-07	Gate Valve and Box (Shallow)
GR-08	Butterfly Valve and Box (Shallow) (For Storage Tank Isolation Use Only)
GR-09	Plug Valve (Shallow) (For Wastewater Treatment Facility Use Only)
GR-10	Typical Valve Box Cover
GR-11	Valve Box Assembly (Deep)
GR-12	Valve Collar
GR-13	Pipe Line Marker (Typical)
GR-14-1	Pipe Tracer Wire
GR-14-2	Pipe Identification - Potable Water Mains
GR-14-3	Pipe Identification - Wastewater Force and Gravity Mains
GR-14-4	Pipe Identification - Reclaimed Water Mains
GR-14-5	Pipe Identification - Raw Water Mains
GR-15-1	Automatic Air Release Valve (Above Ground)
GR-15-2	Automatic Air Release Valve (In Ground)
GR-16	Minimum Separation Requirements
GR-17-1	Aerial Crossing and Access Barrier (Typical): Potable Water and Reclaimed Water Mains
GR-17-2	Sign for Aerial Crossing and Access Barrier: Potable Water and Reclaimed Water Mains
GR-18	Residential Service Locations (Typical)
GR-19-1	Single Family Residential Utility Plan (Typical): Potable Water
GR-19-2	Single Family Residential Utility Plan (Typical): Wastewater
GR-19-3	Single Family Residential Utility Plan (Typical): Reclaimed Water
GR-20-1	Potable Water and Reclaimed Water Services (Typical)
GR-20-2	Standard Rectangular Meter Box Assembly: Potable Water and Reclaimed Water
GR-21	MJ Tapping Sleeve and Gate Valve Assembly (Typical)
GR-22	General Notes
GR-23	THIS PAGE IS INTENTIONALLY BLANK
GR-24	Pig / Swab Launcher Port (Typical)
GR-25	Pig / Swab Receiving Port (Typical)
GR-26	Concrete Arch and Full Encasement
GR-27	Concrete Cradle and Half Encasement
GR-28	Deflection of Pressure Mains

POLK COUNTY UTILITIES, FLORIDA
UTILITIES INSPECTON REPORT

Project Name: _____ Report Number: _____

Utilities Inspector: _____ Inspection Date: _____

PCU Project Number: _____ Data Entry Date: _____

Contractor: _____ Time Arrived: _____ ☐ AM ☐ PM

Engineer: _____ Time Departed: _____ ☐ AM ☐ PM

1. General Observation

☐ Photos Taken ☐ Photos Not Taken

2. Observed Safety Issues (Copy to Risk Management)

☐ Trench Safety Deficiency ☐ Work Zone Safety Deficiency ☐ General Safety Deficiency ☐ MOT Deficiency ☐ Overhead Safety Deficiency

☐ Other

Issue(s)

☐ IMMEDIATE ATTENTION AND/OR CORRECTION REQUIRED BY: Date: _____ Time: _____ ☐ AM ☐ PM

3. Construction Work Underway

☐ **No Activity** ☐ **Gravity Sewer** ☐ **Force Main** ☐ **Lift Station** ☐ **Potable Water** ☐ **Reclaimed Water** ☐ **Raw Water**

4. Observed Construction/Installation Issues

☐ **Not in Accordance with Plans** ☐ **Improper Installation** ☐ **Work Being Completed Satisfactory**

☐ Other

Issue(s)

☐ IMMEDIATE ATTENTION AND/OR CORRECTION REQUIRED BY: Date: _____ Time: _____ ☐ AM ☐ PM

5. Weather

☐ Sunny ☐ Clear ☐ Cloudy ☐ Rainy

6. Temperature

☐ <32F ☐ 32F – 50F ☐ 51F – 70F ☐ 71F - 85F ☐ > 85F

7. Wind

☐ Still ☐ Windy

Signature: _____ Utilities Inspector: _____ Date: _____ Time: _____ ☐ AM ☐ PM

Signature: _____ Utilities Inspector: _____ Date: _____ Time: _____ ☐ AM ☐ PM

1. General Observation

☐ Project File ☐ Inspector ☐ Contractor ☐ Risk Management ☐ Project Manager

☐ Project Engineer ☐ TS Director ☐ CP Director ☐ Other _____

☐ Data Entered into EPD Database

☐ Signed Copy Sent to Project File

CHAPTER 3 **GENERAL REQUIREMENTS** **Section 350-B**

Utilities Inspector's Overtime Tracking Form

PCU Inspector: _____

Project Name: _____

PCU Project File Number: _____

Reason for Overtime Request: _____

_____

If Private Development Related Project:

Construction Company: _____

Superintendent/Foreman: _____ Phone Number: (_____)_____-_____

If County Community Improvement or R&R Project:

PCU: _____ Transportation: _____ Natural Resources: _____ Facilities: _____ Other: _____

Project Manager: _____ Phone Number: (_____)_____-_____

Overtime Start Time: _____ am / pm Overtime Start Time: _____ am / pm

Overtime End Date: _____/_____/_____ Overtime End Date: _____/_____/_____

Total Overtime Hours: _____ X (Inspector's Hourly Rate: $_____ X County Overhead Percentage: 0.33)

X Overtime Rate Multiplier: __ Regular 1.5 or __ Holiday 2.5 = Total Billable Overtime Amount: $_____

Inspector's Signature: _____ Date: _____ Supervisor's Signature: _____ Date: _____

_____ The Private Development Contractor acknowledges by his/her representative's signature below that PCU shall be reimbursed for all overtime costs necessitated by his company during the construction of the subject Project and that the company shall forward a check in the amount stated above within ten business days of its receipt of PCU's invoice.

_____ The CIP or R&R Contractor acknowledges by his/her representative's signature below that PCU shall be reimbursed for all overtime costs necessitated by his company during the construction of the subject CIP Project and that the company shall either:

____ forward a check in the amount stated above within ten (10) business days of its receipt of PCU's invoice **or**

____ deduct the amount stated above from the company's next pay request submittal.

Contractor's Representative's Signature: _____ **Date:** _____

Distribution: ____ Contractor ____ PCU Inspection Supervisor ____ Project Manager ____ Project File ____ PCU Finance

CHAPTER 4

WATER

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CHAPTER 4 WATER Section 410

Potable Water Main Standards and Specifications

PART 1 – GENERAL

A. Potable water mains shall be designed for the estimated tributary population, as delineated in the approved PCU's MASTER PLAN (latest edition) for the subject RUSA. When the DEVELOPER's potable water MASTER PLANS are required, potable water mains shall be designed for the estimated ultimate build out, as approved by PCU. The DEVELOPER shall be required to satisfy the domestic water and fire protection design flow for their planned development (PD) or the development of regional impact (DRI).

PART 2 - LOCATION

A. Mains shall be located within dedicated public rights-of-way or Polk County Utilities Easements.

1. Public Rights-of-Way

When installed in rights-of-way, mains shall maintain a consistent alignment with respect to the centerline of the road. In all cases, mains shall be installed along one side of the road with crossings kept to a minimum.

2. Polk County Utilities Easements

If a main is to be constructed within an easement, the centerline of the pipe shall be located along the centerline of the easement.

a. When not adjacent to County or State rights of way, a minimum width of 20 feet for mains with inverts up to 5 feet below finish grade. For mains with inverts deeper than 5 feet below finish grade, the minimum width shall be twice the invert depth of the main plus 10 feet. All widths shall be rounded up to the nearest even foot. Width of the easement shall be based on the deepest invert depth of each segment of the subject main. Variations in easement size may be authorized by the COUNTY only when deemed appropriate provided that the existing or proposed level of service is maintained and operational maintenance and responsibility is established to the benefit of the COUNTY.

b. Where multiple parallel mains are to be placed within a single easement, the FDEP required horizontal separation distance between the mains shall be added to the above minimum single main easement width and rounded up to the nearest even foot.

c. Have a maximum length of 150 linear feet if the easement terminates in a dead end or an obstruction. Longer easements may be authorized if adequate turnaround and work zone area is provided as based on an AASHTO single unit vehicle. All locations and lengths of easements shall take in consideration

the safety and accessibility of PCU vehicles and personnel.

d. Be free of any permanent structures, such as footers, foundations, walls, screen walls, buildings, air conditioner pads, transformer pads, sign supports, roof overhangs, stormwater structure, swimming pools, storage sheds, patios, etc.

e. Be accessible at all times and not subject to standing water nor under the side slope or bottom of a lake, pond or stormwater retention area, except that perpendicular crossings under swales, small ditches and canals may be authorized in writing by PCU.

f. As designated by PCU for existing use, a Polk County Utilities Easement of not less than 15 feet in width shall be provided parallel to and directly adjacent to all County, State, and Federal rights-of-way. Notwithstanding PCU's easement requirements stated above and herein, easements in typical subdivision construction including those adjacent to internal subdivision roads shall be sized and conveyed in accordance with the LAND DEVELOPMENT CODE. The ultimate width of easements may be based on the number, type, size and depth of the utility lines within the easement.

g. Landscape buffers may be allowed to co-exist with Polk County Utilities Easements as long as raised landscape berms are not utilized. Walls shall be allowed as long as there are no potential conflicts with future repair or replacement of a main. Should PCU disturb or damage any landscaping or other installed improvements within the easement, PCU shall initiate repairs or install replacements in a timely manner at no cost to the property owner.

h. A triangular corner clip type of Polk County Utilities Easement, that has 20 foot long sides, shall be provided at all intersections of County, State, and Federal rights-of-way.

B. Mains within easements shall not be placed under septic tanks or their drain fields, storm water management facilities, buildings, retention ponds, athletic courts, swimming pools, fountains, patios, or other structures. Privacy walls and foundations shall not be placed parallel over mains or within the structure's zone of influence as based on a soil angle of repose of 45 degrees. Mains shall not be located along interior side or rear lot lines, unless approved in writing by PCU. Placement of mains along storm water retention pond berms may be allowed by PCU on a case by case basis when placed in a casing and if such a configuration results in efficient placement and utilization of the system. Service laterals, valves, and other main related improvements shall not be placed along interior side or rear lot lines.

C. Mains may be accepted for ownership and maintenance by PCU if the private streets are designed with an urban design cross section in accordance with the LAND

DEVELOPMENT CODE. Polk County Utilities Easements shall be dedicated over the entire private street rights-of-way. In addition, sufficient area must be available outside of paved areas to maintain PCU mains.

D. Mains shall be designed with uniform positive or negative slopes to avoid undulations and minimize high points and low points in the profile.

E. Offsite mains for all developments shall be extended along the entire frontage of each development. The minimum size of the main to be extended by the DEVELOPER shall be the same size that is the minimum main size required to serve the development. In the event that PCU desires to upsize the main, PCU shall reimburse the DEVELOPER in accordance with the provisions of the Utilities Code.

F. Mains with inverts located up to 5 feet below finish grade shall not be located closer than 10 feet from any structure that requires a Certificate of Occupancy. For mains with inverts located deeper than 5 feet below finish grade, the minimum distance of 10 feet shall be increased by one foot for each one foot of increased depth of the main's invert. All horizontal distances shall be rounded up to the nearest whole foot.

G. Unless specifically determined by PCU to be of benefit to its overall system, potable water infrastructure installed within a non-residential or multi-residential development shall not be subject to ownership, maintenance, or operation by PCU.

PART 3 – DESIGN BASIS

A. Average Daily Flow and Peak Flows:

Average daily water flow shall be calculated by referencing the equivalent residential connection (ERC) flow rates as established in the "Utilities Administration Manual". Water flow rates shall be in accordance with the Peaking Factors contained in the Section entitled "Water Hydraulic Modeling Standards".

B. Fire Flow Requirements:

Fire flow requirements shall be determined in accordance with applicable COUNTY fire codes and the LAND DEVELOPMENT CODE. Where fire flow requirements exceed the anticipated available fire flow from the central water system, on-site fire protection system or other COUNTY/city fire department approved mitigation measures shall be utilized.

C. Design Calculations:

The DEVELOPER's ENGINEER shall submit signed, sealed and dated design calculations along with a compact disc copy of the WaterCad or WaterGems based model with the PLANS for all water distribution projects. Calculations shall show that

the water mains will have sufficient hydraulic capacity to transport the greater of peak hourly flows or the combination of maximum daily flows and fire flows while meeting the requirements of this Section. Minor head losses shall be incorporated in calculations including losses through meters, detector checks and backflow prevention assemblies.

PART 4 - DESIGN

A. Pipe Cover:

A minimum cover of 36 inches shall be provided for all water mains.

B. Pressure:

Distribution systems shall be designed to maintain a minimum static pressure of 20 psi at all points in the system, including the supply side of each meter, under average daily flow conditions. Due to internal water demands, higher minimum pressures may be required at commercial, industrial, and high-density residential areas. A maximum pressure of 35 psi shall be used in calculating domestic water pressure for residential structures up to 2 stories in height and all fire suppression systems. For excessive pressures, pressure-reducing provisions may be required.

C. Design Friction Losses:

Friction losses through mains shall be based on the Hazen and Williams or Darcy-Wiesbach formulas. In the use of the Hazen and Williams formula, the value for "C" shall be 130 for all pipes.

D. Design Pressure and Restraint

1. The main and fittings, including all restrained joint pipe fittings shall be designed to withstand pump operating pressures and pressure surges, but not less than 150 psi.

2. The restrained joint lengths shall be calculated consistent with the table format shown in the STANDARD DRAWINGS.

3. In the event that it is necessary to locate proposed mains or leave existing mains longitudinally under any part of a proposed roadway subject to regular non-residential traffic or with speed limits above 30 miles per hour, such mains shall have restrained joints.

E. Velocity and Diameter:

Only 4, 6, 8, 10, 12, 16, 20, 24, 30, 36, 42, 48, and 54-inch in diameter water mains shall be permitted. Variations in main size may be authorized by the COUNTY when deemed appropriate provided that the existing or proposed level of service is maintained and operational maintenance and responsibility is established to the benefit of the

COUNTY. Water mains with a minimum of 6-inch diameter shall be required for use with fire hydrants. Looped systems shall be required in low-density residential developments. Where looping of mains is not practical, the diameter of dead end mains shall be increased by one pipe size as based on hydraulic modeling. In cul-de-sac situations, mains may be reduced to a minimum of 4 inches in diameter after the last fire hydrant assembly if the length of the reduced size main does not exceed 500 linear feet or will not serve more than 40 ERC's. Mains shall be sized so velocities do not exceed six feet per second under the fire flow plus max day flow condition. In no case shall connections be made to cause velocities to exceed six feet per second in existing mains.

F. Material:

1. Water mains shall be either PVC or ductile iron pipe. HDPE may be used in specific applications as specified in this MANUAL or as approved by PCU. Using the PCU approved hydraulic modeling standards contained within this MANUAL, the ENGINEER shall determine on a case by case basis if it is necessary for all proposed HDPE pipe installations to be increased by one pipe size above all proposed or existing adjacent PVC and Ductile Iron Pipe installations.

G. Fire Hydrant Assembly Location and Spacing:

1. At a minimum, specifications outlined in the latest version of LAND DEVELOPMENT CODE and applicable COUNTY fire codes shall apply. Specifically, minimum fire flow rates for individual uses shall be established by the Fire Marshall.

2. Hydrants assemblies shall be placed on the same side of the roadway as the water mains and shall be placed at 500-foot intervals in commercial, multifamily, and industrial areas. Hydrant spacing for single-family residential and other areas shall be 1,000-foot intervals.

3. Unless otherwise directed by the Fire Marshall, fire hydrant assemblies in non-residential developments shall have a minimum horizontal separation distance from a structure that is equal to the vertical distance from the finished ground elevation to the eaves of the structure.

4. If an existing fire hydrant assembly has to be relocated more than five feet longitudinally for any reason, the main shall be tapped and the existing fire hydrant assembly re-installed by the DEVELOPER. Should the existing assembly not be in good condition according to PCU or not in compliance with this MANUAL, it shall be replaced with a new fire hydrant assembly by the DEVELOPER. Relocations of five feet or less shall be accomplished by the DEVELOPER utilizing a section of pipe of the approximately length, diameter, material, and restrained joints.

H. Dead Ends:

1. In order to provide adequate system reliability, reduce head loss, and avoid water quality degradation, all water mains shall be designed to provide complete system looping with all portions of the system being fed from at least two directions. At the discretion of PCU, dead ends may be permitted in cul-de-sacs if the project does not have future phases or it is determined that no other practical looping alternative is available. Dead end water mains in cul-de-sacs shall be designed and constructed as shown in Figure GR-19-1.

2. Where permanent dead-end mains occur, they shall terminate with a fire hydrant, flushing hydrant, or blow-off assembly for flushing purposes. Automatic-metered flushing devices may be required to maintain water quality in water mains. No potable water flushing device shall be directly connected to any WASTEWATER or STORMWATER SYSTEM.

I. Valves:

Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Inline valves shall be located no more than 500 feet apart in commercial, industrial, and high-density residential areas and no more than 1000 feet in all other areas. In addition, inline valves shall be utilized to isolate a maximum of 40 ERC's in order to reduce inconveniences to other customers. A minimum of two valves per tee and three valves per cross shall be required to isolate and maintain adequate service. Valves shall be placed at phase lines and located at the end of all water main extensions except at cul-de-sacs.

J. Restrained Joints:

1. Pressure piping, fittings, and other items requiring restraint shall be restrained by assemblies or devices designed for the maximum pressure condition (test pressure) in accordance) in accordance with the STANDARD DRAWINGS.

2. In the event that it is necessary to locate proposed mains or leave existing mains longitudinally under any part of a proposed roadway subject to regular non-residential traffic or with speed limits above 30 miles per hour, such mains shall have restrained joints or be constructed within steel casing(s).

K. Separation of Water Mains and Sewers:

1. Separation of potable water, reclaimed water, wastewater, and stormwater systems shall comply with FDEP regulations as detailed in the STANDARD DRAWINGS.

2. Water pipes shall not pass through any part of a storm sewer or manhole. A

minimum separation from storm water structures in accordance with the STANDARD DRAWINGS shall be maintained to facilitate maintenance and operation.

L. Combination Air/Vacuum Release Valves:

Automatic air release valves of appropriate size and number shall be installed in accordance with the STANDARD DRAWINGS to prevent air locking formation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. All such valves are required at significant high points of the main or as specified by PCU. Valves shall be clearly delineated on the profile view for each main in the PLANS. The ENGINEER shall submit calculations to PCU justifying the valve sizes and numbers as specified by AWWA M-51 "Air Release, Air/Vacuum, and Combination Air Valves".

M. Permanent sample stations shall be required in accordance with the STANDARD DRAWINGS and as directed by PCU.

N. Provision for the installation of temporary access points into and egress points out of the piping system for pigging and cleaning purposes shall be incorporated into the design for pipe diameters. Permanent and temporary access and egress points shall conform to the STANDARD DRAWINGS.

O. All buildings over two stories in height shall be provided with individual domestic water service booster pumps which shall be located within each building. Master booster pumps for developments shall not be permitted.

P. All buildings over two stories in height shall be provided with individual fire suppression system booster pumps which shall be located within each building. Master booster pumps for developments shall not be permitted.

PART 5 – SYSTEM CONNECTION AND SERVICE CONNECTIONS

A. Water services and connections shall conform to the applicable provisions of this MANUAL. Only 1, 2, 4, 6, 8, 10, and 12-inch services will be permitted. Where water services greater than 12 inches are required, additional services shall be provided. It is recommended that hospitals install at least two services. PCU will install services and connections to existing water systems up to two-inch, after payment of applicable fees and charges. The CONTRACTOR shall furnish service connections for new water main extensions.

PART 6 - WATER METERING

A. General:

All water service connections shall be metered. In general, the method and location of metering shall follow the guidelines listed below and is subject to PCU's determination of appropriateness.

1. All meters shall be sized in accordance with Section 3 of the "Utilities Administration Manual" and this MANUAL's "Approved Meters List".

2. An above ground meter assembly or assemblies shall be required for all non-residential installations regardless of size.

3. Single family and duplex residential meters that are two inches or smaller shall be installed in PCU approved meter boxes installed by the DEVELOPER.

4. On-site water systems downstream of and served by a master meter assembly shall be maintained by the Homeowners Association, Owners Association, or the Property Owner.

5. The installation, operation, maintenance, and reading of sub-meters shall be the responsibility of the DEVELOPER.

6. The ENGINEER shall obtain approval from PCU before finalizing the metering system design.

7. Unless specifically approved by PCU, meter boxes shall not be installed in sidewalks, driveways, or areas subject to vehicular traffic.

8. Meters subject to vehicular traffic shall be installed in a traffic rated meter box.

B. Single Family, Duplex, and Town Homes Developments with Public Rights-of-Way:

1. Each unit shall be individually metered. Services shall be installed as indicated by the STANDARD DRAWINGS.

2. Multi-family subdivisions and town home developments shall have a minimum 4-inch stub out for each building, or groups of buildings for fire sprinkling systems when required by the Fire Marshall. A 4 inch gate valve and a mechanical joint end cap shall be placed at the end of each stub out.

3. An approved cross connection control assembly shall be provided if a separate fire suppression system is required. Both the cross connection control assembly and the fire suppression system shall be owned and maintained by a Homeowner's/Condominium's Association.

C. Single Family, Duplex, and Town Homes Developments with Private Rights-of-Way:

1. Individual meters may be permitted in accordance with this Section if the private streets are designed with an urban design cross section in accordance with the latest edition of the LAND DEVELOPMENT CODE. A Polk County Utilities Easement shall be dedicated over all private street rights-of-way in their entirety. In addition, sufficient area must be available outside of paved areas to locate water mains, services, and meters. If the above criteria cannot be met, the development shall be master metered.

2. Town Home Subdivisions shall have a minimum 4-inch stub out for each building, or groups of buildings for fire sprinkling systems when required by the Fire Marshall. A 4 inch gate valve and a mechanical joint end cap shall be placed at the end of each stub out.

3. An approved cross connection control assembly shall be provided if a fire suppression system is required. The fire suppression system shall be owned and maintained by the Homeowner's/Condominium's Association.

D. Commercial, Industrial, Institutional, and Multi-Family Developments with Buildings adjacent to Public Rights-of-Way and without Private Fire Suppression Mains:

1. Each building shall be individually metered with the appropriate cross connection control assembly installed. All meters and cross connection control assemblies shall be located adjacent to public rights-of-way at the property line in a Polk County Utilities Easement.

E. Commercial, Industrial, Institutional, and Multi-Family Developments with Buildings adjacent to Private Streets and Private Fire Suppression Mains (including timeshares, condo hotels, apartments, and condominiums developments):

1. Apartments, Condominiums, and Multi-Family Developments shall have one of the following:

   a. A fire service type master meter to provide both domestic and fire suppression supply water. All projects shall be designed so that private sub-metering of individual units with the appropriate cross connection control assemblies shall be accommodated, or

   b. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

2. Commercial, Industrial, and Institutional Developments shall have one of the following:

    a. A fire service type master meter to provide both domestic and fire suppression supply water. All projects shall be designed so that private sub-metering of individual units with the appropriate cross connection control assemblies shall be accommodated, or

    b. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

3. Retail Centers and Malls shall have one of the following:

    a. A master domestic meter where fire suppression is provided by public fire hydrants. All developments shall be designed so that private sub-metering of individual units with the appropriate approved cross connection control assembly shall be accommodated in order to facilitate water conservation. The master meter shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

    b. A fire service type master meter assembly where fire suppression is provided by private fire hydrants and/or fire suppression systems. All developments shall be designed so that private sub-metering of individual units with the appropriate cross connection control assembly shall be accomplished in order to facilitate water conservation. The master meter shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

    c. Dual systems with separate domestic and fire suppression water mains, as approved by PCU. Dual systems shall require installation of the appropriate cross connection control assembly on both the fire suppression main and the domestic main. All projects shall be designed so that private sub-metering of individual units is utilized to facilitate water conservation.

    d. Individual domestic meters to each building or unit where fire suppression is provided by public hydrants. All meters shall be located adjacent to a public right-of-way in a Polk County Utilities Easement, or

F. Meter Installation:

Meters will be installed after payment of applicable fees and charges to PCU. PCU approved meters that are larger than two inches shall be purchased and installed by the DEVELOPER. Installation of meters two inches and smaller shall be provided

and installed by PCU. Single family residential meters that are smaller than two inches in size shall be installed underground in an approved meter box. All other meters shall be installed above ground and located in a Polk County Utilities Easement located adjacent to but outside of public rights-of-way per the STANDARD DRAWINGS.

G. Meter Sizing:

PCU shall approve the size and quantity of all meters in accordance with Part 6 (A) (1) above. The DEVELOPER's ENGINEER shall provide sufficient information on estimated average, peak, and minimum flows so that meter size can be determined.

PART 7 - MATERIALS, INSTALLATION, AND TESTING

A. Applicable provisions of this MANUAL shall apply.

PART 8 - LOCATION AND IDENTIFICATION

A. A means for locating and identifying all water mains and valves shall be provided in accordance with this MANUAL and the STANDARD DRAWINGS.

PART 9 - CROSS CONNECTION CONTROL

A. General:

1. In order to protect the potable water supply system from contamination due to cross-connections, PCU approved cross connection control assemblies shall be installed on the potable water system as outlined in the "Cross Connection Control Policy Manual".

PART 10 – CONSTRUCTION

10.01 SCOPE OF WORK

A. These specifications cover the pipes, fittings, and appurtenances used for potable water systems. All materials shall be utilized in accordance with the appropriate "Approved Materials Checklist".

B. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, or samples for analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

C. Pipe and fitting interior linings shall conform to ANSI/NSF 61 list of approved materials standard.

D. Potable water mains, service piping, and connections shall be installed as indicated in the STANDARD DRAWINGS.

E. Pigging of mains shall be used to remove foreign materials in lieu of flushing.

PART 11 – PRODUCTS

11.01 PIPE MATERIALS

A. PVC Pipe:

PVC water distribution mains shall be manufactured in accordance with AWWA standard C900, C905, or C909, latest edition. Pipe that is 4 to 12 inches in diameter shall be C900 and have a dimension ratio of 18. Pipe larger than 12 inches in diameter shall be C905 or C909 and have a dimension ratio of 25. Pipe shall be blue in color.

B. Ductile Iron Pipe:

Ductile iron pipe shall conform to ANSI/AWWA A21.51/C151. Pipe shall be pressure class 350 for 3-inch to 12-inch, pressure class 250 for 16-inch to 20-inch, pressure class 200 for 24-inch, and pressure class 150 for 30-inch to 64-inch.

C. HDPE Pipe:

HDPE pipe shall be in accordance with AWWA C906 and shall have an outside diameter equal to ductile iron pipe for the same size. Pipe shall have a minimum dimension ratio of 11 for use with ductile iron pipe fittings and have a minimum working pressure of 150 psi. In the event that HDPE pipe with 42 inch and larger diameters are not available due to general industry limitations, PCU may consider the use of outside diameters based on iron pipe sizes.

11.02 JOINT MATERIALS

A. PVC Pipe Joints:

1. PVC pipe shall have integral bell push on type joints conforming to ASTM D3139.

2. Fusible PVC pipe lengths, as used in horizontal directional drill applications only, shall be assembled in the field with butt fused joints. The CONTRACTOR shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as specified by the pipe supplier and this MANUAL.

B. Ductile Iron Pipe Joints:

Joints for ductile iron pipe shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C111., Restrained or flanged joints shall be provided where called for in the PLANS. Flanged points shall conform to AWWA C115.

C. HDPE Pipe Joints:

HDPE joints shall conform to AWWA C906.

11.03 FITTINGS

A. Ductile Iron and PVC Pipe:

Fittings shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153.

B. HDPE Pipe:

1. Fittings used with HDPE pipe shall be mechanical joint ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153 unless otherwise specifically approved by PCU.

11.04 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

A. Pipe and Fittings

Ductile iron pipe and fittings shall have an interior protective lining of cement-mortar with a seal coat of asphaltic material in accordance with ANSI/AWWA A21.4/C104. Exterior ductile iron pipe shall be coated with asphaltic material in accordance with a minimum one mil thick in accordance with ANSI/AWWA A21.51/C151.

B. Additional Applied Exterior Coatings for Above Ground Pipe and Fittings

Pipe, fittings, and valves shall be thoroughly cleaned and given one field coat (minimum 1.5 mils dry thickness) of rust inhibitor primer in addition to the existing factory applied coat of rust inhibitor primer. Intermediate and finished field coats of Alkyd shall also be applied by the CONTRACTOR with a minimum 1.5 mil dry thickness for each coat. Primer and field coats shall be compatible and applied in accordance with the manufacturer's recommendations. Refer to the appropriate "Approved Materials Checklists". Final field coat shall be blue for potable water.

11.05 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement of ductile iron pipe shall be in accordance with ANSI/AWWA A21.51/C105 and blue in color. Polyethylene encasements shall be

required in accordance with AWWA C105 and when crossing or within a power transmission and gas transmission easements.

11.06 SERVICE PIPE, STOPS, FITTINGS, AND SERVICE SADDLES

A. Service Connections at Main:

1. Service connections of one and two inches shall be brass body reduced port type corporation stops, equipped with connections compatible with the polyethylene tubing and threaded in accordance with specifications in AWWA C800, AWWA C901 and shall comply with NSF-61. One and two-inch services at the water main shall have connections for female iron pipe by female iron pipe thread, conforming to AWWA C509.

2. Service connections, 4-inch through 12-inch, shall have iron body resilient seat gate valves.

3. Service taps for air release valve installations shall utilize a 2-inch brass ball type corporation stop.

B. Service Pipe:

1. One-inch and two-inch service lines shall be PE4710 polyethylene tubing with SDR 9 dimensions, conforming to specifications in AWWA C800, AWWA C901, ASTM D-1248, ASTM D-3035, and ASTM D-2239.

2. Service lines, that are 4, 6, 8, 10, and 12 inches in size, shall be the same as water main pipe.

C. Service Control Valves at Property Line:

1. One-inch and two-inch size service curb stops shall be reduced port ball valves, made of brass, cast and machined in accordance with specifications in AWWA C800, AWWA C901, compliant with NSF-61 and compatible with polyethylene tubing connections.

2. For connections larger than two inches, the CONTRACTOR shall provide resilient seat gate valves.

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D. Service Fittings:

1. One-inch and two-inch fittings shall be brass, cast and machined in accordance with specifications in AWWA C800, AWWA C901, complaint with NSF-61, and compatible with polyethylene tubing connections.

2. Fittings, that are 4, 6, 8, 10, and 12 inches in size, shall be the same as water main fittings.

E. Service Tapping Saddles:

1. Stainless Steel Service Saddles:

Saddles shall have epoxy or nylon coated stainless steel 18-8 type 304 straps, and iron pipe threads. Double straps shall be a minimum of 2-inches in width each, Single straps shall be a minimum of three inches wide. Saddles used to connect to HDPE pipe shall allow for the normal expansion and contraction of such pipe.

2. Service Connections:

a. PVC and HDPE Pipe Service Saddle:

i. One-inch and two-inch services shall utilize with controlled OD.

ii. Four-inch or larger services shall use mechanical tapping sleeves, stainless steel sleeve for size on size taps, or epoxy coated sleeves with stainless steel hardware for all other sizes.

b. Ductile Iron Pipe Service Saddle:

i. One-inch and two-inch services shall use a controlled OD service tapping saddle with stainless steel straps and a ductile iron body that is either nylon or epoxy coated.

ii. Four-inch or larger services shall be mechanical tapping sleeves, stainless steel sleeve for size on size taps, or epoxy coated sleeve with stainless steel hardware for all other sizes.

11.07 RESILIENT SEAT GATE VALVES

A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C515, latest revision, and in accordance with these specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve. Valves shall have a minimum pressure rating of 150 psi.

B. Valves that are 16 inches and larger shall have side actuators. The valve body, bonnet and bonnet cover shall be ductile iron ASTM A126, Class B. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550. A two-inch wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C515.

C. Directional Opening:

All valves shall open left or counter clockwise.

D. The valves shall be non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C515. Two stem seals shall be provided and shall be of the o-ring type. The stem nut must be independent of the gate.

E. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the line flow from either direction.

11.08 BUTTERFLY VALVES

A. Typically, butterfly valves shall not be installed within any PCU system, except directly adjacent to storage tanks for isolation purposes.

B. Butterfly valves and operators shall conform to the "AWWA Standard Specifications for Rubber Seated Butterfly Valves", Designation C504, latest version, except as hereinafter specified, shall be Class 150A or B.

C. The valve body materials shall be epoxy coated inside and out as per AWWA C550. The valve body shall be constructed of close grain cast iron per ASTM A126, Class B or equivalent material. All retaining segments and adjusting devices shall be of corrosion resistant material.

D. Valve seats shall be a natural rubber or synthetic rubber compound. Valve seats shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material.

E. The face-to-face dimensions of valves shall be in accordance with above-mentioned AWWA specification for short-body valve.

F. Should PCU find it necessary to install butterfly valves along mains that are 16 inches in diameter or larger, a 6-inch minimum bypass with one gate valve shall be installed around each valve.

G. The valve shaft shall be turned, ground, and polished constructed of Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one-piece unit extending full size through the value disc and valve bearing or it may be of a stub shaft design.

H. Valve Actuator:

The butterfly valve actuators shall conform to the requirements of AWWA standard

specifications for "Rubber Seated Butterfly Valves, Designation C504", insofar as applicable.

I. Directional opening:

All valves shall open left or counter clockwise.

11.09 VALVE BOXES

A. Standard Three-Piece Cast Iron Valve Box:

Three-piece valve boxes are required for mains less than six feet below finished grade as indicated in the STANDARD DRAWINGS. Valve boxes shall comply with AWWA standards and be provided with suitable heavy duty ductile or cast iron bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by PCU. The barrel shall be screw type only and have a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with ductile or cast iron covers. Ductile or cast iron covers shall have "WATER" cast into the top for all water mains.

B. Valve Box Assembly:

Valve box assemblies, as indicated in the STANDARD DRAWINGS, are required for any size main whenever the top of the valve nut is six feet or deeper below the finished surface elevation that is directly above the valve location. Valve boxes shall comply with AWWA standards and be one complete assembled unit composed of the ductile or cast iron valve box with a 5-1/4 inch barrel shaft, and steel extension stem that attaches to the valve body. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable depths.

C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 ft-lb without failure.

D. Valve boxes, located in roadways with speed limits above 30 miles per hour or on mains that are 16 inches in diameter or larger, shall have locking lids utilizing a five sided nut with a special wrench needed to open. Valve lids to be made as shown in the STANDARD DRAWINGS.

E. A test station box shall be installed into the valve pad for placement of the locating wire. The test station box shall be as specified in the appropriate "Approved Materials Checklist".

F. Locating wire shall be 14-gauge single strand solid core copper wire with insulation. The color of the insulation shall be the same color as the color code for the pipe being installed.

G. Each valve marker shall be made of bronze with each specific valve's information clearly imprinted on its top surface, provided with a hanger pin, and installed in each valve collar as shown in the STANDARD DRAWINGS.

11.10 AIR RELEASE VALVES

A. Valves for use in water mains shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be in stalled in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass.

11.11 FIRE HYDRANT ASSEMBLIES

A. General:

Fire hydrant assemblies shall consist of a fire hydrant, isolation gate valve, and associated piping that are attached to each other and the main by restrained joints. Fire hydrants shall have a minimum of 5-1/4-inch valve opening and shall comply with AWWA Standard C502 for fire hydrants for water works service, unless in conflict with this MANUAL, in which case this MANUAL shall apply. Each hydrant shall have 6-inch mechanical joint ends and shall open by turning to the left (counter-clockwise). The barrel of fire hydrants shall be 36 inches in length below final grade elevation to match main depth installation. Hydrants shall be provided with two 2-1/2-inch hose nozzles and one, 4-1/2-inch pumper nozzle, all having National Standard hose threads. Nozzles shall have caps attached by chains. Operating nuts shall be AWWA Standard pentagonal, measuring 1-1/2-inch point to flat. Fire hydrants shall be equipped with o-ring packing. Fire hydrants shall be supplied without drain holes or with permanently plugged drain holes.

B. Coating and painting:

1. All non-brass parts of the hydrant both inside and outside shall be painted, in accordance with AWWA C-502.

2. The shoe of the hydrant below the ground line shall have a fusion bonded epoxy coating and the barrel of the hydrant below ground shall be coated with a mastic

material.

3. The outside of the hydrant, above the finished ground line, shall be thoroughly cleaned and thereafter painted with one coat of paint of a durable composition, a minimum one additional coat of paint on the body of the hydrant and on the bonnet. The first coat must dry thoroughly before the second coat is applied.

4. The above ground portion of hydrants to be owned and maintained by PCU shall receive with two coats of ultra-violet stabilized International Orange colored paint.

5. The above ground portion of privately owned and maintained hydrants shall receive two coats of ultra-violet stabilized paint in a color that does not replicate the color used by PCU or any other water utility within Polk County.

6. The paint used shall be in accordance with the appropriate "Approved Materials Checklist".

C. Hydrant Reflective Pavement Markers:

Where fire hydrants are located adjacent to paved roadways, each fire hydrant shall have a blue reflective pavement marker located as follows:

1. On undivided paved roadways, 6 inches to the hydrant side of the centerline stripe.

2. On divided paved roadways, 6 inches to the side of the lane stripe which is closest to the hydrant in line with the largest port.

3. On un-striped paved roadways, the center of the roadway (not the driving lane).

Typically, the high impact acrylic markers shall measure 4 inches by 4 inches by 0.68 inches, have a minimum compression rating of 6000 pounds (ASTM D4280-04), and have a maximum acceptable deflection rating of 0.130 inch at 2000 pounds.

The marker shall be securely installed on the pavement using a conventional epoxy adhesive. The blue reflective faces of each marker shall face in both directions of traffic flow.

D. All fire hydrant assemblies shall be covered with black plastic bags until such time that the potable water system has been cleared for service by the FDOH.

All fire hydrant assemblies shall be covered with black plastic bags until such time that the potable water system has been cleared for service by the FDOH.

11.12 HYDRAULICALLY OPERATED CONTROL VALVES

A. Hydraulically operated control valves may be installed in distribution systems that

require automatic or remote control, pressure regulation, solenoid operation, rate of flow control, liquid level control, or check valve operation. Each valve shall consist of a main valve and pilot control system designed and installed in accordance with the STANDARD DRAWINGS and Approved Materials Checklist. The main valve shall be hydraulically actuated, line pressure operated, diaphragm actuated, globe pattern valve. The main valve shall contain an EPDM seat disc contained by a disc retainer and forming a tight seal against removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface.

PART 12 -CONSTRUCTION

12.01 MATERIAL IDENTIFICATION AND TESTING

A. Pipe Identification and Location:

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe, which is not clearly marked, is subject to rejection. The CONTRACTOR shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

2. All PVC pipe and other pipe that is factory color-coded on the outside surface of the pipe shall be identified and locatable as specified in the STANDARD DRAWINGS. All DI pipe, and other pipe not factory color-coded on the outside surface of the pipe, shall be identified and locatable as specified in Appendix A, "STANDARD DRAWINGS". Where the above type of identification method is not considered to be practical by PCU, the pipe shall have a field applied three inch wide permanent blue paint stripe down the top outside center of the pipe along its entire length.

B. Material Testing Requirements:

1. If requested by PCU, a sample of pipe to be tested shall be selected at random by PCU or the testing laboratory hired by PCU.

2. When the samples tested conform to applicable standards, all pipe represented by such samples shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed on the project.

3. In the event that any of the test samples fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test samples from the same shipment or delivery, for each sample that failed and the pipe will be considered acceptable if all of these additional samples meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR's expense.

4. Pipe that has been rejected by PCU shall be removed from the site of the work by the CONTRACTOR and replaced with pipe that meets these specifications.

12.02 SEPARATION OF MAINS

Separation shall be in accordance with the "STANDARD DRAWINGS".

12.03 INSTALLATION OF VALVES

A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of PCU before they are installed.

12.04 NOTIFICATION OF CONNECTION TO EXISTING MAINS

A. PCU shall be notified at least five NORMAL WORKING DAYS in advance to schedule main connections and valve operations. All existing valves are to be operated only by PCU. All valves installed are to remain closed during construction.

The CONTRACTOR shall exercise extreme caution when excavating in proximity of PCU mains. PCU main locations shown on plans are not exact or guaranteed. The CONTRACTOR is responsible for field verifying existing utility locations. PCU dispatch operator shall be notified immediately in the event of a force main, water main, or reclaimed water main break or damage. The CONTRACTOR shall immediately repair all damage to PCU mains, at the CONTRACTOR's expense. If the repair is not made in a timely manner, as determined by the PCU Inspector, PCU may perform repairs and the CONTRACTOR will be charged for repairs.

12.05 WATER SERVICE LOCATION AND IDENTIFICATION

A. The location of all service lines shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact location of each service shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Service" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each service shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Service" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the pavement in accordance with the manufacturer's guidelines approximately 6 inches

from the edge of pavement.

12.06 WATER VALVE LOCATION AND IDENTIFICATION

A. On curbed streets, the exact location of each valve shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Valve" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact location of each valve shall be adequately and permanently identified using durable plastic blue colored pavement markers that states "Water Valve" and "Call Before You Dig" as specified by the appropriate "Approved Materials Checklist". Each marker shall be securely attached to the pavement in accordance with the manufacturer's guidelines approximately 6 inches from the edge of pavement.

12.07 HYDRAULICALLY OPERATED CONTROL VALVES

A. The CONTRACTOR shall furnish and install the valve as specified by the PLANS and in accordance with the STANDARD DRAWINGS.

B. The main valve and the pilot control system shall be factory assembled and tested to determine conformance with the requirements of this Specification section.

C. All settings shall be factory pre-set and verified in the field. Hydraulic pilots shall be tagged with model #, adjustment range, and factory setting.

D. All valves shall be installed according to the valve manufacturer's instructions at the location shown in the PLANS.

E. After installation is complete, operational performance tests shall be conducted in the presence of the manufacturer's representative, CONTRACTOR, and ENGINEER. The manufacturer's representative shall provide training and oversee start-up, testing, and adjustment of the valve to ensure zero leakage, correct installation, and function. Any deficiencies revealed during testing shall be corrected and tests repeated at CONTRACTOR's expense until all tests are passed to the satisfaction of the ENGINEER.

F. Operation and Maintenance Manuals shall be provided by CONTRACTOR.

Raw Water Main Design Standards and Specifications

PART 1 - GENERAL

A. Raw water mains shall be utilized to transport untreated water from a source or sources to a potable water production facility.

PART 2 – LOCATION

A. Refer to “Potable Water Main Design Standards and Specifications”.

PART 3- DESIGN CALCULATIONS

A. Refer to “Potable Water Main Design Standards and Specifications”.

PART 4 - DESIGN

A. Pipe Cover:

A minimum cover of 36 inches shall be provided.

B. Pressure:

Refer to “Potable Water Main Design Standards and Specifications”.

C. Diameter:

Refer to “Potable Water Main Design Standards and Specifications”.

D. Velocity:

E. Refer to “Potable Water Main Design Standards and Specifications”.Design Friction Losses:

Refer to “Potable Water Main Design Standards and Specifications”.

F. Design Pressure and Restraint

Refer to “Potable Water Main Design Standards and Specifications”.

G. Valves:

Refer to “Potable Water Main Design Standards and Specifications”.

H. Air Release Valves:

Refer to “Potable Water Main Design Standards and Specifications”.

I. Control Valves:

Refer to "Potable Water Main Design Standards and Specifications".

J. Restrained Joints:

Refer to "Potable Water Main Design Standards and Specifications". Rev March 2012

K. Separation of Raw Water Mains from other Mains:

Separation of raw water, reclaimed water, potable water, and wastewater system shall comply with FDEP regulations and PCU standards per the STANDARD DRAWINGS.

L. Air Release Valves:

Refer to "Potable Water Main Design Standards and Specifications".

M. Permanent sample stations shall not be required on raw water mains.

N. Pigging (Swabbing) Stations:

Refer to "Potable Water Main Design Standards and Specifications".

PART 5 - CONSTRUCTION

5.01 SCOPE OF WORK

A. These specifications cover the pipes, fittings, and appurtenances used for raw water mains. All materials shall be utilized in accordance with the appropriate "Approved Materials Checklists".

B. The CONTRACTOR shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by PCU, furnish certificates, affidavits of compliance, test reports, or samples for analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

C. Pipe and fitting interior linings shall conform to ANSI/NSF 61 list of approved materials standard.

D. Raw water mains, service piping, and connections shall be installed as indicated in the STANDARD DRAWINGS.

E. The color for raw water pipes and appurtenances shall be as directed by FDOH and in accordance with Section 411, 7.01.A.2 below.

F. Fire hydrant assemblies shall not be installed on any part of a raw water main.

G. Pigging of pipe shall be used to remove foreign materials in lieu of flushing.

PART 6 - PRODUCTS

6.01 PIPE MATERIALS

A. PVC Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

B. Ductile Iron Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

C. HDPE Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

6.02 JOINT MATERIALS

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.03 FITTINGS

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.04 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

A. Fittings:

Refer to “Potable Water Main Design Standards and Specifications”.

B. Pipe:

Refer to “Potable Water Main Design Standards and Specifications”.

C. Additional Applied Exterior Coatings for Above Ground Pipe and Fittings:

Refer to “Potable Water Main Design Standards and Specifications”.

6.05 POLYETHYLENE ENCASEMENT

A. Refer to “Potable Water Main Design Standards and Specifications”.

6.06 CONNECTIONS TO MAIN

A. Refer to "Potable Water Main Design Standards and Specifications".

6.07 RESILIENT SEAT GATE VALVES

A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C509, latest revision, and in accordance with these specifications. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve. Valves shall have a minimum pressure rating of 150 psi.

B. Valves that are 16 inches and larger shall have side actuators. The valve body, bonnet and bonnet cover shall be cast iron ASTM A126, Class B. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550. A two-inch wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C509.

C. Directional Opening:

All valves shall open left or counter clockwise.

D. The valves shall be non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C509. Two stem seals shall be provided and shall be of the o-ring type. The stem nut must be independent of the gate.

E. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the line flow from either direction.

6.08 BUTTERFLY VALVES

A. Typically, butterfly valves shall not be installed within any PCU system, except directly adjacent to storage tanks for isolation purposes.

B. Butterfly valves and operators shall conform to the "AWWA Standard Specifications for Rubber Seated Butterfly Valves", Designation C504, latest version, except as hereinafter specified, shall be Class 150A or B.

C. The valve body materials shall be epoxy coated inside and out as per AWWA C550. The valve body shall be constructed of close grain cast iron per ASTM A126, Class B or equivalent material. All retaining segments and adjusting devices shall be of corrosion resistant material.

D. Valve seats shall be a natural rubber or synthetic rubber compound. Valve seats shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material.

E. The face-to-face dimensions of valves shall be in accordance with above-mentioned AWWA specification for short-body valve.

F. Should PCU find it necessary to install butterfly valves along mains that are 16 inches in diameter or larger, a 6-inch minimum bypass with one gate valve shall be installed around each valve.

G. The valve shaft shall be turned, ground, and polished constructed of Type 304 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one-piece unit extending full size through the value disc and valve bearing or it may be of a stub shaft design.

H. Valve Actuator:

The butterfly valve actuators shall conform to the requirements of AWWA standard specifications for "Rubber Seated Butterfly Valves, Designation C504", insofar as applicable.

I. Directional opening:

All valves shall open left or counter clockwise.

6.09 VALVE BOXES

A. Standard Three-Piece Cast Iron Valve Box:

Three-piece valve boxes are required for mains less than six feet below finished grade as indicated in the STANDARD DRAWINGS. Valve boxes shall comply with AWWA standards and be provided with suitable heavy duty ductile or cast iron bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by PCU. The barrel shall be screw type only and have a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with ductile or cast iron covers. Ductile or cast iron covers shall have "RAW" cast into the top for all water mains.

B. Valve Box Assembly:

Valve box assemblies, as indicated in the STANDARD DRAWINGS, are required for any size main whenever the top of the valve nut is six feet or deeper below the finished surface elevation that is directly above the valve location. Valve boxes shall comply with AWWA standards and be one complete assembled unit composed of the ductile or cast iron valve box with a 5-1/4 inch barrel shaft, and steel extension stem that attaches to the valve body. All moving parts of the extension stem shall be enclosed in a

housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable depths.

C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 ft-lb without failure.

D. Valve boxes, located in roadways with speed limits above 30 miles per hour or on mains that are 16 inches in diameter or larger, shall have locking lids utilizing a five sided nut with a special wrench needed to open. Valve lids to be made as shown in the STANDARD DRAWINGS.

E. A test station box shall be installed into the valve pad for placement of the locating wire. The test station box shall be as specified in the appropriate "Approved Materials Checklist".

F. Locating wire shall be 14-gauge single strand solid core copper wire with insulation. The color of the insulation shall be the same color as the color code for the pipe being installed.

G. Each valve markers shall be made of brass with each specific valve's information clearly imprinted on its top surface, provided with a hanger pin, and installed in each valve collar as shown in the STANDARD DRAWINGS.

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6.10 AIR RELEASE VALVES

A. Valves for use in water mains shall be single body automatic air release valves designed to release large quantities of air at start up, admit air on shut down, and release air in operation. Automatic combination air and vacuum release valves shall be utilized to prevent both air locking and vacuum formation. Valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Valves must be installed in an enclosure as shown on the STANDARD DRAWINGS. Fittings from the main to the valve in the enclosure shall be threaded and made of brass.

