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**IFB NO. Y16-762-PH**

**ISSUED: April 7, 2016**

**INVITATION FOR BIDS**

**FOR**

**ANDERSON ROAD WATER MAIN AND FORCEMAIN REPLACEMENT PROJECT**

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**Mail or Hand Deliver**

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**PART H  
TECHNICAL SPECIFICATIONS**

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**NEW BID BOND REQUIREMENT – See Part C, Instructions to Bidders, Paragraph 19 e.**

# ANDERSON ROAD WATER MAIN AND FORCE MAIN REPLACEMENT PROJECT

## TECHNICAL SPECIFICATIONS

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**SECTION 01001**  
**GENERAL WORK REQUIREMENTS**

**PART 1 - GENERAL**

1.01 NOTICES

- A. All notices or other papers required to be delivered by the Contractor to the County shall be delivered to the office of the Engineering Division, Orange County Utilities Department, 9150 Curry Ford Road, Orlando, FL 32825.

1.02 WORK TO BE DONE

- A. The Contractor shall furnish all labor, materials, equipment, tools, services, and incidentals to complete all work required by these specifications and as shown on the Drawings, at a rate of progress which will ensure completion of the Work within the Contract Time stipulated.
- B. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, clean up, replacements, and restoration required as a result of damages caused during this construction.
- C. The Contractor shall comply with all City, County, State, Federal, and other codes, which are applicable to the proposed Work.
- D. All newly constructed Work shall be carefully protected from injury in any way. No wheeling, walking, or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at his own expense.
- E. Scope of Work: See Section 01010 "Summary of Work" and the Bid Schedule for details.

1.03 DRAWINGS AND PROJECT MANUAL

- A. The Work shall be performed in accordance with the Drawings and Specifications prepared by the County/Professional. All work and materials shall conform to the Orange County Utilities Standards and Construction Specifications Manual, latest edition or as indicated in these Specifications or Drawings.
- B. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the County/Professional, and shall notify same, in writing, of all errors, omissions, conflicts and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting there from, nor from rectifying such conditions at his own expense.

- C. All schedules are given for the convenience of the County and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.
- D. Intent:
  - 1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified either in the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
  - 2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the Contractor in accordance with the specification on the Drawings.
  - 3. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.
- E. Refer to the Contract for the order of precedence of items and documents.

#### 1.04 PROTECTION AND RESTORATION

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every means of protection necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or the Contractor shall make good the damage in other manner acceptable to the County/Professional.
- B. Protection of Trees and Shrubs
  - 1. Protect with boxes or other barricades.
  - 2. Do not place excavated material so as to injure trees or shrubs.
  - 3. Install pipelines in short tunnels between and under root systems.
  - 4. Support trees to prevent root disturbance during nearby excavation.
- C. Tree and Limb Removal
  - 1. Tree limbs, which interfere with equipment operation and are approved for pruning, shall be neatly trimmed and the tree cut coated with tree paint.
  - 2. The County may order the Contractor, for the convenience of the County, to remove trees along the line or trench excavation. The Contractor shall obtain any permits required for removal of trees. Ordered tree removal shall be paid for under the appropriate Contract Items.



- D. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by the Contractor with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.
- E. Lawn Areas: All lawn areas disturbed by construction shall be replaced with like kind to a condition similar or equal to that existing before construction. Where sod is to be removed, it shall be carefully removed, and the same re-sodded, or the area where sod has been removed shall be restored with new sod in the manner described in the applicable section.
- F. Where fencing, walls, shrubbery, grass strips or area must be removed or damaged incident to the construction operation, the Contractor shall, after completion of the work, replace or restore to the original condition.
- G. The cost of all labor, materials, equipment, and work for restoration shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.

#### 1.05 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.
- B. Sound levels measured by the County/Professional shall not exceed 45 dBA from 8 p.m. to 8 a.m. or 55 dBA 8 a.m. to 8 p.m. This sound level shall be measured at the exterior of the nearest exterior wall of the nearest residence. Levels at the equipment shall not exceed 85 dBA at any time. Sound levels in excess of these values are sufficient cause to have the Work halted until equipment can be quieted to these levels. Work stoppage by the County/Professional for excessive noise shall not relieve the Contractor of the other portions of this specification including, but not limited to, completion dates and bid amounts.
- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