PART 7 - EXECUTION

7.01 MATERIAL IDENTIFICATION AND TESTING

A. Pipe Identification and Location:

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. DI pipe shall meet all applicable requirements of AWWA C151. Pipe, which is not clearly marked, is subject to rejection. The CONTRACTOR shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

2. All PVC pipe and other pipe that is factory color-coded on the outside surface of the pipe shall be identified and locatable as specified in the STANDARD DRAWINGS. Olive green is the material identification color established by FDOH for raw water pipe. All DI pipe, and other pipe not factory color-coded on the outside surface of the pipe, shall be identified and locatable as specified by the "STANDARD DRAWINGS. Where the above type of identification method is not considered to be practical by PCU, the pipe shall have a field applied three inch wide permanent paint stripe down the top outside center of the pipe along its entire length. Identification color shall be olive green in accordance with the requirements established by the FDOH.

B. Material Testing Requirements:

1. If requested by PCU, a sample of pipe to be tested shall be selected at random by PCU or the testing laboratory hired by PCU.

2. When the samples tested conform to applicable standards, all pipe represented by such samples shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed on the project.

3. In the event that any of the test samples fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test samples from the same shipment or delivery, for each sample that failed and the pipe will be considered acceptable if all of these additional samples meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR's expense.

4. Pipe that has been rejected by PCU shall be removed from the site of the work by the CONTRACTOR and replaced with pipe that meets these specifications.

7.02 SEPARATION OF MAINS

A. Separation shall be in accordance with the "STANDARD DRAWINGS".

7.03 INSTALLATION OF VALVES

A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in

the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of PCU before they are installed.

7.04 NOTIFICATION OF CONNECTION TO EXISTING MAINS

A. PCU shall be notified at least five NORMAL WORKING DAYS in advance to schedule main connections and valve operations. All existing valves are to be operated only by PCU. All valves installed are to remain closed during construction.

The CONTRACTOR shall exercise extreme caution when excavating in proximity of PCU mains. PCU main locations shown on plans are not exact or guaranteed. The CONTRACTOR is responsible for field verifying existing utility locations. PCU dispatch operator shall be notified immediately in the event of a force main, water main, or reclaimed water main break or damage. The CONTRACTOR shall immediately repair all damage to PCU mains, at the CONTRACTOR's expense. If the repair is not made in a timely manner, as determined by the PCU Inspector, PCU may perform repairs and the CONTRACTOR will be charged for repairs.

7.05 VALVE LOCATION AND IDENTIFICATION

A. The location of all valves shall be as shown on the STANDARD DRAWINGS. On curbed streets, the exact longitudinal location of each valve shall be adequately and permanently identified using durable blue colored A-TAG style pavement markers that states "Raw Water Valve" and "Call Before You Dig" that are securely installed into the curb in accordance with the manufacturer's guidelines approximately 6 inches from the top of the curb.

B. Where no curb exists, the exact longitudinal location of each valve shall be adequately and permanently identified using durable blue colored A-TAG style pavement markers that states "Raw Water Valve" and "Call Before You Dig" that are securely installed into the pavement in accordance with the manufacturer's guidelines approximately 3 inches from the edge of pavement.

Testing and Inspection for Acceptance

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. These specifications cover the testing and inspection for the acceptance of water systems.

B. Hydrostatic tests shall be conducted for pressure pipes, joints, fittings and valves for allowable limits of pressure and leakage. Air testing of pressure pipes will not be permitted under any circumstance.

C. Requests for testing and acceptance of water systems shall follow the procedure in listed in the Section entitled “Field Testing and Inspection Procedures”.

D. The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, grit, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing and chlorinating of a new pipeline swabbing shall be utilized as specified on the construction plans for each project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TESTS

A. Swabbing

1. All mains shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand, and debris from main.

2. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the CONTRACTOR to provide and remove temporary access and egress points for the cleaning, as required.

3. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled, and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

4. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test.

5. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.

6. The CONTRACTOR shall locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.

7. At the receiver or exit point for the poly swab, the CONTRACTOR is responsible for creating a safe environment for collection of debris, water, and the swab. The CONTRACTOR shall provide for the protection of surrounding personnel and property and the safe retrieval of the swab.

8. Only PCU personnel shall operate the supply valve from the existing distribution system. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab is retrieved.

    a. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
    b. Swabbing speed shall range between two and five feet per second. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

B. Hydrostatic Pressure Testing of Ductile Iron and PVC Pressure Pipe:

1. Hydrostatic pressure tests shall consist of a pressure test and leakage test for non-butt welded jointed pipes. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops and fire hydrants assemblies. Testing shall be performed from in-line valve to in-line valve with a depressurized section behind each valve, whenever possible.

    a) All pipe sections to be pressure tested shall be subjected to a minimum hydrostatic pressure of 150 psi. The duration of each pressure test shall be for a period of two hours. If during the test, the integrity of the tested line is in question, PCU may require a six-hour pressure test. The basic provisions of AWWA C600 shall be applicable.

    b) All testing and the quantity of acceptable leakage shall be documented and certified using the appropriate Pressure Test Form.

    c) Water supply from the existing distribution system shall be provided through a jumper connection consisting of fittings, a reduced pressure zone cross connection control assembly, and installed as shown in the STANDARD DRAWINGS.

d) Procedure for Pressure Test:

Pipe to be tested shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Provisions shall be made to expel air entrapped in the pipe before applying the specified test pressure. To accomplish this, taps shall be made, and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replace by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained. Provisions of AWWA C600 and C651, where applicable, shall apply.

2. Procedure for Leakage Test:

a) After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C600 shall apply.

b) Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{ND(P)^{1/2}}{7{,}400}$$

Note:
L - Allowable leakage in gallons per hour.
N - Number of joints in the tested line.
D - Nominal diameter of the pipe in inches.
P - Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved off section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, the CONTRACTOR shall locate and replace or repair the defective joints, pipe or valve until the leakage from subsequent testing is within the specified allowance.

C. Hydrostatic Pressure Testing of HDPE and Fusible PVC Pressure Pipe:

1. After installation, the butt welded jointed pipe shall be tested in accordance with this MANUAL with the following modifications:

a) Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure, shall not exceed five hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be

depressurized and allowed to "relax" for a minimum of eight hours before it is brought back up to test pressure.

b) Prior to Hydrostatic Pressure Testing Procedure:

i. Hydraulically clean the main to be tested with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.
ii. Insure that main to be tested is restrained against horizontal and vertical movement. Exposing joints only is allowed.

c) Hydrostatic Pressure Testing Procedure:

i. Fill main slowly with water to remove air.
ii. Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.
iii. Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.
iv. Reduce pressure by 10 psi and monitor for 1 hour.
v. Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

D. The CONTRACTOR shall furnish all necessary equipment and material, make all taps and furnish all closure pieces in the pipe as required. Equipment to be furnished by the CONTRACTOR shall include graduated containers, pressure gauges, hydraulic forces pumps, and suitable hoses and piping. The PCU representative shall monitor a satisfactory test.

E. The CONTRACTOR may conduct preliminary hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified. Where any section of pipe is provided with concrete thrust collar, pressure test will not be made until at least five days have elapsed after the thrust collar is installed.

F. Disinfection:

1. Newly installed mains shall be filled, flushed, and disinfected in accordance with the ANSI/AWWA C651. During the chlorination period, valves, hydrants and appurtenances in the treated section shall be operated to ensure they are disinfected with the new main. Before being placed into service, new mains or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 25 milligrams per liter and that a chlorine residual of not less than 10 milligrams per liter remains in the water after

standing 24 hours in the pipe. The free residual chlorine concentration shall be monitored, documented and certified for the initial application and after a 24-hour contact period. The testing/monitoring location points, the disinfection process utilized and free chlorine residuals shall be documented and certified using a PCU approved Disinfection Certification Form.

2. The interior of all pipe and fittings, including couplings and fittings, used in making repairs and connections in shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed.

G. Final Flushing and Testing:

1. Following chlorination, all treated water shall be thoroughly flushed from the new main. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine. Flushing shall take place until, upon testing, the free chlorine residual obtained is not in excess of that normally carried in the system.

2. Water samples shall be collected from the approved sampling points. Each sample result shall show acceptable bacteriological results for two consecutive days. The CONTRACTOR shall have all testing conducted by a private laboratory that is certified by the State of Florida.

3. Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of PCU personnel.

4. Copies of testing results and all related correspondence with the FDEP shall be submitted to PCU.

H. The distribution system piping is to remain isolated and out of service until PCU receives clearance from FDEP.

I. Repetition of Flushing and Testing:

Should the initial treatment result in an unsatisfactory bacterial test, the CONTRACTOR shall repeat the original disinfection procedure until satisfactory results are obtained.

PART 4 - ACCEPTANCE

4.01 LOCATE WIRE CHECK

A. The locating wire will be inspected and tested for continuous continuity along the entire length of the main and correct material as specified in the appropriate "Approved Materials Checklist".
B. Valve locations will be inspected for the proper installation of the locating wire in accordance with the STANDARD DRAWINGS and tested for continuity between the main and the valve.

4.02 FIRE HYDRANTS

A. Fire hydrants will be tested for smooth operation. Fire hydrant assemblies shall be inspected for absence of leakage from any ports, joints, and or fittings in the hydrant assembly to the main. PCU shall confirm that hydrants are painted the correct colors as stated in the Section entitled "Potable Water System Standards and Specifications", installed as shown in the STANDARD DRAWINGS, and located in accordance with the RECORD DRAWINGS.

4.03 VALVES

A. Valves will be operated to verify a smooth and correct operation, plus the correct direction of opening. PCU shall confirm the location in accordance with the RECORD DRAWINGS and installed in accordance with the STANDARD DRAWINGS.

4.04 VALVE BOXES

A. Valve boxes will be inspected to ensure they are clear of debris, centered over the operating nut, and installed with a collar as shown in the STANDARD DRAWINGS. The depth of the operating nut will be measured to finished grade to confirm that a riser is installed or not required. Valve boxes shall meet the material standards listed in the appropriate "Approved Materials Checklist".

4.05 SERVICE LINES

A. Service lines shall be properly identified, free from conflicts with any structure, installed as shown in the STANDARD DRAWINGS, and the number location and size is as shown on the RECORD DRAWINGS to serve all intended properties. The materials shall be as listed in the appropriate "Approved Materials Checklist".

4.06 BLOW OFF VALVE ASSEMBLIES

A. Blow off valve assemblies shall be free from any conflicts with any structures, installed in accordance with the STANDARD DRAWINGS, located as shown in the RECORD DRAWINGS and tested to ensure correct operation. The materials shall be as listed in the appropriate "Approved Materials Checklist".\

4.07 AUTOMATIC AIR RELEASE VALVE ASSEMBLIES

A. Valve assemblies shall be free from any conflicts with any structures, installed in accordance with the STANDARD DRAWINGS, and located as shown on the RECORD DRAWINGS tested to ensure correct operation and confirm materials as listed in the appropriate “Approved Materials Checklist”.

CHAPTER 4 **WATER** **Section 450-B**

Approved Materials Checklist

PLEASE TYPE OR PRINT CLEARLY IN BLACK INK

Project Name: _____

PCU Project File Number: _____

Contractor's Name: _____

Contractor's Address: _____

Contractor's Signature: _____

Engineer's Name: _____

Engineer's Address: _____

PCU Reviewer: _____ Date: _____

Approved: ____ Denied/Resubmit: ____

Comments:
_____
_____
_____
_____
_____
_____

With the submission of this document, the CONTRACTOR understands that the use of the following selected items, as individually indicated by the use of an "X", is mandatory.

Substitutions using other items contained within this Checklist shall be initiated by the CONTRACTOR submitting a revised Checklist to PCU for its review and approval at least 10 calendar days in advance of need.

It is also understood by the CONTRACTOR that PCU shall reject materials and products not in accordance with this document and the MANUAL. Any material or product not contained within this Checklist shall be approved in advance by the Utilities Code Committee in accordance with the provisions of the Utilities Code.

Shop drawings shall be required for all structures and similar items not contained on this checklist, such as manholes, wet wells, and other castings.

Approved Materials Checklist

Four (4) sets of the CONTRACTOR's and ENGINEER's executed APPROVED MATERIALS CHECKLIST and any necessary shop drawings shall be submitted to PCU for its use and approval, plus the number of sets needed for the CONTRACTOR use. Ordering materials and products without specific written approval from PCU of the submitted list and shop drawings is NOT recommended and is done at the CONTRACTOR's sole expense and responsibility.

NOTE: The latest changes approved by the Utilities Code Committee are indicated by "underlining" and deleted items by "~~strikethroughs~~".

Water Category 1 of 10: VALVES AND ACCESSORIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Combination Air / Vacuum Release Valves:			
	ARI	D-040	Combination
	ARI	S-050	Air Release Only
	ARI	S-010	Air Release Only
	Val-Matic	VM-38	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-45	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-200C	Combination – Plant, Facility Use Only
Air / Vacuum Release Valve Enclosure (Horizontal Venting and Medium Blue):			
	Water Plus	131632	
	Channell	BPH 1730	
	Hydro-Guard	Safety-Guard 15100 Low Profile or 02100	
Air / Vacuum Release Valve Vault Frame And Cover:			
	US Foundry	USF-679-BK-M	
	CertainTeed	Pamrex 36"	Alternative – Not to be used in paved roadways.
Blow Off Valve:			
	Hydro Guard	HG-2 Low Profile	Automatic Blow Off (Self-contained unit)
	Charles Multi-Purpose Housing (CMPH) with individual parts to assemble	Series CMPH 5500 (Enclosure)	Alternative to all-in-one blow off valves.
		Solorain 8014N Programmable Actuator	Enclosure color may be

Approved Materials Checklist

		HRC-990-SD-MD Latching Solonoid for HRC 990 Controller	Sand Stone or Granite. Assembly required
		HRC-990-04-MS Hydro-Rain 1-4 Zone Battery Controller	
		205T Glove Valve Npt Threads without FC Irritrol	
	Channell Budget Pedestal Housing (BPH) with individual parts to assemble	Series BPH 1230 (Enclosure)	Alternative to all-in-one blow off valves Enclosure color may be Sand Stone or Granite. Assembly required
		Solorain 8014N Programmable Actuator	
		HRC-990-SD-MD Latching Solonoid for HRC 990 Controller	
		HRC-990-04-MS Hydro-Rain 1-4 Zone Battery Controller	
		205T Glove Valve Npt Threads without FC Irritrol	
Butterfly Valves 42-inch And Larger: (8 mil Epoxy Coated, Lined (AWWA), And For On-Site Water Production Facility Use Only):			
	M & H	4500	
	Mueller/Pratt	Linseal III / BV (Ground Hog)	
Butterfly Valves 16-inch And Larger: (Rubber Seated (AWWA):			
	Val-Matic	2000	To be utilized as directed by PCU.
Gate Valves 16-inch Through 48-inch (Resilient Seated Only With Side Actuators):			
	American Flow Control	Series 2500	
	Mueller	Series A-2361	
	M & H	Series 4067	
Gate Valves 12-inch And Smaller (Resilient Seated Only):			
	American Flow Control	Series 2500	
	M & H	Series 4067	
	Mueller	Series A-2360	
	Clow	Series F-6100	
Hydraulically Operated Control Valves (Pressure Reducing/Sustaining Valves):			
	Cla-Val		Model or Series based on field application.
	OCV		Model or Series based on field application.

Approved Materials Checklist

	Watts/Ames		Model or Series based on field application.
Sample Station (Above Grade) (Blue in Color):			
	Water Plus	Series 301W	May be used as an alternative to the field assembled sample station.
	Hydro-Guard	Safety-Guard SGBSS-05 SS or -06 SS with S300 Enclosure	May be used as an alternative to the field assembled sample station.
Tapping Valves (Resilient Seated Only):			
	American Flow Control	Series 2500	
	M & H	Series 4751	
	Mueller	Series T-2360 & T-2361	
	Clow	Series F-6114	
Insertion Valves - MJ/Ductile Iron RWGV (In Place of Line Stop/Tapping Sleeve)			
	Team Industrial Products	InsertValve	Available 4” through 12”
Test Station Box For Buried Valves:			
	Bingham/Taylor	P200NFG2T	
Valve Boxes with Lids (5¼ -Inch, ASTM A48 30B Cast or Ductile Iron, With “WATER” cast into the lid top):			
	Bingham / Taylor Foundry	4905-X, 4905, 4904L	
	Tyler	Series 6850	
	American Flow Control*	Trench Adapter Models 1 through 9	* For mains with valve nuts that are 6’ or deeper.
	Sigma	VB261, VB262, VB264, VB4650W	
	Mueller	MVB	Use w/ AJBV-4” Locking Bolt
	Star		Heavy Duty Screw or Slip Type

Approved Materials Checklist

Water Category 2 of 10: SERVICE MATERIALS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Angle Stops Ball Type (1-inch And 2-inch CTS OD Tubing By 5/8-inch By ¾-inch And 2-inch Meter):			
	Ford	BA43-242W, BFA43-777W	
	Mueller	P24258, P24276	
	McDonald	4642B-22, 4602B-22	
Angle Stops Ball Type (3/4-inch FIP By 5/8-inch By 3/4-inch Meter):			
	Ford	BA13-232W	
	Mueller	B24265R	
	McDonald	4604B	
Corporation Stops Ball Type (1-inch and 2-inch With AWWA Iron Pipe Threads Only/Pack Joint Outlet For CTS):			
	Ford	FB1000	
	Mueller	P25008	
	McDonald	4701B-22	
Curb Stops Straight Valves (Curb Stop To Be Ball Type, Reduced Port FIP By FIP 3/4-inch By 3/4-inch):			
	Ford	B11-233W	
	Mueller	B-20200-R	
	McDonald	6101W	
Curb Stops Straight Valves (Ball Type Compression By Meter, 1-inch And 2-inch CTS OD Tubing By 5/8-inch By ¾-inch Meter):			
	Ford	B43-342W, BF43-777W	
	Mueller	P24350, B24337, B24335	
	McDonald	6100MW-22	
Curb Stops Straight Valves (Ball Type Compression By Compression):			
	Ford	BA44-444W	
	Mueller	P25146	
	McDonald	6100W-22	
Dual Check Valve (Two Independently Acting Spring-Loaded Check Valves)			
	Apollo	4NLF-3C5-5B	For ¾-inch Meter
	Apollo	4NLF-3S6-5B	For 1-inch Meter
Polyethylene Tubing (Blue With UV Protection [SDR-9] 1-inch And 2-inch Only):			
	Endot	PE-4710 EndoPure	

Approved Materials Checklist

	Endot	PE-4710 EndoTrace	Alternative Pipe and Locating Wire Combo
	Charter Plastics	PE-4710	
	ARNCO	PE-4710 Perma-Guard	
	ARNCO	PE-4710 Perma-Find	Alternative Pipe and Locating Wire Combo
	ADS	CTS PE4710	Service Tubing
Service Saddles (Epoxy Or Nylon Coated Ductile Iron Body with Stainless Steel 18-8-Type 304 Straps, CC Threads – 2-inch To Be Iron Pipe Threads Controlled OD Saddles To Be Used On C-900 And IPS OD PVC Pipe, Double Straps To Be 2-inch Minimum Width Each):			
	Ford	Series FC202	
	JCM	Series 406	
	Mueller	DR2S, DR2SOD	
	McDonald	3855, 3855	
	Cascade	CNS 1, CNS 2	
	Romac	202N	
	Romac	202N-H	For Use With HDPE Pipe
Y Branch (1-inch By 2-inch):			
	Ford	U-48-43	
	Mueller	P15363	
	McDonald	08U2M	
Y Branch Assemblies With Angle Ball Valves (1-inch By 2-inch):			
	Ford	UVB43-42W	
	Mueller	P15363-05	
	McDonald	09U2BW	
Meter Boxes w/ Cast Iron Lids (Black, HDPE):			
	Carson	10152026 (Box) 10151033 (Combo)	10154018 (Lid)
	DFW Alliance	DFW1200-12-Body (Box) DFW1200-12-1C (Combo Unit)	DFW1200-1C-LID (Lid)

Approved Materials Checklist

Water Category 3 of 10: PIPE MATERIAL			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Casing Spacers (All Sizes) Stainless Steel With Vinyl Runners:			
	Cascade	Series CCS / CCPS / AZ	
	PSI	Series S-G-2	
	PSI-Ranger	Ranger II	
	RACI	S/T, F/G, P/Q, M/N, E/H	
	CCI	CSS8, CSS12	
	Advanced Systems		
Ductile Iron Pipe Cement Lined (4-inch To 12-inch = PC 350, 16-inch To 20-inch= PC 250, 24-inch = PC 200, 30-inch To 64-inch = PC 150) (DI Flanges As Applicable, AWWA C115):			
	American		
	Clow		
	Griffin		
	McWane		
	US Pipe		
Paint: Aerial Pipe, Fittings, And Valves (Field and Factory Primer):			
	Color Wheel	635 Primer Red	
	Glidden	Alkyd Metal Primer	
	Porter/International	286 U-Primer	
	Tnemec	37H-77 Chem-Primer	
	Tnemec	Pota-Pox Plus N140	
	Wasser	Ferro Clad Primer	
Paint: Finish (Exterior):			
	Color Wheel	600 Alkyd Enamel	
	Glidden	Alkyd Industrial Enamel	
	Porter/International	2749 Alkyd Gloss	
	Tnemec	Tnemec - Gloss 2H	
	Tnemec	Pota-Pox 100 Series 22	
PVC (Blue) 4-inch Through 12-inch Pipe (AWWA C-900, DR18) and 16-inch and larger pipe (AWWA C-905 or C-909, DR 25):			
	Bristolpipe	4” to 12”	
	Certainteed	Certa-Lok 4” to 12”	
	Diamond Plastic		
	Ipex		
	JM-Eagle		

Approved Materials Checklist

	National Pipe		
	NAPCO		North American Pipe Company
	Upinor ETI 9	Ultra Blue-C-909	
	Underground Solutions	Fusible PVC	For Horizontal Directional Drill Use Only
HDPE Pipe DR11 (Blue Striped):			
	Chevron/Phillips	Performance Pipe / ISCO Pipe	
	CSR	Polypipe/Charter Plastics	
	JM-Eagle		
	National Plastics		
	ARNCO		
Potable Water Main Identification Tape (Blue, 6-Inches Wide, 2-Inch High Black Lettering, Adhesive Backed):			
Buried Potable Water Main Warning Tape (Blue, 3-inches Wide, 1-Inch High Black Lettering, Non-Adhesive Backed):			
Locating Wire (Single Strand 14-Gauge Solid Copper Wire with Blue Colored Insulated Covering):			
	Copperhead	Reinforced Locating Wire	Alternative
Locating Marker Systems (Potable Water) (Blue In Color):			
	3M	Scotch Mark EMSII Electronic Marker Blue Locator #1265	
	3M	Scotch Marker Electronic Ball Marker #1404	
Curb and Pavement Markers (Blue in Color, Imprinted With The Words "POLK COUNTY UTILITIES" And "CALL 811 BEFORE YOU DIG" With "POTABLE WATER SERVICE" or "POTABLE WATER VALVE" As Applicable):			
	Rhino	ATAGNCT-C (Custom Imprinting)	New Construction
	Rhino	ATAGRFT-C (Custom Imprinting)	Retrofit to Existing Improvements
	DAS Manufacturing	Reflective Duracast Style (Custom Imprinting)	New Construction or Retrofit

Approved Materials Checklist

Water Category 4 of 10: PIPE FITTINGS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Expansion Joints:			
	EBAA Iron		
	Metraflex		
	Star	Star Flex Series 5000, 5100, & 5200	
	Proco		
	Mercer Rubber		
Fittings C153 SSB / C110 Flange (Cement Mortar Lined And Asphaltic Coated In Accordance With C104) (Outside Surfaces Shall Be Prime Coated Only If Located Aboveground And Painted):			
	American		
	Union/Tyler		
	US Pipe		
	Serampore Industries (SIP)		
	Sigma		
	Star Pipe		
Restrained Joints - Ductile Iron Pipe:			
	American	Fast Grip Gasket Flex Ring Field Flex Ring Lok Ring	
	EBAA Iron Inc.	Mega-lug Series 1100 Series 1700 Bell Restrainer Series RS-3800 Restrainer - sleeve included	
	Serampore Industries (SIP)	EZ Grip	For DI Pipe
	Sigma	One LOK SLD	
	Sigma	LOK Series PVP and PVPF	

	Star	Stargrip Series 3000, 3000S,& 3000OS Series 3100S & 3100P Flange Adapter Series 200 & 400 Retainer Gland Series 600 Series 1000, 1100, & 1200 Adapter Flange Series 3200 & 4200	
	Tyler/Union	Tuf Grip TLD Series 1000, 1000S Tuf Grip Dual Wedge Restraint Series 1500	For DI Pipe Use For PVC, DIP, HDPE pipe use
Restrained Joints - PVC Pipe:			
	EBAA Iron Inc.	Mega-lug Series 2000PV Series 1500 & 1600 Bell Restrainer (4-inch to 12-inch) Series RS-3800 Restrainer – sleeve included	
	JCM	620 Sur-Grip Bell Joint 621 Sur-Grip Bell Joint	
	Uni-Flange/Ford	1350 Bell Restrainer 1360 Bell Restrainer 1390 Bell Restrainer 900 Adapter Flange 1300 Fitting Restrainer 1500 Series	
	Serampore Industries (SIP)	EZ Grip	For PVC
	Sigma	One LOK SLC	
	Sigma	PV LOK Series PVP and PVPF	
	Star	PVC Stargrip Series 4000 & 4000P PVC Harness Series 1000, 1100, & 1200 Adapter Flange Series 3200 & 4200 Adapter Flange Series 200 & 400	

	Tyler/Union	Tuf Grip TLP Series 2000, 2000S Tuf Grip Dual Wedge Restraint Series 1500 Bell Joint Restraints Series 3000: 32U, 33U, 34U, 35U	For PVC Pipe Use For PVC, DIP, HDPE pipe use For PVC Pipe Use
Tapping Sleeves (For All Taps On IPS OD PVC pipe, Including Size On Size (18-8 Type 304 Stainless Steel Body, Flange And Bolts), Flange To Accept Standard Tapping Sleeves):			
	Ford	Series FTSS	
	JCM	Model 432	
	Mueller	Series H-304 S/S	
	Cascade	CST-EX	
	Total Piping Solutions	Triple Tap	
Tapping Sleeves (Mechanical Joint For All Taps On Cast Iron, Ductile Iron, PVC-900 & AC Pipe, All Taps Including Size On Size):			
	American Flow Control	Series 2800	
	Mueller	Series H-615, H-616, H-619	
	JCM	Series 432	
	Total Piping Solutions	Triple Tap	
Tapping Sleeves (Fabricated Steel, Mechanical Joint, Fusion Bonded Epoxy Coated):			
	JCM	Series 414	

Water Category 5 of 10: FIRE HYDRANT ASSEMBLIES			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Fire Hydrants (5 1/4 Inch Valve Opening, Final Exterior Color - Painted International Orange):			
	American Flow Control	B-84-B	
	Kennedy	K81A	
	Mueller	Super Centurion 250	
Anti-Terrorism Valve for Fire Hydrants (5 1/4 Inch Valve Opening) (For Installation in New and Existing Non-HS Type Fire Hydrants):			
	Davidson	ATV	To be utilized as directed by PCU for potable water system security purposes.

Approved Materials Checklist

Water Category 6 of 10: VALVES AND ACCESSORIES (PLANTS AND REMOTE FACILITIES)			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Automatic Combination Air / Vacuum Release Valves:			
	Val-Matic	VM-38	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-45	Air Release Only – Plant, Facility Use Only
	Val-Matic	VM-200C	Combination – Plant, Facility Use Only
Gate Valves, Butterfly Valves			
	DeZurik	BAW Series Butterfly	According to Application.
	DeZurik	Knife Gate Valve	According to Application
	Val-Matic	American BFV Butterfly	According to Application.
	Val-Matic	Ductile Iron RSGV	According to Application.
Valve Actuators			
	Beck	Model 11	Remote Indication or Position Display According to Application
	Auma	SA	Remote Indication or AumaMatic, According to Application
Hydraulically Operated Control Valves (Pressure Reducing/Sustaining Valves):			
	Cla-Val		Model or Series based on field application.
	OCV		Model or Series based on field application.
	Watts/Ames		Model or Series based on field application.

Approved Materials Checklist

Water Category 7 of 10: PUMPS, CHEMICAL FEED SYSTEMS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Vertical Turbine			
	Goulds		
	Flowserve	VIC, VIT, SMVT, or DWT	based on application.
	Deming		(AKA: Process Systems, Inc.)
	National		
Centrifugal/Split Case			
	Aurora		
	Flowserve		
	Goulds		
Chemical Pumps			
	Prominent		Appropriate series based on flow rate. Degassing heads for NaOCl.
Skid, Shelf Mounted Feed Systems			
	Blue Planet		Utilize "Polk County" junction box with hour meter/operating indication.
Chemical Tanks			
	Snyder	Captor/Dual Containment	HDLPE with NaOCl Resin
	Poly Processing Co.	Saf-T tank,	XLPE with OR 1000 Inner Coating

Approved Materials Checklist

Water Category 8 of 10: TANKS and GENERATORS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Pre-stressed Concrete Tanks			
	Crom		
	Pre-con		
Hydro-pneumatic			
	Modern Welding		15,000 gallons unless otherwise determined by PCU. All coatings shall be approved by Polk County Utilities in accordance with NSF, AWWA, FDEP or other recognized authority for potable water service.
Standby Power Generators			
	Kohler		3-Ph, 480V Diesel
	Caterpillar		3-Ph, 480V Diesel
	Cummins		3-Ph, 480V Diesel
Fuel Tanks (Stand-alone)			
	Convault		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Modern Welding		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.
	Phoenix		Pneumercator level/leak detection systems also required. LC 1000 w/ LS600 and LS610.

Approved Materials Checklist

Water Category 9 of 10: FLOW METERS			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
Flow Meters (Electro-magnetic)			
	Siemens	Sitrans FM Mag, 5000 series unless using bussed network.	
	ABB	WaterMaster Series	
	Foxboro	9100A w/ IMT 25	

Water Category 10 of 10: ELECTRICAL			
ITEM TO BE USED	**Manufacturer**	**Part Number**	**Comments**
VFDs, Relays, Breakers			
	Schneider-Electric	Square D	
Security/Surveillance System			
	Axis		Camera/Equipment
	Bosch		Camera/Equipment
	Pelco		Camera/Equipment
	Exaqvision		Software

Water System Hydrostatic Pressure Test Report (PVC and Ductile Iron Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in strict conformance with AWWA standard C600, latest revision. Maximum allowable leakage shall be: $L = \frac{ND(P)^{1/2}}{7,400}$

Where:
L = maximum allowable leakage, measured in gallons per hour
N = number of joints in the tested line (where a pipe joins a pipe or a pipe joins a fitting)
D = nominal diameter of pipe, measured in inches
P = test gauge pressure, measured in pounds per square inch (minimally 150 psi)
(For a 2-hour test at 150 psi, equation simplifies to: L = ND x 0.00331)

TESTING PARAMETERS & SYSTEM INFORMATION

Test Pressure (minimally 150 psi):			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 2 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	
Test Segment Location:			

Pipe Type	Diameter, inches	Length, feet	Number of joints	Max. Leakage for 2 Hour Test, gallons
Total Maximum Allowable Leakage, gallons:				
Total Actual Leakage, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

Water System Hydrostatic Pressure Test Report (HDPE Pipe)

Project: _____

PCU Project No.: _____

Procedures for conducting this test shall be in accordance with ASTM F 2164 and AWWA Standard C600, latest revision, where applicable. Pneumatic Testing is strictly prohibited.

Prior to Hydrostatic Pressure Testing Procedure:

1) Hydraulically clean the main to be tested with a polypropylene swab (pig) to remove dirt, sand, and debris from the main prior to hydrostatic testing.
2) Insure that the main to be tested is restrained against horizontal and vertical movement. Exposure of end connection joints only may be allowed.

Hydrostatic Pressure Testing Procedure:

1) Fill main slowly with water to remove air.
2) Pressurize up to 1.5 times the Pressure Class of the pipe used at the lowest point of the main being tested.
3) Maintain for 4 hours while adding water as needed in non-monitored amounts as pipe will expand while until pressure.
4) Reduce pressure by 10 psi and monitor for 1 hour.
5) Main passes if there are no leaks within 5 percent of the remaining pressure after reduction.

Disinfection is to be performed in accordance with AWWA Standard C651.

TESTING PARAMETERS & SYSTEM INFORMATION

Calculated Test Pressure:			psi
Beginning Test Pressure:	psi	Ending Test Pressure:	psi
Test Duration (minimally 5 hours):		Hours:	
Date of Test:			
Time at Start of Test:		Time at End of Test:	

Diameter, inches	Length, feet	Pressure Class, psi	Test Segment Location

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		

Water System Pigging Report

Project: _____

PCU Project No.: _____

Procedures for pigging the system shall be in strict conformance with the Polk County Utilities Standards and Specifications Manual.

PIGGING PARAMETERS & SYSTEM INFORMATION

Date of Pigging:			
Time at Start of Pigging		Time at End of Pigging:	
Pigged Segment Location:			
Pig Outside Diameter:		Pig's Maximum % Compression of Full Size:	
Pig Exterior Material Composition:		Pig Interior Material Composition:	
Pig Manufacturer:			

Pipe Type	Diameter, inches	Length, feet	Number of Times Pigged	Estimated Amount of Water Used for Pigging, gallons
Total Estimated Amount of Water Used for Pigging, gallons:				
Total Actual Amount of Water Used for Pigging, gallons:				

CONTRACTOR & INSPECTOR PERSONNEL INFORMATION

	Contractor	Inspector
Signature:		
Printed Name:		
Company Name:		
Phone Number:		
Date:		

APPENDIX A

VACUUM TEST HOLE REPORT

CIVILSURV
A Tradition of Innovative Engineering

2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 1

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

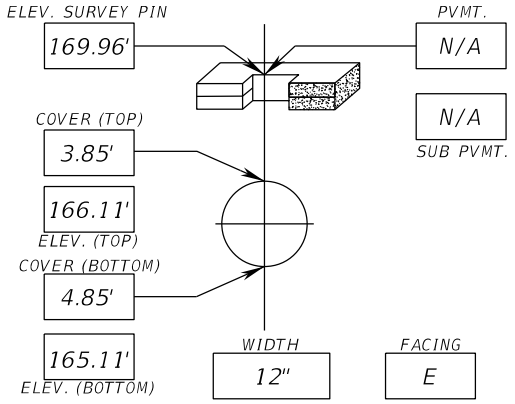
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: WHITE PVC

SIZE AS FOUND: 12"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/18/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

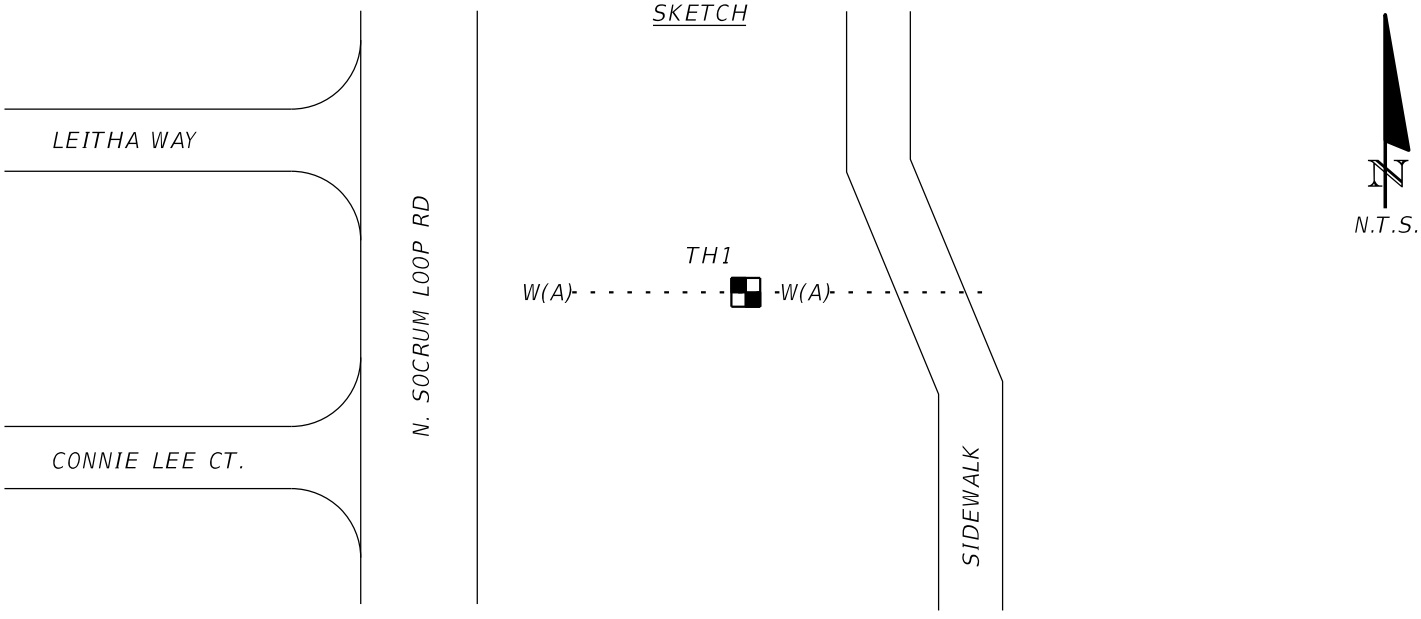
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 12" PVC WATERLINE
RUNNING EAST/ WEST TO SCHOOL

(LOCATE #1)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 2

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

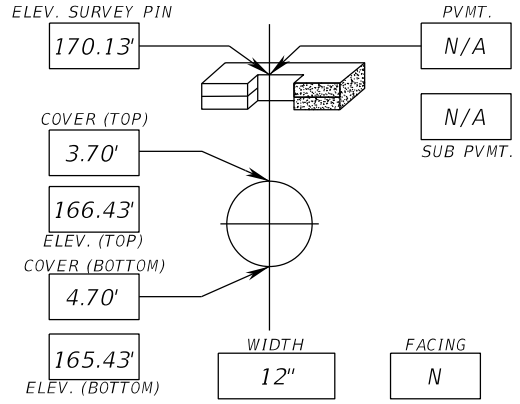
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 12"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/18/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

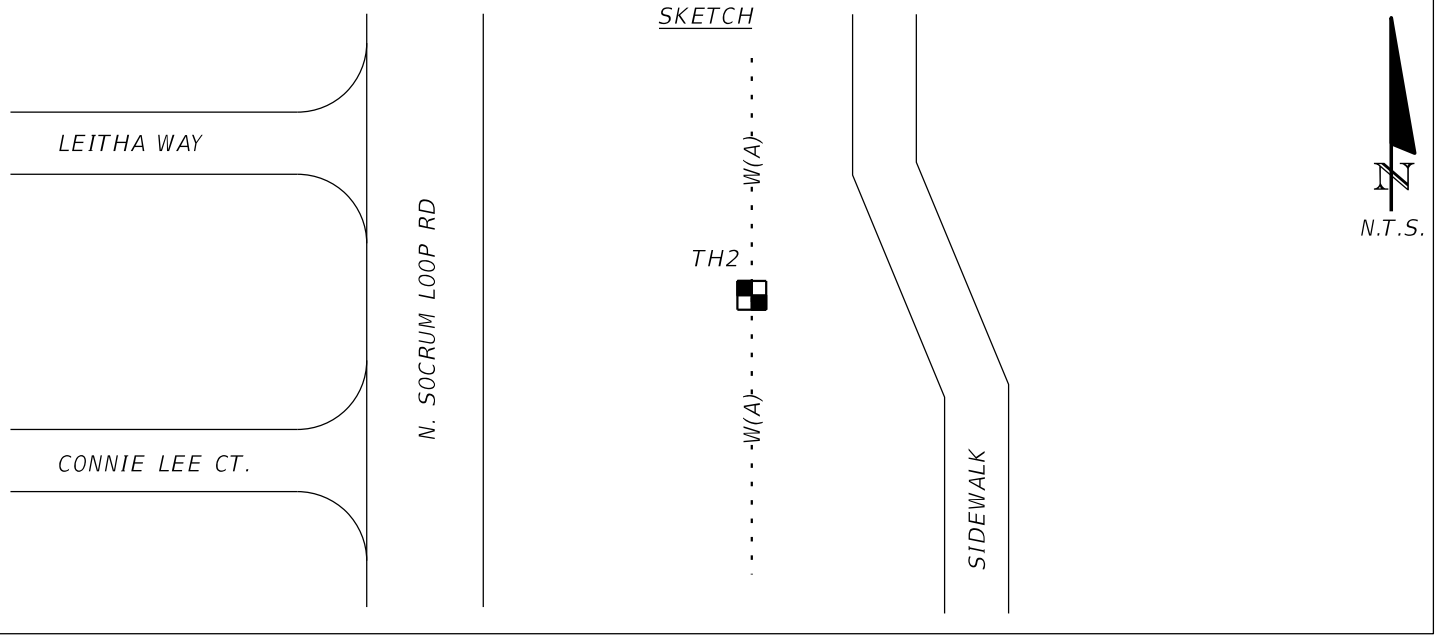
NOTES:

FOUND 12" PVC WATERLINE
RUNNING NORTH / SOUTH
ALONG N SOCRUM LOOP RD

(LOCATE #2)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 3

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

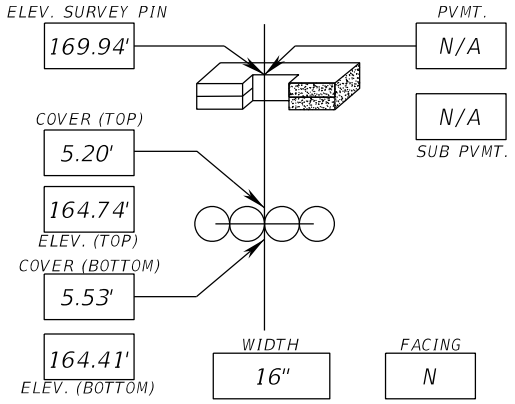
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: (4) CONDUITS ORANGE/PINK IN COLOR

SIZE AS FOUND: (4) – 4"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/18/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

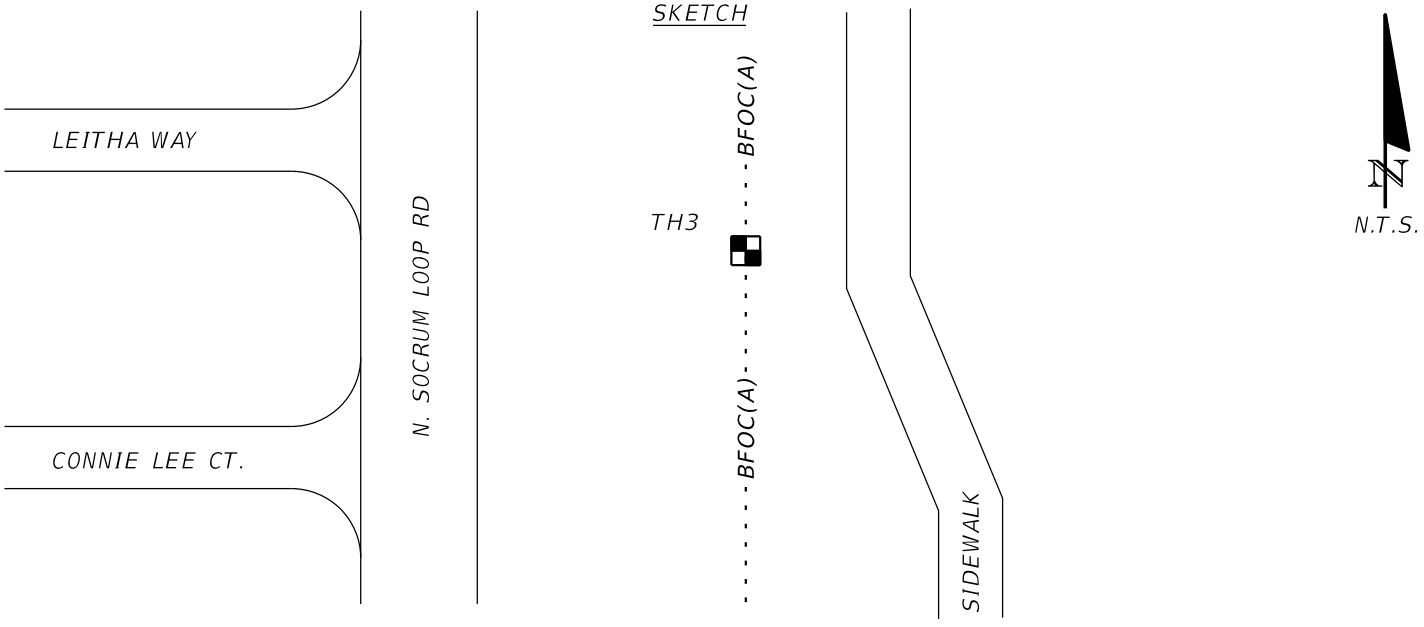
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (4) – 4" PVC RUNNING NORTH/ SOUTH

(LOCATE #3A)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 4

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

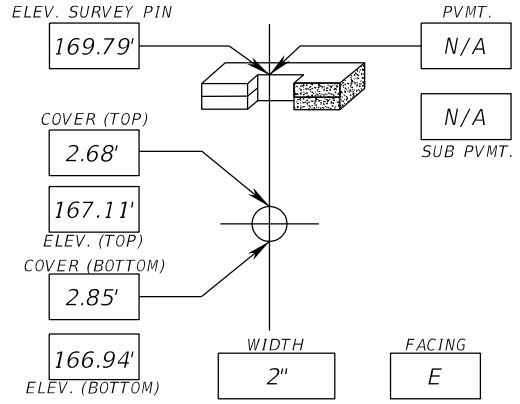
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: 2" WHITE

SIZE AS FOUND: 2"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/18/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

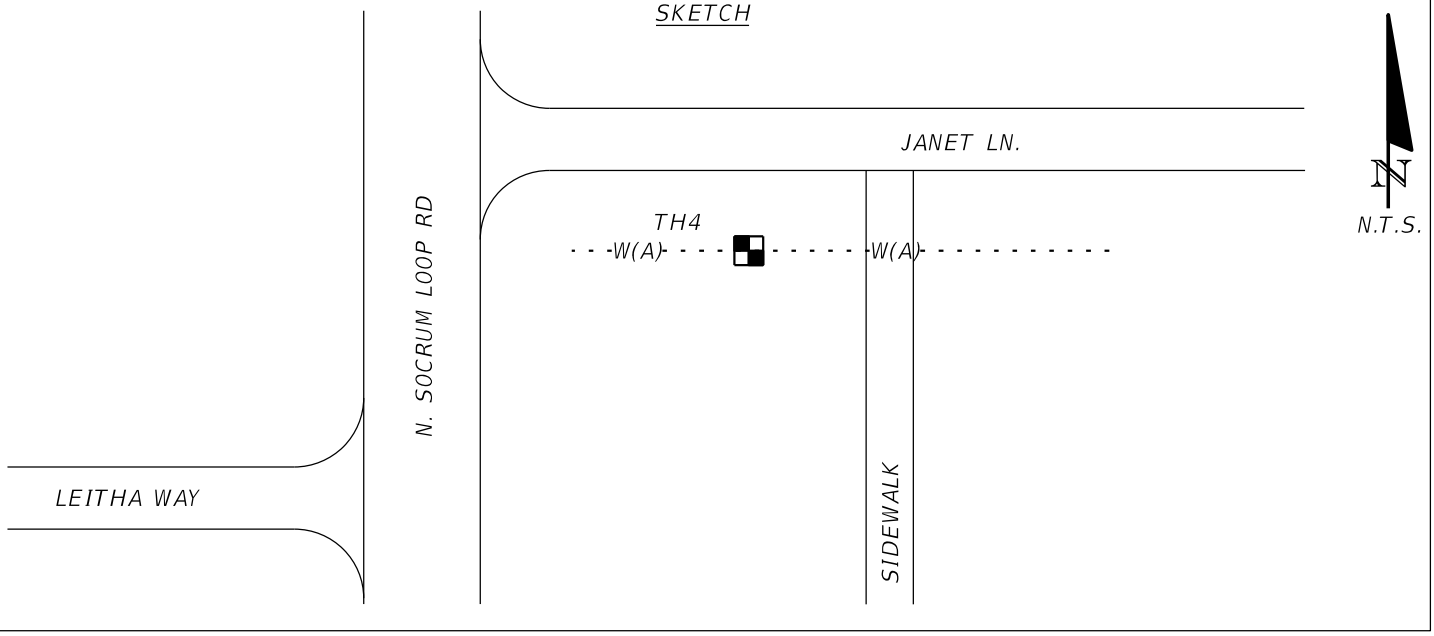
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
2" PVC RUNNING EAST TO MOBILE HOME PARK

(LOCATE #3B)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 5

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. TEL. SAN F.M. STORM
OTHER:

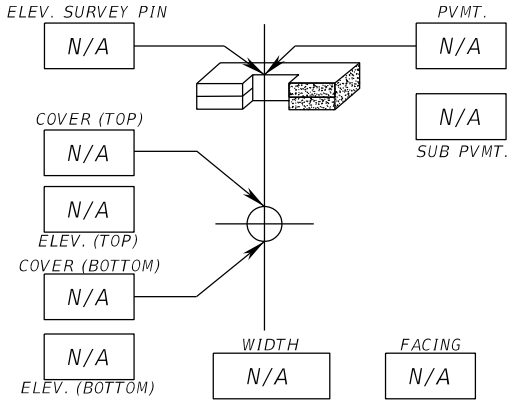
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: NOT FOUND

SIZE AS FOUND: N/A

UTILITY CONDITION: GOOD FAIR POOR (N/A)

RIBBON INSTALLED: RED BLUE YELLOW ORANGE N/A PINK (WHITE) PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET MOIST DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

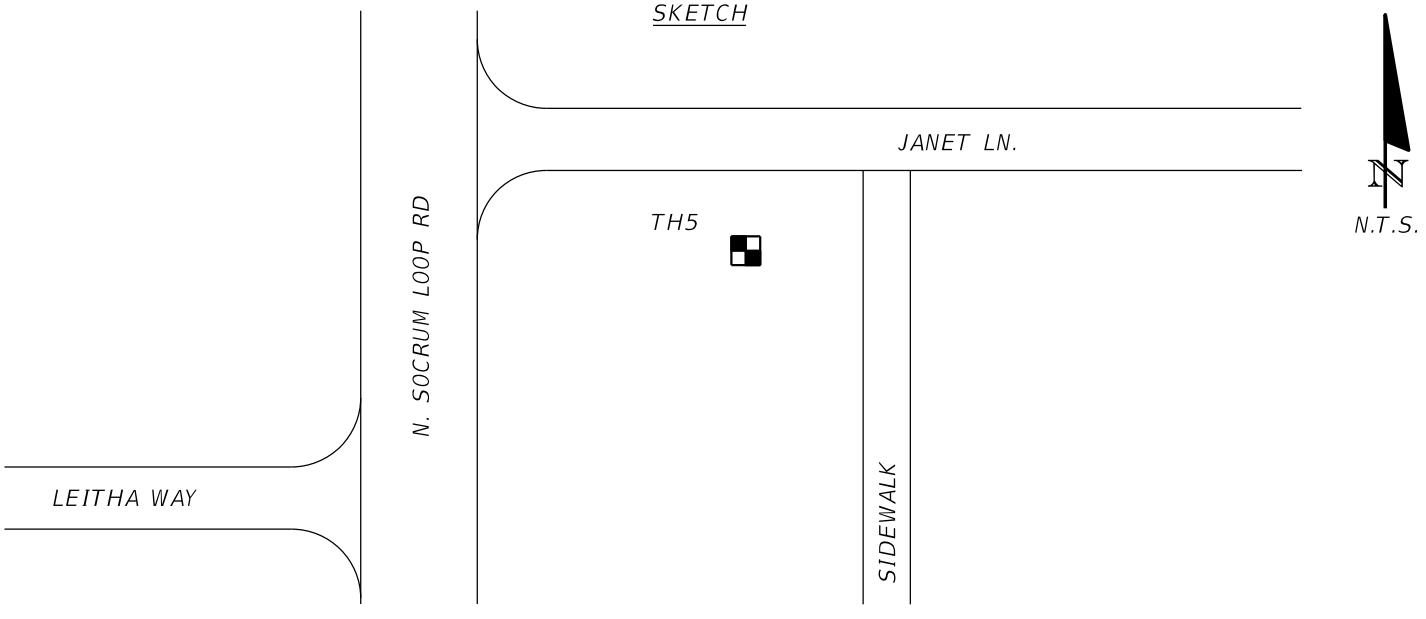
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
VACUUMED TO 5' DEEP PROBED TO 6'
ALONG NORTH SOUTH AND EAST WEST
AXIS NO UTILITIES FOUND

(LOCATE #3C)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 6

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

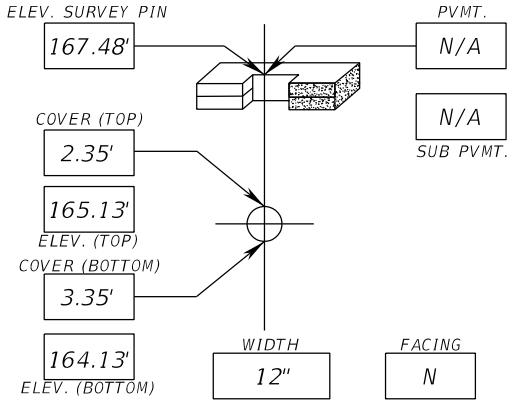
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: 12" WHITE

SIZE AS FOUND: 12"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

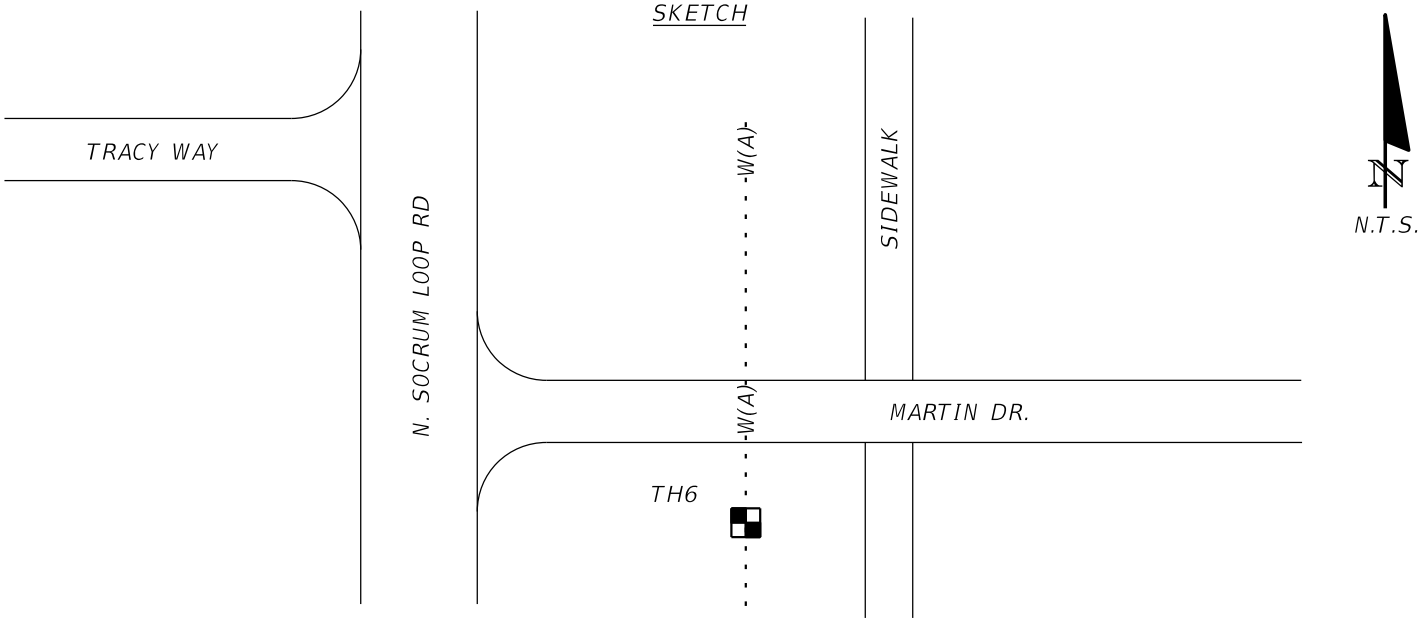
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #4)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 7

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

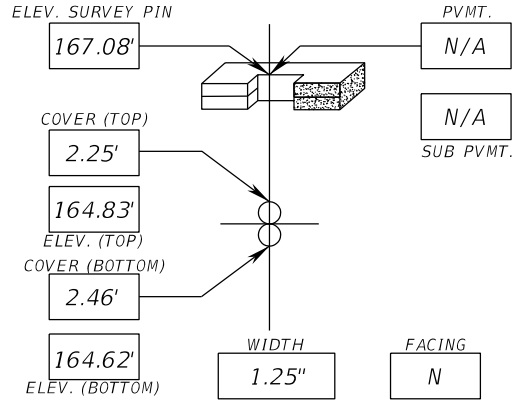
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

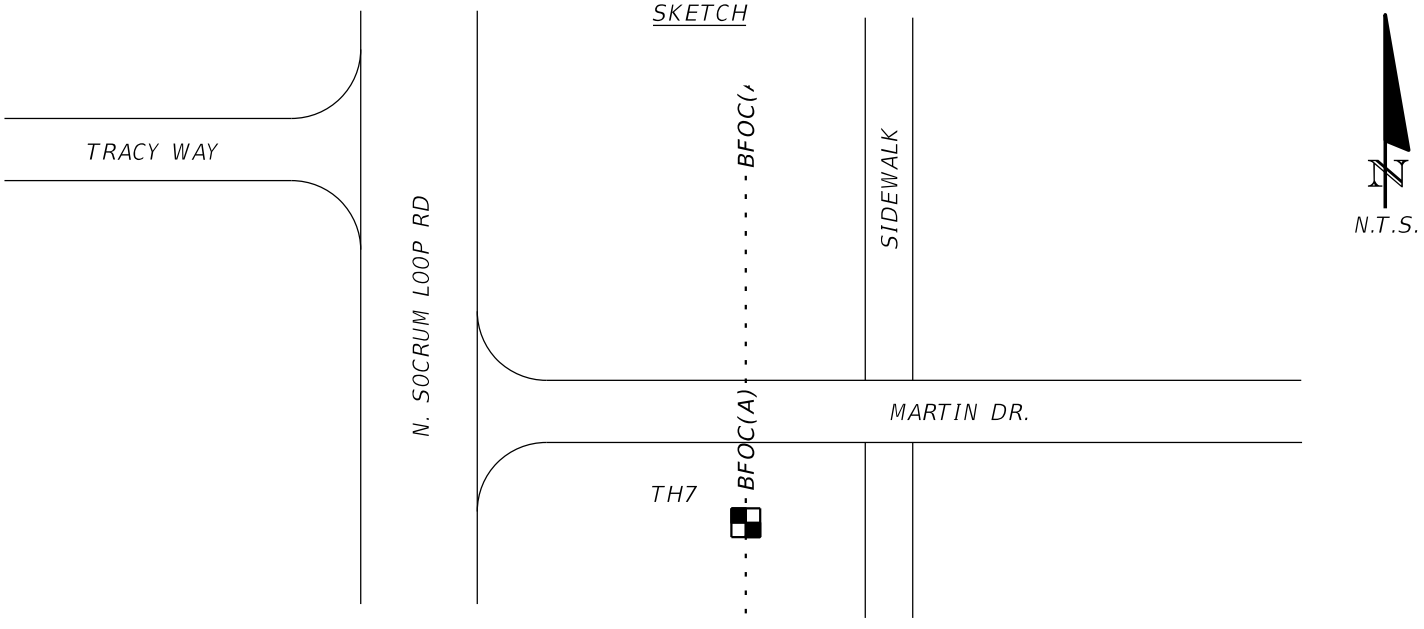
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #5A)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 7A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

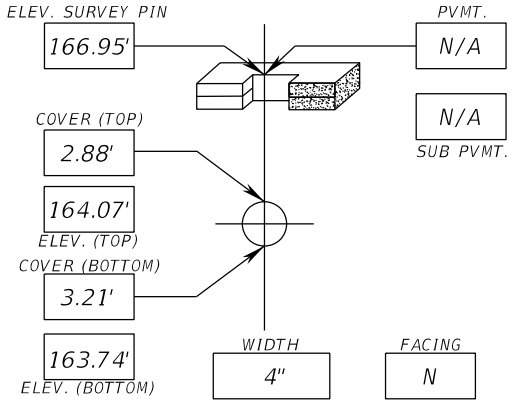
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 4"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

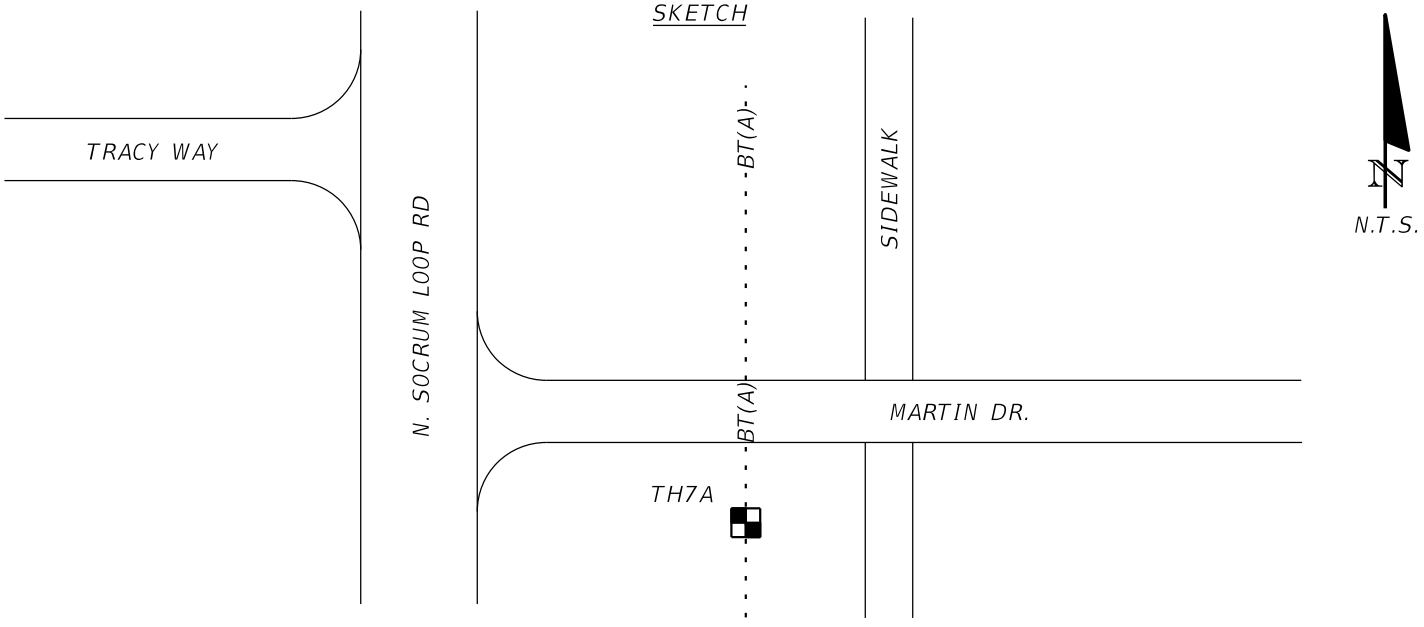
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #5A)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 7B

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

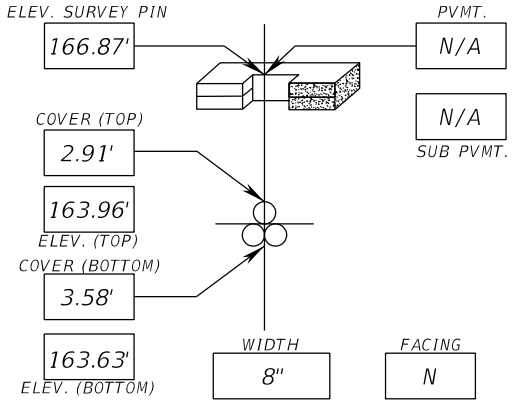
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: (3) 4"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A
PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT
(SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #5A)

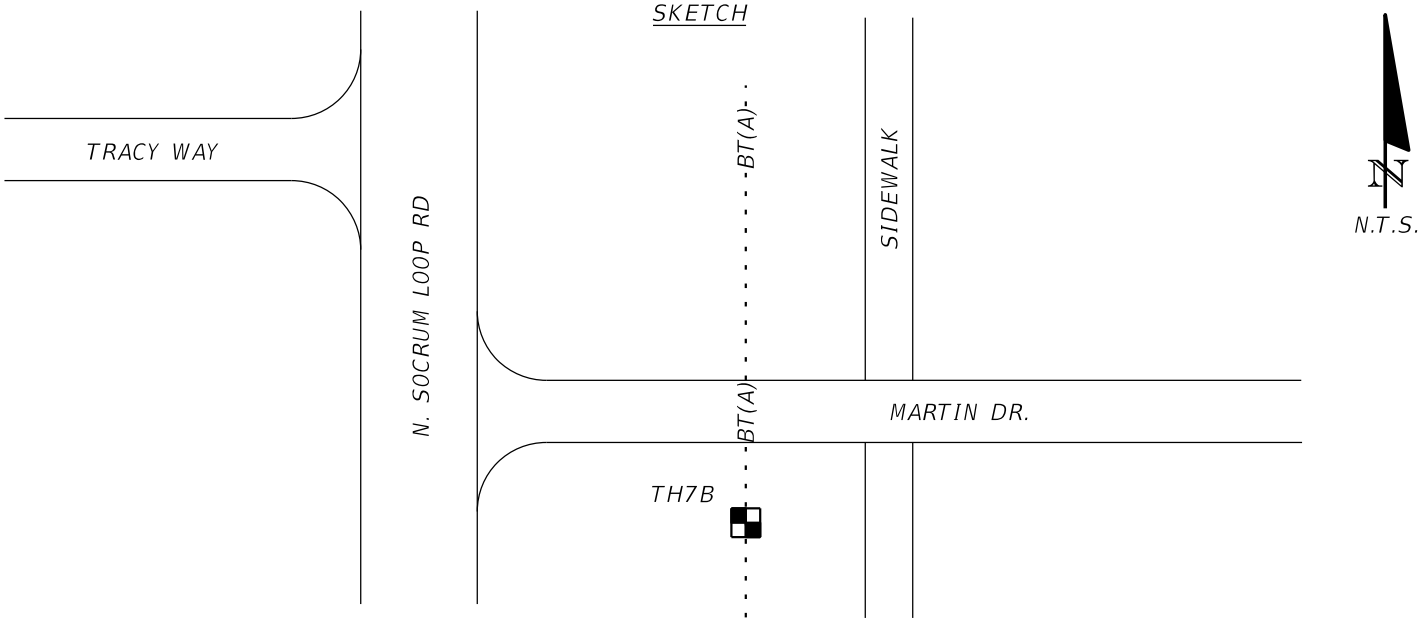
SURVEY INFORMATION: _____

GIVEN ELEVATION: _____

TIME:

STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
A Tradition of Innovative Engineering

2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 8

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: (GAS) WATER ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: (GAS) WATER ELEC. TEL. SAN F.M. STORM
OTHER:

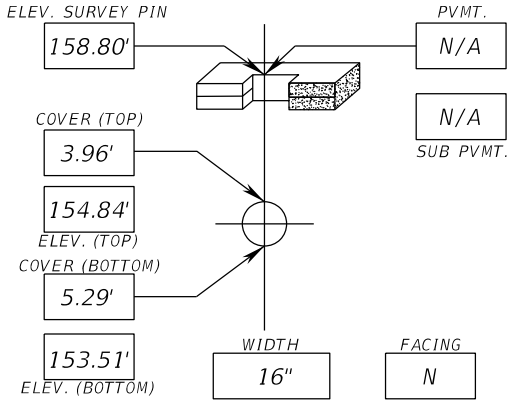
MATERIAL AS FOUND: DI CI (STL) W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: COATED WITH SEALER

SIZE AS FOUND: 16"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE (YELLOW) ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: BK

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

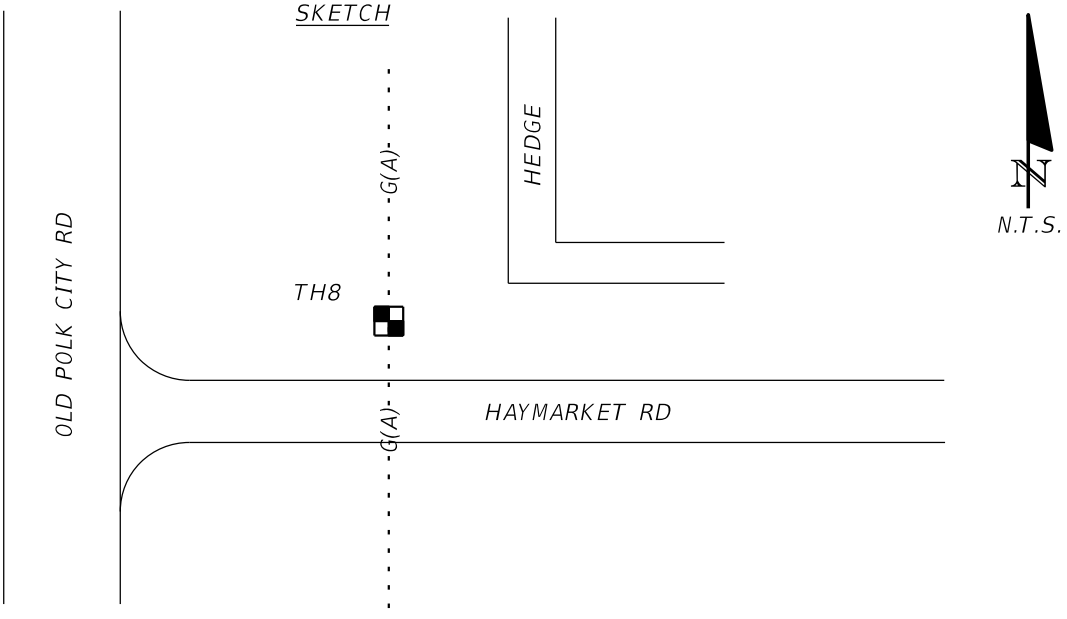
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FLORIDA GAS REPRESENTATIVE ON SITE DURING VACUUM EXCAVATION

(LOCATE #31)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 9

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: (GAS) WATER ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: (GAS) WATER ELEC. TEL. SAN F.M. STORM
OTHER:

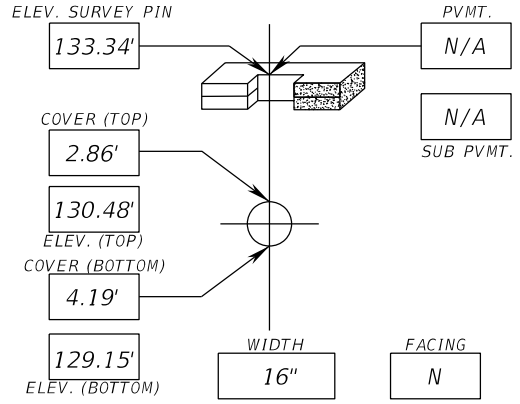
MATERIAL AS FOUND: DI CI (STL) W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 16"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE (YELLOW) ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: BK

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

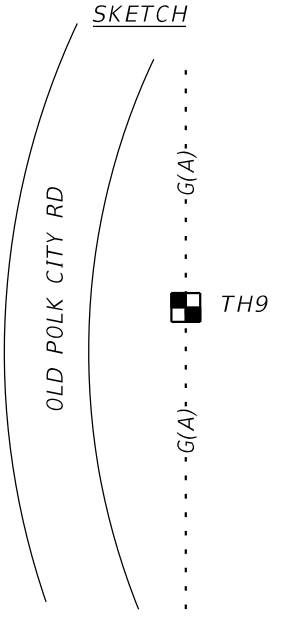
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FLORIDA GAS REPRESENTATIVE ON SITE DURING VACUUM EXCAVATION

(LOCATE #25)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 10

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

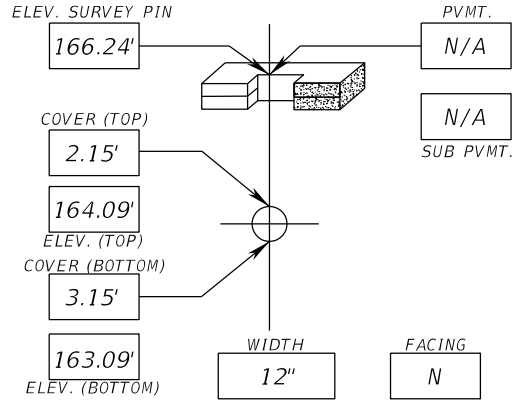
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 12"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #5B)

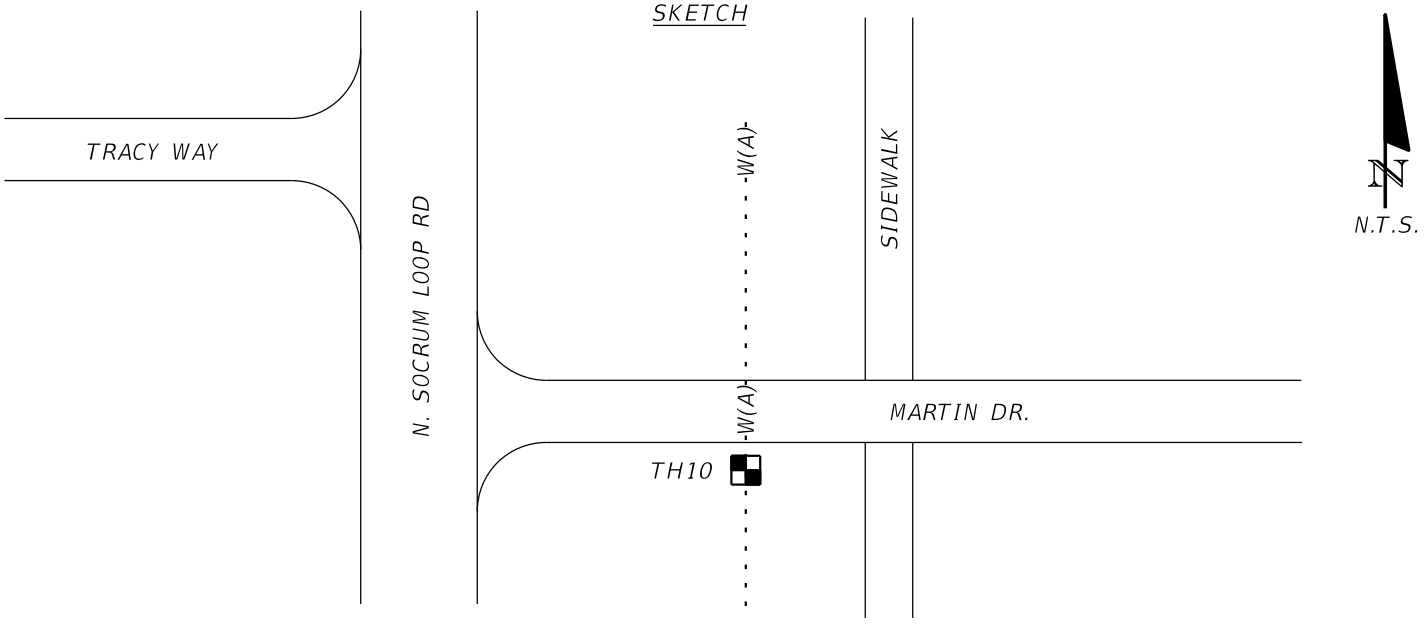
SURVEY INFORMATION: _____

GIVEN ELEVATION: _____

TIME:

STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 11

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

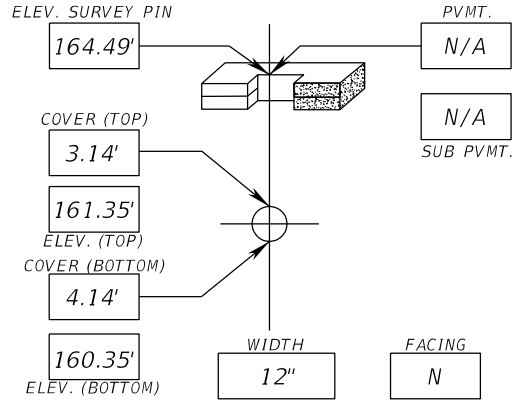
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 12"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

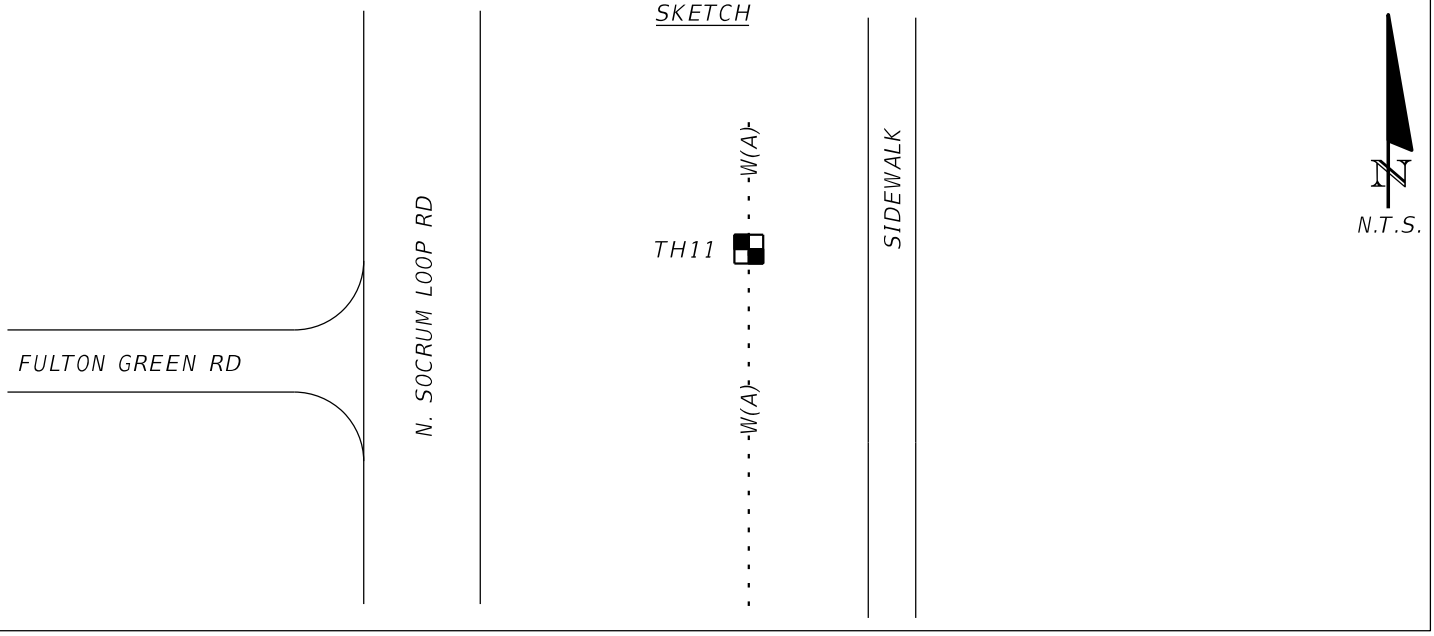
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #6)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 12

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

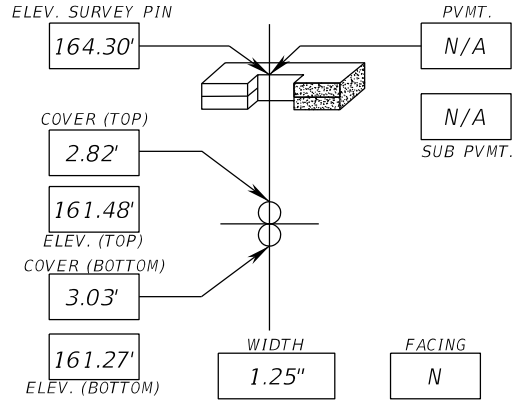
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: BK

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

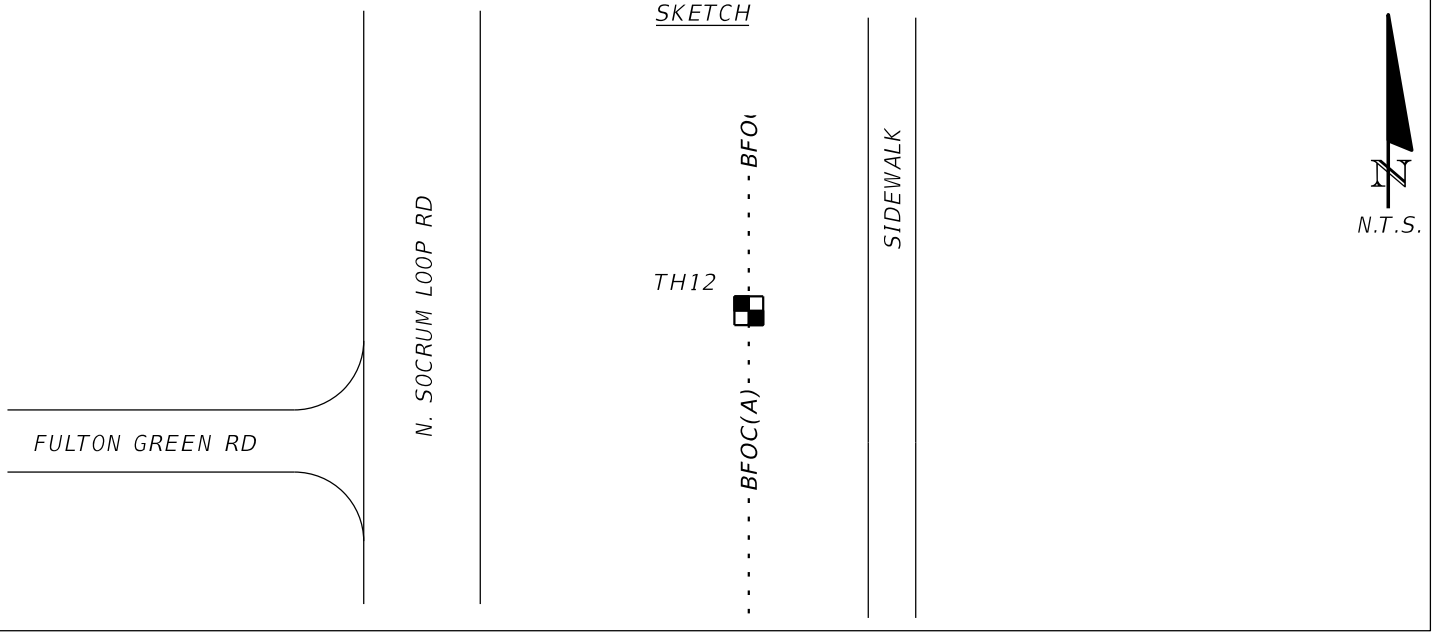
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #7A)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 13

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

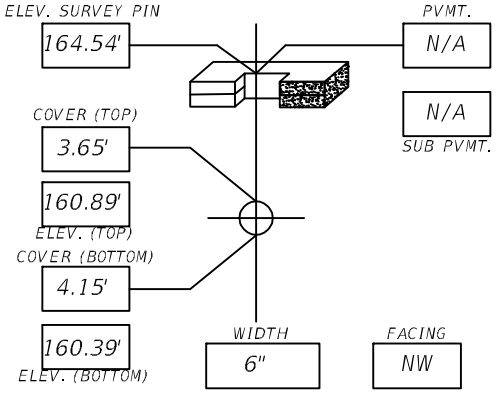
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 6"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: BK

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

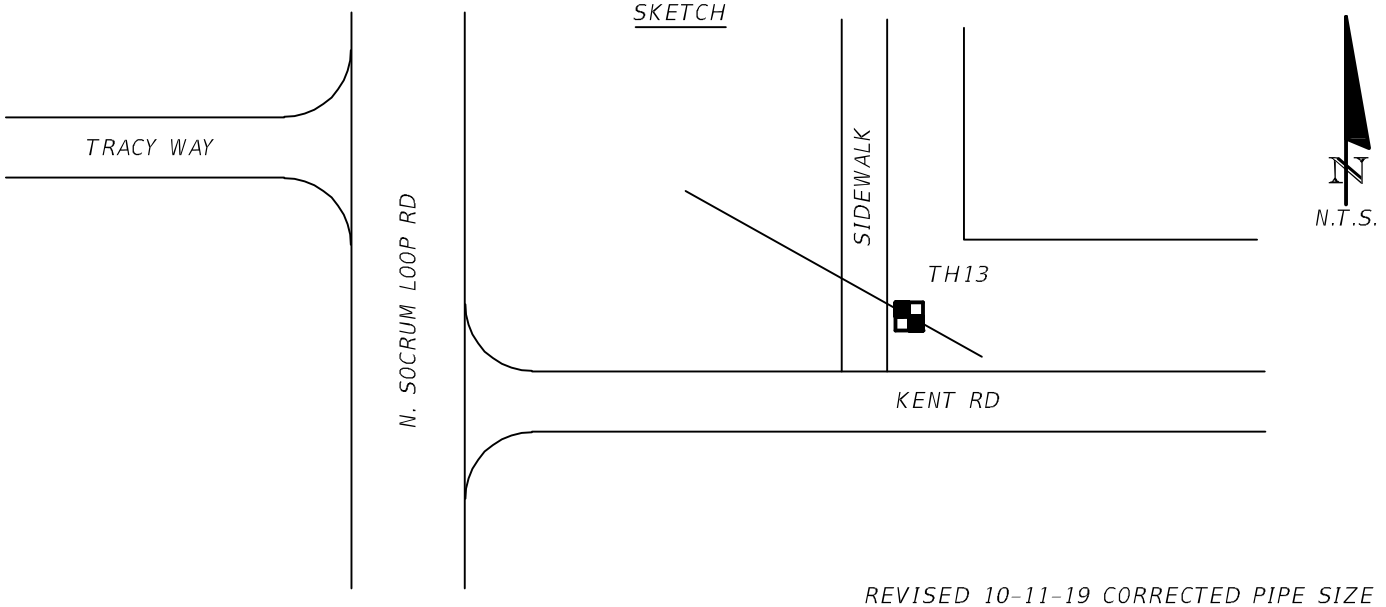
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #7B)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



REVISED 10-11-19 CORRECTED PIPE SIZE

VACUUM TEST HOLE REPORT

CIVILSURV
A Tradition of Innovative Engineering

2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 14

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

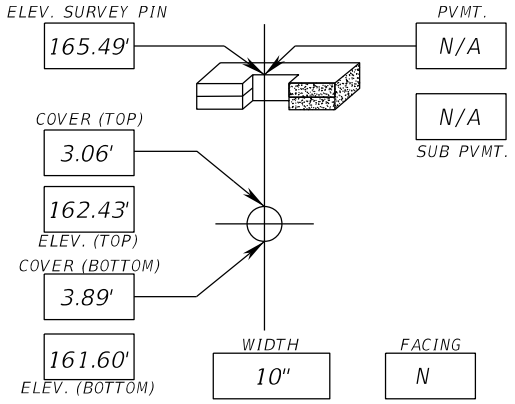
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 10"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: BK

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

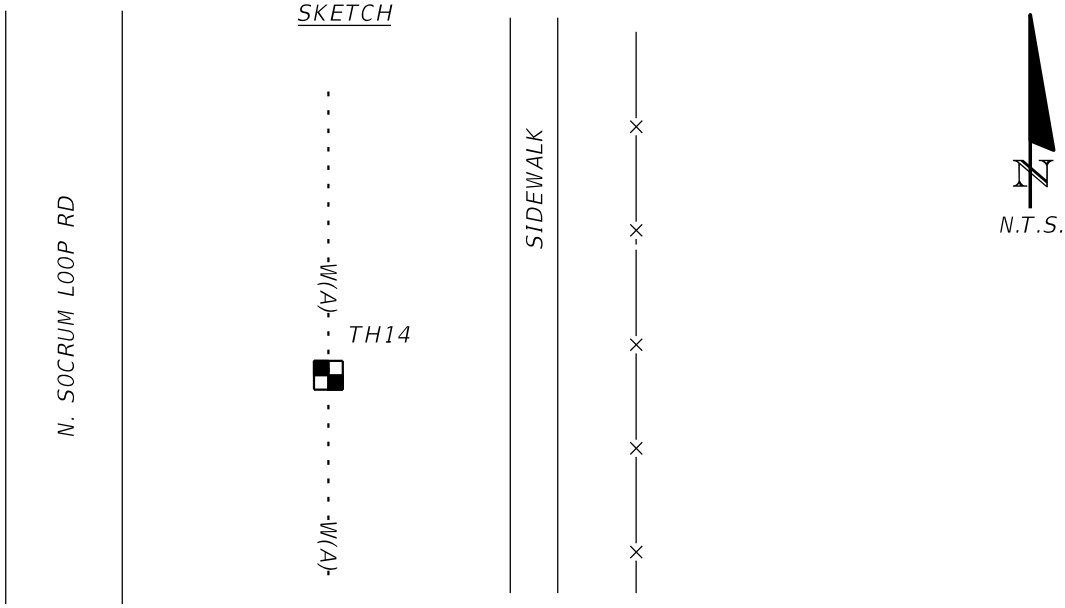
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #8)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
A Tradition of Innovative Engineering

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 15

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

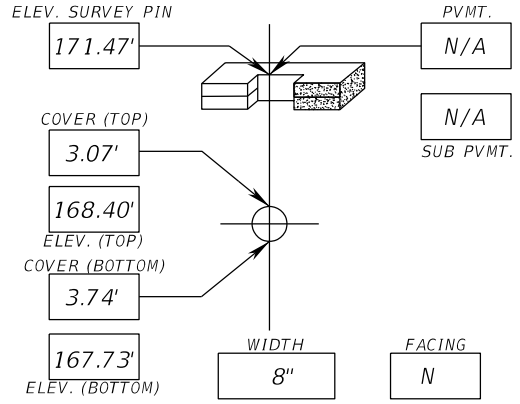
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 8"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #11A)

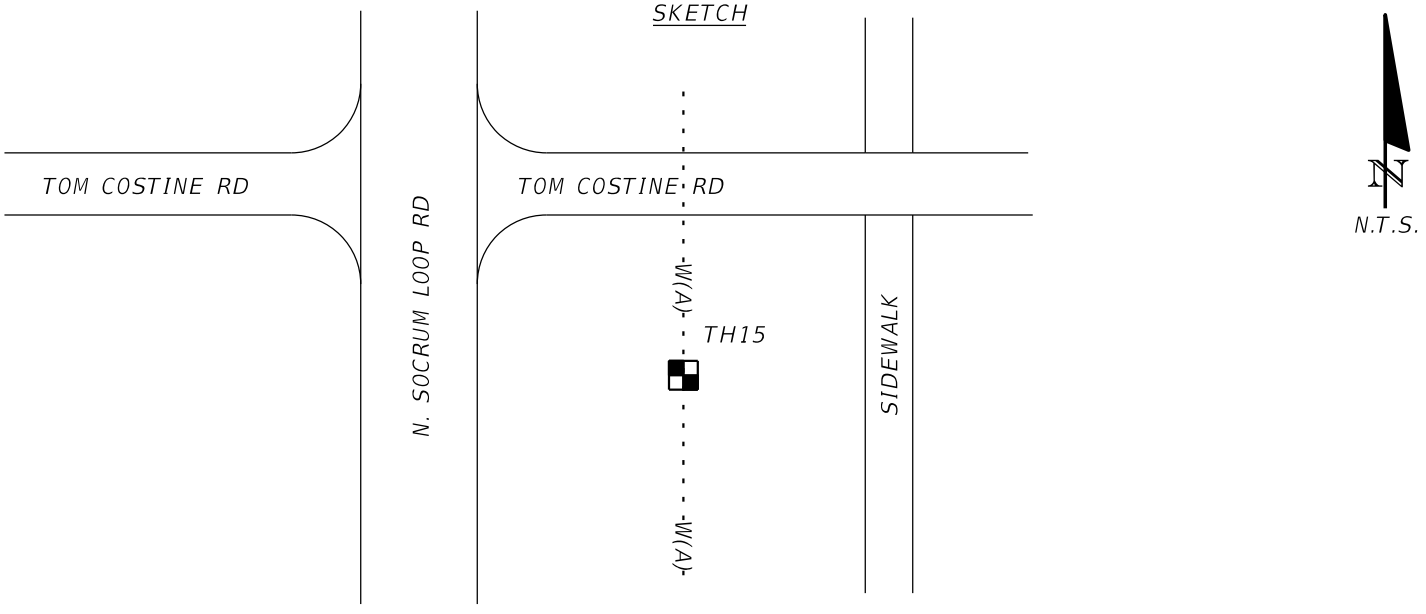
SURVEY INFORMATION: _____

GIVEN ELEVATION: _____

TIME:

STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 15A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

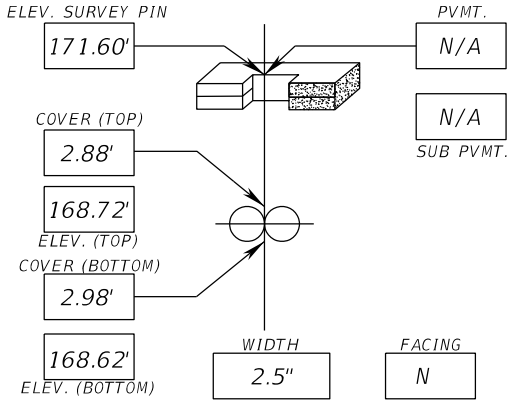
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:3/25/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

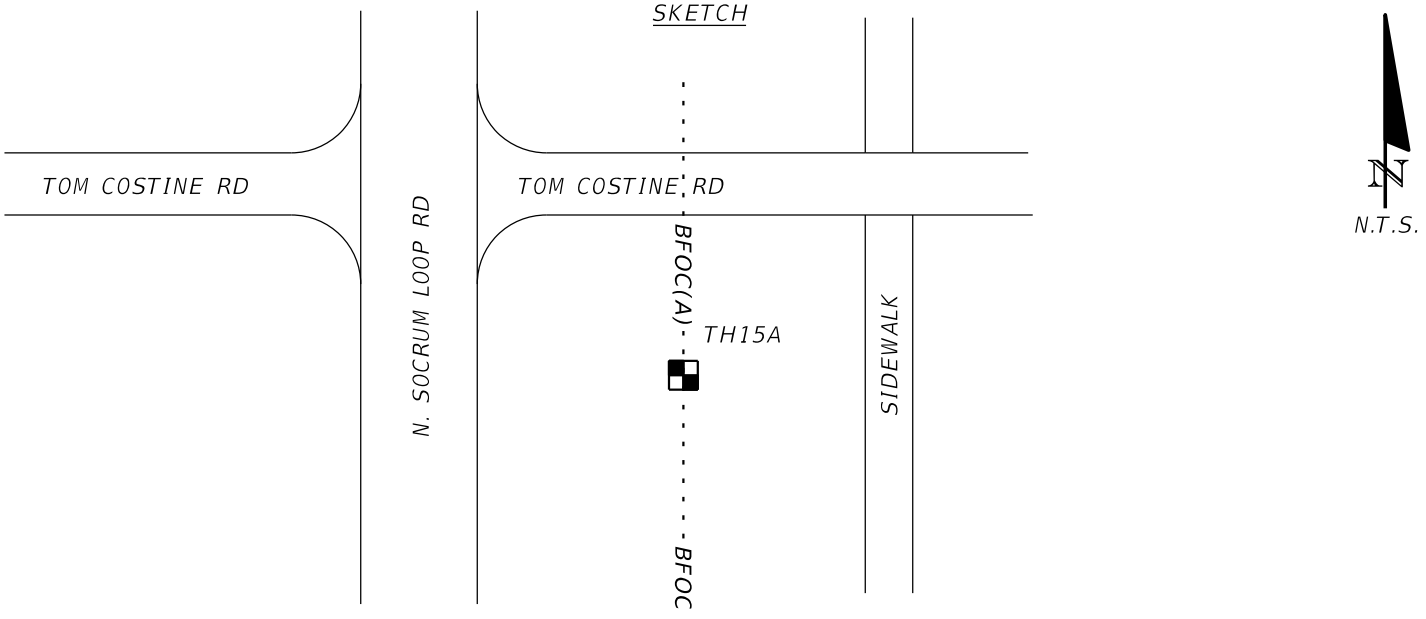
NOTES:

LEADING INTO WIRE PULL BOX

(LOCATE #11A)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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A Tradition of Innovative Engineering

2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 16

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

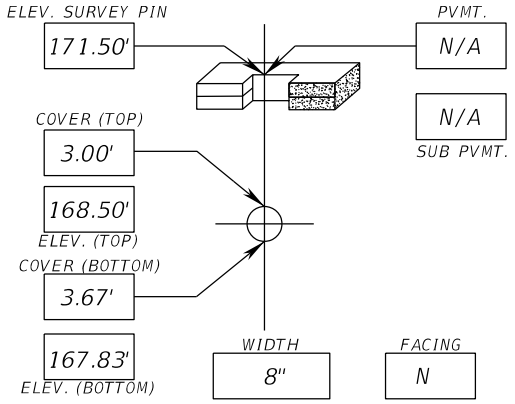
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 8"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/02/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

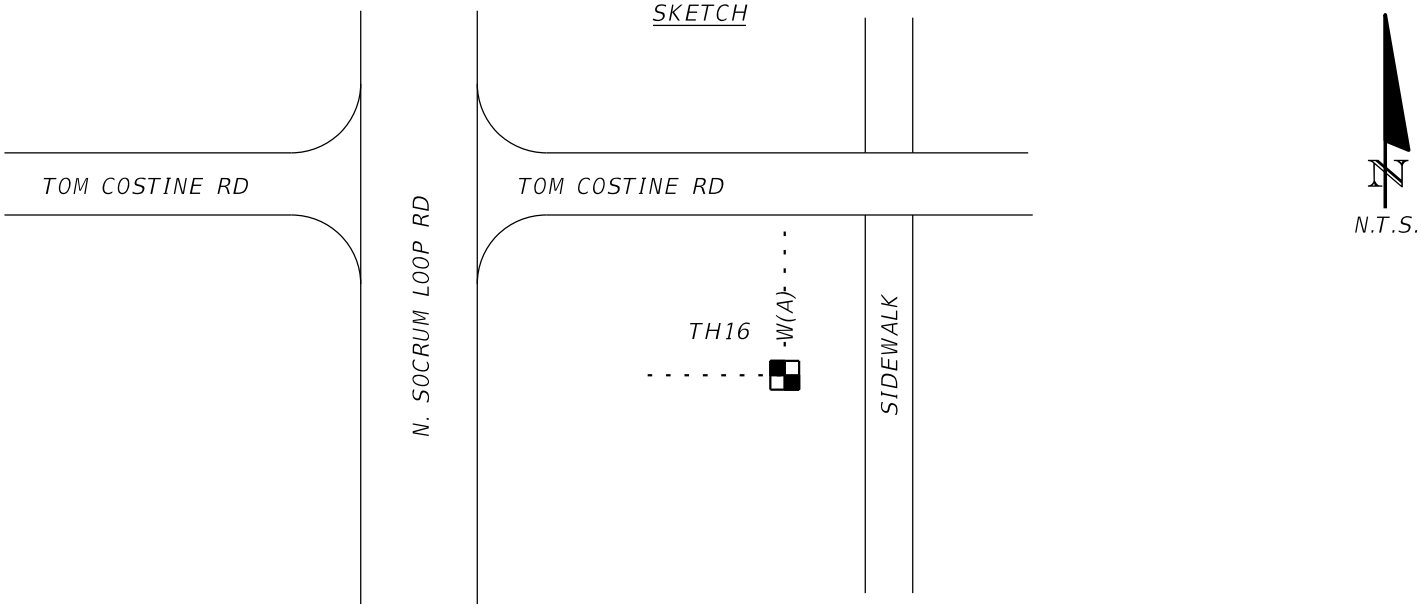
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 8" PVC PIPES AT 90° ELBOW
WITH CONCRETE THRUST BLOCK
(ELEV. AT TOP OF PIPE)