#### 1.06 CONTRACTOR'S PAYMENTS TO COUNTY FOR OVERTIME WORK

- A. **County Inspector Work Hours: Normal work hours for the County's inspector(s) are defined as any 8-hour period between the hours of 7:00 a.m. and 7:00 p.m. on the weekdays of Monday through Friday. Any County Inspector(s) work beyond the aforementioned normal work hours shall be requested in writing 48-hours in advance. All overtime, any County holidays or weekend work compensation for the County's Inspector(s) to work beyond the normal working hours are considered overtime compensation and shall be paid for by the Contractor. The overtime pay rate will be \$51.00 per hour or the most current rate as listed in the County Fee Directory prepared by the Office of Management and Budget, in section "Orange County Utilities Engineering & Construction", under the heading of "Inspection Fee**

**other than Normal Working Hours". The Contractor agrees that the County shall deduct charges for work outside normal work hours and for overtime pay from payments due the Contractor.**

#### 1.07 MAINTENANCE OF SERVICE

- A. Unless noted otherwise on the plans, the operation of the existing water, reclaimed water or wastewater facility on each of the respective locations shall remain in service until the transfer of service has been completed. The Contractor shall, prior to interrupting any utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the County and make arrangements for the interruption which will be satisfactory to the County.
- B. Utility lines that are damaged during construction shall be repaired by the Contractor and service restored within 4-hours of the breakage. The County retains the option of repairing any damage to utility pipes in order to expedite service to the customers. The Contractor will remain responsible for all costs associated with the repair.

#### 1.08 TRANSFER OF SERVICE

- A. When the County has accepted a proposed facility and placed it into operation, the transfer of service is complete. The Contractor may begin the work of removing the existing or temporary facilities.

#### 1.09 LABOR

- A. Supervision: The Contractor shall supervise and direct the Work efficiently and with his best skills and attention. The Contractor shall have a competent, English speaking superintendent or representative, who shall be on the site of the Project at all working hours, and who shall have full authority by the Contractor to direct the performance of the Work and make arrangements for all necessary materials, equipment, and labor without delay.
- B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the Work shown on the Drawings or specified herein to avoid any work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any, shall conform to precedent agreements and decisions on record with the Building and Construction Trades Department, AFL-CIO, dated June, 1973, including any amendments thereto.
- C. Apprenticeship: The Contractor shall comply with all of the requirements of Section 446, Florida Statutes, for all contracts in excess of \$25,000 excluding roadway, highway or bridge contracts and the Contractor agrees to insert in any subcontract under this Contract the requirements of this Article.

## 1.10 MATERIALS AND EQUIPMENT

### A. MANUFACTURER

1. All transactions with the manufacturers or Subcontractors shall be through the Contractor, unless the Contractor and the County/Professional request that the manufacturer or Subcontractor communicate directly with the County/Professional. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. All workmanship and materials shall be of the highest quality. The equipment shall be the product of manufacturers who are experienced and skilled in the field with an established record of research and development. No equipment will be considered unless the manufacturer has designed and manufactured equipment of comparable type and size and have demonstrated sufficient experience in such design and manufacture.
3. No material shall be delivered to the Site without prior approval of the County/Professional.
4. All apparatus, mechanisms, equipment, machinery, and manufactured articles for incorporation into the Project shall be the new (most current production at time of bid) and unused standard products of recognized reputable manufacturers.
5. Manufactured and fabricated products:
  - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
  - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
  - c. Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.
  - d. Products shall be suitable for service conditions as specified and as stated by manufacturer.
  - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
  - f. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

## 1.11 MANUFACTURER'S SERVICE

- A. Where service by the manufacturer is specified to be furnished as part of the cost of the item of equipment, the Work shall be at the Contractor's expense.
- B. The services provided shall be by a qualified manufacturer's service representative to check and verify the completed installation, place the equipment in operation, and instruct the County's operators in the operation and maintenance procedures. Such services are to be for period of time and for the number of trips specified. A working day is defined as a normal 8-hour working day on the job and does not include travel time.
- C. The services shall further demonstrate to the County/Professional's complete satisfaction that the equipment will satisfactorily perform the functions for which it has been installed.