(LOCATE #10)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 17

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. TEL. SAN F.M. STORM
OTHER:

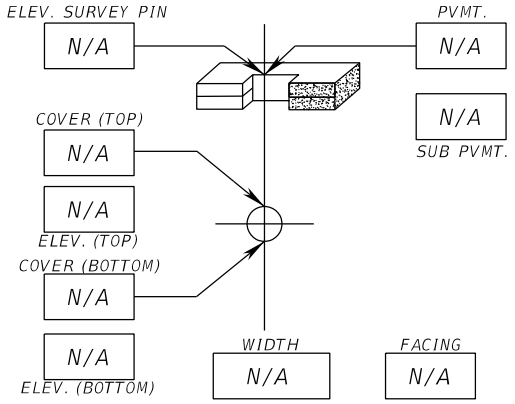
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: NOT FOUND

SIZE AS FOUND: N/A

UTILITY CONDITION: GOOD FAIR POOR (N/A)

RIBBON INSTALLED: RED BLUE YELLOW ORANGE N/A PINK (WHITE) PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET MOIST DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

FORM BY: CH ASSISTED BY: WS

NUMBER OF HOLES: 1 TODAY'S DATE:3/19/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP

AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
VACUUMED TO 5' DEEP PROBED TO 6'
ALONG NORTH SOUTH AND EAST WEST
AXIS NO UTILITIES FOUND

(LOCATE #15)

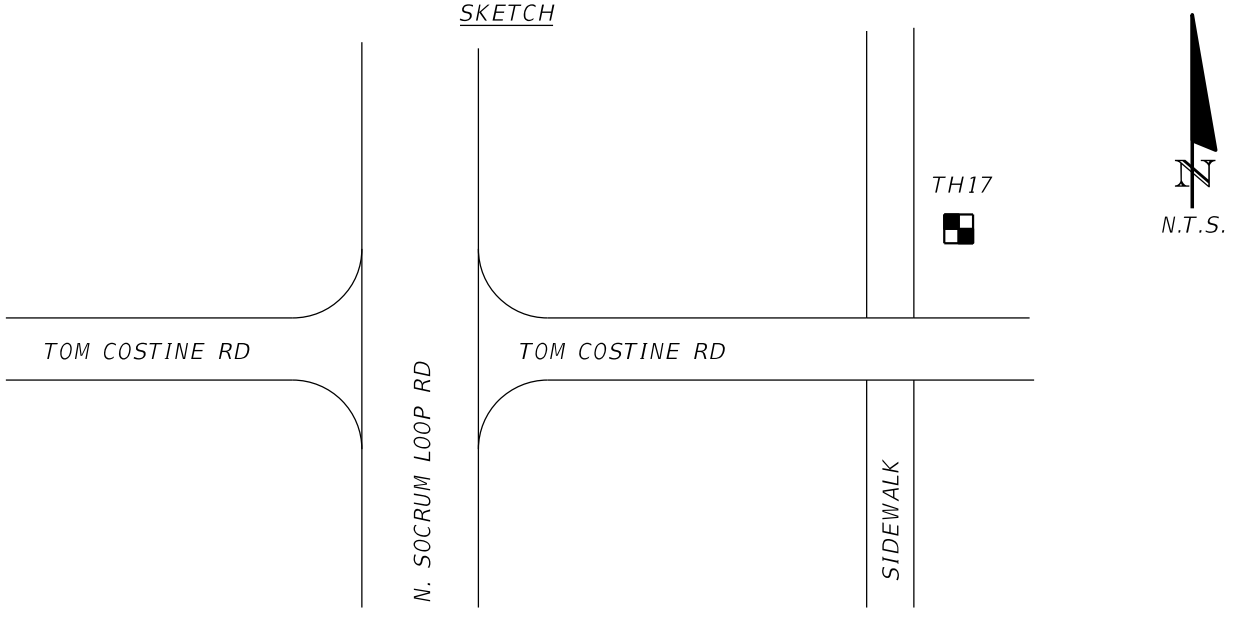
SURVEY INFORMATION:

GIVEN ELEVATION:

TIME:

STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 18

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

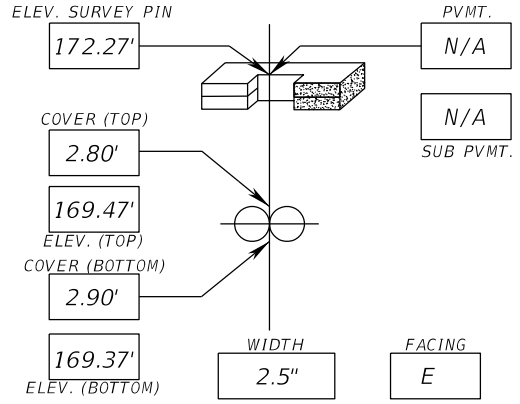
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:TS

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/02/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

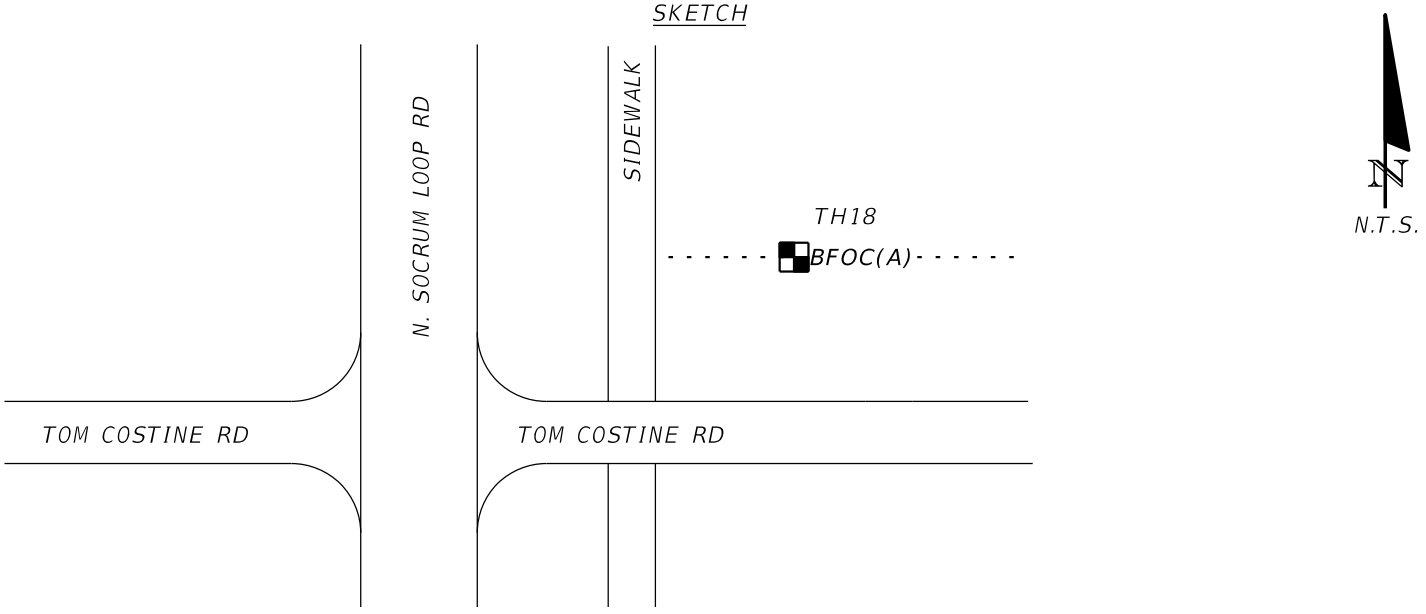
NOTES:

LEADING INTO WIRE PULL BOX

(LOCATE #14)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
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FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 19

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

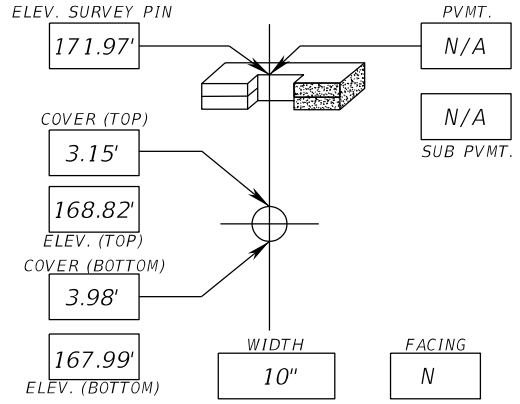
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 10"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:TS

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/02/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

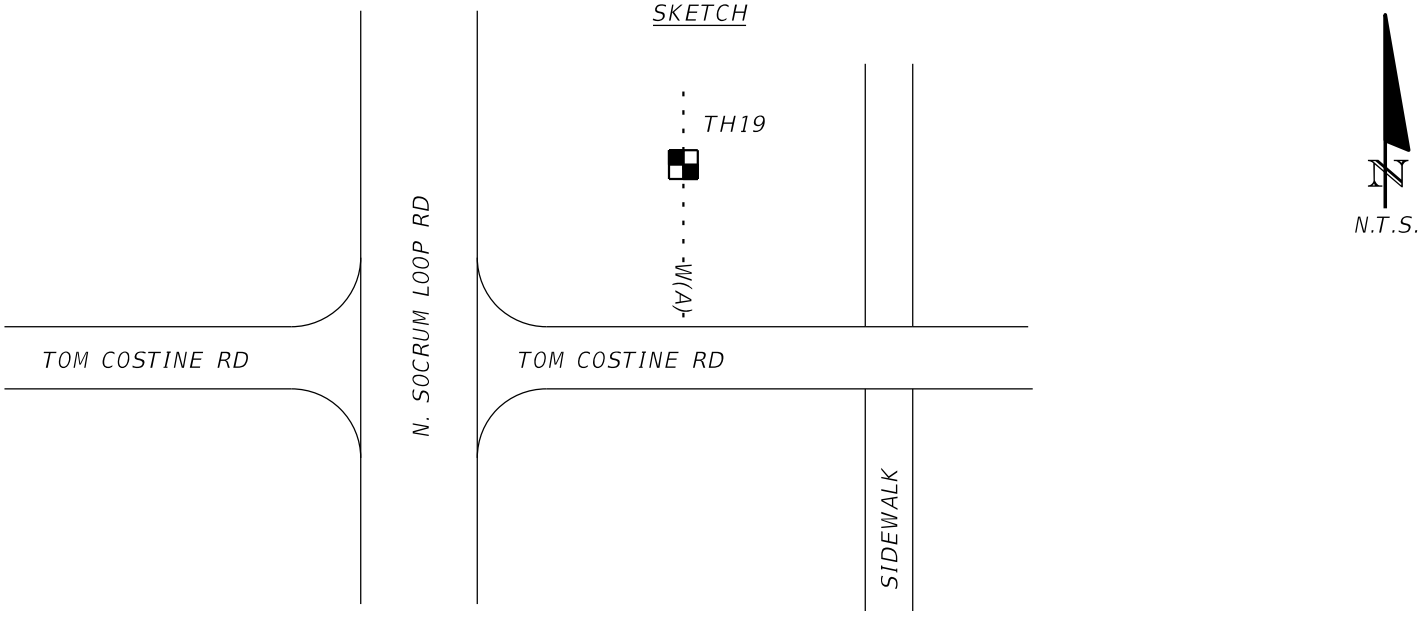
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #12)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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CIVILSURV JOB #: 195:001:003

TEST HOLE #: 20

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

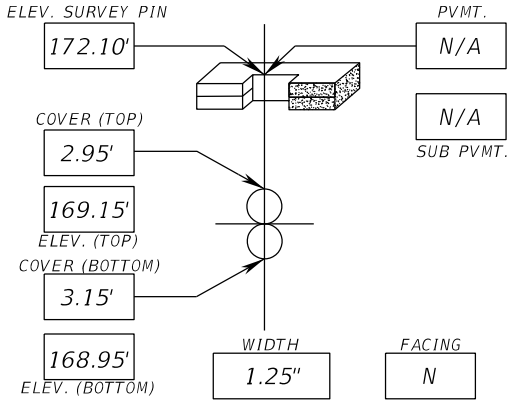
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:TS

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/02/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

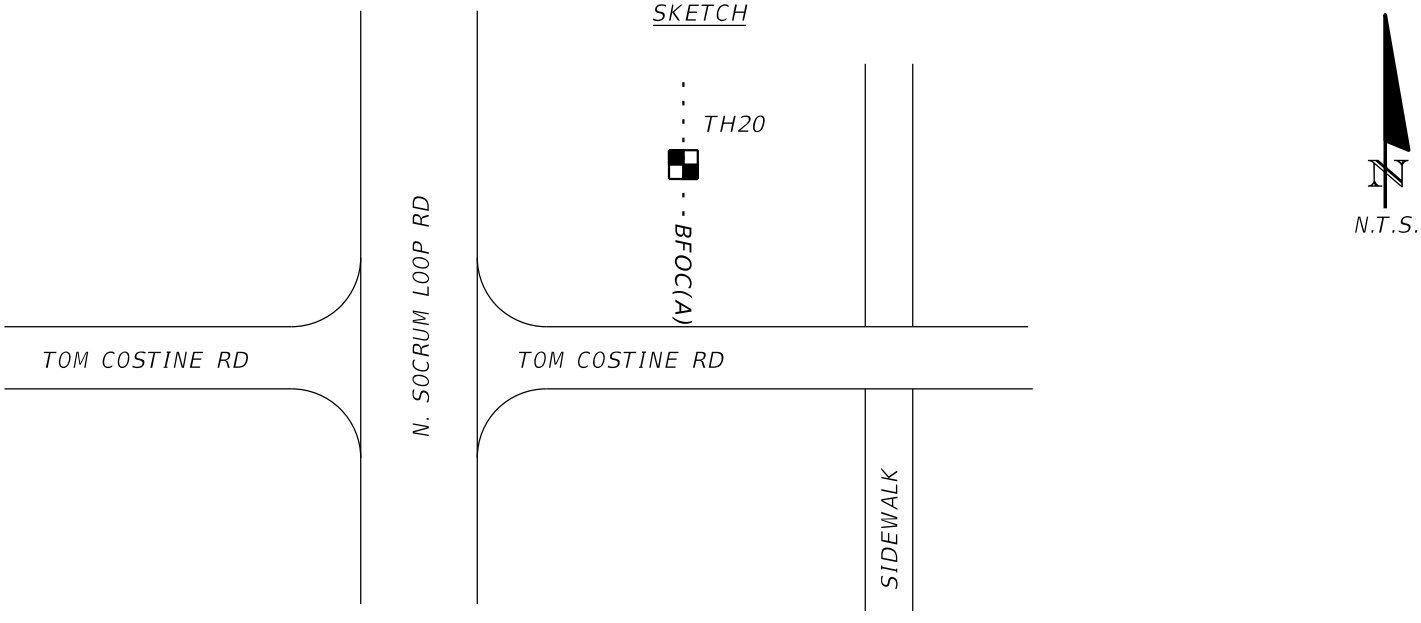
NOTES:

LEADING INTO WIRE PULL BOX

(LOCATE #13)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 21

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

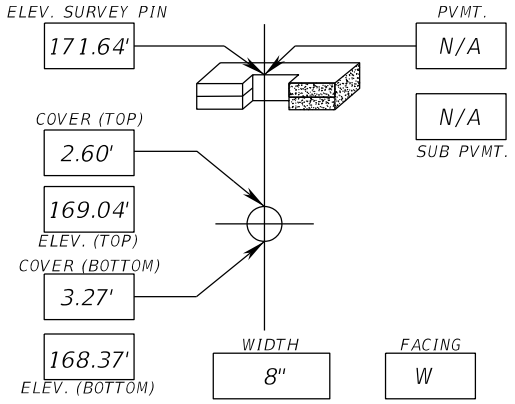
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 8"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/03/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

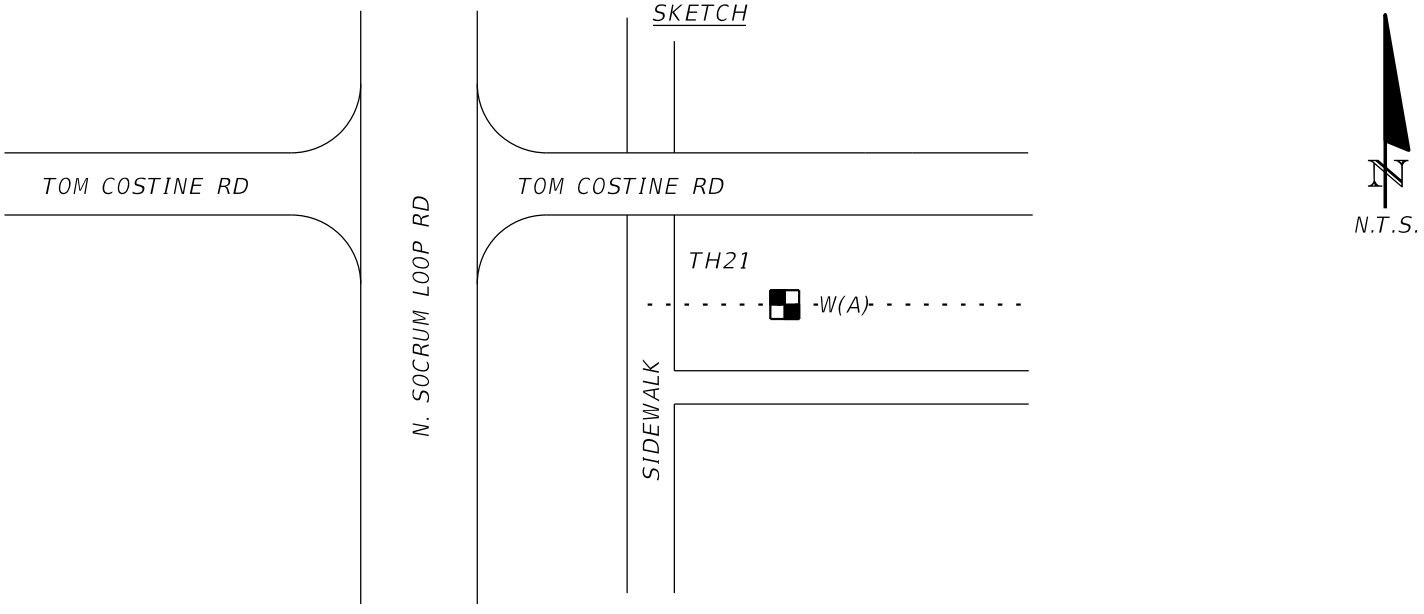
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #11A)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

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LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 22

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

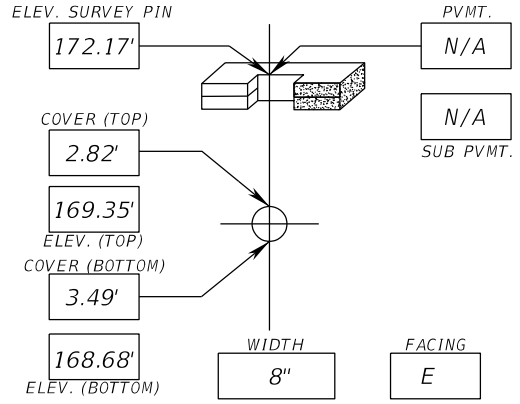
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 8"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:BK

FORM BY: CH ASSISTED BY: TS, BK

NUMBER OF HOLES: 1 TODAY'S DATE:4/03/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

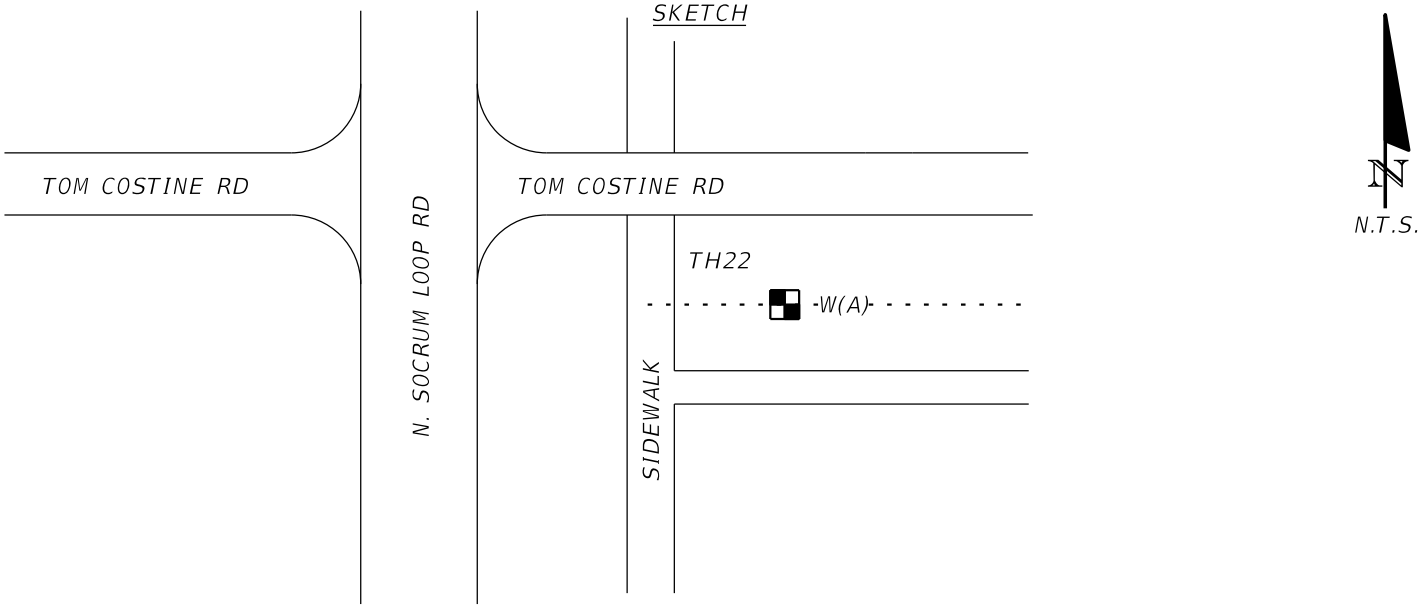
SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

(LOCATE #11C)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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LAKELAND, FL 33811
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FAX: 863.646.3378

CIVILSURV JOB #: 195:001:003

TEST HOLE #: 23

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL.) SAN F.M. STORM
OTHER:

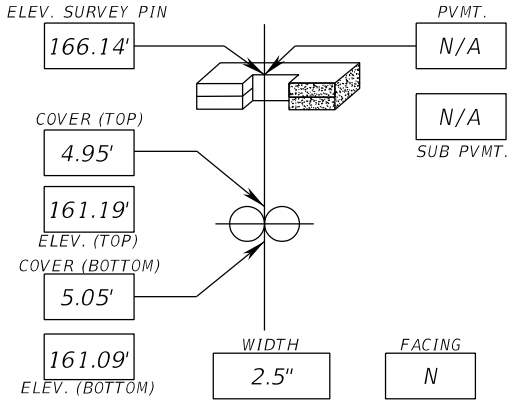
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW (ORANGE) N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: (GRASS) SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD (SOFT) WET (MOIST) DRY DIRT (SAND) CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY:CH FORM CHECKED BY:TS

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE:4/03/19

INSTALLED: NAIL (HUB&TACK) CHISX IRON ROD & CAP
AT: (CROWN) EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

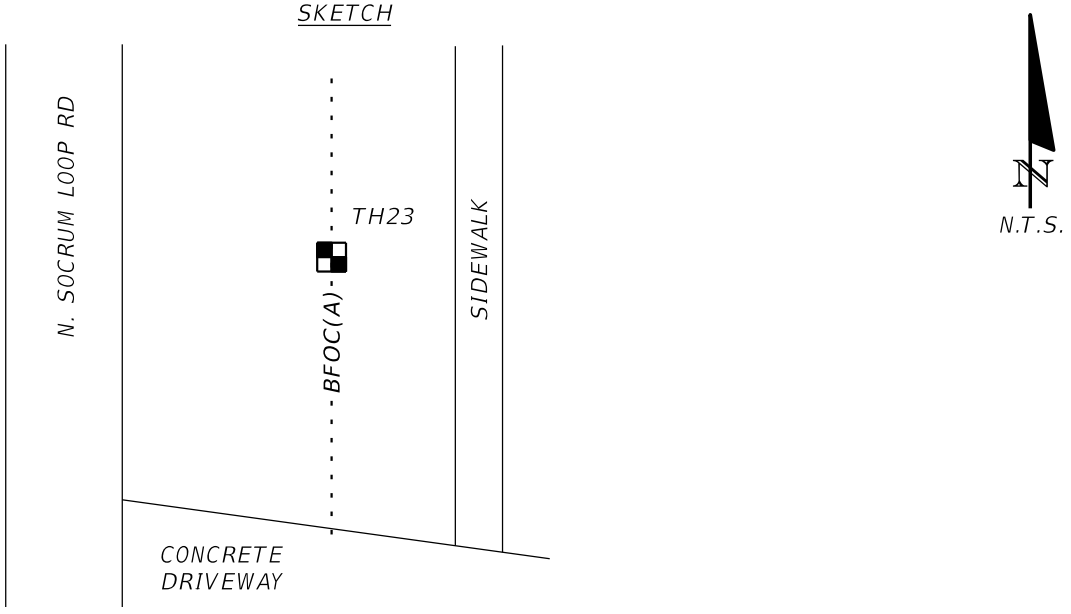
NOTES:

LEADING INTO WIRE PULL BOX

(LOCATE #17)

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 24

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

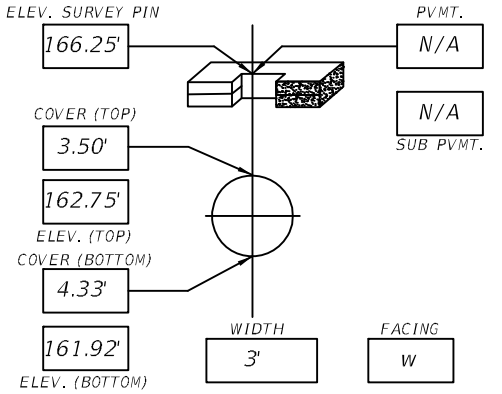
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR (PVC) UNK DB CABLE N/A

OTHER: ?????

SIZE AS FOUND: 10"

UTILITY CONDITION: (GOOD) FAIR POOR N/A

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

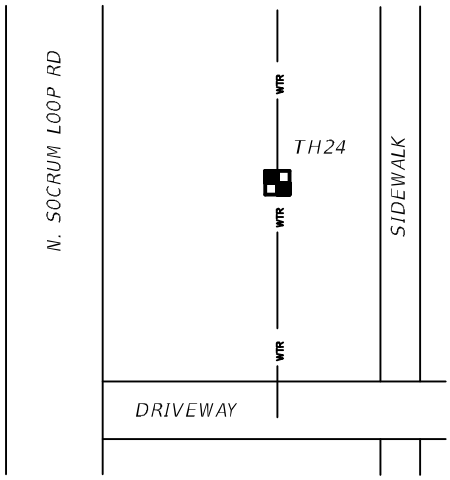
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 10" PVC WATERLINE
RUNNING NORTH/SOUTH PARALLEL
TO ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 25

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS (WATER) ELEC. TEL. SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: STAINLESS STEEL

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: 10" TEE

FORM BY: CH ASSISTED BY: BK, TS

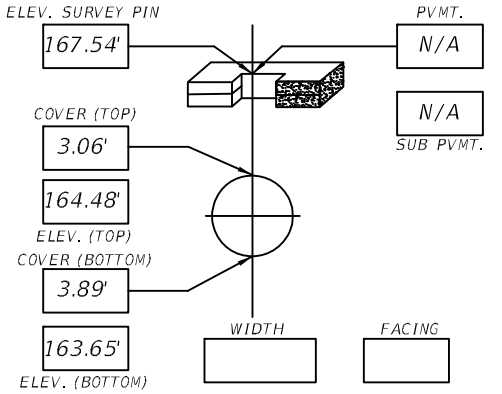
UTILITY CONDITION: (GOOD) FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

RIBBON INSTALLED: RED (BLUE) YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W



SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

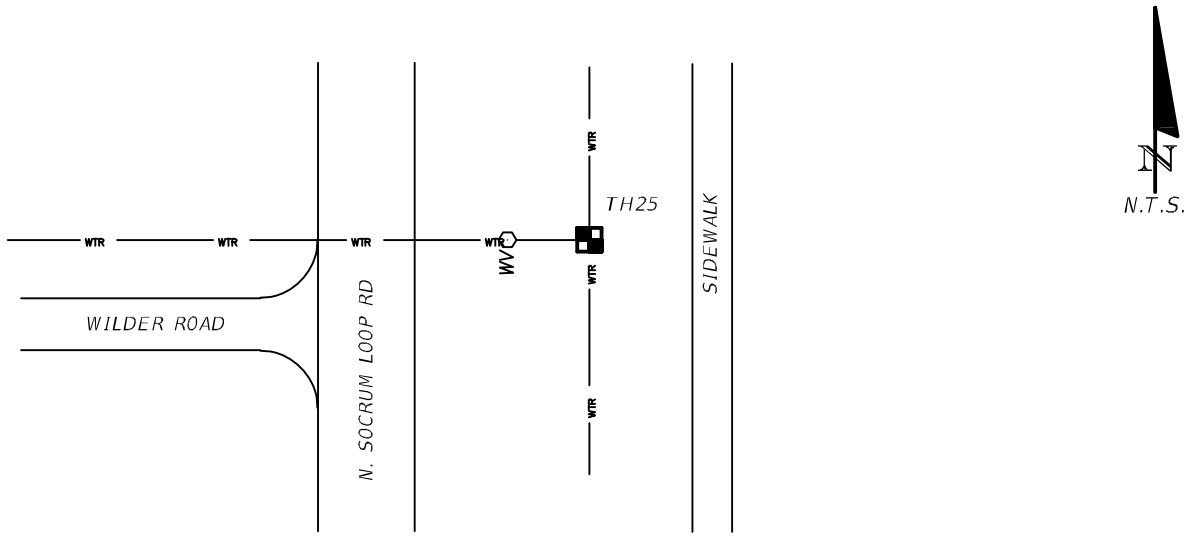
SURVEY INFORMATION:

GIVEN ELEVATION:

TIME:

STATION: OFFSET:

SKETCH



CIVILSURV
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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 26

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (2) 1.25"

FORM BY: BK ASSISTED BY: CH, TS

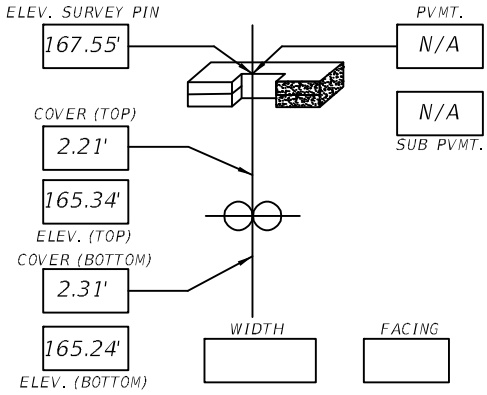
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W



SURVEY PIN LOCATED BY: CIVILSURV

NOTES:

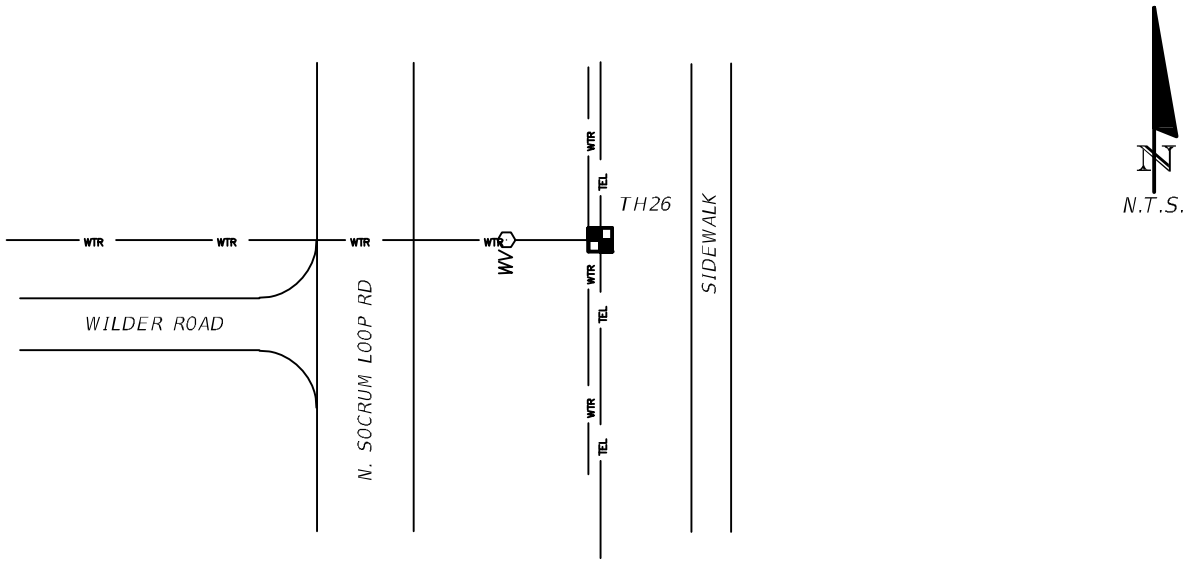
SURVEY INFORMATION:

GIVEN ELEVATION:

TIME:

STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 27

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

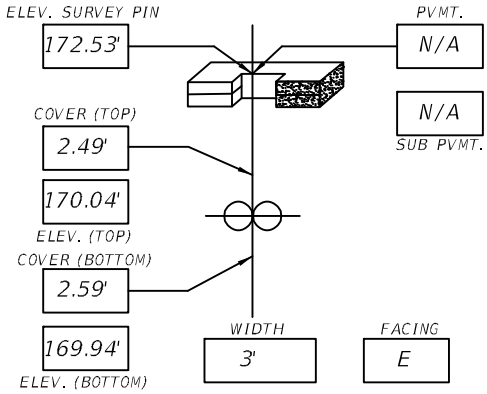
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

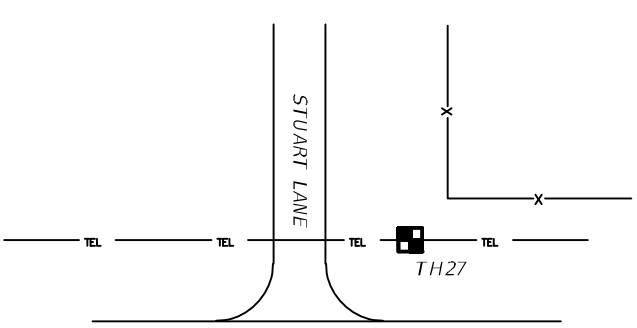
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING EAST/WEST PARALLEL TO ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



N

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 28

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (2) 1.25"

FORM BY: BK ASSISTED BY: CH, TS

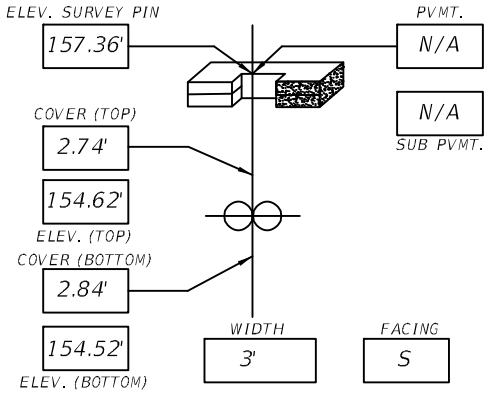
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

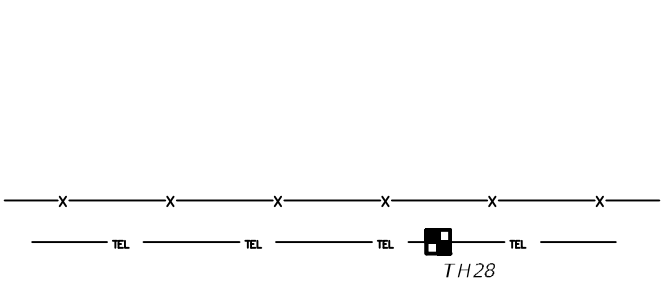


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING
EAST/WEST PARALLEL TO ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 29

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

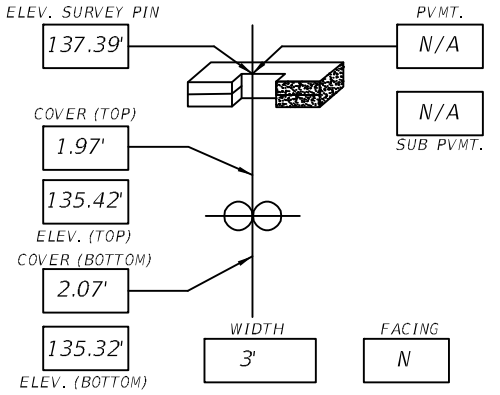
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

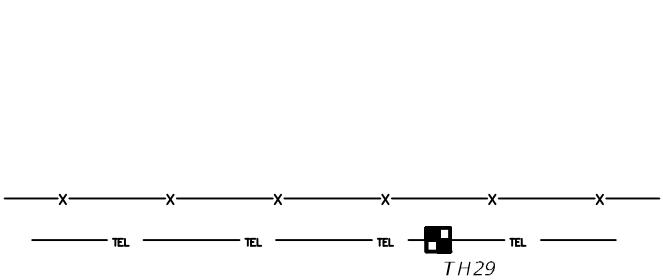
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING EAST/WEST PARALLEL TO ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



N

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 30

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK [DB CABLE] N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

SIZE AS FOUND: 3/8" DIAMETER

FORM BY: BK ASSISTED BY: CH, TS

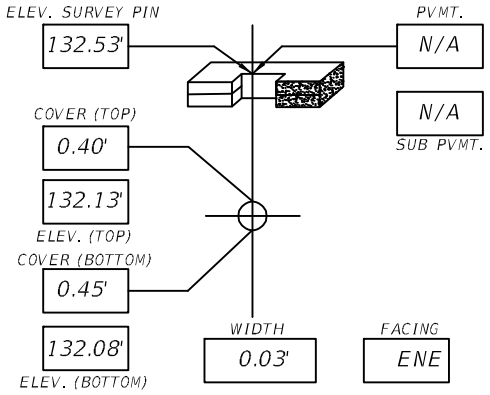
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

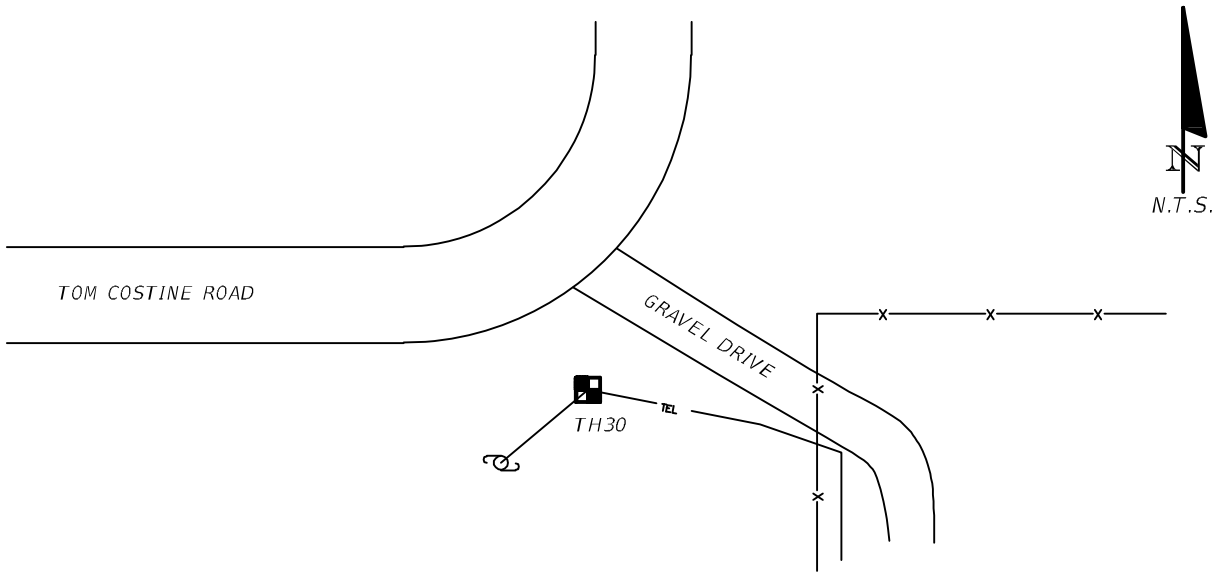


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
SMALL TELEPHONE CABLE RUNNING FROM POWER POLE TO SOUTH SIDE OF GATE OPENING.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
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CIVILSURV JOB #: 195:001:004

TEST HOLE #: 31

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: 10"

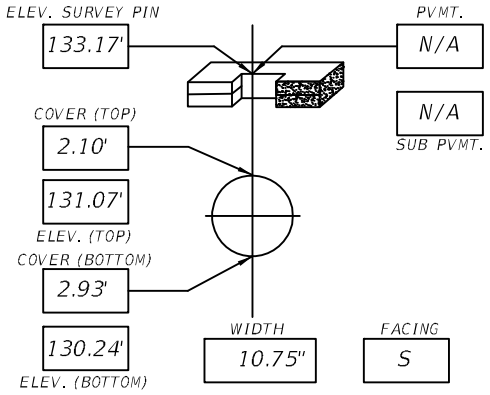
FORM BY: CH ASSISTED BY: BK, TS

UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/8/19

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

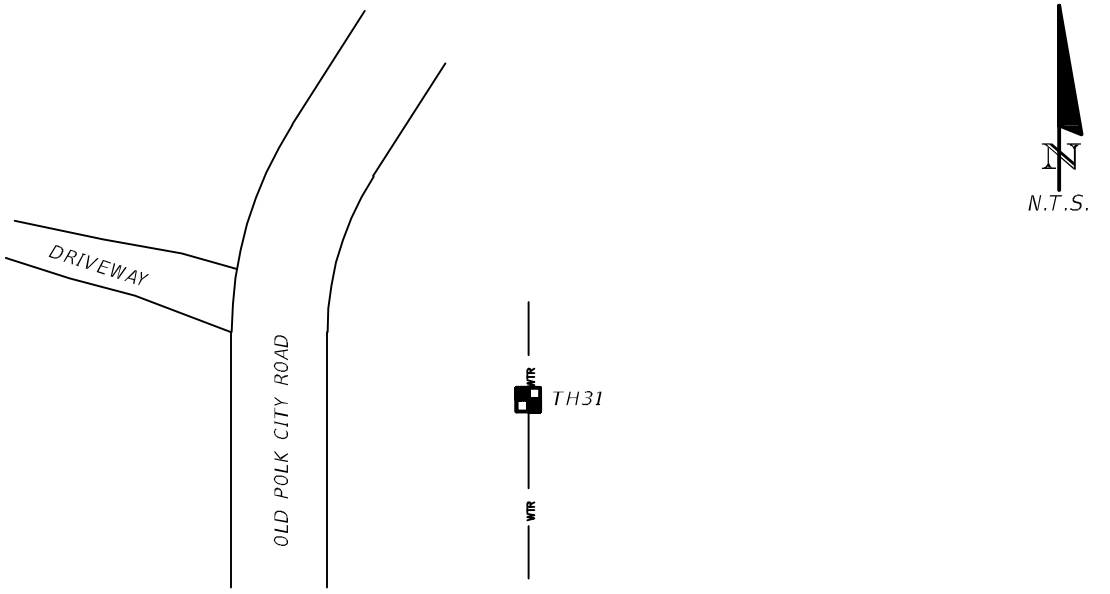


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 10" PVC WATER MAIN

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 32

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. TEL. SAN F.M. STORM
OTHER: NO UTILITIES FOUND

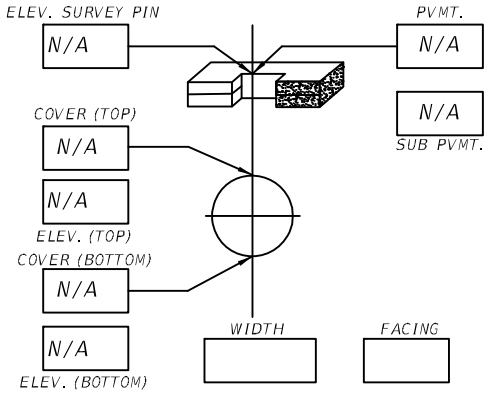
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND:

UTILITY CONDITION: GOOD FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/8/19

INSTALLED: NAIL HUB&TACK CHISX IRON ROD & CAP

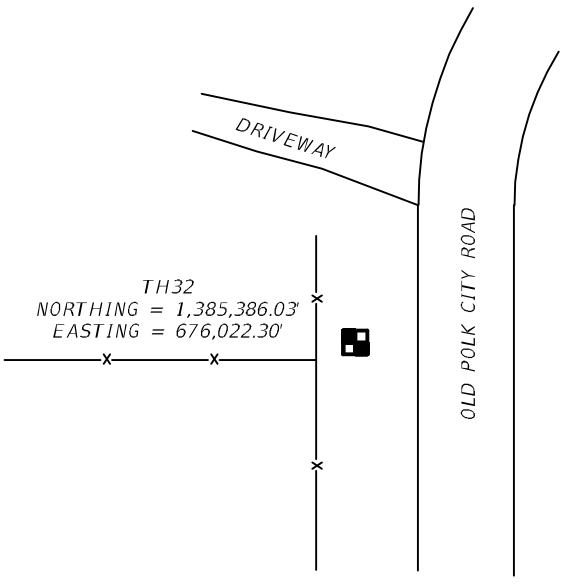
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
NO UTILITIES FOUND

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 33

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (2) 1.25"

FORM BY: CH ASSISTED BY: BK, TS

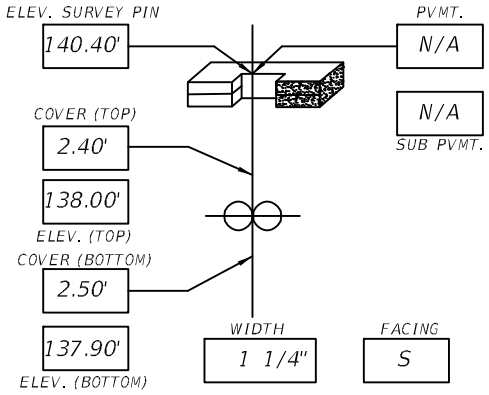
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

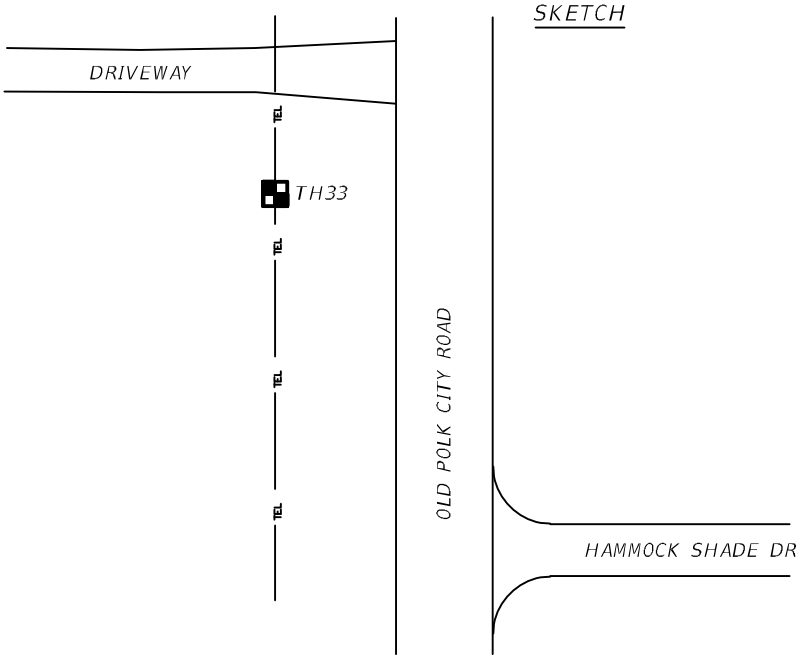


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING
NORTH/SOUTH PARALLEL TO ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 34

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

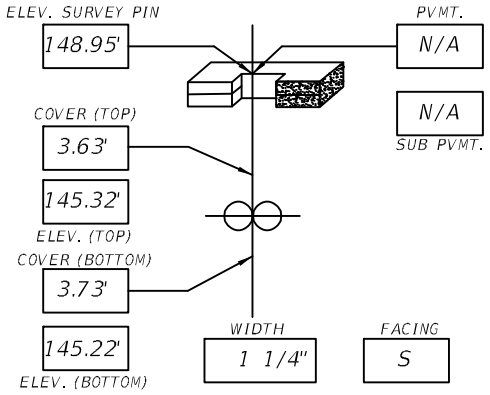
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1.25"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/4/19

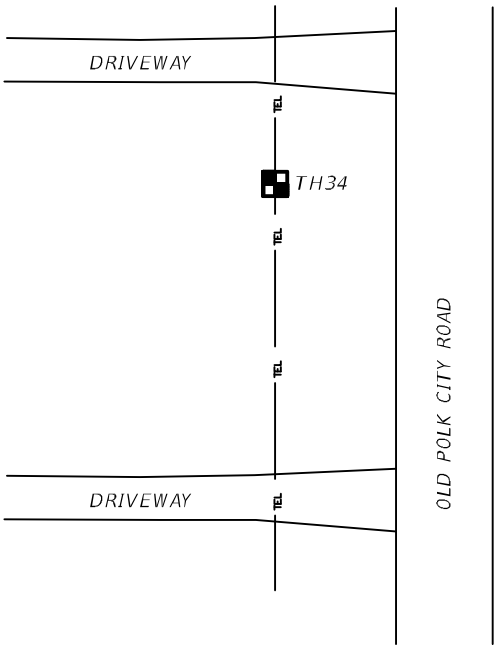
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING NORTH/SOUTH PARALLEL TO ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



N.T.S.