## 1.12 INSPECTION AND TESTING

### A. General

1. All materials and equipment furnished by the Contractor shall be subject to the inspection, review and acceptance of the County and meet the requirements as outlined in the Orange County Utilities Standards and Construction Specifications Manual. If in the testing of any material or equipment it is ascertained by the County/Professional that the material or equipment does not comply with the Contract, the Contractor shall be notified thereof, and the Contractor will be directed to refrain from delivering said material or equipment, or to remove it promptly from the Site or from the Work and not accepted by the County shall be replaced with acceptable material, without cost to the County.
2. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEE, except as may otherwise be stated herein.
3. The Contractor shall give notice in writing to the County sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the County shall arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials; or the County will notify the Contractor that the inspection will be made at a point other than the point of manufacture; or the County will notify the Contractor that inspection will be waived.
4. When inspection is waived or when the County/Professional so requires, the Contractor shall furnish to the County authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include five (5) copies of the results of physical tests and chemical analysis, where necessary, that have been made directly on the product or on similar products of the manufacturer.
5. The Contractor must comply with these provisions before shipping any material. Such inspections by the County shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

### B. Cost

1. County shall employ and pay for the services of an independent testing laboratory to perform testing indicated on the Contract Documents, or at the County's discretion to ensure conformity with the Contract Documents.
2. The cost of field leakage and pressure tests and shop tests of materials and equipment specifically called for in the Contract Documents shall be borne by the Contractor. Such costs shall be deemed to be included in the Contract price.
3. The Contractor shall notify the County laboratory a minimum of 48-hours in advance of operations for scheduling of tests. When tests or inspections cannot be performed after such notice, the Contractor shall reimburse County for expenses incurred.

4. The Contractor shall pay for all work required to uncover, remove, replace, retest, etc., any work not tested due to the Contractor's failure to provide the 48-hours advance notice or due to failed tests. The Contractor shall also provide compensation for the County/Professional's personnel for required re-testing due to failed or rescheduled testing.

C. Shop Testing

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the worksite until the County/Professional notifies the Contractor, in writing, that the results of such tests are acceptable.
2. The manufacturing company shall provide five (5) copies of the manufacturer's actual shop test data and interpreted results signed by a responsible official of the manufacturing company and notarized, showing conformity with the Contract Documents as a prerequisite for the acceptance of any equipment. The cost of shop tests (excluding cost of County's representative) and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor and shall be included in the Contract price.

D. Field Testing:

1. The County shall employ and pay for services of an independent testing laboratory to perform testing specifically indicated in the Contract Documents. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract. The Contractor shall provide compensation for retesting of all failed tests.
2. The County may at any time during the progress of the Work, request additional testing beyond that which is specified in the Contract. This testing will be at the County's expense. Contractor shall:
  - a. Cooperate with laboratory personnel, provide access to the Project.
  - b. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
  - c. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes, which require control by the testing laboratory.

E. Demonstration Tests: Upon completion of the Work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance or demonstration tests as specified or required to provide compliance with the Contract Documents. The Contractor shall furnish all labor, fuel, energy, water and all other equipment necessary for the demonstration tests at no additional cost to the County.

F. Final Inspection: Prior to preparation of the final payment application, a final inspection will be performed by the County to determine if the Work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents. See also Section 01700 "Project Closeout."

- G. Inspection by existing utility owners: The Contractor shall pay for all inspections during the progress of the work required and provided by the owner of all existing public utilities paralleling or crossing the Work, as shown on the Drawings. All such inspection fees shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.
- H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida Department of Environmental Protection, and other authorized governmental agencies shall have free access to the site for inspecting materials and work, and the Contractor shall afford them all necessary facilities and assistance for doing so. Any instructions to the Contractor resulting from these inspections shall be given through the County. These rights of inspections shall not be construed to create any contractual relationship between the Contractor and these agencies.

### 1.13 PROJECT SITE AND ACCESS

#### A. RIGHT-OF-WAY AND EASEMENTS

1. The use of public streets and alleys shall be such as to provide a minimum of inconvenience to the public and to other traffic. Any earth or other excavated material shall be removed by the Contractor and the streets cleaned to the satisfaction of the County.
2. The Contractor shall not enter or occupy private land outside of easements, except by written permission of the property owner.
3. At the time of the Pre-Construction meetings, the Contractor shall become fully acquainted with the status of all easements. Should easements not be acquired by the County in specific areas of the Work, the Contractor shall sequence and schedule his work therein so as not to interfere with the progress of work in other areas of the Project. Any rescheduling of work due to easement acquisitions shall be performed by the Contractor at no additional cost to the County. The County agrees that it will make every effort to acquire all remaining easements with all speed and diligence possible so as to allow the completion of the Work within the Contract time.

#### B. ACCESS

1. Neither the material excavated nor the materials or equipment used in the construction of the Work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.
2. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business access with the business Owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored and all construction debris removed within 48-hours of backfilling trench.
3. Contractor agrees that representatives of the County and any governmental agents will have access to the Work wherever it is in preparation or progress and that the Contractor shall provide facilities for such access and inspection.

## 1.14 UTILITIES

### A. UTILITY CONSTRUCTION

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage or water. Other public or private property, which may be affected by the Work, shall be deemed included hereunder.
2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means. The Contractor shall, at his own expense, provide suitable and safe bridges 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.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits described by the County. If any excavation becomes a hazard, or if it excessively restricts traffic at any point, the County may require special construction procedures. As a minimum, the Contractor shall conform to the following restoration procedures:
  - a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas; limerock base or soil cement base (match existing) shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material. At the end of each workweek, the S-I asphaltic surface course shall be completed and opened to traffic. Contractor shall coordinate his construction activity including density tests and inspections to allow sufficient time to achieve this requirement. All driveway cuts shall be backfilled, compacted, and limerock base spread and compacted immediately after installation. Contractor shall coordinate with the individual property owners prior to removing the driveway section. Any utility crossing an existing roadway, parking lot or other paved area shall be patched by the end of the working day.
  - b. All pipe and fittings shall be neatly stored in a location, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.
  - c. Final Restoration Overlay: After completing all installations, and after testing of the pipe (but no sooner than 30-days after applying the S-I asphaltic surface), final restoration shall be performed. In no event shall final restoration begin after substantial completion. Final restoration shall provide an S-III asphaltic overlay as specified in an uninterrupted continuous operation until completion. Any additional restoration required after testing shall be repaired in a timely manner at no additional cost to the County.
  - d. Maintenance of all restored facilities shall be the Contractor's responsibility. This maintenance shall be performed on an on-going basis during the course of construction. The Contractor's Progress Schedule shall reflect the above restoration requirements.

- e. Additional Restoration for Work in Business or Commercial Districts: The Contractor shall restore all private property, damaged by construction, to its original condition. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business accesses with the business owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored within 24-hours of backfilling trench.

## B. EXISTING UTILITIES

1. The locations of all existing underground piping, structures and other facilities are shown based on information received from the respective owner. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping, conduit and cables to be encountered. It is the Contractor's responsibility to verify all existing underground piping, structures and other facilities.
2. The Contractor shall, at all times, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, utility services; and shall cooperate fully with the owners thereof to that end.
3. When existing facilities are found to be in conflict with the Work, the County reserves the right to modify alignments to avoid interference with existing facilities.
4. All utilities, which do not interfere with the work, shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the County. Any existing facilities, which require operation to facilitate repairs, shall be operated only by the owner of the respective utility.
5. It is the responsibility of the Contractor to ensure that all utility and/or poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation.

## C. NOTICES

1. All governmental utility departments and other owners of public utilities, which may be affected by the Work, will be informed in writing by the Contractor two (2) weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.
2. The Contractor shall comply with Florida Statute 553.851 regarding protection of underground gas pipelines. Evidence of notification to the gas pipeline owner shall be furnished to the County within two (2) weeks after the execution of the Contract.
3. It shall be the Contractor's responsibility to contact utility companies at least 72-hours in advance of breaking ground in any area or on any unit of the work so maintenance personnel can locate and protect facilities, if required by the utility company.



4. The Contractor shall give a minimum five (5) working day notice to utility personnel prior to interrupting a utility service (water, sewer, etc.).

#### D. EXPLORATORY EXCAVATIONS

1. Exploratory excavations shall be conducted by the Contractor for the purpose of locating underground pipelines or structures in advance of the construction. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48-hours or 1,000-feet in advance of work. If there is a potential conflict, the Contractor shall notify the County/Professional immediately. Information on the obstruction to be furnished by the Contractor shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the County.

#### E. UTILITY CROSSINGS

1. It is intended that wherever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the County this procedure is not feasible, the County may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings.

#### F. RELOCATIONS

1. Relocations shown on the Drawings: Public utility installations or structures, including but not limited to poles, signs, fences, piping, conduits and drains that interfere with the positioning of the work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.
2. Relocations not shown on the Drawings
  - a. Where public utility installations or structures are encountered during the course of the work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the County, removal, relocation, replacement or rebuilding is necessary to complete the Work, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the County, for the Contractor to accomplish.
  - b. If such work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required.
  - c. If such work is accomplished by the Contractor, it will be paid for as a Change Order.
3. All existing castings, including valve boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench restoration and pavement replacement, shall be adjusted by the Contractor to bring them flush with the surface of the finished work.