CIVILSURV
CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 35

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: [HARD] [SOFT] WET [MOIST] [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK DB CABLE N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

OTHER: HDPE

COVER ESTABLISHED BY:CH FORM CHECKED BY:WS

SIZE AS FOUND: (2) 1.25"

FORM BY: CH ASSISTED BY: BK, TS

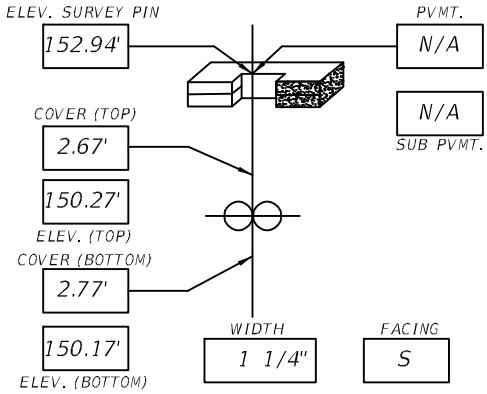
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/8/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

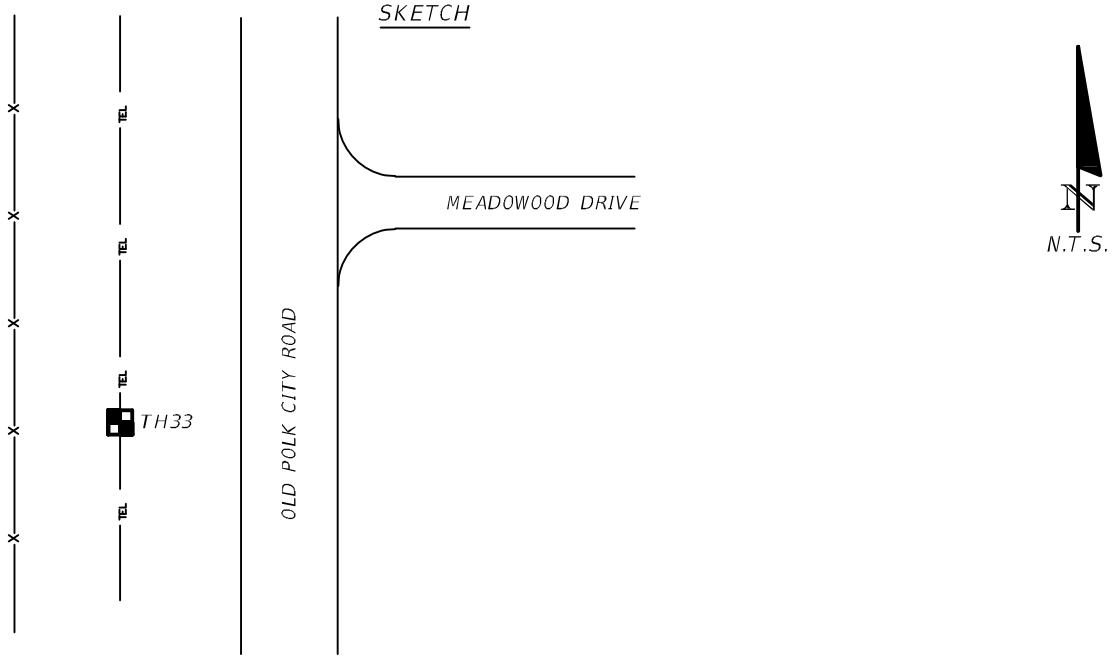


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1.25" HDPE PIPES RUNNING
NORTH/SOUTH PARALLEL TO ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 36

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

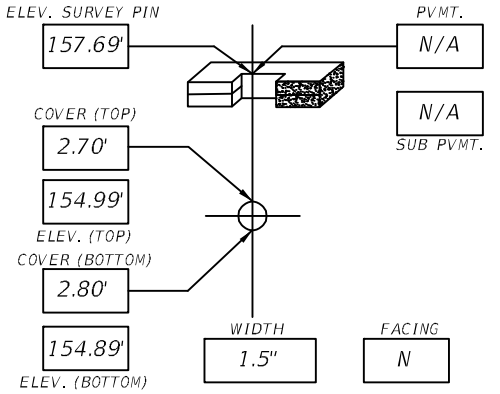
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: 1.25"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] SOFT WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/8/19

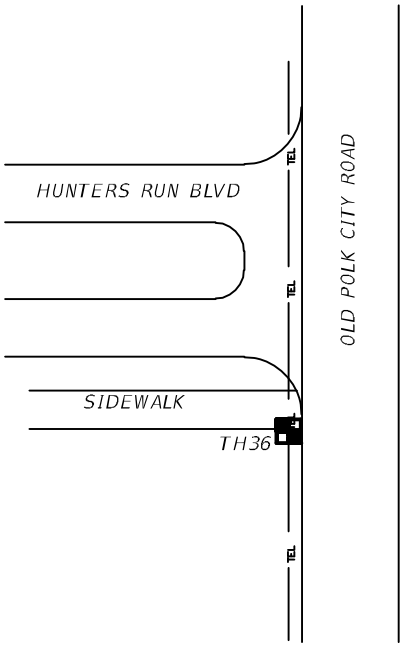
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 1.25" HDPE PIPE RUNNING NORTH/SOUTH

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



N
N.T.S.

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 36-A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

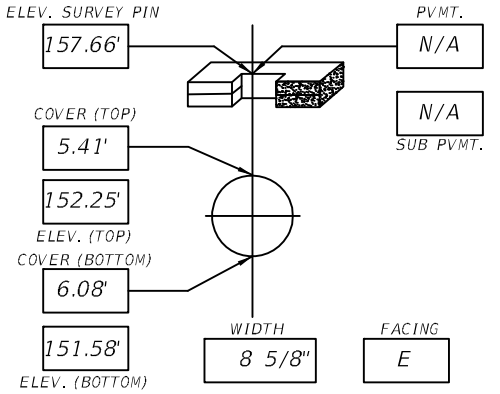
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 8"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] SOFT WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 2 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/8/19

INSTALLED: NAIL HUB&TACK CHISX IRON [PAINT MARK]

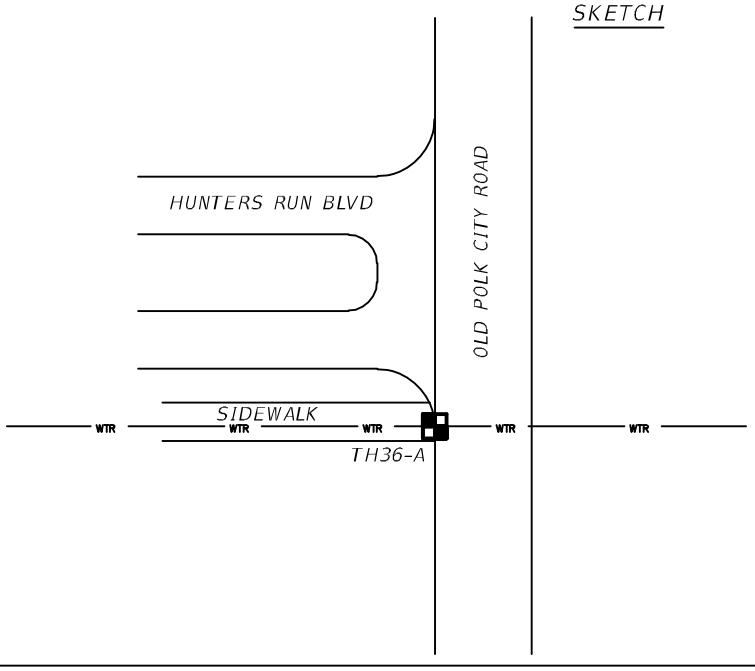
AT: CORNER CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 8" WATER MAIN UNDER SIDEWALK RUNNING EAST/WEST UNDER OLD POLK CITY ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 37

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

SOIL CONDITIONS: [HARD] SOFT WET MOIST [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR PVC UNK [DB CABLE] N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: 2"

FORM BY: CH ASSISTED BY: BK, TS

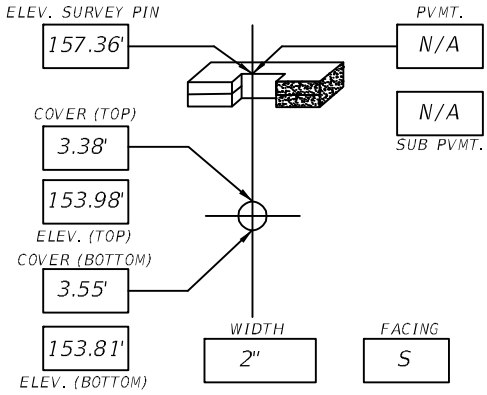
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/11/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

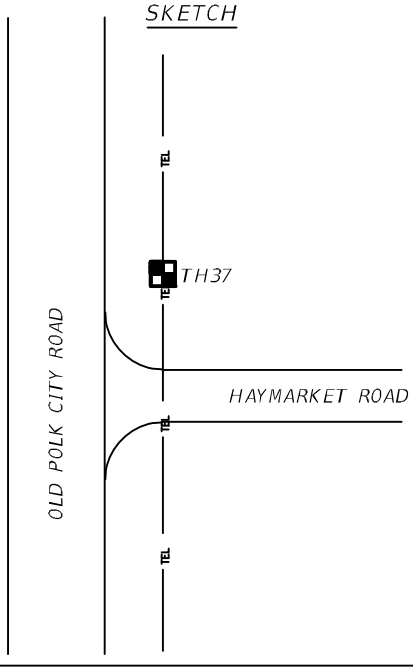


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" TELEPHONE CABLE RUNNING
NORTH/SOUTH PARALLEL TO ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 38

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

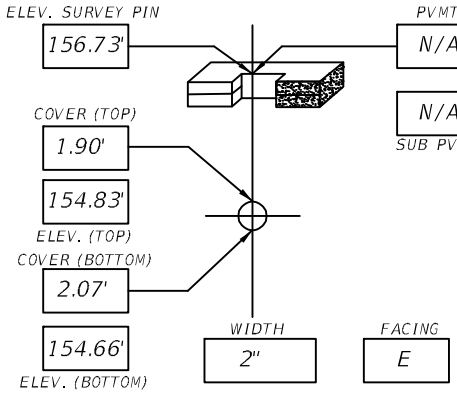
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/11/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

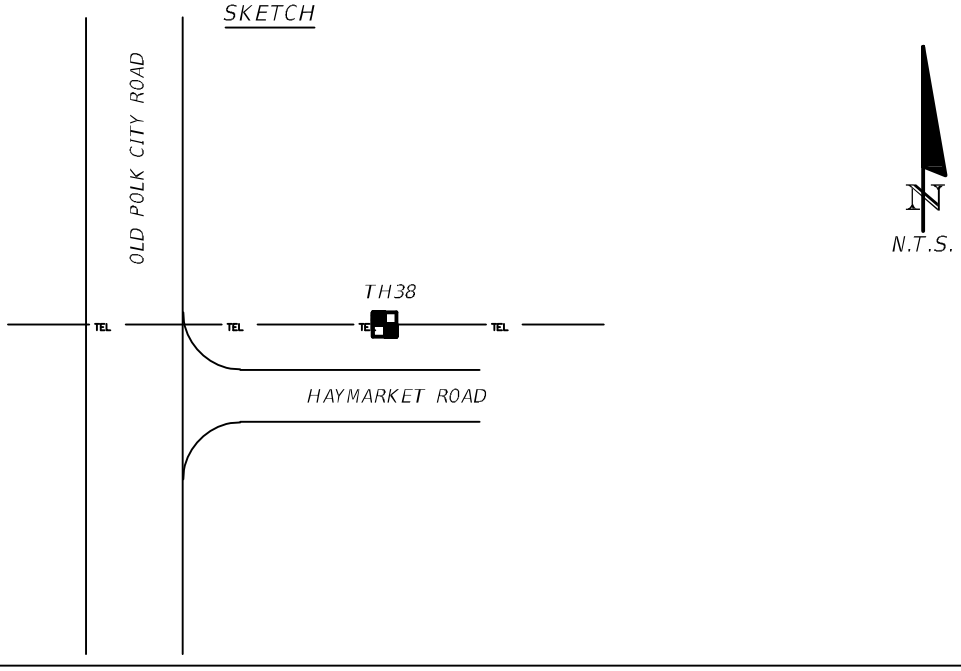
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" TELEPHONE CABLE RUNNING EAST/WEST PARALLEL TO ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 39

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. (TEL) SAN F.M. STORM
OTHER:

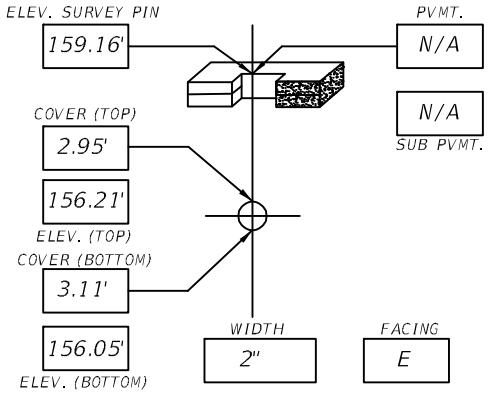
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] [SOFT] WET [MOIST] [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/11/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

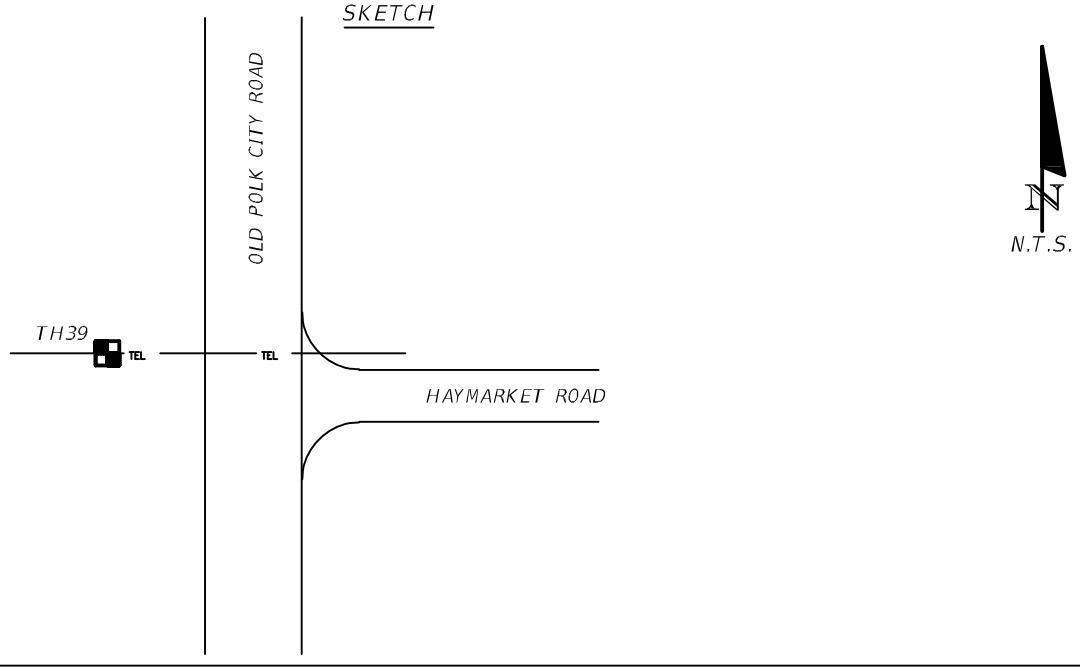
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" TELEPHONE CABLE RUNNING EAST/WEST PERPENDICULAR TO OLD POLK CITY ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 40

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

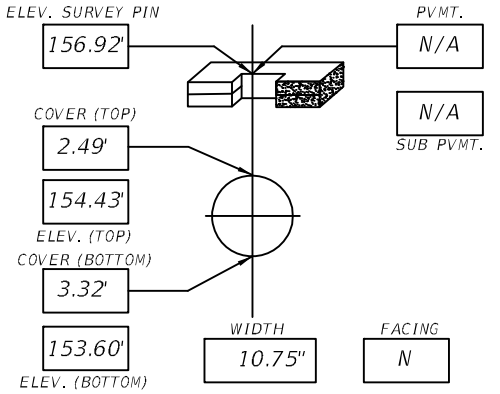
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 10"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] SOFT WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 4/11/19

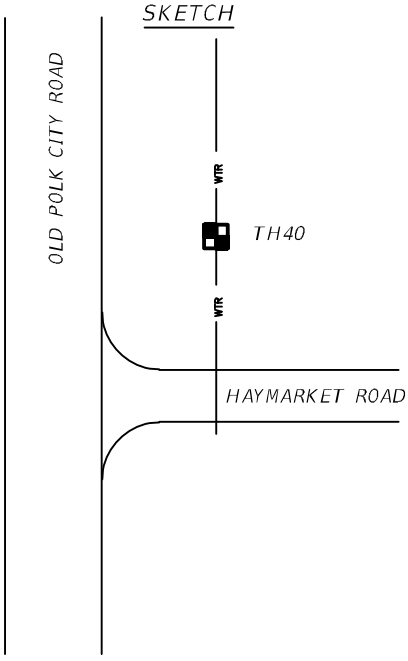
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 10" WATERLINE RUNNING NORTH/SOUTH PARALLEL TO OLD POLK CITY ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



N.T.S.

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 41

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

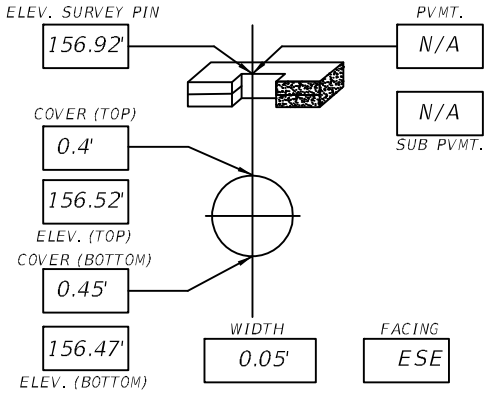
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 1/2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE [YELLOW] ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

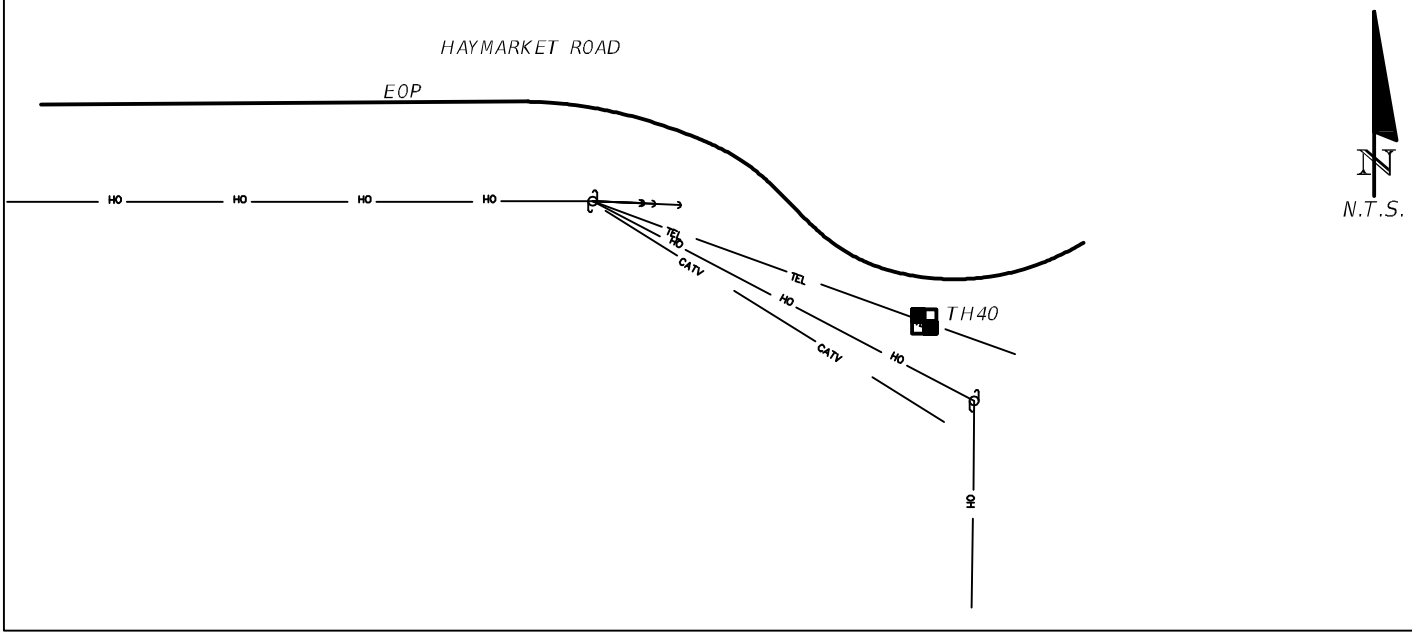
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 1/2" TELEPHONE CABLE 0.4' BELOW GROUND RUNNING ESE AROUND SOUTH SIDE OF CUL-DE-SAC

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 42

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

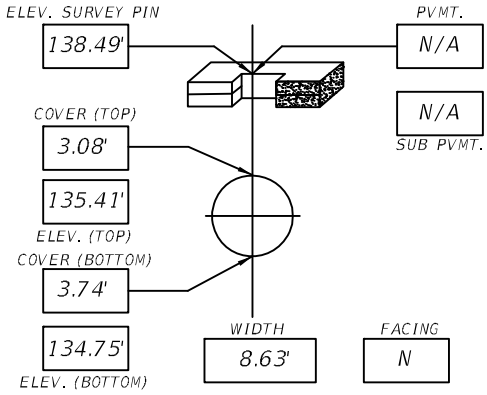
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: GREEN/BLUE

SIZE AS FOUND: 8"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

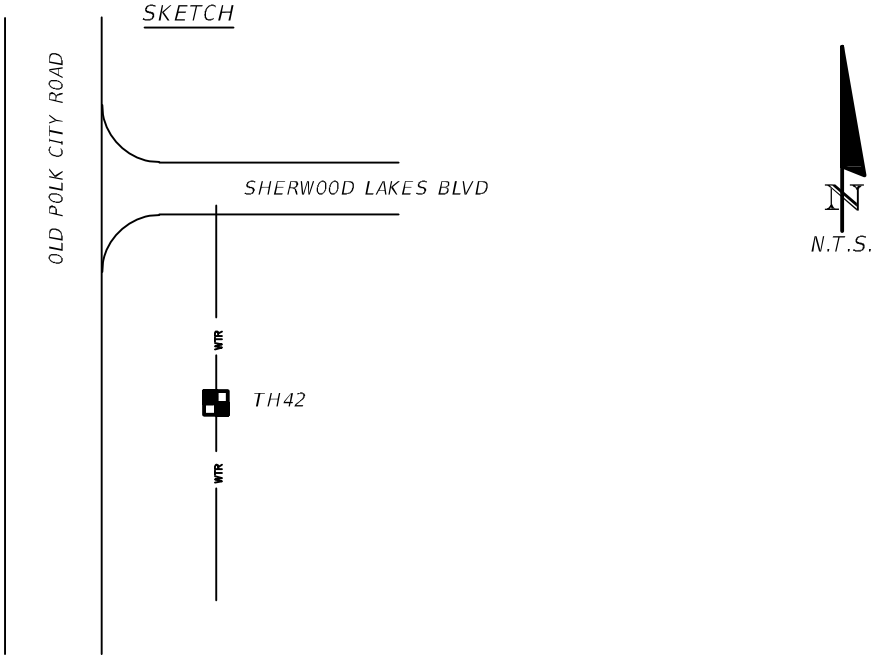
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 8" WATERLINE RUNNING NORTH/SOUTH PARALLEL TO WALT WILLIAMS ROAD

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



CIVILSURV
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2525 DRANE FIELD ROAD SUITE 7
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TELEPHONE: 863.646.4771
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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 43

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. TEL. SAN F.M. STORM
OTHER: NONE

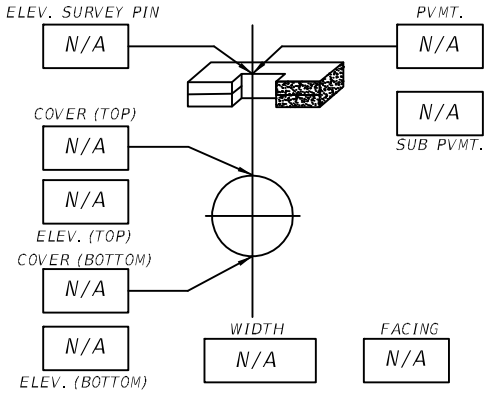
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: N/A

SIZE AS FOUND: N/A

UTILITY CONDITION: GOOD FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: WS

FORM BY: CH ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

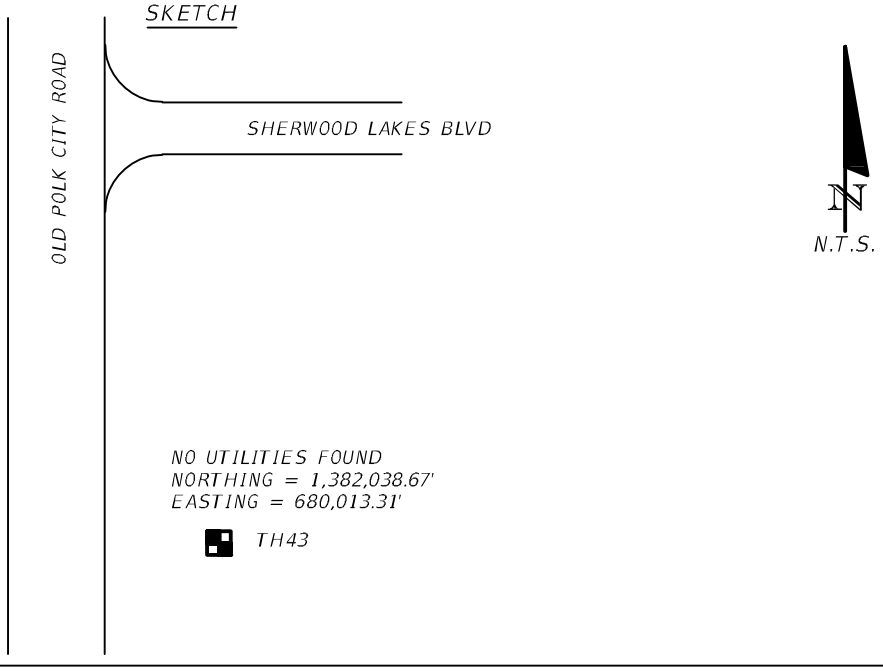
INSTALLED: NAIL HUB CHISX IRON ROD & CAP [LATH]
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
NO UTILITIES FOUND

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 44

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

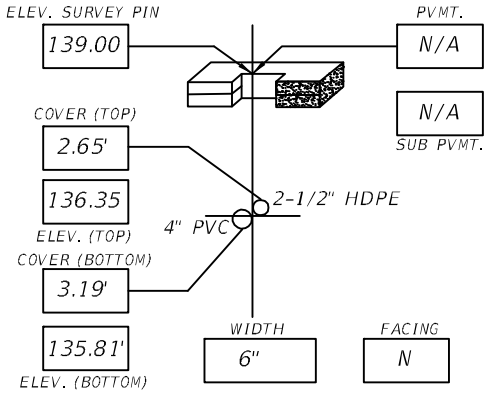
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: 2-1/2" HDPE

SIZE AS FOUND: (1) 4" PVC & (1) 2-1/2" HDPE

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

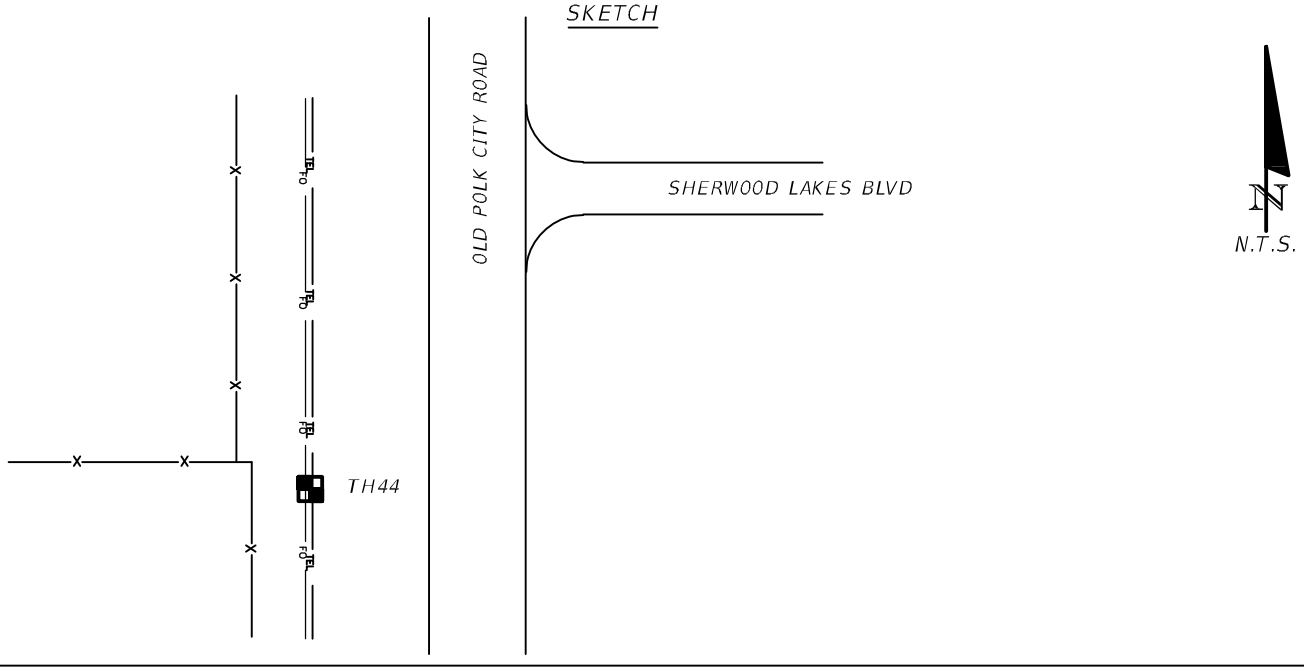
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP LATH
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (1) 2-1/2" BLACK HDPE PIPE AND (1) 4" GRAY PVC PIPE. THE 2-1/2" HDPE SITS JUST ABOVE AND ON THE EAST SIDE OF THE 4" PVC PIPE.

SURVEY INFORMATION:
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 45

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

SOIL CONDITIONS: [HARD] [SOFT] WET MOIST DRY DIRT
[SAND] CLAY [ROCKY] SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (3) 2" WHITE PVC

FORM BY: CH ASSISTED BY: TS

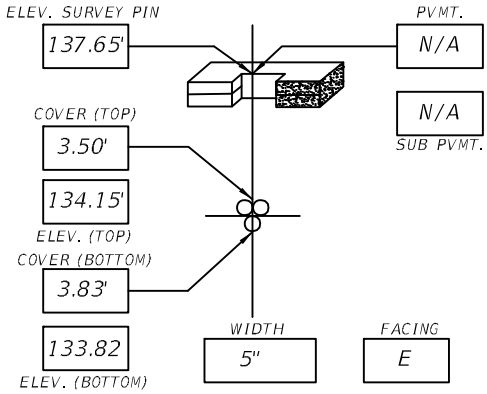
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP LATH

AT: [CROWN] EDGE OF UTILITY: N S E W

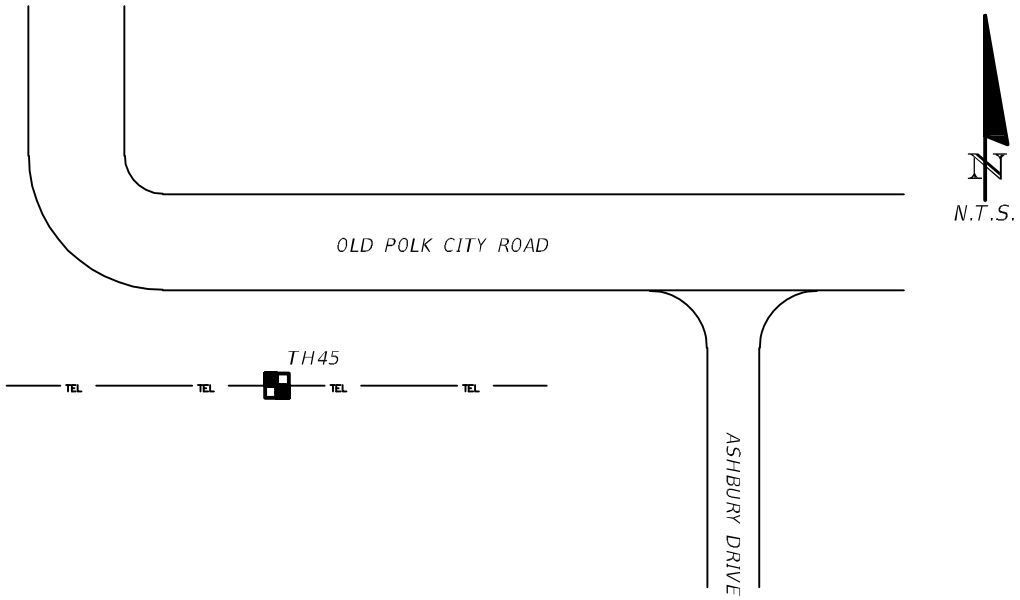


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (3) 2" WHITE PVC CONDUIT RUNNING
EAST/WEST PARALLEL WITH ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 46

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER [ELEC.] TEL. SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

LOCATED UTILITY: GAS WATER [ELEC.] TEL. SAN F.M. STORM
OTHER:

SOIL CONDITIONS: [HARD] [SOFT] [WET] [MOIST] [DRY] [DIRT]
[SAND] [CLAY] [ROCKY] SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (3) 4" CONDUIT

FORM BY: CH ASSISTED BY: TS

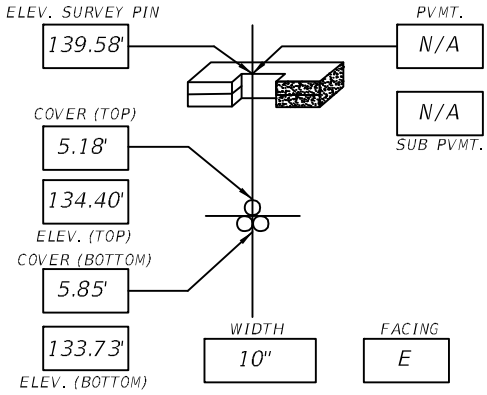
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/16/19

RIBBON INSTALLED: [RED] BLUE YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP LATH

AT: [CROWN] EDGE OF UTILITY: N S E W

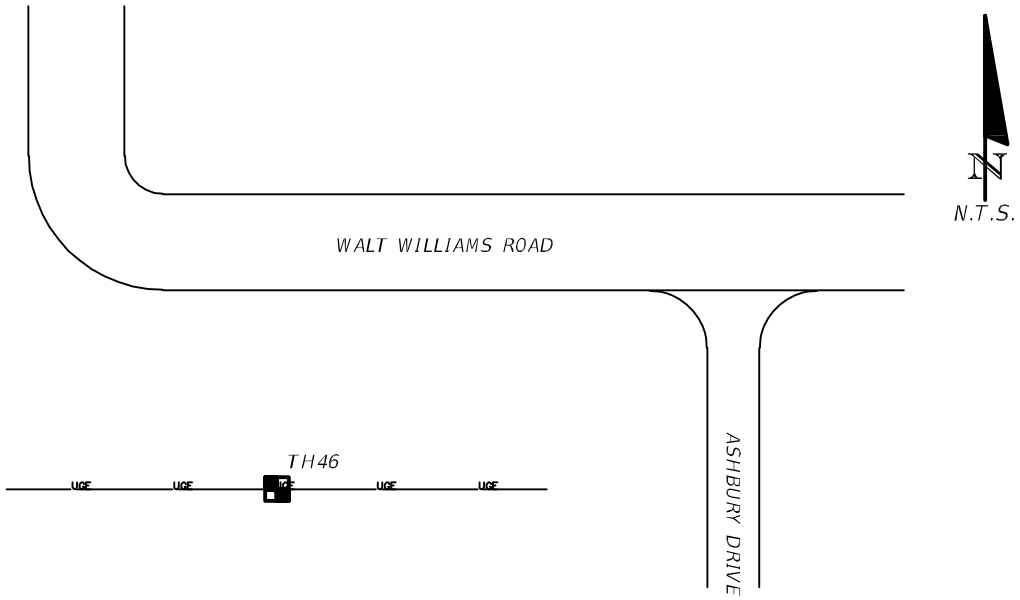


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (3) 4" GRAY PVC CONDUIT RUNNING
EAST/WEST PARALLEL WITH ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 47

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

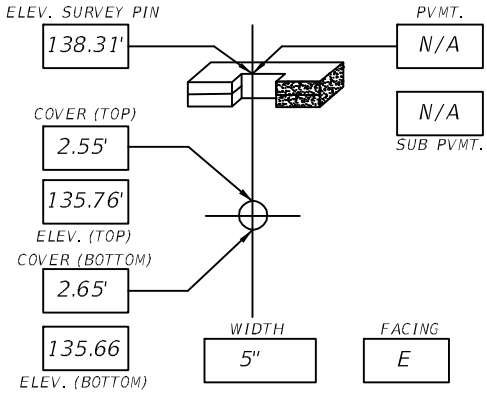
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: HDPE

SIZE AS FOUND: (2) 1-1/4"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] [SOFT] WET [MOIST] DRY DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 2 TODAY'S DATE: 4/17/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

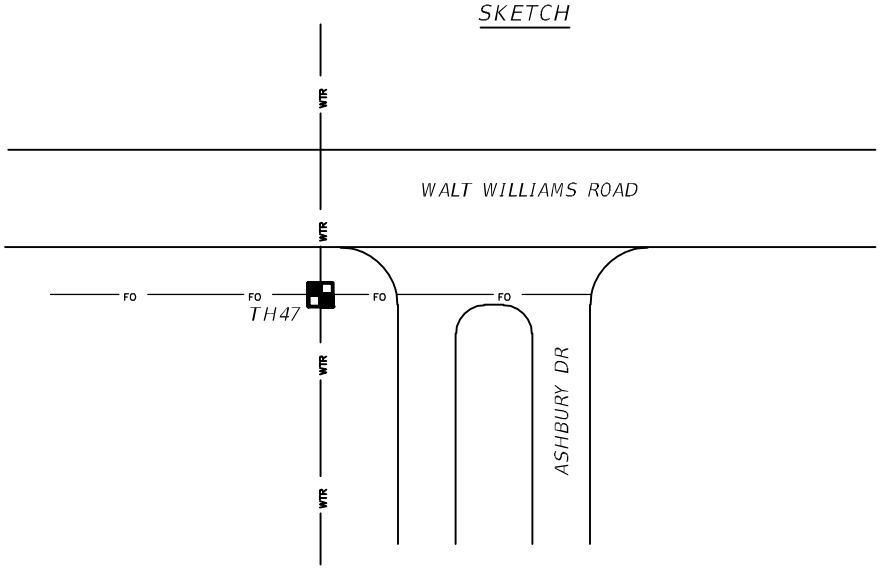
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 1-1/4" HDPE PIPES RUNNING EAST/WEST.
THERE IS A 10" WATER MAIN LYING BENEATH THE PIPES RUNNING NORTH/SOUTH UNDER WALT WILLIAMS ROAD

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



N.T.S.

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 47-A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

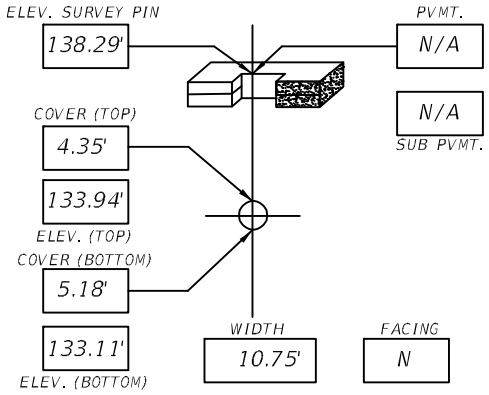
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 10"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] [SOFT] WET [MOIST] [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 2 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 2 TODAY'S DATE: 4/17/19

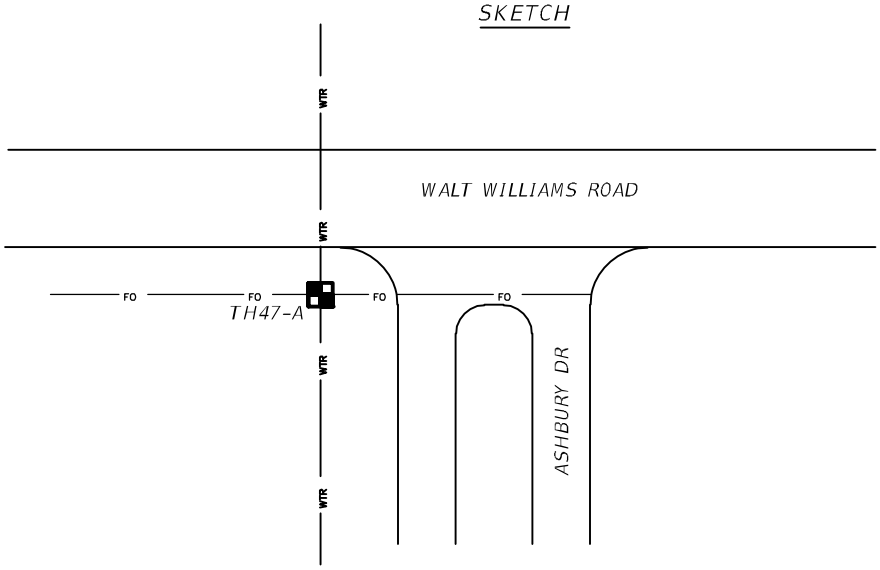
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 10" WATER MAIN RUNNING NORTH/SOUTH UNDER WALT WILLIAMS ROAD. WATER MAIN LIES BENEATH (2) 1-1/4" HDPE PIPES RUNNING EAST/WEST.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 48

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER [ELEC.] TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER [ELEC.] TEL. SAN F.M. STORM
OTHER:

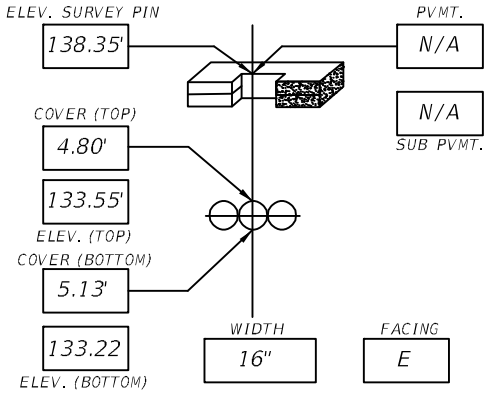
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: (3) 4" GRAY PVC CONDUIT

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: [RED] BLUE YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: [HARD] SOFT WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/17/19

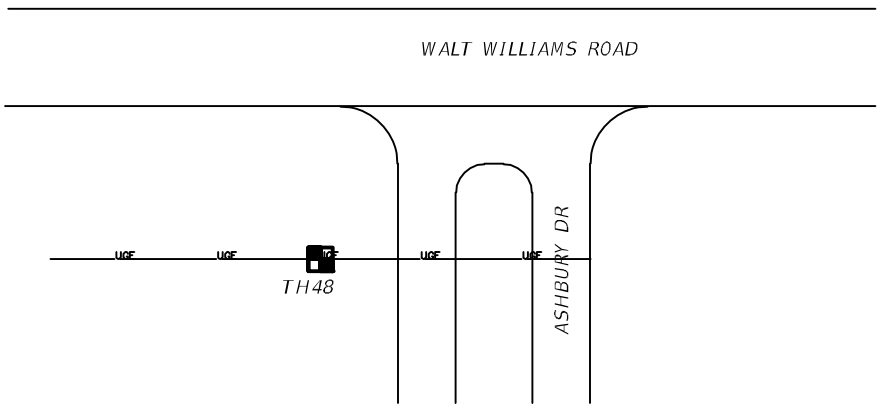
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (3) 4" PVC CONDUIT RUNNING EAST/WEST UNDER ASHBURY DRIVE.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



N
N.T.S.

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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 49

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

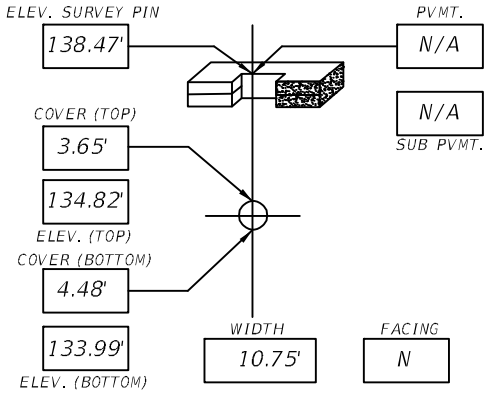
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 10"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 2 TODAY'S DATE: 4/17/19

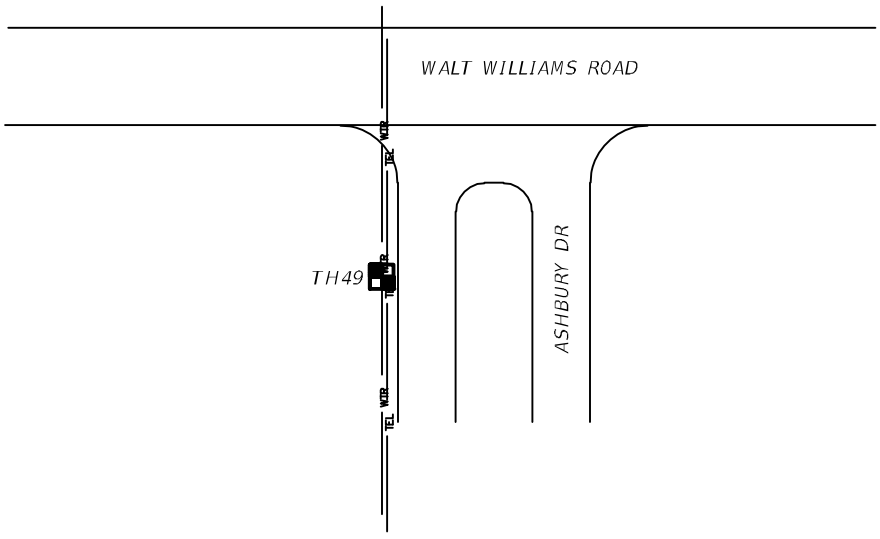
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 10" WATER MAIN RUNNING NORTH/SOUTH PARALLEL TO ASHBURY DR. WATER MAIN LIES BENEATH (2) 2" PVC PIPES ALSO RUNNING NORTH/SOUTH.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



N
N.T.S.

CIVILSURV
CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 49-A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

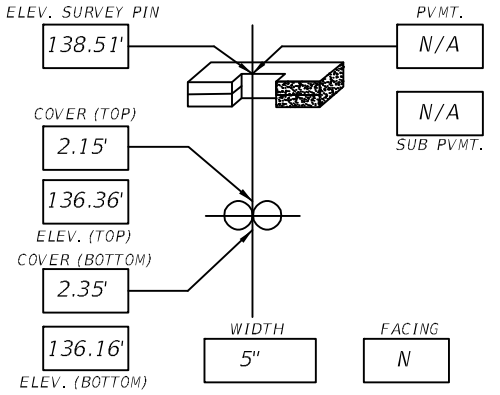
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: (2) 2" WHITE PVC

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR (N/A)

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 2 OF : 2 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 2 TODAY'S DATE: 4/17/19

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

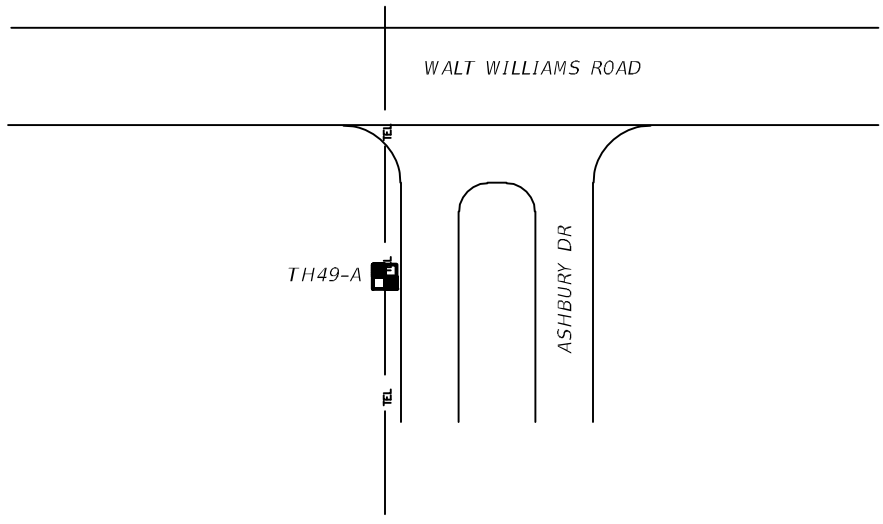
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 2" PVC PIPES RUNNING NORTH/SOUTH PARALLEL TO ASHBURY DR. PIPES ARE ABOVE A 10" WATER MAIN RUNNING NORTH/SOUTH.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



N
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CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 50

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

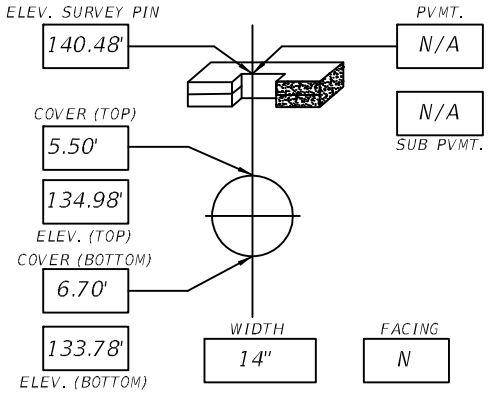
MATERIAL AS FOUND: DI CI [STL] W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK DB CABLE N/A

OTHER: _____

SIZE AS FOUND: 14"

UTILITY CONDITION: GOOD [FAIR] POOR N/A

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

SOIL CONDITIONS: [HARD] SOFT WET MOIST [DRY] DIRT
[SAND] CLAY [ROCKY] SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: BK, TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/18/19

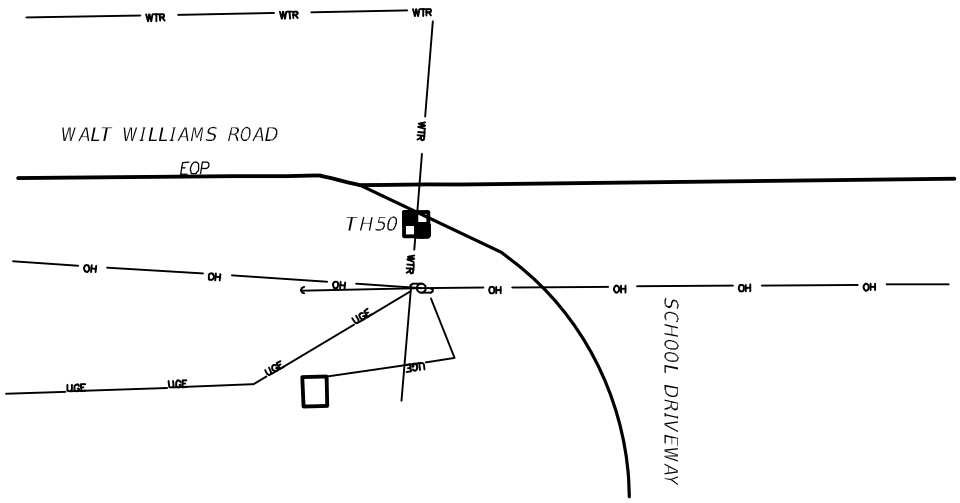
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 14" STEEL PIPE USED AS A SLEEVE FOR JACK AND BORE UNDER WALT WILLIAMS ROAD.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 51

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

LOCATED UTILITY: GAS WATER [ELEC.] TEL. SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

SHEET 1 OF : 3 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (3) 4" PVC/ALUMINUM PIPES

FORM BY: CH ASSISTED BY: TS

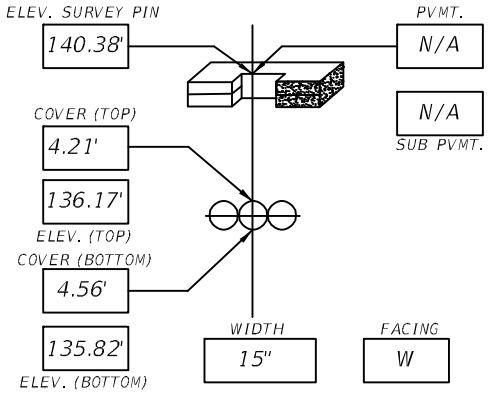
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 3 TODAY'S DATE: 4/18/19

RIBBON INSTALLED: [RED] BLUE YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

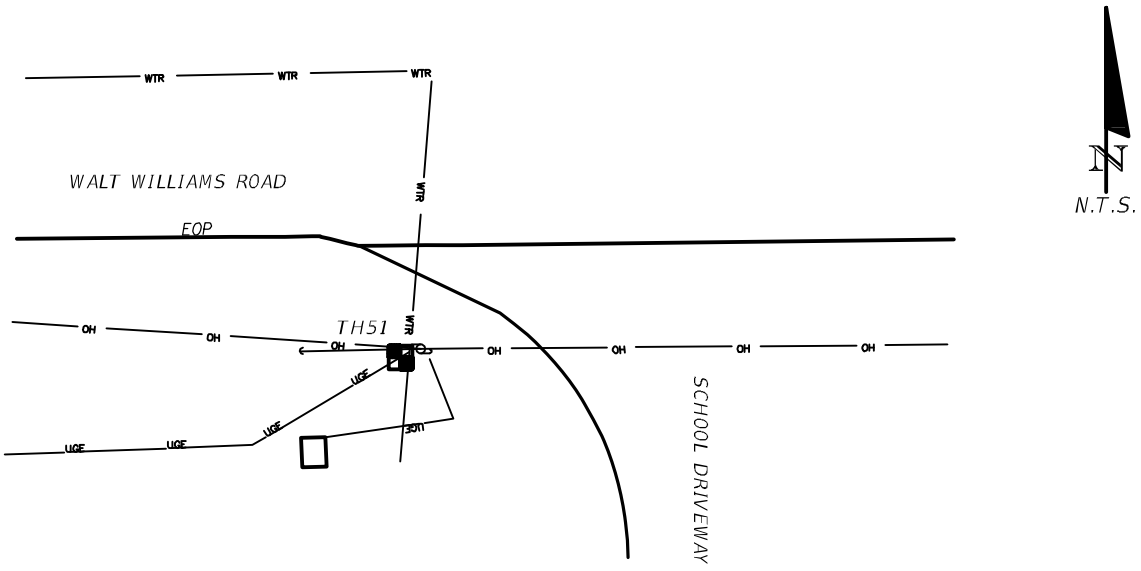


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (3) 4" ALUMINUM CONDUITS RUNNING FROM
POWER POLE AND TRANSITIONING TO PVC CONDUIT.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 51-A

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

LOCATED UTILITY: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SHEET 2 OF : 3 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: 8"

FORM BY: CH ASSISTED BY: TS

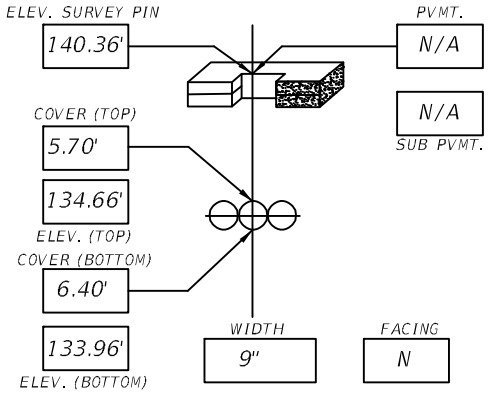
UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 3 TODAY'S DATE: 4/18/19

RIBBON INSTALLED: RED [BLUE] YELLOW ORANGE N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP

AT: [CROWN] EDGE OF UTILITY: N S E W

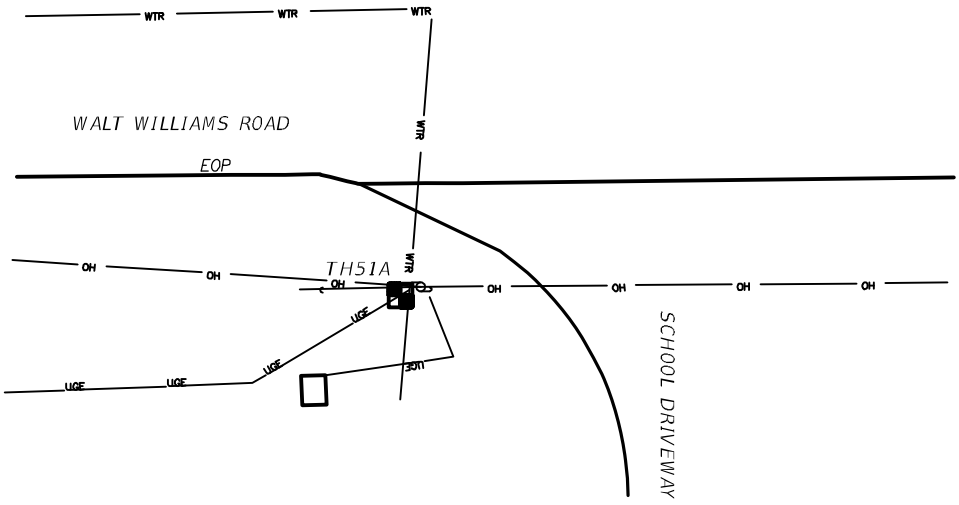


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 8" WATER MAIN RUNNING NORTH/SOUTH.

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 51-B

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS [WATER] ELEC. TEL. SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET [MOIST] DRY DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

SHEET 3 OF : 3 PROPOSED: WATERLINE

OTHER: _____

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: (2) 2" PVC

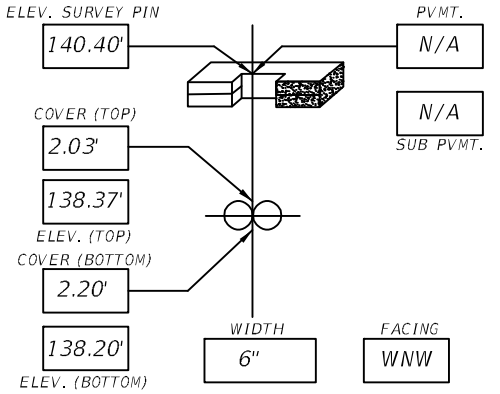
FORM BY: CH ASSISTED BY: TS

UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 3 TODAY'S DATE: 4/18/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

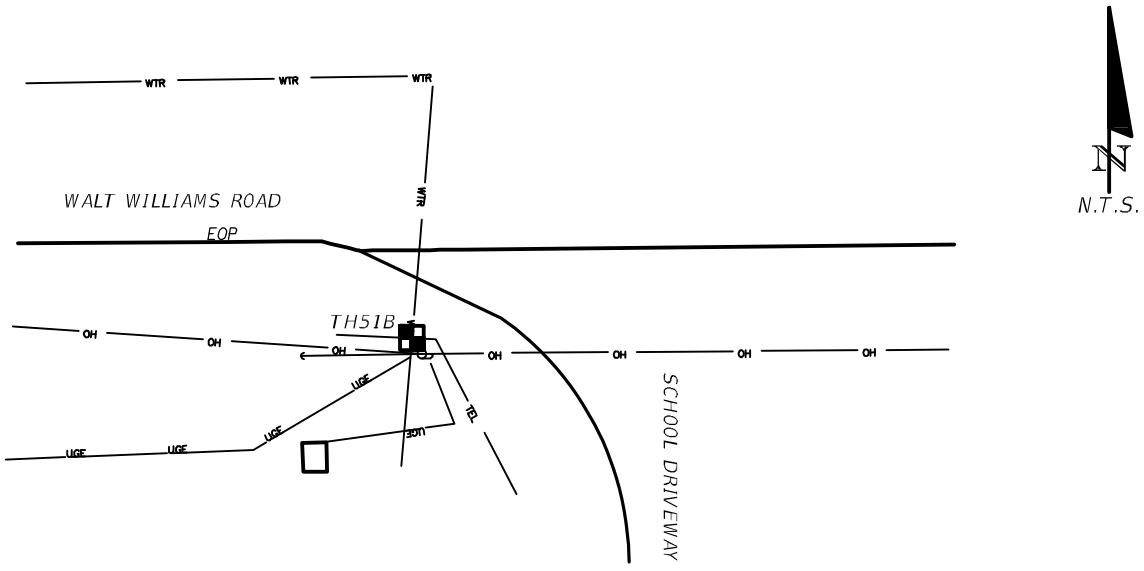


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND (2) 2" PVC CONDUITS

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 52

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

PAVEMENT TYPE: NONE ASPHALT CONCRETE
ASPHALT OVER CONCRETE
BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT
[SAND] CLAY ROCKY SOLID-ROCK N/A

MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT
PLA T.COTTA ACP GALV. ROUGH POUR
SMOOTH POUR [PVC] UNK DB CABLE N/A

OTHER: _____

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

SIZE AS FOUND: 4" PVC

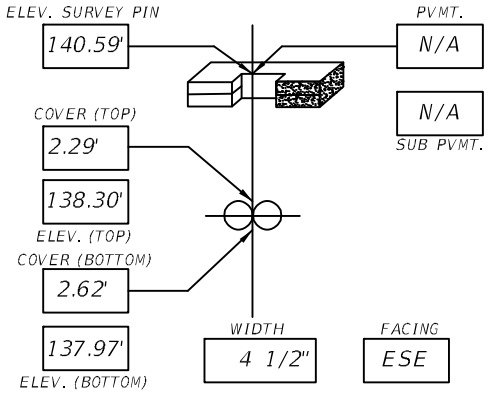
FORM BY: CH ASSISTED BY: TS

UTILITY CONDITION: [GOOD] FAIR POOR N/A

NUMBER OF HOLES: 1 TODAY'S DATE: 4/18/19

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A
PINK WHITE PURPLE GREEN

INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

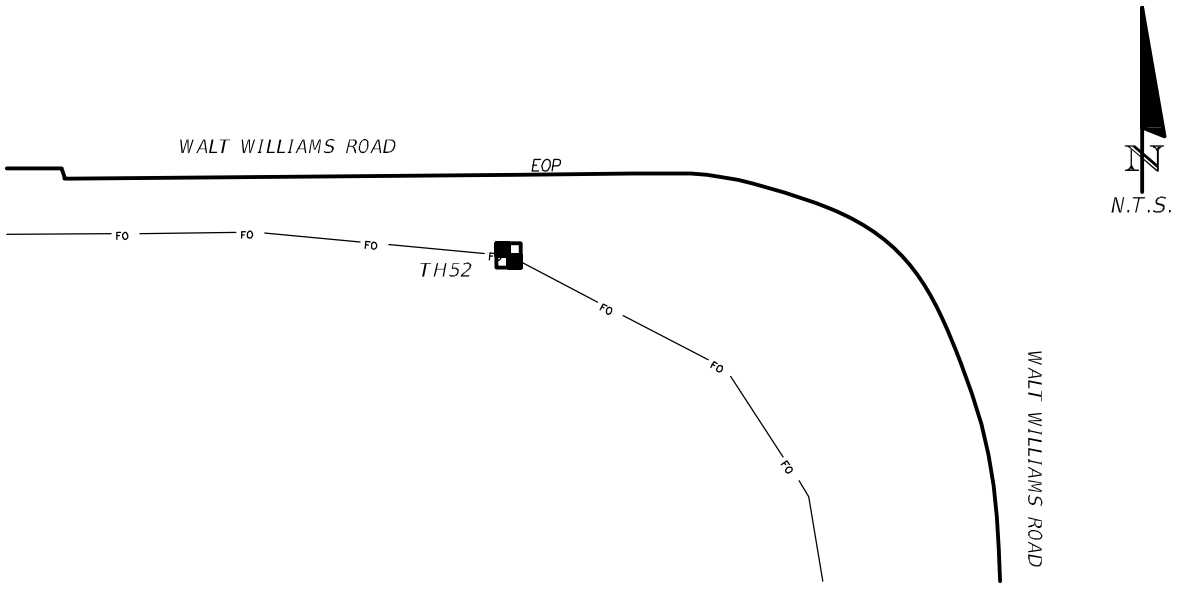


SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 4" PVC PIPE (WHITE)

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



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VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 195:001:004

TEST HOLE #: 53

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: CAROLLO ENGINEERS INC.

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. TEL. SAN F.M. STORM
OTHER: BURIED CABLE TV

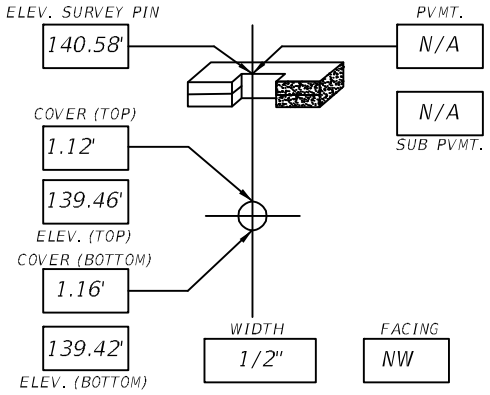
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 1/2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: [GRASS] SIDEWALK DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR [N/A]

SOIL CONDITIONS: HARD [SOFT] WET MOIST [DRY] DIRT [SAND] CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: CH ASSISTED BY: TS

NUMBER OF HOLES: 1 TODAY'S DATE: 4/18/19

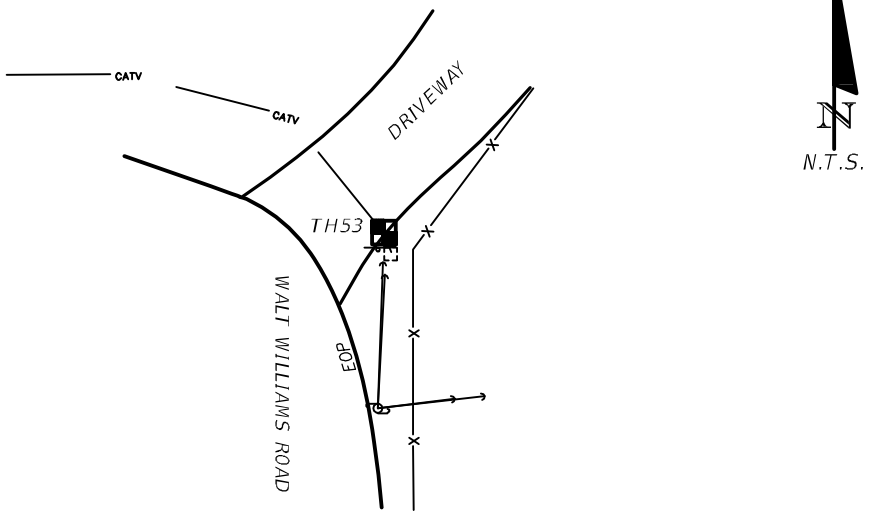
INSTALLED: NAIL [HUB] CHISX IRON ROD & CAP
AT: [CROWN] EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 1/2" CABLE

SURVEY INFORMATION: _____
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 030:004:016

TEST HOLE #: TC 1

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: POLK CO, UTILITIES DIVISION

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER: BURIED CABLE TV

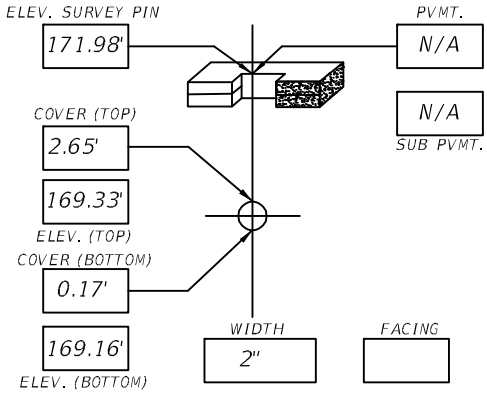
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR N/A

SOIL CONDITIONS: HARD SOFT WET MOIST DRY DIRT SAND CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 10/08/19

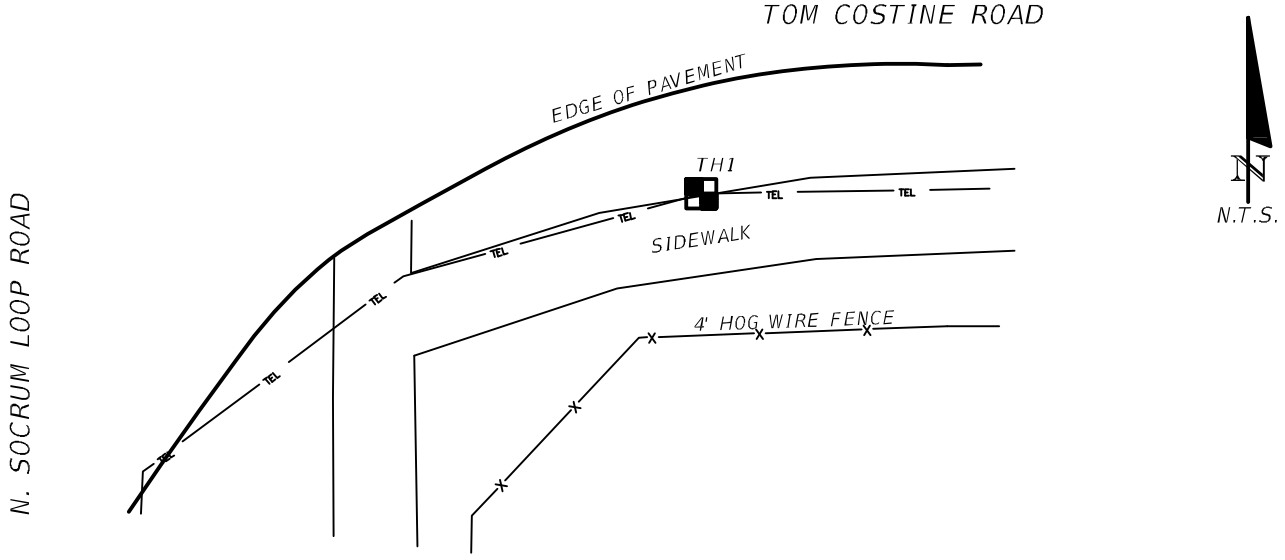
INSTALLED: NAIL HUB CHISX IRON ROD & CAP
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" CABLE
UNDER NORTH EDGE OF SIDEWALK

SURVEY INFORMATION: NORTHING = 1,385,939.49'
EASTING = 670,249.88'
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV DESIGN GROUP, INC.
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TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 030:004:016

TEST HOLE #: TC 2

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: POLK CO, UTILITIES DIVISION

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER: BURIED CABLE TV

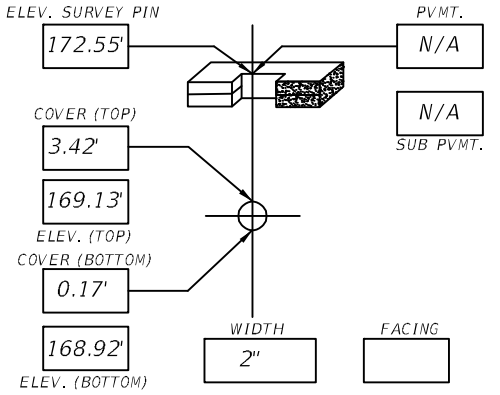
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR N/A

SOIL CONDITIONS: HARD SOFT WET MOIST DRY DIRT SAND CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 10/08/19

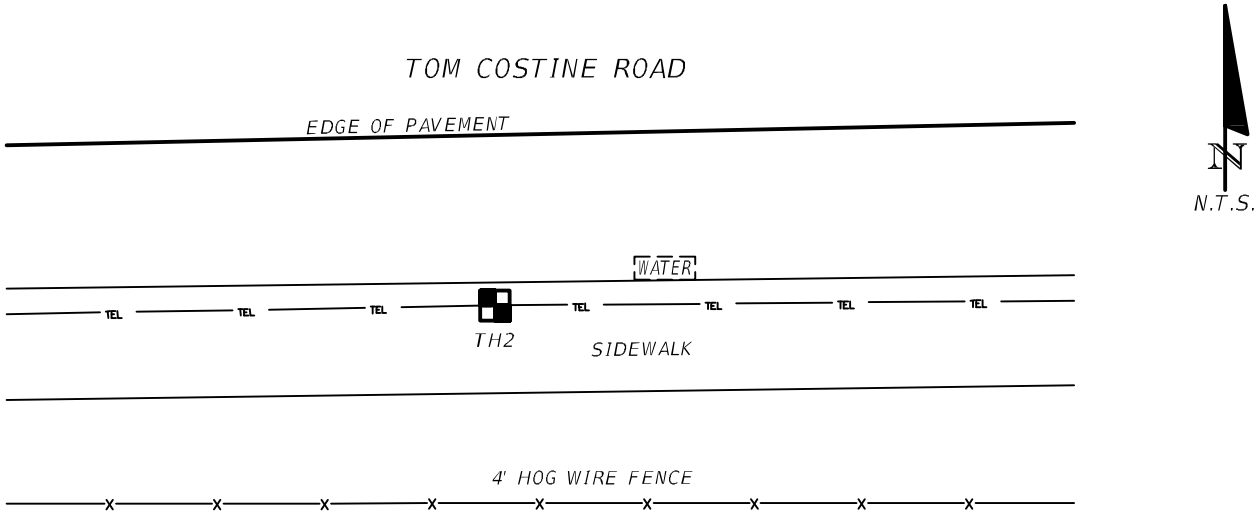
INSTALLED: NAIL HUB CHISX IRON ROD & CAP
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" CABLE UNDER SIDEWALK

SURVEY INFORMATION: NORTHING = 1,385,940.14'
EASTING = 670,286.15'
GIVEN ELEVATION:
TIME:
STATION: OFFSET:

SKETCH



VACUUM TEST HOLE REPORT

CIVILSURV
CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

CIVILSURV JOB #: 030:004:016

TEST HOLE #: TC 3

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: POLK CO, UTILITIES DIVISION

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER: BURIED CABLE TV

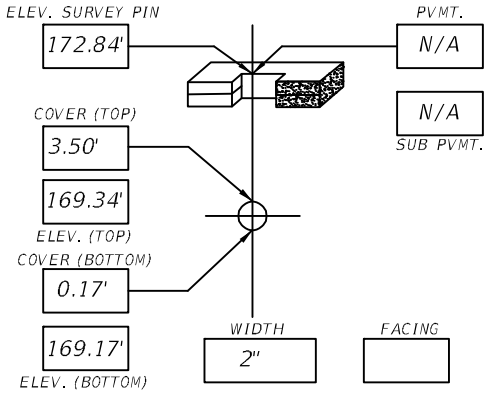
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR N/A

SOIL CONDITIONS: HARD SOFT WET MOIST DRY DIRT SAND CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 10/08/19

INSTALLED: NAIL HUB CHISX IRON ROD & CAP
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2" CABLE UNDER SIDEWALK

SURVEY INFORMATION: NORTHING = 1,385,940.56'
EASTING = 670,338.01'
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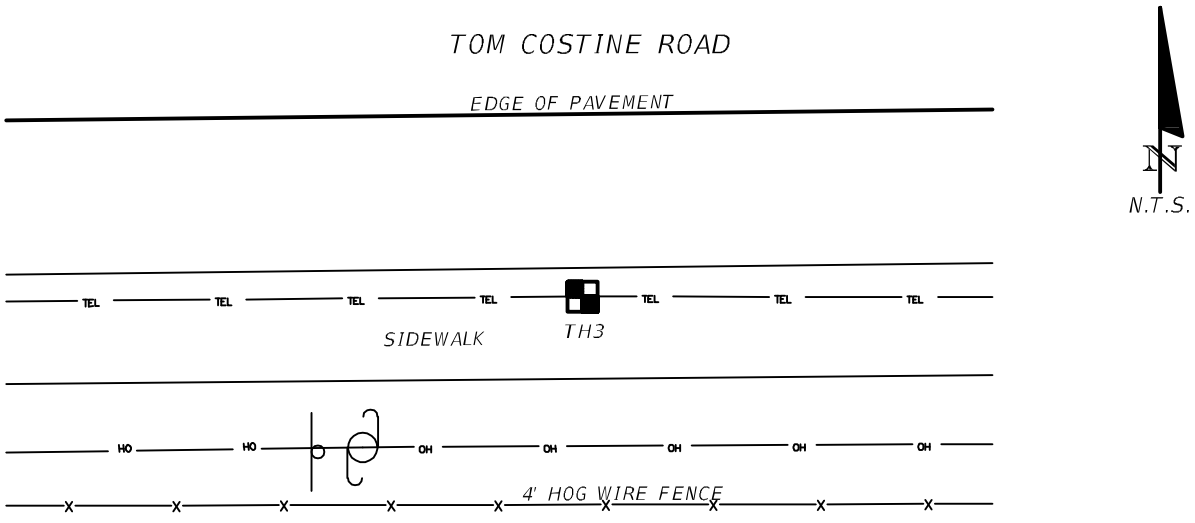
TIME:
STATION: OFFSET:

SKETCH



CIVILSURV
CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 030:004:016

TEST HOLE #: TC 4

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: POLK CO, UTILITIES DIVISION

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER: BURIED CABLE TV

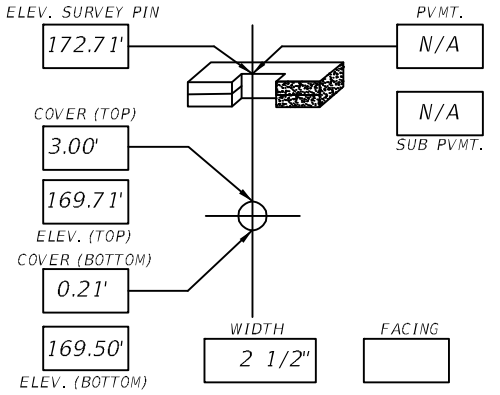
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2 1/2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR N/A

SOIL CONDITIONS: HARD SOFT WET MOIST DRY DIRT SAND CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 10/08/19

INSTALLED: NAIL HUB CHISX IRON ROD & CAP
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2 1/2" CABLE UNDER SIDEWALK

SURVEY INFORMATION: NORTHING = 1,385,942.41'
EASTING = 670,960.47'
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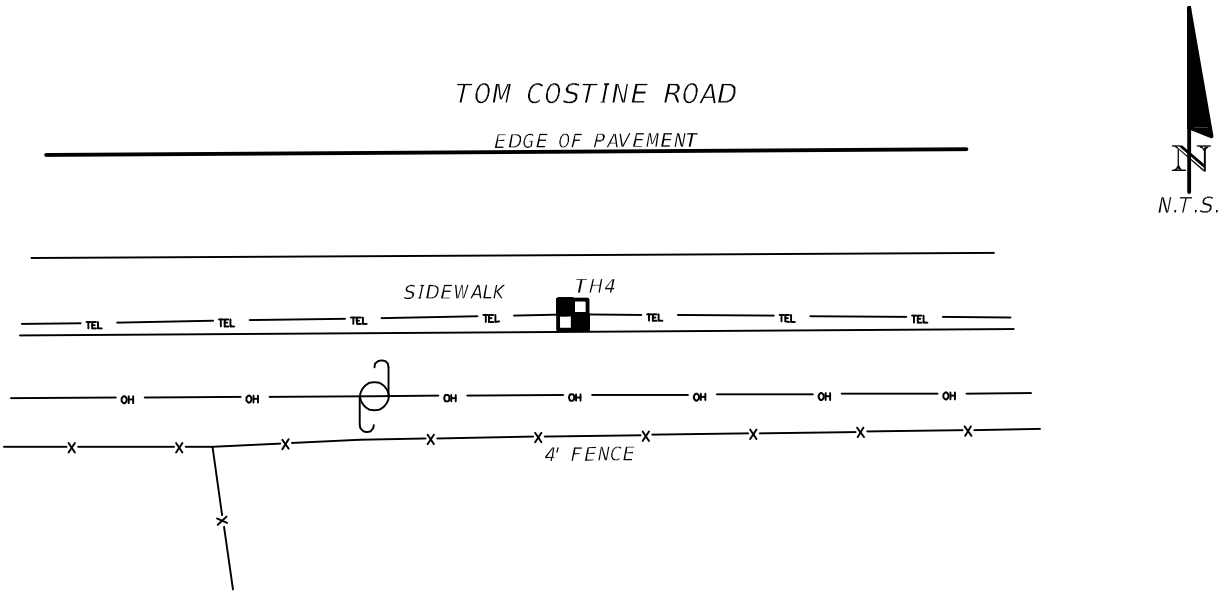
TIME:
STATION: OFFSET:

SKETCH



CIVILSURV
CIVILSURV DESIGN GROUP, INC.
2525 DRANE FIELD ROAD SUITE 7
LAKELAND, FL 33811
TELEPHONE: 863.646.4771
FAX: 863.646.3378

VACUUM TEST HOLE REPORT

CIVILSURV JOB #: 030:004:016

TEST HOLE #: TC 5

CIVILSURV PM: KG

PROJECT NAME: GIBSON OAKS

F.D.O.T. JOB#: WORK ORDER #:

LOCATE REQUESTED BY: POLK CO, UTILITIES DIVISION

REQUESTED LOCATE: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER:

LOCATED UTILITY: GAS WATER ELEC. [TEL.] SAN F.M. STORM
OTHER: BURIED CABLE TV

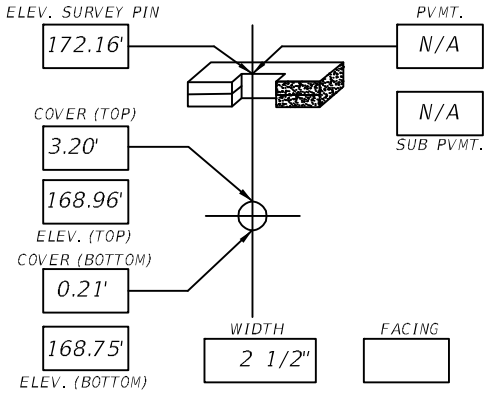
MATERIAL AS FOUND: DI CI STL W/STL VCPX RCP TILE DUCT PLA T.COTTA ACP GALV. ROUGH POUR SMOOTH POUR PVC UNK [DB CABLE] N/A

OTHER: _____

SIZE AS FOUND: 2 1/2"

UTILITY CONDITION: [GOOD] FAIR POOR N/A

RIBBON INSTALLED: RED BLUE YELLOW [ORANGE] N/A PINK WHITE PURPLE GREEN



PAVEMENT TYPE: NONE ASPHALT CONCRETE ASPHALT OVER CONCRETE BRICK COBBLES PAVERS
OTHER: GRASS [SIDEWALK] DIRT N/A

PAVEMENT CONDITIONS: GOOD FAIR POOR N/A

SOIL CONDITIONS: HARD SOFT WET MOIST DRY DIRT SAND CLAY ROCKY SOLID-ROCK N/A

SHEET 1 OF : 1 PROPOSED: WATERLINE

COVER ESTABLISHED BY: CH FORM CHECKED BY: CH

FORM BY: BK ASSISTED BY: CH

NUMBER OF HOLES: 1 TODAY'S DATE: 10/08/19

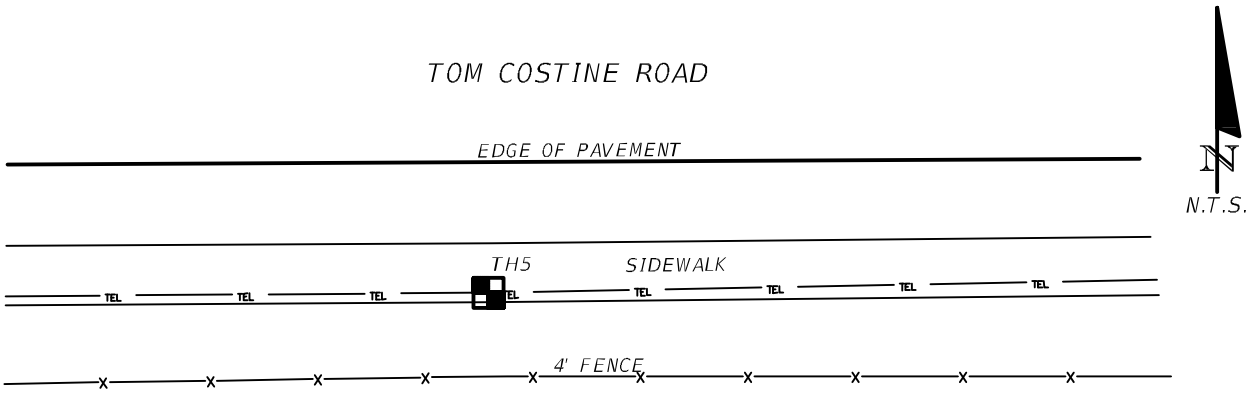
INSTALLED: NAIL HUB CHISX IRON ROD & CAP
AT: CROWN EDGE OF UTILITY: N S E W

SURVEY PIN LOCATED BY: CIVILSURV

NOTES:
FOUND 2 1/2" CABLE UNDER SIDEWALK

SURVEY INFORMATION: NORTHING = 1,385,942.49'
EASTING = 671,013.86'
GIVEN ELEVATION: _____
TIME:
STATION: OFFSET:

SKETCH



APPENDIX B

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 E
Bartow FL 33830-4268
Ph: (863) 533-9007
Fax: (863) 533-8997

August 29, 2019

Carollo Engineers, Inc.
200 East Robinson St., Suite 1400
Orlando, FL 32801
Attn: Dwayne R. Kreidler

Re: Madrid Project No. 12818.3
Geotechnical Engineering Report
Proposed Gibson Oaks Water Main
Lakeland, Florida

Dear Mr. Kreidler:

Madrid Engineering Group, Inc. (Madrid) is pleased to submit this Geotechnical Engineering Report summarizing the results of our geotechnical subsurface exploration and engineering evaluation services completed for the above referenced project. The work was completed in general accordance with the authorized scope of work in our cost estimate proposal dated April 5, 2018 and provides general geotechnical recommendations regarding the proposed construction.

We appreciate the opportunity to be of service to you on this project and look forward to working with you on future projects. If you have any questions, please do not hesitate to contact us.

Sincerely,
Madrid Engineering Group, Inc. (EB 6509)

Kevin M. Hill, P.E.
Sr. Project Manager
Florida P.E. No. 72949

Attachment: Geotechnical Engineering Report

Madrid Engineering Group, Inc.

Geotechnical Engineering Report

Gibson Oaks Water Main, Lakeland, Florida

Prepared for:

Carollo Engineers, Inc.

Prepared by:

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, FL 33830
863-533-9007

Project No. 12818.3
August 2019

EXECUTIVE SUMMARY

Project Description

Project Features Relative to This Report	
Gibson Oaks Water Main	• Approx. 5,000 feet along N. Socrum Loop Road • Approx. 3,000 feet along Tom Costine Road • Approx. 1,000 feet directional drill on west side of Gibson Oaks WPF and 2,200 feet directional drill beneath a wetland on east side of Gibson Oaks WPF. • Approx. 3,000 feet along Old Polk City Rd. • Approx. 3,000 feet along Walt Williams Rd.

Field Activities

SPT Borings	
Pipeline	• SPT-1 through SPT-4 on east side of N. Socrum Loop Rd. • SPT-5 and SPT-6 on north side of Tom Costine Rd. • SPT-8 through SPT-10 on west side of Old Polk City Rd. • SPT-13 and SPT-14 on west/south side of Walt Williams Rd.

Findings and Recommendations

The proposed alignment falls along generally suitable soil conditions. In addition, the shallow sandy soils encountered (depths ranging from about 4 to 14 feet bgs) in the borings were generally suitable for re-use as backfill. Clayey sands, where encountered within trench excavations, may retain moisture and can be difficult to compact. Loose zones, if at the pipe subgrade level, should be over-excavated and replaced.

We assume the pipeline will be installed via open cut method between depths of approximately 5 to 8 feet below existing grade. Directional drilling is also proposed along portions of the alignment; however, some locations have not been provided. Assuming this invert depth range for open cut areas, and based on the results of the boring program, the trench excavations will typically expose mostly very loose to medium dense fine sands (SP) to clayey sands (SC) with occasional thin layers of slightly silty sands (SP-SM). A shallow static water table (1.5 to 4 feet depth) was only encountered in the borings along N. Socrum Loop Road at the west end of the alignment. The remainder of the borings either did not encounter a discernible water table or there may have been a perched water table on top of the clayey sand stratum. It is likely that dewatering will not be required in the central and eastern portions of the

alignment (although those are the lower elevations of the site), depending on the depth of excavation.

Very loose to loose clean sands were commonly encountered in the surficial 4 to 14 feet (depth to clayey sand varies across the site) and may not be stable in the short-term during excavations; the need for trench wall support should be anticipated by the contractor.

Prior to construction, bulk samples representative of anticipated subgrade and fill soils should be collected and subjected to Standard Proctor testing. Existing sandy soils excavated and intended for reuse as backfill may require moisture conditioning to permit adequate compaction.

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FIGURES

Figure 1 Location Map
Figure 2 USGS GIS Topographic Map
Figure 3 NRCS/USDA Soils Map
Figure 4 Boring Location Plan

APPENDICES

Appendix A Soil Boring Logs
Appendix B Laboratory Test Results

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 General

Madrid Engineering Group (Madrid) is pleased to submit this report summarizing the results from our limited subsurface soil exploration, consistent with the instructions provided by Carollo Engineers, Inc. (Client), and geotechnical engineering evaluation for the proposed Gibson Oaks water main pipeline in Lakeland, Florida. This pipeline is located on either side of another the proposed PW01 water main (which we also completed a geotechnical investigation for at the same time, Madrid Project No. 13171) and some references to the PW01 water main are included in this report. Additionally, no borings were completed during this project at the Gibson Oaks WPF as Madrid has existing soil data from our previous geotechnical investigation (Madrid Project No. 12818 for Carollo Engineers, Inc., dated December 14, 2017) for the facility and some soil data from that report is referenced in this report. Our conclusions and recommendations are based on the results of our field exploration, laboratory testing, and appropriate engineering analyses.

Madrid understands the following regarding the specific features:

Table 1.1

Project Features Relative to This Report	
Gibson Oaks Water Main	• Approx. 5,000 feet along N. Socrum Loop Road • Approx. 3,000 feet along Tom Costine Road • Approx. 1,000 feet directional drill on west side of Gibson Oaks WPF and 2,200 feet directional drill beneath a wetland on east side of Gibson Oaks WPF. • Approx. 3,000 feet along Old Polk City Rd. • Approx. 3,000 feet along Walt Williams Rd.

The purpose of this exploration was to collect subsurface soil and groundwater information to provide an evaluation of the existing subsurface conditions at the boring locations (along the pipeline alignment and at potential directional drill locations) and to identify constraints or limitations (to the extent possible) that the subsurface conditions may impose on the planned construction. A preliminary site survey and proposed alignment was provided during our investigation.

The scope of work for this investigation included review of existing geological data, a field exploration and laboratory testing program, evaluation of soil testing results,

evaluating site suitability and providing general geotechnical recommendations for construction.

1.2 Site Location and Description

The subject site is generally located approximately 4 miles northeast of the interchange between US Highway 98 and I-4 in Lakeland, Florida as shown on **Figure 1**, **Location Map**. Specifically, the site is located in Sections 7, 8, 17 and 18, Township 27 South, Range 24 East in Polk County, Florida. The proposed pipeline alignment traverses along rolling hill terrain in residential neighborhoods. Elevations estimated from survey topography (provided by the Client) at the boring locations ranging between approximately 131 feet in the northeast portion of the alignment to 172 feet at the west portion of the alignment. USGS GIS topographic information is also provided on **Figure 2, USGS Topographic Map**. Boring/test elevations provided in this report were estimated based on provided survey data in the vicinity of our borings; no surveying was completed by Madrid.

1.3 Soil Survey Review

The Natural Resources Conservation Services (NRCS) Soil Survey reports provide a general description of the typical shallow soil strata (about 6 feet) encountered within each particular soil mapping unit and reports typical depth to seasonal high water levels. The NRCS defines seasonal high water as “a zone of saturation at the highest average depth during the wettest season that is at least six inches thick, persists for more than a few weeks, and is within six feet of the soil surface.” The Soil Survey for Polk County indicates shallow soils along the alignment are comprised of seven (7) different soil map units, as shown on **Figure 3, Soils Map**.

Candler sand, 0 to 5 percent slopes (map unit 3). According to the NRCS, *Candler sand, 0 to 5 percent slopes is an excessively drained soil that is on uplands and knolls on flatwoods. Areas of this soil range from about 30 to several hundred acres. Slopes are smooth to concave. Typically, this soil has a dark brown sand surface layer about 6 inches thick. The subsurface layer to a depth of about 63 inches is brownish yellow sand that grades to yellow. The next layer to a depth of at least 80 inches is yellow sand that has a very thin, strong brown lamellae. This Candler soil does not have a high water table within a depth of 80 inches. The available water capacity is low or very low.*

Pomona fine sand (map unit 7). According to the NRCS, *this Pomona soil is poorly drained on broad areas on flatwoods. Areas of this soil range from 5 to several hundred acres. Slopes are smooth to concave and are 0 to 2 percent. Typically, this soil has a very dark gray fine sand surface layer about 6 inches thick. The subsurface layer to a depth of about 21 inches is sand. It is light brownish gray in the upper part*

and light gray in the lower part. The subsoil to a depth of about 26 inches is dark reddish brown loamy fine sand. Below that is very pale brown and light gray fine sand to a depth of about 48 inches, light gray fine sandy loam to a depth of about 60 inches, and light gray sandy clay loam to a depth of about 73 inches. The underlying material is light gray loamy sand to a depth of at least 80 inches. This Pomona soil is reported to have a seasonal high water table within 12 inches of the surface for 1 to 4 months during most years. The available water capacity is low. This soil is severely limited as a site for urban development because of wetness. The absorption fields can be elevated by adding fill material. The high water table interferes with proper functioning of septic tank absorption fields. To overcome the problems caused by wetness on sites used for buildings or local roads and streets, a drainage system can be installed to lower the high water table or fill material can be added to increase the effective depth to the high water table.

Sparr sand, 0 to 5 percent slopes (map unit 14). *This somewhat poorly drained soil is in areas of seasonally wet uplands and knolls on flatwoods. Areas of this soil range from about 10 to 40 acres. Slopes are smooth. Typically, this soil has a dark gray sand surface layer about 8 inches thick. The subsurface layer is brown to very pale brown sand to a depth of about 57 inches. The subsoil is sandy clay loam to a depth of at least 80 inches. It is very pale brown in the upper part, yellowish brown in the next part, and light gray in the lower part. This Sparr soil has a seasonal high water table at a depth of 20 to 40 inches for 1 to 4 months in most years. The available water capacity is low. Wetness is a severe limitation affecting septic tank absorption fields, sewage lagoons, and sanitary landfills and a moderate limitation affecting sites for dwellings without basements, small commercial buildings, and local roads and streets.*

Tavares fine sand, 0 to 5 percent slopes (map unit 15). According to the NRCS, *Tavares fine sand, 0 to 5 percent slopes is a moderately well drained soil on broad uplands and knolls on flatwoods. Areas of this soil range from about 10 to 80 acres. Slopes are smooth to convex. Typically, this soil has a dark grayish brown fine sand surface layer about 8 inches thick. The underlying material to a depth of at least 80 inches is light yellowish brown fine sand that grades to very pale brown. This Tavares soil has a seasonal high water table at a depth of 40 to 80 inches for several months in most years. The available water capacity is very low. Permeability is rapid or very rapid.*

Smyrna and Myakka fine sands, 0 to 2 percent slopes (map unit 17). These soils are described as *poorly drained soils in broad areas on flatwoods. The proportion of Smyrna versus Myakka varies within this area. Areas of each soil are large enough to be mapped separately, but due to present use at the time of printing, were mapped as one unit. Typically, the Smyrna soil has a black fine sand surface layer about 4*

inches thick. The subsurface layer is gray fine sand to a depth of about 12 inches. The subsoil is dark brown and brown fine sand to a depth of about 25 inches. Below that is very pale brown fine sand to a depth of about 42 inches and very dark brown fine sand to a depth of about 48 inches. The underlying material is brown and light brownish gray fine sand to a depth of at least 80 inches. Typically, the Myakka soil has a very dark gray fine sand surface layer about 7 inches thick. The subsurface layer is gray fine sand to a depth of about 25 inches. The subsoil is fine sand to a depth of about 36 inches and black in the upper part and dark brown in the lower part. The underlying material is yellowish brown fine sand to a depth of at least 80 inches. The Smyrna and Myakka soils have a seasonal high water table within 12 inches of the surface for 1 to 4 months in most years. The available water capacity is low. Permeability is moderate or moderately rapid in the subsoil.

Pomello fine sand (map unit 22). According to the NRCS, this is *moderately well drained soil on low, broad ridges and low knolls on flatwoods. Typically, this soil has a dark gray fine sand surface layer about 5 inches thick. The subsurface layer is white fine sand to a depth of about 48 inches. The subsoil to a depth of about 53 inches is dark reddish brown fine sand that is coated with organic matter. To a depth of about 63 inches, it is black fine sand that is coated with organic matter. The underlying material is dark brown fine sand to a depth of at least 80 inches. In a few areas the subsoil is weakly cemented by organic matter. The seasonal high water table is at a depth of 24 to 40 inches for 1 to 4 months in most years. The available water capacity is very low and permeability is moderately rapid in the subsoil.*

Hontoon Muck (map unit 35). This soil map unit is only in the wetland that directional drilling will go beneath and is not anticipated in any open cut areas of the alignment. According to the NRCS, *Hontoon muck is very poorly drained soil in swamps and marshes. Slopes are dominantly less than 1 percent but range from 0 to 2 percent. Typically, this soil is black muck to a depth of about 11 inches and dark brown muck to a depth of about 75 inches. The underlying material is black sandy loam to a depth of at least 80 inches. This Hontoon soil has a seasonal high water table that is at or above the surface except during extended dry periods. The available water capacity is very high. Permeability is rapid. This soil has very severe limitations affecting urban and recreational uses because of the ponding and low strength.*

2.0 FIELD EXPLORATION

2.1 Test Pits

Three shallow test pits (TP-1 through TP-3) were completed adjacent to SPT borings along the proposed alignment. The test pits were completed to look for

historical indicators of a seasonal high water table (SHWT) in the soil profile on the side walls of the test pits. The test pit results are as follows:

- TP-1 (at SPT-2 along N. Socrum Loop Rd.): Estimated SHWT depth of 12 to 18 inches bgs.
- TP-2 (at SPT-6 on Tom Costine Rd.): No historical indicators found in the test pit walls.
- TP-3 (at SPT-14 on Walt Williams Rd.): No historical indicators found in the test pit walls.

2.2 Standard Penetration Test Borings

Between August 5 and August 8, 2019, Madrid explored subsurface conditions along the proposed alignment by drilling eleven (11) Standard Penetration Test (SPT) borings (SPT-1 through SPT-10 and SPT-14) with track mounted drilling equipment to a depths of 15 to 25 feet below ground surface (bgs). It should be noted that borings SPT-11 through SPT-13 were completed along the PW01 portion of the water main (between SPT-10 and SPT-14) and information for those borings along PW01 are provided in the Madrid's report #13171. A GPS hand unit (typical accuracy of +/- 10 feet) was utilized in the field for location purposes. Boring locations are shown at the bottom of the boring logs in **Appendix A**. The boring locations are plotted on an aerial photograph of the proposed alignment (**Figure 4**) and should be considered approximate. It should be noted that borings SPT-1 through SPT-4 were adjusted in the field to the east side of the sidewalk due to numerous buried utilities to the west of the sidewalk. These existing utilities (conflicts) should be noted by the designer. The following borings were completed:

Table 2.2

SPT Borings	
Pipeline	• SPT-1 through SPT-4 on east side of N. Socrum Loop Rd. • SPT-5 and SPT-6 on north side of Tom Costine Rd. • SPT-8 through SPT-10 on west side of Old Polk City Rd. • SPT-13 and SPT-14 on west/south side of Walt Williams Rd.

Disturbed samples from the SPT borings were obtained using a split-spoon sampler in general accordance with ASTM Specification D 1586, using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound slide hammer falling a distance of 30 inches. An auto-hammer was used for all borings except for SPT-10 which was completed with a safety hammer. An engineering technician familiar with soil classification and field evaluations logged the borings in the field and placed samples in sealed containers and returned them to Madrid's laboratory for further classification. Upon completion, the boreholes were backfilled in general accordance with industry

standards. The soil boring logs and a fence diagram have been included with this report in **Appendix A**. Soil samples will be retained for a period of 3 months unless otherwise notified.

3.0 SUBSURFACE CONDITIONS AND LABORATORY TESTING

3.1 Subsurface Soil Conditions

In general, the SPT borings encountered mostly very loose to loose (but occasionally medium dense) fine sand (SP) from the ground surface to depths of approximately 4 to 14 feet bgs except for a thin layer of slightly silty sand (SP-SM) at the surface of borings SPT-5, SPT-9 and SPT-10. Below the sand stratum was loose to dense clayey sand (SC), slightly silty sand (SP-SM) or slightly clayey sand (SP-SC). In borings SPT-6 and SPT-8, the clayey sand was underlain by soft to firm clay (CH) beginning at depths of approximately 12 to 17 feet bgs.

The borings that Madrid previously completed (2017) that are closest to the proposed directional drill pit at the Gibson Oaks WPF found generally loose to medium dense fine sand (SP) throughout each boring (maximum depth at 25 feet bgs). Based on deeper borings at this facility (although more distant), the clayey sand/clay stratum was first encountered at depths ranging from about 17 to 27 feet bgs depending on the boring referenced.

No losses of drilling fluid circulation were reported in any of the SPT borings. The general soil profiles described above and as presented on the boring logs are based on our interpretation of subsurface conditions encountered at the boring locations only. Boundaries between soil layers are approximate and for illustration purposes only. Variations in soil conditions in both horizontal and vertical directions different from those presented are likely to exist between boring locations.

It should be noted that in the area of directional drilling under the wetland some linear features were noted on the historic photos which may indicate some man-made excavations to unknown depth which could affect the directional drilling.

Dec. 2004 Photo

Jan. 2008 Photo

3.2 Groundwater Conditions and Seasonal High Ground Water

The proposed pipeline alignment has about 40 feet of relief from the higher area of the alignment to the west to the lower areas in the central and eastern portions of the alignment. Borings SPT-1 through SPT-4 were the only borings that appeared to encounter a static water table which was encountered between approximately 1.5 to 4 feet bgs. Boring SPT-6 encountered what appeared to be a perched water table at the top of the clayey sand layer at about 6 feet bgs. The remainder of the borings did not encounter a discernible water table within the surficial 10 feet bgs when drilling with mud began (making it difficult to discern a water table below that depth). Our previous borings at the Gibson Oaks WPF (2017) found a water table ranging from about 4 to 5 feet bgs; however, the proposed design included addition of 3 to 5 feet of fill and site grading to improve drainage such that the actual water depth may be deeper depending on when the fill is installed relative to excavation of the directional drill pit.

Clayey sand typically has a low permeability and it is difficult to discern a water table depth in clayey soils. Seasonal fluctuations in the groundwater level should be anticipated due to variations in rainfall and water perching on top of the clayey sand is likely to occur after rain events.

The Test Pits revealed historical indicators (indicated by color patterns in the side walls) of a SHWT at a depth of approximately 12 to 18 inches along N. Socrum Loop Road (TP-1) at the west end of the alignment, which is also where we encountered a shallow water table as shallow as 1.5 feet bgs. We also note that the borings were completed within the wet season. The Soil Survey for Polk County, Florida describes the seasonal high water table (SHWT) for the map units along the pipeline alignment (excluding the wetland Hontoon muck) to range from within 12 inches of the surface (map unit 7) to greater than 80 inches (map unit 3). Based upon the published survey information and our findings during the exploration, depending on the time of year of construction, a water table is likely to be encountered in open trenches along approximately 40% to 50% of the alignment (mostly in the western portions of the site).

3.3 Laboratory Testing

Laboratory tests for natural water content (ASTM D2216), percent passing the No. 200 sieve (ASTM D1140) and organic content (ASTM D 2974) were performed on selected samples retrieved during the field exploration from the SPT borings to verify the visual and tactile soil classifications. Laboratory test reports are included in **Appendix B**. A brief summary of the results is provided below:

Table 3.3a

Lab Summary	
<#200 Sieve	0.9% - 56.6%
% Moisture	6.1% - 58.6%
% Organic	1.1% (one test)

4.0 EVALUATION AND GENERAL RECOMMENDATIONS

4.1 General Considerations

The following conclusions and recommendations are based on our understanding of the proposed project, the data obtained from the field exploration, experience with similar conditions, and generally accepted principles and practices of geotechnical engineering. The proposed alignment falls along generally suitable soil conditions. In addition, the shallow sandy soils encountered (depths ranging from about 4 to 14 feet bgs) in the borings were generally suitable for re-use as backfill. Actual soil conditions between borings will vary. Clayey sands, where encountered within trench excavations, may retain moisture and can be difficult to compact. Loose zones, if at the pipe subgrade level, should be over-excavated and replaced.

Typically, a water main pipeline will require at least 3 feet of cover. We assume the pipeline will be installed via open cut method between depths of approximately 5 to 8 feet below existing grade. Directional drilling is also proposed along portions of the alignment. Assuming this invert depth range for open cut areas, and based on the results of the boring program, the trench excavations will typically expose mostly very loose to medium dense fine sands (SP) to clayey sands (SC) with occasional thin layers of slightly silty sands (SP-SM). A shallow static water table (1.5 to 4 feet depth) was only encountered in the borings along N. Socrum Loop Road at the west end of the alignment. The remainder of the borings either did not encounter a discernible water table or there may have been a perched water table on top of the clayey sand stratum.

It is likely that dewatering will not be required in the central and eastern portions of the alignment (although those are the lower elevations of the site), depending on the depth of excavation.

Very loose to loose clean sands were commonly encountered in the surficial 4 to 14 feet (depth to clayey sand varies across the site) and may not be stable in the short-term during excavations; the need for trench wall support should be anticipated by the contractor. Unless trench excavations are intended to be open cut with shallow side slopes in accordance with OSHA Type C Soils or shallower, shoring or trench boxes may need to be installed very soon after excavation to reduce the chance of soil sloughing into the trench, which will widen the excavation area.

Prior to construction, bulk samples representative of anticipated subgrade and fill soils should be collected and subjected to Standard Proctor testing. As different soil types are encountered during excavation, additional Proctor samples of each new soil type should be collected and tested. Existing sandy soils excavated and intended for reuse as backfill may require moisture conditioning to permit adequate compaction.

4.2 Site Preparation and Earthwork

4.2.1 Excavation and Shoring

In general, the anticipated depth of trench excavations typically ranges from about 5 to 8 feet, but locally as deep as possibly 10 to 12 feet below existing grade for directional drill pit excavations. The bases of trench excavations will expose soil conditions that will vary along the alignment but most soils will be very sandy (SP and SP-SM) soils overlying clayey sand (SC). Clayey sand may be encountered at the base of excavations. Based on the results of our boring program, materials at the base of trench excavations along most of the route are likely to be either very loose to medium dense sand or clayey sand. If encountered, organic or plastic soils at the bases of the trench excavations should be excavated to at least one foot below the design trench depth and replaced with pipe bedding material, placed and compacted as described later in this report. The trench width should be sufficiently wide to allow proper compaction along the haunches and the sides of the pipe (typically at least 1-foot wider than the outside pipe diameter or more). Minimum trench depth required is 1 foot below the proposed bottom of the pipe to allow for placement of bedding material.

Braced or shored excavations may be required at some locations along the alignment for space limitations using trench boxes or other stabilization methods. Excavation stability is the responsibility of the contractor. All excavations should conform to the Occupational Safety and Health Act (OSHA) requirements for Type C soils as described Federal Register 29 CFR Part 1926. Excavated materials should not

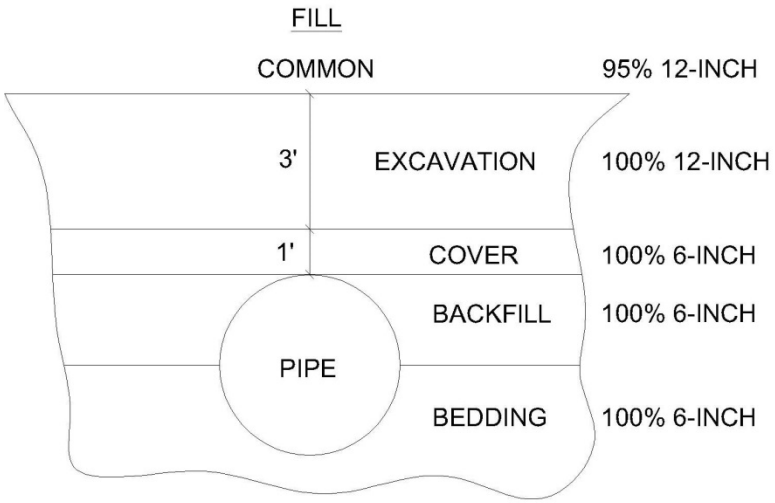
be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth, unless specific provisions for surcharge loading have been included in the design of the excavation slope or shoring system. Design of a shoring system is the responsibility of the selected contractor. A number of variable factors, such as nature and strength of excavated soils, depth of excavation and groundwater, proximity of adjacent structures, and economics of construction method, etc., will affect the choice of support method. All vertical shoring or prefabricated trench lining systems should be continuous and maintained in place to assure adequate temporary stability during backfilling of the pipe trench as recommended subsequently.

4.2.2 Dewatering

Groundwater was only encountered in the western portion of the proposed alignment; it was not encountered/discernible in the surficial 10 feet of the eastern half of the alignment. Depending on the time of year of construction, groundwater control may be needed by the contractor. When necessary, a dewatering system should be designed and installed to draw the groundwater table down to a minimum depth of two feet below the final excavated grade. If needed, for excavations up to 10 to 15 feet depth, depending on the local soil profile present, a shallow well-point system may be adequate for trenches and small excavations. Nearby ponds should be considered when designing a dewatering system. Excavations in excess of 15 feet depth may require a multi-stage well-point system, deep wells or a single stage well-point installed from a reduced grade elevation to accomplish the recommended drawdown. Sump pumps may be effective, but only to locally dewater the soils; they may only be useful at very localized installations. The contractor should employ a registered professional engineer to design all shoring and dewatering systems.

4.2.3 Pipe Bedding and Backfilling

The following diagram indicates the typical pipe backfill limits and compaction requirements (6 or 12-inch lifts) that we recommend:



Clean fine sands (SP) containing less than five percent passing the U.S. standard No. 200 sieve and less than four percent organic matter (as determined by ASTM D2974) may be used as select sand pipe bedding material. Most of the soils encountered at this site should meet this criterion, but clayey sand will be present at the base of excavations in some areas and careful inspection of excavated soil should be made regularly to ensure consistency in the pipe bedding soil. Suitable pipe bedding should be free of stones, gravel, organics, vegetation and other deleterious material, placed in uniform loose lifts not exceeding six inches thick and compacted to at least 100 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor-SPMDD). Bedding material within the middle 1/3 of the pipe diameter should be loosened for better seating of the pipe in the bedding soil and shaped to allow for bell joints if applicable. Pipe bedding material should be placed from one foot below to at least half-way up the pipe. Particular care needs to be exercised during pipe bedding placement and compaction around pipe haunches, elbows, and curves. Loose bedding materials may subsequently compact in-service, if subjected to dynamic or vibrational loading due to surge pressures, resulting in excessive pipe deflections and possibly failure.

Soils in the backfill and cover zones (from half-way up the pipe to 1-foot over the pipe, as shown on the graphic above) should consist of clean to relatively clean sand (SP) or slightly silty sand (SP-SM) with no more than 12% silty fines passing the No. 200 sieve and less than 4% organic content, and also compacted to 100% of the SPMDD in lifts no greater than 6-inch compacted thickness. Compaction should be performed at the base of all excavations prior to placing the first layer of backfill to assure soil density equal to or greater than the natural soils. If over-excavation is required to remove unsuitable soils, cover/backfill soil compacted to at least 95% of SPMDD in not more than 12-inch lifts should be used to bring it back up to the bedding subgrade level.

Excavation backfill material more than 1 foot above the pipe should consist of granular soils with less than 15 percent fines content passing the No. 200 sieve and an organic content of not more than 4 percent generally conforming to USCS soil types SP to SP-SM/SP-SC and SM; use of Clayey Sand (SC) may present moisture conditioning problems and is not recommended. Smaller seams of clayey sand (up to a few inches in diameter) are allowable and should not present difficulty with compaction as long as the majority of the soil is relatively clean sand. It appears that the majority of the excavated soils will meet these requirements, but the contractor should expect some import of clean sand fill will be required. At the boring locations, organics were encountered only in trace amounts. Organic soils, if encountered, are not suitable backfill soils in any location and should be replaced with suitable fill. Excavation backfill

typically should be placed in lifts no greater than 12 inches in compacted thickness and compacted to 100 percent of SPMDD. Common fill used more than 3 feet above the top of pipe and outside of structure, driveways or pavement areas can have up to 20% fines and be compacted to 95 percent of SPMDD. Excavated spoil material intended for reuse as backfill will likely require moisture conditioning to permit adequate compaction.

4.3 Quality Assurance

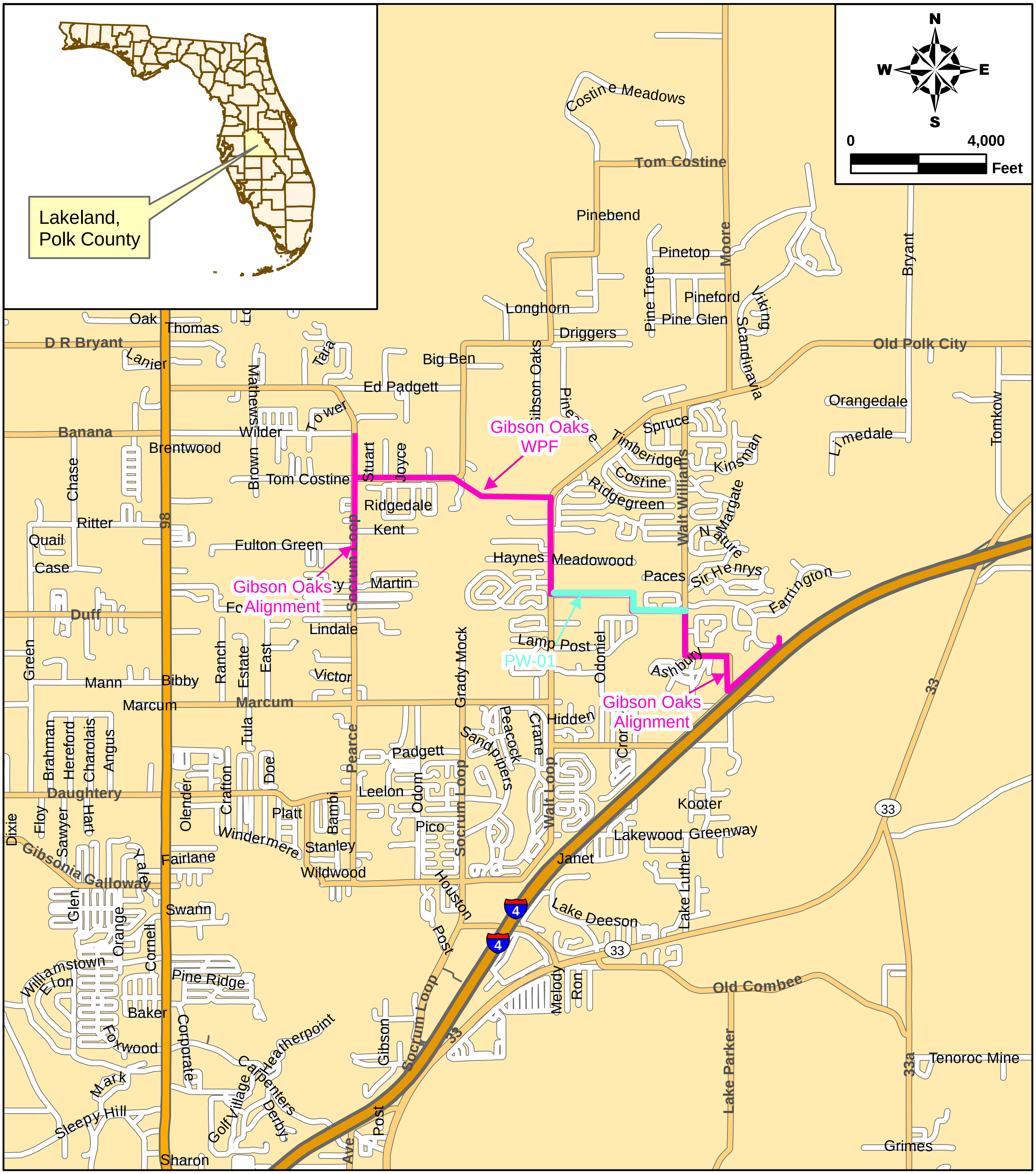
We recommend implementing a comprehensive quality assurance program to verify that all earthwork and construction is conducted in accordance with the recommendations herein and the appropriate plans and specifications. It is strongly recommended that Madrid be retained to perform materials testing and inspection services to observe that the subsurface conditions are as we have discussed herein and that pipe bedding, ground densification, deleterious soil removal and fill placement is in accordance with our recommendations. Madrid cannot accept responsibility for any conditions which deviate from those described in this report if not engaged to provide construction observation and testing for this project. An on-site engineering technician should monitor all site preparation to verify that all deleterious materials have been removed and should observe earthwork activities to verify that the pipe backfill soils conform to the recommendations herein. In-situ density tests should be conducted during filling activities to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for natural and fill soils to confirm they meet minimum compaction requirements.

5.0 LIMITATIONS

This report has been prepared for Carollo Engineers, Inc. for the proposed Gibson Oaks Water Main pipeline in Lakeland, Florida. The information in this report is intended for the sole use of the addressees and their assigns/agents and may not be relied upon or used by any third party without expressed written consent. The evaluations and recommendations presented herein are based on Madrid's interpretation and understanding of site conditions and information provided by the Client. This report is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions may exist at the site. This study is not intended to be an evaluation of sinkhole risk. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface. The study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. Madrid is not responsible for the independent conclusions, opinions, and/or recommendations made

by others based on the field investigation and laboratory testing data presented in this report. Soil samples will be stored at our Bartow Office for a period of 3 months from the date of this report unless other arrangements are made.

FIGURES



Sources: GIS Information (ESRI)

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Carollo Engineers, Inc.

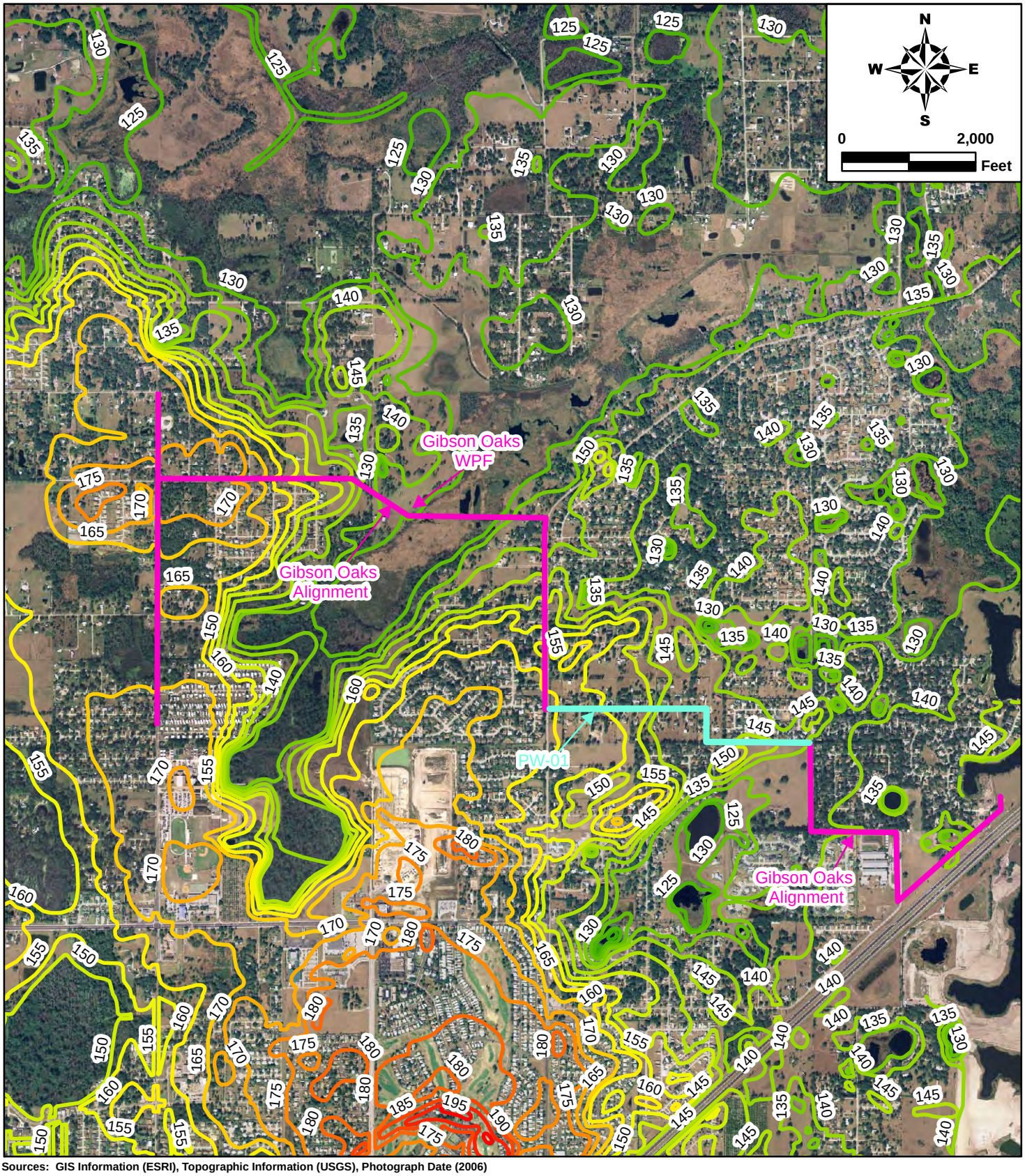
FIGURE 1
Location Map
Gibson Oaks Water Mains
Lakeland, Florida

Madrid Project Number:
12818.3

Notes:

Drawn By: TFS

Checked By: KH



Sources: GIS Information (ESRI), Topographic Information (USGS), Photograph Date (2006)

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Carollo Engineers, Inc.

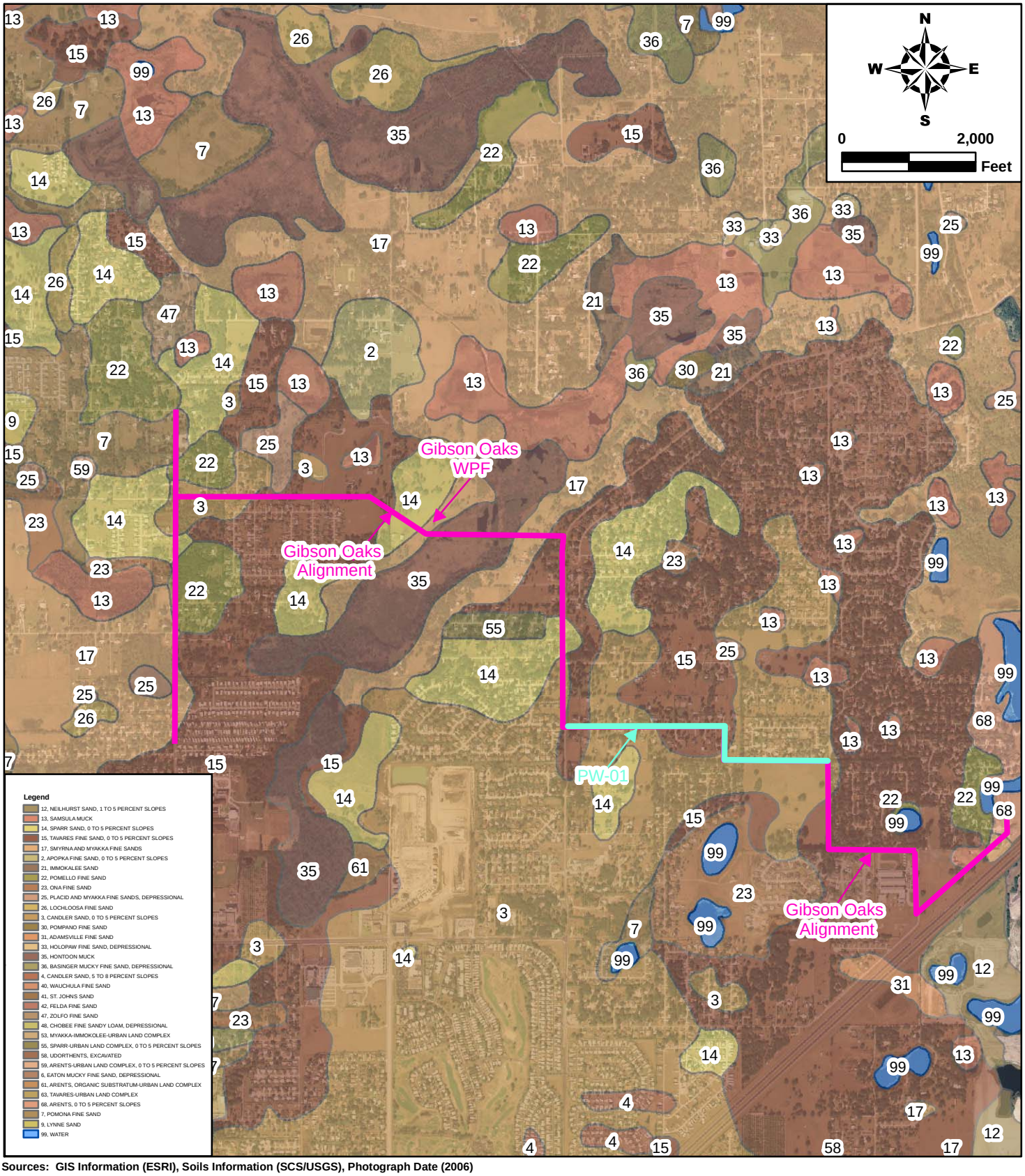
FIGURE 2
USGS Topographic Map
Gibson Oaks Water Mains
Lakeland, Florida

Madrid Project Number:
12818.3

Notes:

Drawn By: TFS

Checked By: KH



Sources: GIS Information (ESRI), Soils Information (SCS/USGS), Photograph Date (2006)

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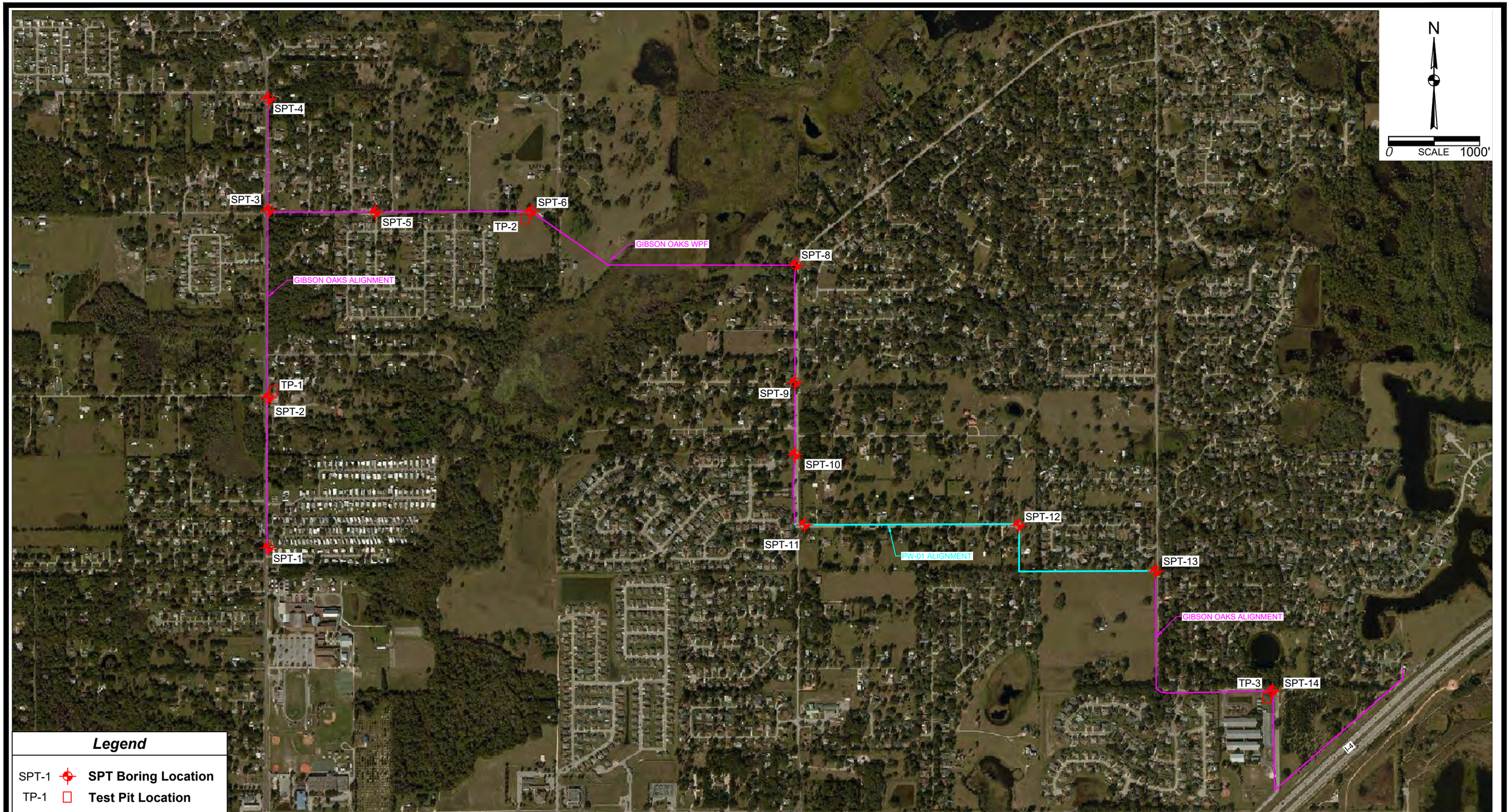
FIGURE 3
NRCS/USDA Soils Map
Gibson Oaks Water Mains
Lakeland, Florida

Madrid Project Number:
12818.3

Notes:

Drawn By: TFS

Checked By: KH



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Notes: Aerial Data Source–2019 Microsoft Corporation, 2019 DigitalGlobe, 2019 CNES Distribution Airbus DS.
Pipeline alignments are approximate.

Drawn By: TFS

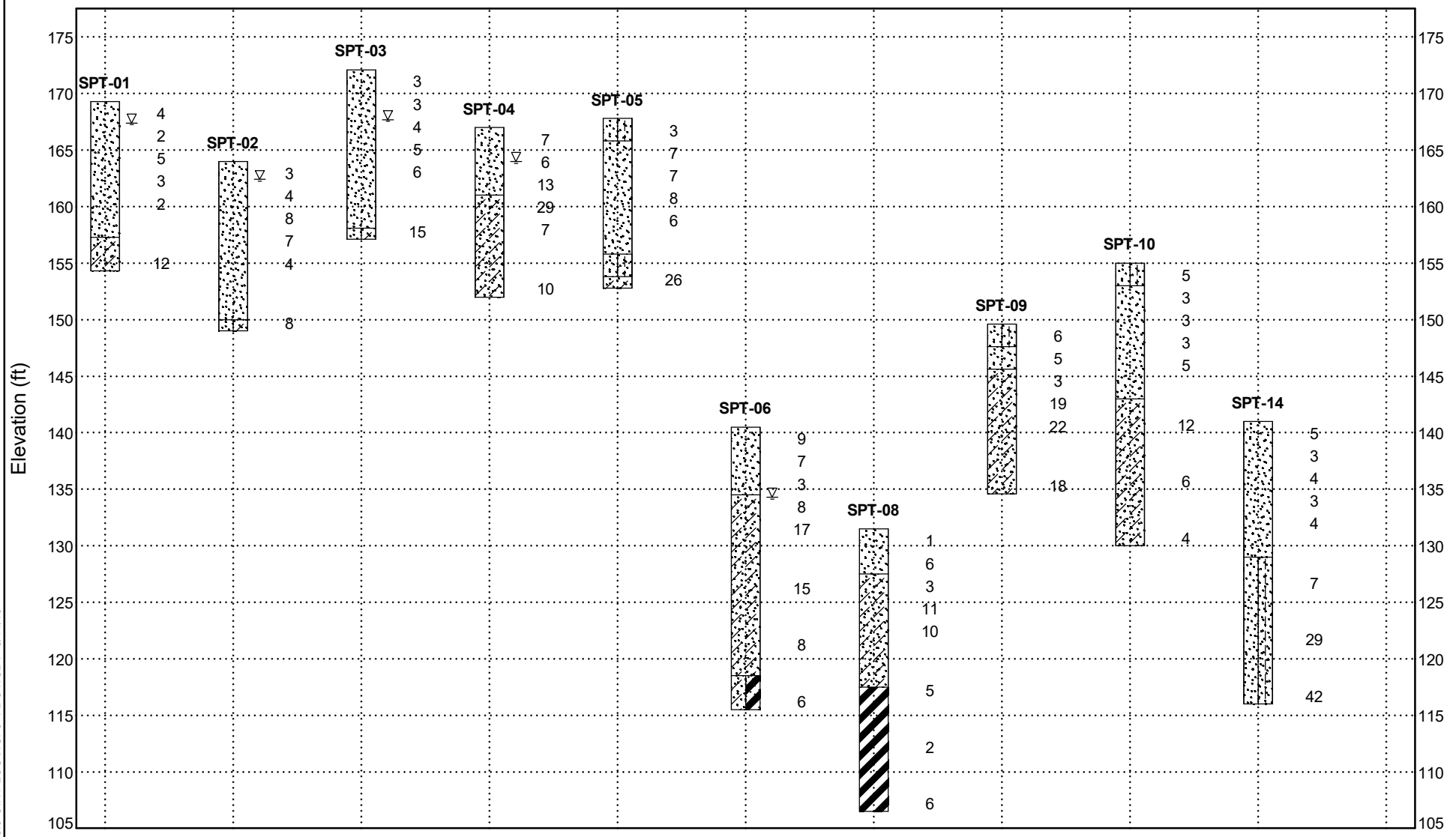
Checked By: KH

Carollo Engineers, Inc.

FIGURE 4
Boring Location Plan
Gibson Oaks Water Mains
Lakeland, Florida

Madrid Project Number:
12818.3

APPENDIX A



TEST BORING FENCE RECORD

PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines
PAGE 1 OF 1

Madrid Engineering Group

LEGEND

- Water Table
- Loss of Drilling Fluid Circulation
- USCS sand
- USCS slightly silty sand
- USCS clayey sand
- USCS borderline clayey sand/highly plastic sandy clay
- USCS slightly clayey sand
- USCS highly plastic clay

FENCE NO HORIZONTAL UNIT 12818.3 GINT LOGS.GPJ FDOT.GDT 8/14/19

BORING NO. SPT-01

DATE DRILLED 8/5/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 1.9 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose very dark gray sand (SP)	0		1-2-2-2	4	
	Very loose grayish brown		165	2-1-1-1	2	
	Loose dark yellowish brown	5		1-2-3-1	5	
	Very loose yellowish brown			1-2-1-1	3	
	Dark brown		160	2-1-1-2	2	
12	Medium dense gray clayey sand (SC) <#200=20.7%	10				
			155	3-6-6	12	
		15				

BORING LOCATION: 28.13638°N, 81.95636°W

BORING NO. SPT-02

DATE DRILLED 8/5/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 1.6 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Very loose light gray sand (SP)	0		WOR-1-2-2	3	
	Loose gray <#200=1.6%		160	2-2-2-3	4	
	Brown	5		4-3-5-5	8	
	Very dark brown			3-3-4-4	7	
			155	3-2-2-2	4	
		10				
14	Light brownish gray		150	4-4-4	8	
	Loose light brownish gray slightly clayey sand (SP-SC)	15				

0 10 20 30 40 60 80 100

BORING LOCATION: 28.14092°N, 81.95636°W

BORING NO. SPT-03

DATE DRILLED 8/5/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 4.4 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Very loose grayish brown sand (SP)	0		1-1-2-0	3	
	Light yellowish brown		170	2-1-2-2	3	
	Loose brownish yellow	5		2-2-2-3	4	
	Light brownish gray <#200=1.2%		165	3-2-3-3	5	
	Very pale brown			3-3-3-2	6	
		10	160			
14	Medium dense gray					
	Medium dense gray slightly clayey sand (SP-SC)			6-8-7	15	
		15				

BORING LOCATION: 28.14658°N, 81.95634°W

BORING NO. SPT-04

DATE DRILLED 8/6/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 3 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Loose gray sand (SP)	0		1-3-4-3	7	
	Brown		165			
				4-2-4-4	6	
	Medium dense dark brown	5		6-6-7-7	13	
6	Dense dark brown clayey sand (SC) <#200=25.9%		160	4-19-10	29	
	Loose pale brown			2-2-5-6	7	
		10	155			
	Medium dense very pale brown			3-5-5	10	
		15				

BORING LOCATION: 28.14995°N, 81.95634°W

BORING NO. SPT-05

DATE DRILLED 8/7/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not encountered in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Very loose dark gray slightly silty sand (SP-SM)	0		1-1-2-3	3	
2	Loose grayish brown sand (SP)		165	2-4-3-4	7	
	Light gray <#200=2.3%	5		1-4-3-4	7	
	White			3-4-4-4	8	
			160			
	Gray			4-3-3-3	6	
		10				
12	Loose dark gray slightly silty sand (SP-SM)		155			
14	Dense dark gray clayey sand (SC)			4-14-12	26	
		15				

BORING LOCATION: 28.14653°N, 81.9527°W

BORING NO. SPT-06

DATE DRILLED 8/7/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table, possibly perched, encountered at 6'2". No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose gray sand (SP)	0	140	2-5-4-7	9	
				5-4-3-3	7	
	Very loose grayish brown	5	135	1-2-1-2	3	
6	Loose light gray clayey sand (SC) <#200=25.0%		▽	2-2-6-8	8	
	Medium dense very pale brown			8-8-9-9	17	
		10	130			
	White with silty sand			7-7-8	15	
		15	125			
	Loose light gray			4-4-4	8	
		20	120			
22	Loose light gray clayey sand to sandy clay (SC/CH)					
				2-3-3	6	
		25				

BORING LOCATION: 28.14655°N, 81.94738°W

BORING NO. SPT-08

DATE DRILLED 8/8/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not discernible in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Very loose gray sand (SP)	0	130	WOH 12"-1-2	1	
	Loose very pale brown			2-3-3-2	6	
4	Very loose light gray clayey sand (SC) <#200=20.6%	5	125	2-2-1-3	3	
	Medium dense			3-5-6-5	11	
	White			4-5-5-5	10	
	Loose	10	120			
14	Firm light grayish brown clay (CH)	15	115	2-3-2	5	
	Soft yellowish brown <#200=56.6%	20	110	2-1-1	2	
	Firm	25		2-4-2	6	

BORING LOCATION: 28.14493°N, 81.93837°W

BORING NO. SPT-09

DATE DRILLED 8/7/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not discernible in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose dark gray slightly silty sand (SP-SM)	0		1-3-3-3	6	
2	Loose very pale brown sand (SP)			2-2-3-2	5	
4	Very loose brown clayey sand (SC) <#200=20.5%		145	1-2-1-7	3	
	Medium dense brownish yellow	5		7-8-11-12	19	
			140	6-10-12-10	22	
		10				
	Light gray			6-8-10	18	
		15	135			

BORING LOCATION: 28.14138°N, 81.93841°W

BORING NO. SPT-10

DATE DRILLED 8/7/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not encountered in the surficial 10 feet bgs. No loss of circulation. Safety hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose very dark brown slightly sand (SP-SM)	0	155	1-2-3-3	5	
2	Very loose dark gray sand (SP)			2-1-2-1	3	
	Brown	5	150	2-2-1-2	3	
	Light yellowish brown			1-2-1-2	3	
	Loose very pale brown <#200=4.6%			2-2-3-4	5	
		10	145			
12	Medium dense light gray clayey sand (SC) <#200=17.0%			4-6-6	12	
		15	140			
	Loose yellow			3-3-3	6	
		20	135			
	Very loose brownish yellow			2-2-2	4	
		25	130			

BORING LOCATION: 28.1392°N, 81.9384°W

BORING NO. SPT-14

DATE DRILLED 8/8/2019
PROJECT NUMBER 12818.3
PROJECT Water Main Pipelines

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not encountered in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value
	Loose dark gray sand with trace organics at surface (SP) Organics=1.1%	0	140	3-2-3-2	5
	Very loose gray			1-1-2-2	3
	Loose very pale brown	5	135	2-2-2-3	4
	Very loose <#200=0.9%			2-1-2-3	3
	Loose gray			2-2-2-3	4
12	Loose gray slightly silty sand (SP-SM)	10	130	2-3-4	7
	Dense dark gray with trace organics	15	125	3-7-22	29
	Very dense	20	120	8-12-30	42
		25			

● STANDARD PENETRATION TEST

0 10 20 30 40 60 80 100

BORING LOCATION: 28.13205°N, 81.92213°W

APPENDIX B

MADRID ENGINEERING GROUP, INC.
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ASTM C117-13 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 12818.3
Project Name: Water Pipeline
Project Location: Lakeland
Client: Carollo

Date Tested: 8/9/2019
Tested By: TW

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-1 13.5-15'	24	341.04	287.72	8.23	84.0%	19.1%	229.86	20.7%
SPT-2 2-4'	11	159.11	133.50	8.10	83.0%	20.4%	131.46	1.6%
SPT-3 6-8'	12	178.52	150.16	8.08	83.4%	20.0%	148.47	1.2%
SPT-4 6-8'	17	86.97	74.45	8.09	84.1%	18.9%	57.28	25.9%
SPT-5 4-6'	22	103.04	88.46	8.16	84.6%	18.2%	86.62	2.3%
SPT-6 6-8'	23	183.16	159.96	8.13	86.7%	15.3%	122.06	25.0%
SPT-8 4-6'	18	201.04	173.38	8.06	85.7%	16.7%	139.36	20.6%
SPT-8 18.5-20'	16	105.15	69.29	8.08	63.1%	58.6%	34.62	56.6%
SPT-9 4-6'	7	192.69	161.33	8.08	83.0%	20.5%	129.91	20.5%
SPT-10 8-10'	15	140.54	130.76	8.15	92.6%	8.0%	125.14	4.6%
SPT-10 13.5-15'	19	196.89	171.01	8.17	86.3%	15.9%	143.34	17.0%
SPT-14 6-8'	5	157.93	134.74	8.15	84.5%	18.3%	133.58	0.9%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve (\%)} = \frac{(S_D - S_R)}{S_D} * 100$$

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AASHTO T267 ORGANIC CONTENT

Project Number: 12818.3
Project Name: Water Pipeline
Project Location: Lakeland
Client: Carollo

Date Tested: 8/9/2019
Technician: TW

Sample	Container Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moist-ure Content (%)	Furnace Container Name	$W_{fC}+S_D$ (g)	$W_{fC}+S_{FD}$ (g)	W_{fC} (g)	Organic Content (%)
SPT-14 0-2'	8	156.80	148.28	8.06	94.3%	6.1%	10	196.00	194.47	55.78	1.1%

Average Organic Content (%): 1.1%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
W_{fC} = Weight of Furnace Container
S_{FD} = Weight of Furnace Dried Sample

$$\text{Solids Content (\%)} = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content (\%)} = \frac{(S_W - S_D)}{S_D} * 100$$

$$\text{Organic Content (\%)} = \frac{(S_D - S_{FD})}{S_D} * 100$$

APPENDIX C

MADRID ENGINEERING GROUP, INC.
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August 28, 2019

Hydro Solutions Consulting
3616 Harden Blvd., Suite 110
Lakeland, FL 33803
Attn: Matt O'Connor

Re: Madrid Project No. 13171
Geotechnical Engineering Report
Proposed PW01 Water Main
Lakeland, Florida

Dear Mr. O'Connor:

Madrid Engineering Group, Inc. (Madrid) is pleased to submit this Geotechnical Engineering Report summarizing the results of our geotechnical subsurface exploration and engineering evaluation services completed for the above referenced project. The work was completed in general accordance with the authorized scope of work in our cost estimate proposal dated August 23, 2017 and provides general geotechnical recommendations regarding the proposed construction.

We appreciate the opportunity to be of service to you on this project and look forward to working with you on future projects. If you have any questions, please do not hesitate to contact us.

Sincerely,
Madrid Engineering Group, Inc. (EB 6509)

Kevin M. Hill, P.E.
Sr. Project Manager
Florida P.E. No. 72949

Attachment: Geotechnical Engineering Report

Madrid Engineering Group, Inc.

Geotechnical Engineering Report

PW01 Water Main, Lakeland, Florida

Prepared for:

Hydro Solutions Consulting

Prepared by:

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, FL 33830
863-533-9007

Project No. 13171
August 2019

EXECUTIVE SUMMARY

Project Description

Project Features Relative to This Report	
PW01 Water Main	The PW01 water main will be approximately 4,400 feet long between Old Polk City Road and Walt Williams Road. It will follow along Haymarket Drive and then follow an easement between properties to the south and east of Haymarket Drive.

Field Activities

SPT Borings	
Pipeline	• SPT-11 through SPT-13 (15 feet)

Findings and Recommendations

The proposed alignment falls along generally suitable soil conditions. In addition, the soils encountered in the borings were generally suitable for re-use as backfill. Actual soil conditions between borings will vary. Clayey sands, if encountered within trench excavations, may retain moisture and can be difficult to compact. Loose zones, if at the pipe subgrade level, should be over-excavated and replaced.

We assume the pipeline will be installed via open cut method between depths of approximately 5 to 8 feet below existing grade. No directional drilling is proposed along the PW01 portion of the alignment. Assuming this invert depth range, and based on the results of the boring program, the trench excavations will typically expose mostly very loose to loose fine sands (SP) with occasional silty or clayey sands (SP-SM, SP-SC and SC). A shallow water table was not encountered in the borings (completed during the wet season) and it is likely that dewatering will not be required in most areas, depending on the depth of excavation. Very loose to loose clean sands were commonly encountered and may not be stable in the short-term during excavations; the need for trench wall support should be anticipated by the contractor.

Prior to construction, bulk samples representative of anticipated subgrade and fill soils should be collected and subjected to Standard Proctor testing. As different soil types are encountered during excavation, additional Proctor samples of each new soil type should be collected and tested. Existing sandy soils excavated and intended for reuse as backfill may require moisture conditioning to permit adequate compaction.

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FIGURES

Figure 1 Location Map
Figure 2 USGS GIS Topographic Map
Figure 3 NRCS/USDA Soils Map
Figure 4 Boring Location Plan

APPENDICES

Appendix A Soil Boring Logs
Appendix B Laboratory Test Results

1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 General

Madrid Engineering Group (Madrid) is pleased to submit this report summarizing the results from our limited subsurface soil exploration, consistent with the instructions provided by Hydro Solutions Consulting (Client), and geotechnical engineering evaluation for the proposed PW01 water main pipeline in Lakeland, Florida. This pipeline is part of a larger pipeline design project and some references to the larger project (which we also completed a geotechnical investigation for at the same time, Madrid Project No. 12818.3) are included in this report. Our conclusions and recommendations are based on the results of our field exploration, laboratory testing, and appropriate engineering analyses.

Madrid understands the following regarding the specific features:

Table 1.1

Project Features Relative to This Report	
PW01 Water Main	The PW01 water main will be approximately 4,400 feet long between Old Polk City Road and Walt Williams Road. It will follow along Haymarket Drive and then follow an easement between properties to the south and east of Haymarket Drive.

The purpose of this exploration was to collect subsurface soil and groundwater information to provide an evaluation of the existing subsurface conditions at the boring locations (along the pipeline alignment) and to identify constraints or limitations (to the extent possible) that the subsurface conditions may impose on the planned construction. A preliminary site survey and proposed alignment was provided during our investigation.

The scope of work for this investigation included review of existing geological data, a field exploration and laboratory testing program, evaluation of soil testing results, evaluating site suitability and providing general geotechnical recommendations for construction.

1.2 Site Location and Description

The subject site is generally located approximately 4 miles northeast of the interchange between US Highway 98 and I-4 in Lakeland, Florida as shown on **Figure 1**, **Location Map**. Specifically, the site is located in Section 17, Township 27 South, Range 24 East in Polk County, Florida. The proposed PW01 pipeline alignment traverses along rolling hill terrain in residential neighborhoods. The western portion of

the alignment followed Haymarket Drive while the eastern portion does not follow any roadways. Elevations estimated from survey topography (provided by the Client) at the boring locations ranging between approximately 137 feet in the middle portion of the alignment to 157 feet at the west end of the alignment. USGS GIS topographic information is also provided on **Figure 2, USGS Topographic Map** which suggests lowest areas are in the middle portion and at the east end of the alignment. Boring/test elevations provided in this report were estimated based on provided survey data in the vicinity of our borings; no surveying was completed by Madrid.

1.3 Soil Survey Review

The Natural Resources Conservation Services (NRCS) Soil Survey reports provide a general description of the typical shallow soil strata (about 6 feet) encountered within each particular soil mapping unit and reports typical depth to seasonal high water levels. The NRCS defines seasonal high water as "a zone of saturation at the highest average depth during the wettest season that is at least six inches thick, persists for more than a few weeks, and is within six feet of the soil surface." The Soil Survey for Polk County indicates shallow soils at the site are comprised of **Candler sand, 0 to 5 percent slopes** (map unit 3) in the west-central and eastern portions of the alignment and **Tavares fine sand, 0 to 5 percent slopes** (map unit 15) at the west end and the central portion of the alignment, as shown on **Figure 3, Soils Map**.

According to the NRCS, *Candler sand, 0 to 5 percent slopes is an excessively drained soil that is on uplands and knolls on flatwoods. Areas of this soil range from about 30 to several hundred acres. Slopes are smooth to concave. Typically, this soil has a dark brown sand surface layer about 6 inches thick. The subsurface layer to a depth of about 63 inches is brownish yellow sand that grades to yellow. The next layer to a depth of at least 80 inches is yellow sand that has a very thin, strong brown lamellae. This Candler soil does not have a high water table within a depth of 80 inches. The available water capacity is low or very low.*

According to the NRCS, *Tavares fine sand, 0 to 5 percent slopes is a moderately well drained soil on broad uplands and knolls on flatwoods. Areas of this soil range from about 10 to 80 acres. Slopes are smooth to convex. Typically, this soil has a dark grayish brown fine sand surface layer about 8 inches thick. The underlying material to a depth of at least 80 inches is light yellowish brown fine sand that grades to very pale brown. This Tavares soil has a seasonal high water table at a depth of 40 to 80 inches for several months in most years. The available water capacity is very low. Permeability is rapid or very rapid.*

2.0 FIELD EXPLORATION

2.1 Standard Penetration Test Borings

On August 7, 2019, Madrid explored subsurface conditions at the site by drilling three (3) Standard Penetration Test (SPT) borings (SPT-11 through SPT-13) with track mounted drilling equipment to a depth of 15 feet below ground surface (bgs). A GPS hand unit (typical accuracy of +/- 10 feet) was utilized in the field for location purposes. Boring locations are shown at the bottom of the boring logs in **Appendix A**. The boring locations are plotted on an aerial photograph of the proposed alignment (**Figure 4**) and should be considered approximate. The following borings were completed:

Table 2.1

SPT Borings	
Pipeline	• SPT-11 through SPT-13 (15 feet)

Disturbed samples from the SPT borings were obtained using a split-spoon sampler in general accordance with ASTM Specification D 1586, using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound slide hammer (safety hammer) falling a distance of 30 inches. An engineering technician familiar with soil classification and field evaluations logged the borings in the field and placed samples in sealed containers and returned them to Madrid's laboratory for further classification. Upon completion, the boreholes were backfilled in general accordance with industry standards. The soil boring logs have been included with this report in **Appendix A**. Soil samples will be retained for a period of 3 months unless otherwise notified.

3.0 SUBSURFACE CONDITIONS AND LABORATORY TESTING

3.1 Subsurface Soil Conditions

In general, the SPT borings along PW01 encountered mostly very loose to loose fine sand (SP) from the ground surface to depths of approximately 8 to 12 feet bgs except for a thin layer of clayey sand fill (SC) at the surface of SPT-13. Below the sand stratum in borings SPT-11 and SPT-12 was loose to medium dense slightly clayey sand (SP-SC). In boring SPT-13, the sand was underlain by loose slightly silty sand (SP-SM) from about 8 to 12 feet bgs followed by medium dense sand (SP).

No losses of drilling fluid circulation were reported in any of the SPT borings. The general soil profiles described above and as presented on the boring logs are based on our interpretation of subsurface conditions encountered at the boring locations

only. Boundaries between soil layers are approximate and for illustration purposes only. Variations in soil conditions in both horizontal and vertical directions different from those presented are likely to exist between boring locations.

3.2 Groundwater Conditions and Seasonal High Ground Water

The PW01 alignment has about 20 feet of relief from the higher portion of the alignment to the west to the lower portions in the central and eastern portions of the alignment. We did not encounter a discernible water table in the surficial 10 feet of the SPT borings at the time of our investigation. Drilling fluid was introduced into the boring after 10 feet which makes it difficult to identify a water table below that depth. Seasonal fluctuations in the groundwater level should be anticipated due to variations in rainfall and water perching on top of the clayey sand is likely to occur.

The Soil Survey for Polk County, Florida describes the seasonal high water table (SHWT) for the map units to be between 40 and 80 inches below the surface at the west end and in the central portions of the alignment and below a depth of 80 inches in the west-central and eastern portions of the alignment. Based upon the published survey information and our findings during the exploration, depending on the time of year of construction, a water table likely will not be encountered in open trenches along the PW01 alignment.

3.3 Laboratory Testing

Laboratory tests for natural water content (ASTM D2216) and percent passing the No. 200 sieve (ASTM D1140) were performed on selected samples retrieved during the field exploration from the SPT borings to verify the visual and tactile soil classifications. Laboratory test reports are included in **Appendix B**. A brief summary of the results is provided below:

Table 3.3a

Lab Summary	
<#200 Sieve	8.7% - 13.2%
% Moisture	10.6% - 23.0%

4.0 EVALUATION AND GENERAL RECOMMENDATIONS

4.1 General Considerations

The following conclusions and recommendations are based on our understanding of the proposed project, the data obtained from the field exploration,

experience with similar conditions, and generally accepted principles and practices of geotechnical engineering. The proposed alignment falls along generally suitable soil conditions. In addition, the soils encountered in the borings were generally suitable for re-use as backfill. Actual soil conditions between borings will vary. Clayey sands, if encountered within trench excavations, may retain moisture and can be difficult to compact. Loose zones, if at the pipe subgrade level, should be over-excavated and replaced.

Typically, a water main pipeline will require at least 3 feet of cover. We assume the pipeline will be installed via open cut method between depths of approximately 5 to 8 feet below existing grade. No directional drilling is proposed along the PW01 portion of the alignment. Assuming this invert depth range, and based on the results of the boring program, the trench excavations will typically expose mostly very loose to loose fine sands (SP) with occasional silty or clayey sands (SP-SM, SP-SC and SC). A shallow water table was not encountered in the borings (completed during the wet season) and it is likely that dewatering will not be required in most areas, depending on the depth of excavation. Very loose to loose clean sands were commonly encountered and may not be stable in the short-term during excavations; the need for trench wall support should be anticipated by the contractor. Unless trench excavations are intended to be open cut with shallow side slopes in accordance with OSHA Type C Soils or shallower, shoring or trench boxes may need to be installed very soon after excavation to reduce the chance of soil sloughing into the trench, which will widen the excavation area.

Prior to construction, bulk samples representative of anticipated subgrade and fill soils should be collected and subjected to Standard Proctor testing. As different soil types are encountered during excavation, additional Proctor samples of each new soil type should be collected and tested. Existing sandy soils excavated and intended for reuse as backfill may require moisture conditioning to permit adequate compaction.

4.2 Site Preparation and Earthwork

4.2.1 Excavation and Shoring

In general, the anticipated depth of trench excavations typically ranges from about 5 to 8 feet bgs. The bases of trench excavations will expose soil conditions that will vary along the alignment but most soils will be very sandy (SP, SP-SM and SP-SC). Occasionally, clayey sand may be encountered as fill at the surface or at the base of excavations. Based on the results of our boring program, materials at the base of trench excavations along most of the route are likely to be either loose to very loose very sandy soils. If encountered, organic or plastic soils at the bases of the trench excavations should be excavated to at least one foot below the design trench depth and

replaced with pipe bedding material, placed and compacted as described later in this report. The trench width should be sufficiently wide to allow proper compaction along the haunches and the sides of the pipe (typically at least 1-foot wider than the outside pipe diameter or more). Minimum trench depth required is 1 foot below the proposed bottom of the pipe to allow for placement of bedding material.

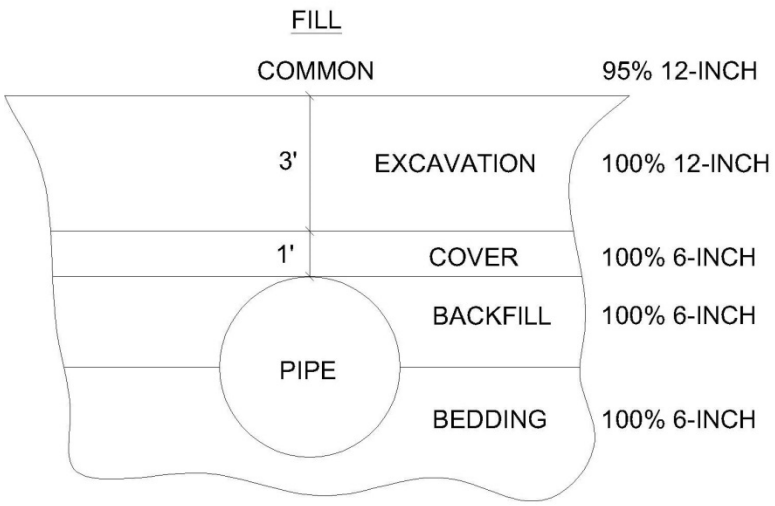
Braced or shored excavations may be required along the alignment for space limitations using trench boxes or other stabilization methods. Excavation stability is the responsibility of the contractor. All excavations should conform to the Occupational Safety and Health Act (OSHA) requirements for Type C soils as described Federal Register 29 CFR Part 1926. Excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth, unless specific provisions for surcharge loading have been included in the design of the excavation slope or shoring system. Design of a shoring system is the responsibility of the selected contractor. A number of variable factors, such as nature and strength of excavated soils, depth of excavation and groundwater, proximity of adjacent structures, and economics of construction method, etc., will affect the choice of support method. All vertical shoring or prefabricated trench lining systems should be continuous and maintained in place to assure adequate temporary stability during backfilling of the pipe trench as recommended subsequently.

4.2.2 Dewatering

Groundwater was not encountered in the surficial 10 feet of the SPT borings. Drilling fluid was introduced into the boring after 10 feet which makes it difficult to identify a water table below that depth. Depending on the time of year of construction, groundwater control will likely not be needed by the contractor. However, if necessary, a dewatering system should be designed and installed to draw the groundwater table down to a minimum depth of two feet below the final excavated grade. If needed, a shallow well-point system may be adequate for trenches and small excavations. Nearby ponds should be considered when designing a dewatering system. Sump pumps may be effective, but only to locally dewater the soils; they may only be useful at very localized installations. The contractor should employ a registered professional engineer to design all shoring and dewatering systems.

4.2.3 Pipe Bedding and Backfilling

The following diagram indicates the typical pipe backfill limits and compaction requirements (6 or 12-inch lifts) that we recommend:



Clean fine sands (SP) containing less than five percent passing the U.S. standard No. 200 sieve and less than four percent organic matter (as determined by ASTM D2974) may be used as select sand pipe bedding material. Most of the soils encountered at this site should meet this criterion, but clayey sand may be present in some areas and careful inspection of excavated soil should be made regularly to ensure consistency in the pipe bedding soil. Suitable pipe bedding should be free of stones, gravel, organics, vegetation and other deleterious material, placed in uniform loose lifts not exceeding six inches thick and compacted to at least 100 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor-SPMDD). Bedding material within the middle 1/3 of the pipe diameter should be loosened for better seating of the pipe in the bedding soil and shaped to allow for bell joints if applicable. Pipe bedding material should be placed from one foot below to at least half-way up the pipe. Particular care needs to be exercised during pipe bedding placement and compaction around pipe haunches, elbows, and curves. Loose bedding materials may subsequently compact in-service, if subjected to dynamic or vibrational loading due to surge pressures, resulting in excessive pipe deflections and possibly failure.

Soils in the backfill and cover zones (from half-way up the pipe to 1-foot over the pipe, as shown on the graphic above) should consist of clean to relatively clean sand (SP) or slightly silty sand (SP-SM) with no more than 12% silty fines passing the No. 200 sieve and less than 4% organic content, and also compacted to 100% of the SPMDD in lifts no greater than 6-inch compacted thickness. Compaction should be performed at the base of all excavations prior to placing the first layer of backfill to assure soil density equal to or greater than the natural soils. If over-excavation is required to remove unsuitable soils, cover/backfill soil compacted to at least 95% of SPMDD in not more than 12-inch lifts should be used to bring it back up to the bedding subgrade level.

Excavation backfill material more than 1 foot above the pipe should consist of granular soils with less than 15 percent fines content passing the No. 200 sieve and an organic content of not more than 4 percent generally conforming to USCS soil types SP to SP-SM/SP-SC and SM; use of Clayey Sand (SC) may present moisture conditioning problems and is not recommended. Smaller seams of clayey sand (up to a few inches in diameter) are allowable and should not present difficulty with compaction as long as the majority of the soil is relatively clean sand. It appears that most of the excavated soils will meet these requirements, but the contractor should consider some import of clean sand fill may still be required. At the boring locations, organics were encountered only in trace amounts. Organic soils, if encountered, are not suitable backfill soils in any location and should be replaced with suitable fill. Excavation backfill typically should be placed in lifts no greater than 12 inches in compacted thickness and compacted to 100 percent of SPMDD. Common fill used more than 3 feet above the top of pipe and outside of structure, driveways or pavement areas can have up to 20% fines and be compacted to 95 percent of SPMDD. Excavated spoil material intended for reuse as backfill will likely require moisture conditioning to permit adequate compaction.

4.3 Quality Assurance

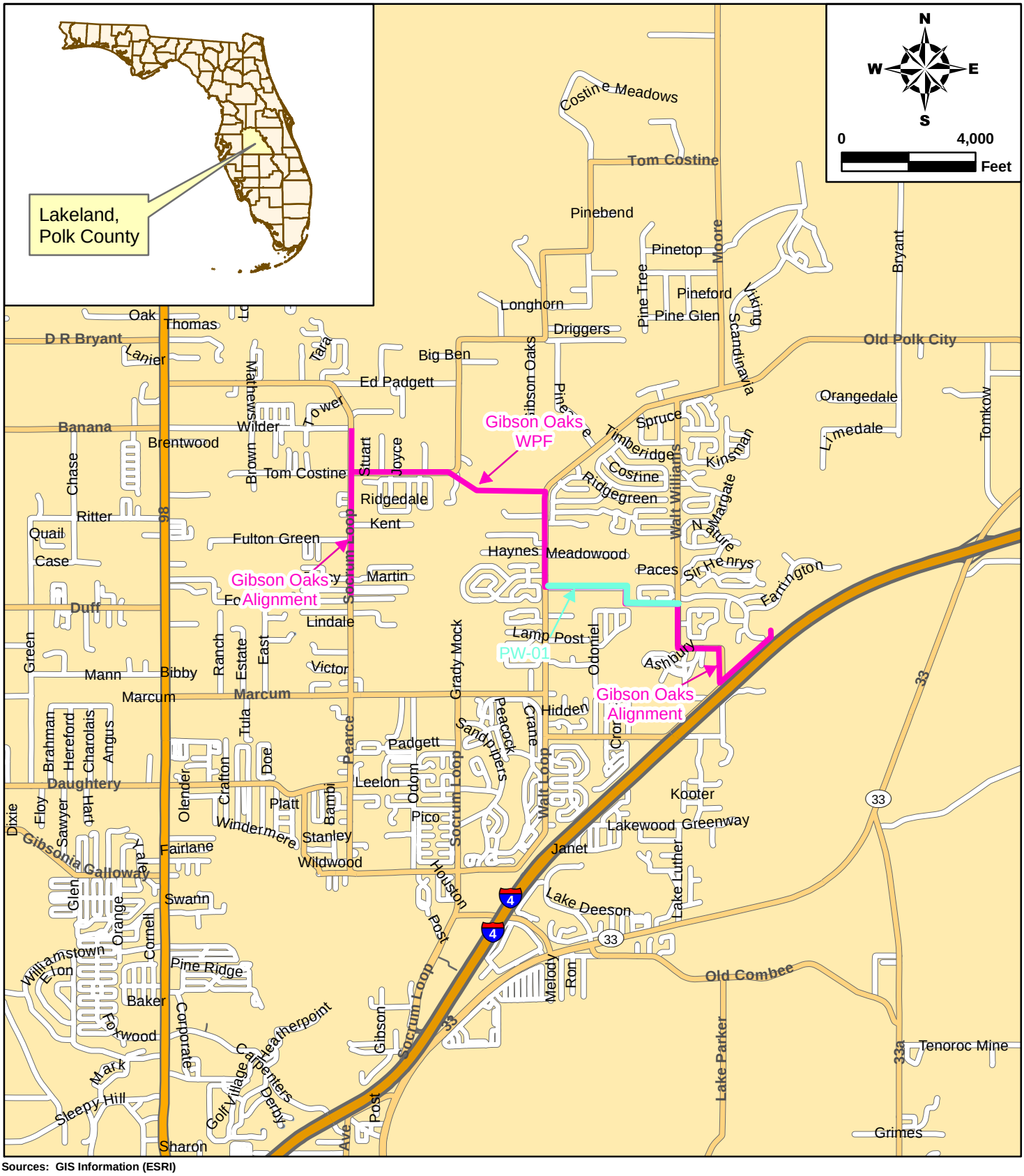
We recommend implementing a comprehensive quality assurance program to verify that all earthwork and construction is conducted in accordance with the recommendations herein and the appropriate plans and specifications. It is strongly recommended that Madrid be retained to perform materials testing and inspection services to observe that the subsurface conditions are as we have discussed herein and that pipe bedding, ground densification, deleterious soil removal and fill placement is in accordance with our recommendations. Madrid cannot accept responsibility for any conditions which deviate from those described in this report if not engaged to provide construction observation and testing for this project. An on-site engineering technician should monitor all site preparation to verify that all deleterious materials have been removed and should observe earthwork activities to verify that the pipe backfill soils conform to the recommendations herein. In-situ density tests should be conducted during filling activities to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for natural and fill soils to confirm they meet minimum compaction requirements.

5.0 LIMITATIONS

This report has been prepared for Hydro Solutions Consulting for the proposed PW01 Water Main pipeline in Lakeland, Florida. The information in this report is intended for the sole use of the addressees and their assigns/agents and may not be relied upon or used by any third party without expressed written consent. The

evaluations and recommendations presented herein are based on Madrid's interpretation and understanding of site conditions and information provided by the Client. This report is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions may exist at the site. This study is not intended to be an evaluation of sinkhole risk. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface. The study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. Madrid is not responsible for the independent conclusions, opinions, and/or recommendations made by others based on the field investigation and laboratory testing data presented in this report. Soil samples will be stored at our Bartow Office for a period of 3 months from the date of this report unless other arrangements are made.

FIGURES



Sources: GIS Information (ESRI)

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Hydro Solutions, Inc.

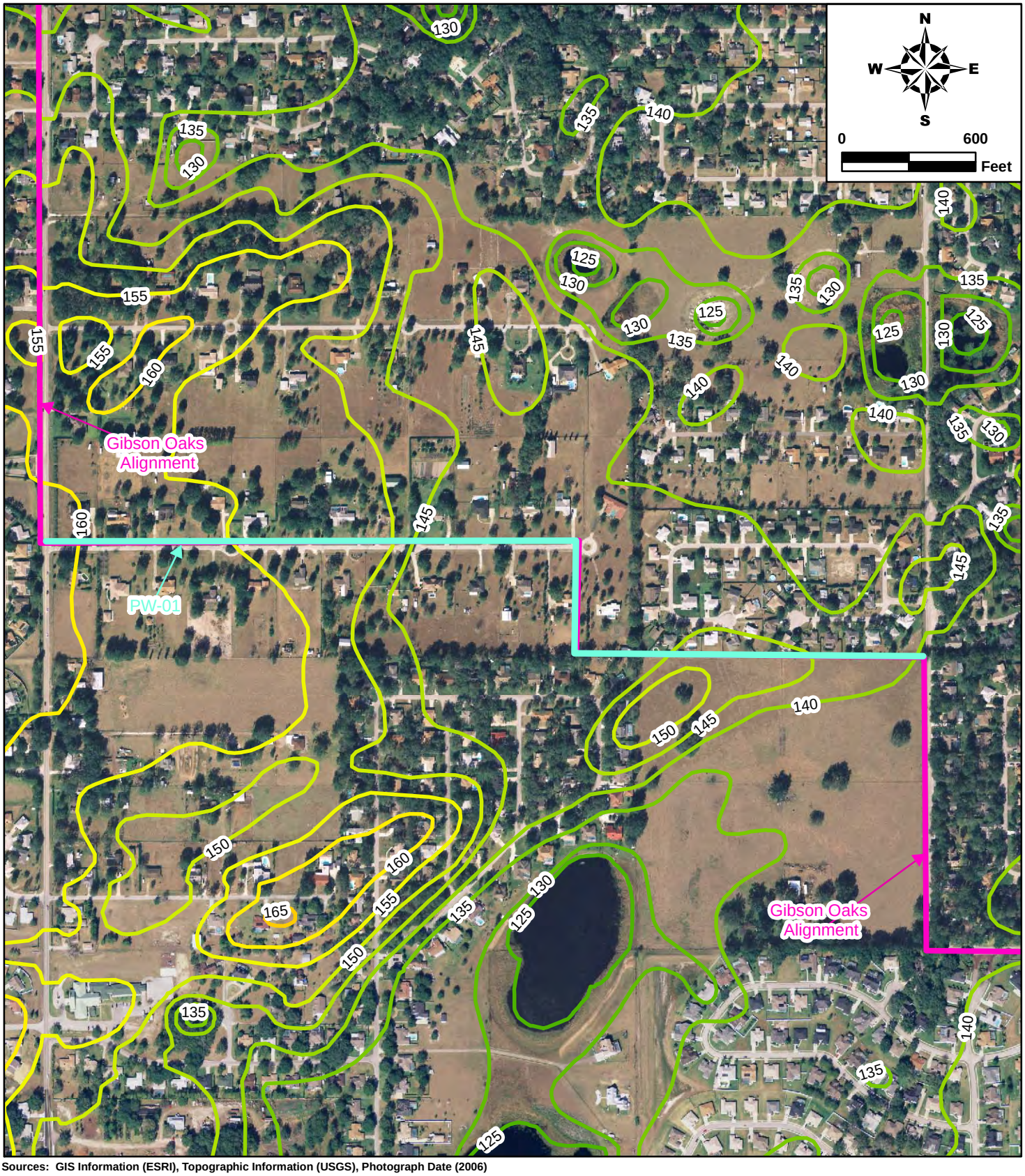
FIGURE 1
Location Map
PW-01 Water Main
Lakeland, Florida

Madrid Project Number:
13171

Notes:

Drawn By: TFS

Checked By: KH



Sources: GIS Information (ESRI), Topographic Information (USGS), Photograph Date (2006)

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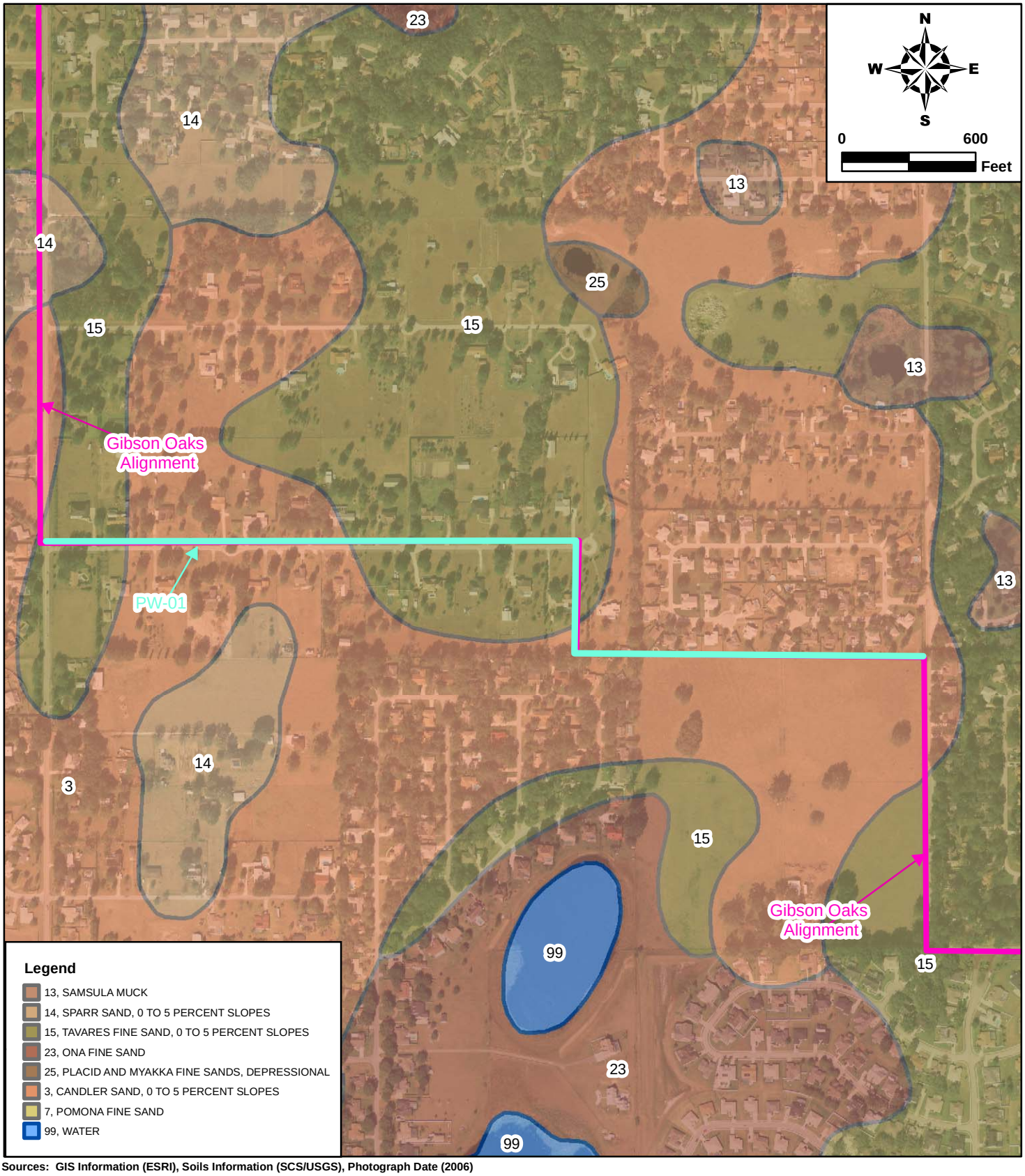
Hydro Solutions, Inc.

FIGURE 2
USGS Topographic Map
PW-01 Water Main
Lakeland, Florida

Madrid Project Number:
13171

Notes:	Drawn By: TFS	Checked By: KH



Sources: GIS Information (ESRI), Soils Information (SCS/USGS), Photograph Date (2006)

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Carollo Engineers, Inc.

FIGURE 3
NRCS/USDA Soils Map
PW-01 Water Main
Lakeland, Florida

Madrid Project Number:
13171

Notes:

Drawn By: TFS

Checked By: KH

Legend

SPT-11 — **SPT Boring Location**

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Hydro Solutions, Inc.

FIGURE 4
Boring Location Plan
PW-01 Water Main
Lakeland, Florida

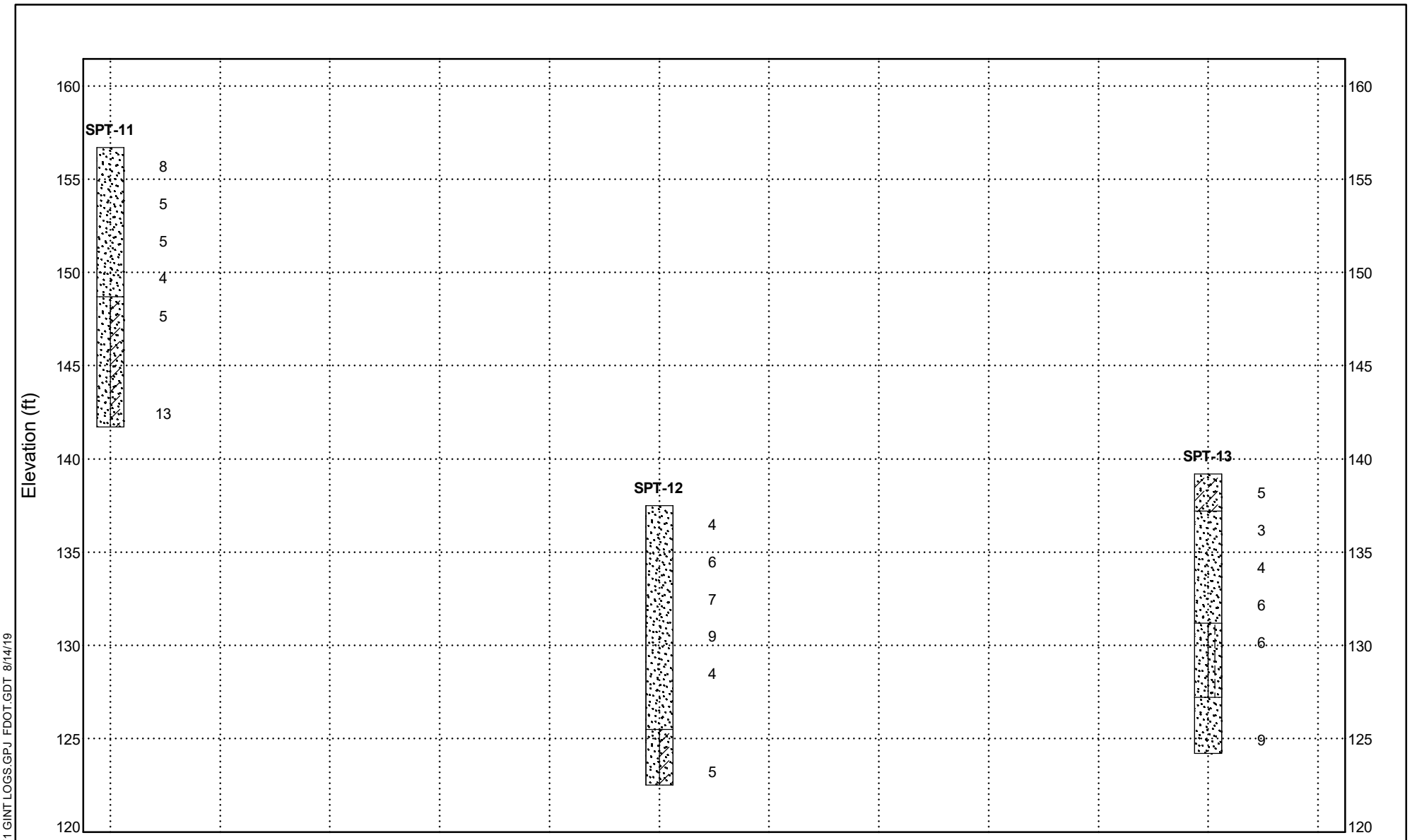
Notes: Aerial Data Source–2019 Microsoft Corporation, 2019 DigitalGlobe, 2019 CNES Distribution Airbus DS.
Pipeline alignments are approximate.

Drawn By: TFS

Checked By: KH

Madrid Project Number:
13171

APPENDIX A



TEST BORING FENCE RECORD

PROJECT NUMBER 13171
PROJECT PW01 Pipeline
PAGE 1 OF 1

Madrid Engineering Group

LEGEND

- Water Table
- Loss of Drilling Fluid Circulation
- USCS sand
- USCS slightly silty sand
- USCS slightly clayey sand
- USCS clayey sand

FENCE NO HORIZONTAL UNIT 13171 GINT LOGS.GPJ FDOT.GDT 8/14/19

BORING NO. SPT-11

DATE DRILLED 8/7/2019
PROJECT NUMBER 13171
PROJECT PW01 Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not discernible in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Loose grayish brown sand (SP)	0				
			155	3-4-4-5	8	
	Very pale brown			2-3-2-3	5	
		5		2-3-2-3	5	
			150	2-2-2-3	4	
8	Loose very pale brown slightly clayey sand (SP-SC) <#200=8.7%			2-3-2-4	5	
		10				
			145			
	Medium dense			4-6-7	13	
		15				

BORING LOCATION: 28.13707°N, 81.93808°W

BORING NO. SPT-12

DATE DRILLED 8/7/2019
PROJECT NUMBER 13171
PROJECT PW01 Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not encountered in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Loose dark gray sand (SP)	0		2-2-2-2	4	
	Grayish brown		135	2-3-3-2	6	
	Very pale brown	5		2-4-3-5	7	
	Medium dense			6-4-5-3	9	
	Loose		130	3-2-2-3	4	
12	Loose light gray slightly clayey sand (SP-SC) <#200=11.0%	10				
			125	1-2-3	5	
		15				

BORING LOCATION: 28.13705°N, 81.93078°W

BORING NO. SPT-13

DATE DRILLED 8/7/2019
PROJECT NUMBER 13171
PROJECT PW01 Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not discernible in the surficial 10 feet bgs. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Loose dark gray clayey sand (SC) <#200=13.2%	0		1-3-2-1	5	
2	Very loose light gray sand (SP)		135	1-1-2-4	3	
	Loose	5		4-3-1-3	4	
				3-3-3-3	6	
8	Loose gray slightly silty sand (SP-SM)		130	1-2-4-2	6	
		10				
12	Medium dense gray sand (SP)		125	4-5-4	9	
		15				

0 10 20 30 40 60 80 100

BORING LOCATION: 28.13566°N, 81.92611°W

APPENDIX B

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, Florida 33830
(863)533-9007 FAX: (863)533-8997

ASTM C117-13 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 13171
Project Name: Water Pipeline
Project Location: Lakeland
Client: Hydro Solutions

Date Tested: 8/9/2019
Tested By: TW

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-11 8-10'	27	102.71	93.64	8.06	90.4%	10.6%	86.22	8.7%
SPT-12 13-15'	26	136.80	112.75	8.07	81.3%	23.0%	101.28	11.0%
SPT-13 0-2'	25	115.03	103.92	8.10	89.6%	11.6%	91.27	13.2%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$

APPENDIX D

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 E
Bartow FL 33830-4268
Ph: (863) 533-9007
Fax: (863) 533-8997

December 11, 2019

Polk County Utilities Administration
1011 Jim Keene Blvd.
Winter Haven, FL 33880
Attn: James Tully

RE: Gibson Oaks Pipeline Additional Borings (Report Addendum) (Revised)
Lakeland, Florida
Madrid Project No. 13494.13

Mr. Tully:

This letter report from Madrid Engineering Group, Inc. (Madrid) summarizes the results from our additional subsurface soil exploration and evaluation for three (3) additional SPT borings at locations specified by the County along the proposed Gibson Oaks pipelines in Lakeland, Florida. Madrid previously completed a Geotechnical Report for these pipelines (Madrid Report No. 12818.3 for Carollo Engineers, Inc., dated August 29, 2019). Data from that report is not reproduced herein and this report is intended to be an Addendum to that report (i.e., this is not a stand-alone report). This report includes additional recommendations based on the results of the three additional borings completed. Our evaluation is based upon the results of our field exploration, laboratory tests, and appropriate engineering analyses.

Field Exploration

Madrid conducted the subsurface exploration on November 21 and November 25, 2019 by completing three (3) standard penetration test (SPT) borings to a depth of 15 feet depth below ground surface (bgs) using the mud-rotary drilling method. On December 10 (SPT-15 and SPT-16) and December 11, 2019 (SPT-17), Madrid returned to the sites to continue the borings to a depth of 30 feet bgs. Soil samples were collected from the boreholes in general accordance with ASTM D1586 using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound slide auto-hammer falling a distance of 30 inches. Soil samples collected from the SPT borings were placed in sealed containers and returned to Madrid's laboratory for examination, classification in general accordance with the USCS (United Soil Classification System - ASTM D2487), and selected laboratory testing. Upon completion, each borehole was filled from bottom to top with cement grout and bentonite chips. Soil boring logs are included with this report. Samples will be retained for 3 months unless other arrangements have been made.

The three boring locations are scattered along the proposed pipeline alignment. Boring SPT-15 is located to the east of Walt Williams Road (on private property), which appears to be an alternate pipeline route option at the east end of the alignment where directional drilling may be used. Borings SPT-16 and SPT-17 were located at/near proposed directional drilling pits on either side of the wetland near the middle of the alignment. The boring locations are shown on **Figure 5**, which includes the original proposed pipeline alignment and borings completed for our previous investigation. Elevations referenced in this report should be considered approximate; no surveying was completed by Madrid.

Subsurface Soil Conditions

In general, all three SPT borings encountered very loose to loose (to medium dense in SPT-16) fine sand (SP) in the surficial approximate 17 feet bgs. Below the sand unit in SPT-15 was very loose slightly organic silty sand (SM) to a depth of about 22 feet bgs followed by medium dense to loose sand to the termination depth at 30 feet bgs. Below the sand unit in SPT-16 was firm to very soft clay (CH) to the termination depth at 30 feet bgs. Below the sand in SPT-17 was firm clay (CH) to a depth of about 22 feet bgs followed by loose clayey sand to the termination depth at 30 feet bgs. Some slightly cemented clay was encountered near the bottom of both borings SPT-16 and SPT-17. No losses of circulation occurred at the boring locations. The **SPT Boring Logs** are included with this report.

Groundwater Conditions

A water table was reported at a depth of 26 inches bgs in boring SPT-16 and at a depth of 36 inches in SPT-15. Boring SPT-17 did not encounter a discernible water table within the surficial 10 feet bgs (drilling with mud began at 10 feet bgs) at the time of our investigation.

Laboratory Testing

Laboratory tests for natural water content (ASTM D2216) and percent passing the No. 200 sieve (ASTM D1140) were performed on selected samples from the SPT borings collected to verify the visual and tactile soil classifications. Laboratory test reports are included with this letter report.

- The laboratory tests indicate trace to minor fines content in sediments at depths from 2 to 8 feet bgs in the SPT borings. Percent passing the No. 200 sieve for the samples tested ranges from 2.0 to 4.7 percent.
- Moisture testing for samples from the borings revealed in-situ natural moisture contents ranging from 15.1 to 25.6 percent.

Evaluation and Recommendations

The soils encountered during the field activities were mostly very loose to loose fine sands (SP) in the surficial approximate 17 feet bgs. In boring SPT-15, the underlying soils were very sandy with very loose slightly organic silty sand between about 17 and 22 feet bgs. Below this was medium dense to loose sand. Borings SPT-16 and SPT-17 found more cohesive soils below the surficial sands with mostly very soft to firm clays (CH) in both borings as well as some loose clayey sands (SC) in boring SPT-17. The water table was shallow (about 2 to 3 feet bgs in borings SPT-15 and SPT-16 but not discernible in the surficial 10 feet of SPT-17. As mentioned in our previous report for other boring locations, very loose to loose clean sands were commonly encountered and may not be stable in the short-term during excavations; the need for trench wall support should be anticipated by the contractor. These most recent borings (SPT-15 through SPT-17) found very loose sands (SPT-15) and very soft to firm clays (SPT-16 and SPT-17) below a depth of about 17 feet bgs that the contractor should be aware of for directional drilling. The change of soil conditions from loose to medium dense sands transitioning to very loose silty sands or soft clays may affect drilling. No very dense soils were encountered in these areas. All of the soils excavated in the surficial 15 feet of these three boring locations should be suitable for re-use (replacement backfill when drilling is complete.

We do not recommend any changes to the earthwork recommendations (compaction, pipe bedding, backfilling, etc.) from our previous report (see Section 4.2.3 of that report for earthwork recommendations).

Limitations

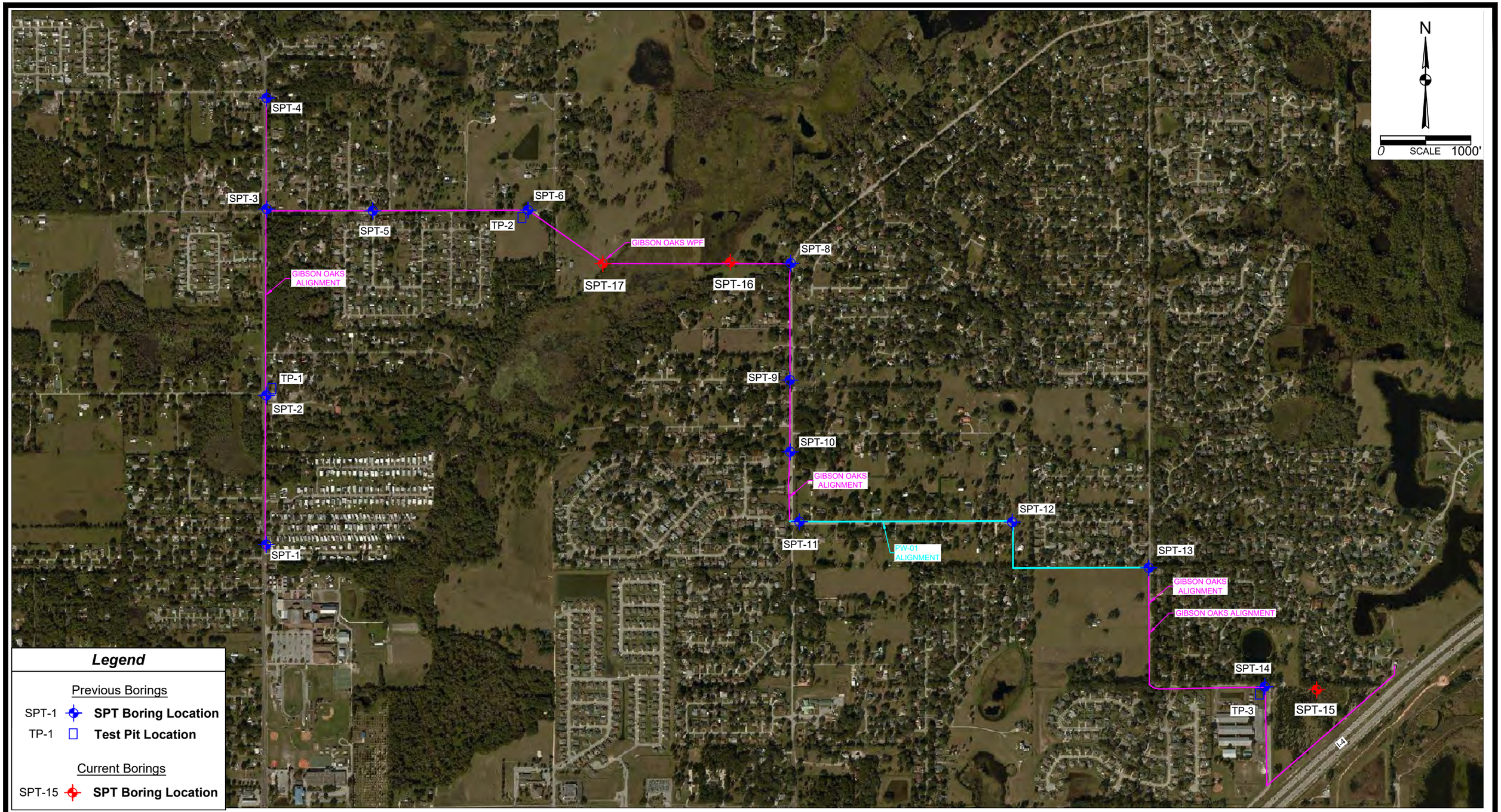
This report addendum has been prepared for Polk County Utilities for the proposed Gibson Oaks pipeline project. The conclusions presented herein are based on Madrid's interpretation and understanding of site conditions. This report is intended for use by Polk County and their assigns/agents; it is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions may exist at the project site. The limited study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. Madrid is not responsible for the independent conclusions, opinions, and/or recommendations made by others based on the field investigation data presented in this report. This limited investigation included relatively shallow soil borings and did not include an evaluation of sinkhole potential.

We appreciate the opportunity to be of service to you on this project and look forward to working with you on future projects. If you have any questions, please do not hesitate to contact us.

Sincerely,
Madrid Engineering Group, Inc. (EB 6509)

Kevin M. Hill, P.E.
Project Manager
Florida P.E. No. 72949

Attachments: Figure 5 Boring Location Plan
SPT Boring Logs
Laboratory Test Results



MADRID ENGINEERING GROUP, INC.
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EB-0006509

Polk County

FIGURE 5
Boring Location Plan–Additional Borings
Gibson Oaks Water Mains
Lakeland, Florida

Notes: Aerial Data Source–2019 Microsoft Corporation, 2019 DigitalGlobe, 2019 CNES Distribution Airbus DS. Pipeline alignments are approximate.

Drawn By: TFS

Checked By: KH

Madrid Project Number:
13494.13

BORING NO. SPT-15

DATE DRILLED 11/25/2019
PROJECT NUMBER 13494.13
PROJECT Gibson Oaks Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 3'. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Blows	N-Value
0	Loose gray sand (SP)	2-2-2-3	4
		2-3-2-2	5
5	Dark gray <#200=2.0%	2-2-2-3	4
		2-2-2-2	4
		3-2-2-2	4
10			
		3-3-3	6
15			
17	Very loose very dark brown slightly organic silty sand (SM)	WOH/18"	WOH/18"
20			
22	Medium dense light brownish gray sand (SP)	5-7-10	17
25			
	Loose brown	2-3-5	8
30			

Elev. (ft): 135, 130, 125, 120, 115, 110

● STANDARD PENETRATION TEST
0 10 20 30 40 60 80 100

BORING LOCATION: 28.13195°N, 81.92035°W

BORING NO. SPT-16

DATE DRILLED 11/25/2019
PROJECT NUMBER 13494.13
PROJECT Gibson Oaks Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table encountered at 2.2'. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	● STANDARD PENETRATION TEST (0 10 20 30 40 60 80 100)
	Loose dark gray sand (SP)	0		1-2-2-2	4	
	Very loose <#200=2.3%			2-2-1-2	3	
	Loose		125			
		5		2-2-3-3	5	
				1-2-2-2	4	
			120	3-3-3-4	6	
		10				
	Medium dense		115	4-5-4	9	
		15				
17	Firm light greenish gray clay (CH)		110	2-2-2	4	
		20				
	Soft		105	1-1-1	2	
		25				
	Very soft with white cemented clay		100	1-1/12"	1	
		30				

BORING LOCATION: 28.14492°N, 81.94482°W

BORING NO. SPT-17

DATE DRILLED 11/21/2019
PROJECT NUMBER 13494.13
PROJECT Gibson Oaks Pipeline

TEST BORING RECORD
Madrid Engineering Group

REMARKS: Water table not discernible in surficial 10 feet. No loss of circulation. Auto hammer used.

Depth (ft)	DESCRIPTION	Depth (ft)	Elev. (ft)	Blows	N-Value	STANDARD PENETRATION TEST
	Very loose dark gray sand (SP)	0	130	1-1-1-1	2	
	Loose			3-2-4-6	6	
		5	125	6-4-4-4	8	
	Dark grayish brown <#200=4.7%			3-2-2-3	4	
				3-3-3-4	6	
		10	120			
				2-4-4	8	
		15	115			
17	Firm light greenish gray clay (CH)					
				3-2-2	4	
		20	110			
22	Loose light greenish gray clayey sand with white cemented clay (SC)					
				2-2-2	4	
		25	105			
				3-3-2	5	
		30	100			

BORING LOCATION: 28.14496°N, 81.94045°W

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(863)533-9007 FAX: (863)533-8997

ASTM C117-13 MOISTURE / PERCENT < No. 200 SIEVE

Project Number: 13494.13
Project Name: Gibson Oaks Pipeline
Project Location: Lakeland, FL
Client: Polk County

Date Tested: 12/1/2019
Tested By: WG

Sample	Cont. Name	W_C+S_W (g)	W_C+S_D (g)	W_C (g)	Solids Content (%)	Moisture Content (%)	W_C+S_R (g)	<#200 (%)
SPT-15 4-6'	118	194.88	160.74	7.61	81.8%	22.3%	157.69	2.0%
SPT-16 2-4'	119	294.18	235.72	7.64	79.6%	25.6%	230.40	2.3%
SPT-17 6-8'	120	211.61	184.92	7.66	86.9%	15.1%	176.62	4.7%

W_C = Weight of Container
S_W = Weight of Wet Sample
S_D = Weight of Dry Sample
S_R = Weight of Sample Retained

$$\text{Solids Content } (\%) = \frac{S_D}{S_W} * 100$$

$$\text{Moisture Content } (\%) = \frac{W_{H_2O}}{S_D} * 100$$

$$< \#200 \text{ Sieve } (\%) = \frac{(S_D - S_R)}{S_D} * 100$$