4. All existing utility systems which conflict with the construction of the work herein, which can be temporarily removed and replaced, shall be accomplished at the expense of the Contractor. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the Contractor.

## 1.15 RELATED CONSTRUCTION REQUIREMENTS

### A. PUBLIC INFORMATION OFFICER

1. The Contractor shall provide community interaction and coordination through a designated Public Information Officer (PIO). The PIO will provide resolution to complaints and problems from community members affected by the construction for the entire project duration. The PIO will manage a 24-hour hotline phone number for citizens to call. The PIO will field these calls, provide answers to questions, research issues with the project team or appropriate agencies and follow up each complaint in a timely manner. The PIO will maintain a daily diary of call and/or interactions with the community, as well as a complaint log chronicling all issues and proposed resolutions.
2. The PIO shall attend the project progress meetings and provide the project team with a report of public issues since the last progress meeting. The PIO will also disseminate roadway closures, sewer hookups, temporary and permanent restoration and other relevant construction information to the community, as well as, when appropriate, to the media, emergency services personnel and other interested agencies.
3. The designated PIO shall have previous experience in providing similar services on Orange County Utilities, Orange County Public Works or FDOT construction projects. The PIO shall be fluent in English and Spanish and shall visit the construction site, meeting locations and affected resident's homes as required.

### B. TRAFFIC MAINTENANCE

1. Refer to Section 01570 – Maintenance of Traffic

### C. BARRIER AND LIGHTS

1. The Contractor shall exercise extreme care in the conduct of the Work to protect health and safety of the workmen and the public. The Contractor shall provide all protective measures and devices necessary, in conformance with applicable local, state and federal regulations. Protective measures shall include but are not limited to barricades, warning lights/flashers and safety ropes.
2. All equipment and vehicles operating within 10-feet of the roadway shall have flashing strobe lights attached.

### D. DEWATERING AND FLOTATION

1. The Contractor, with his own equipment, shall do all pumping necessary to dewater any part of the work area during construction operations to insure dry working conditions. The Contractor shall take the necessary steps to protect on-site and off-site structures. Damage to any structures due to dewatering shall be repaired or the structures replaced at the Contractor's expense.
2. The Contractor shall be completely responsible for any tanks, wetwells or similar

structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. The proposed final structures have been designed to account for buoyancy; however the Contractor may employ methods, means and techniques during construction which may affect the buoyancy of structures. The Contractor shall take the necessary steps to protect structures. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the Contractor's expense.

3. Contractor shall be responsible for any required permits for the discharge of ground water.

#### E. DUST AND EROSION CONTROL

1. The Contractor shall prevent dust nuisance from his operations or from traffic.
2. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.
3. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the County, FDEP and any other agency having jurisdiction.
4. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the County, FDEP and any other agency having jurisdiction.
5. The construction of temporary erosion and sedimentation control facilities shall be in accordance with the technical provision of section 104 "Prevention, Control, and Abatement of Erosion and Water Pollution" of the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

#### F. LINES AND GRADES

1. All Work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the County/Professional.
2. When the location of the Work is dimensioned on the Drawings, it shall be installed in that location; when the location of the Work is shown on a scaled drawing, without dimensions, the Work shall be installed in the scaled location unless the County approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required. The County/Professional may require detailed pipe laying drawings and schedules for project control.
3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the County, and shall be solely responsible for the accuracy thereof.
4. Water main and forcemain shall be installed to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The stationing shown on the Drawings for air and vacuum release valve assemblies are approximate and the Contractor shall field adjust these locations to locate these valves at the highest point

- in the pipeline installed. All locations must be accepted by the County.
5. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:
    - a. Gravity lines; continuous control, using laser beam technology.
    - b. Pressure lines; control stakes set at 50-foot intervals using surveyors' level instrument.

#### G. TEMPORARY CONSTRUCTION

1. Temporary fences: If, during the course of the Work, it is necessary to remove or disturb any fencing, the Contractor shall at his own expense, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced.
2. Responsibility for Temporary Structures: In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation.

#### H. DAILY REPORTS

1. The Contractor shall submit to the County's Representative daily reports of construction activities including non-work days. The reports shall be complete in detail and shall include the following information:
  - a. Days from Notice to Proceed; Days remaining to substantial and final completion.
  - b. Weather information
  - c. Work activities with reference to the Critical Path Method (CPM) schedule activity numbers (including manpower, equipment and daily production quantities for each individual activity).
  - d. Major deliveries
  - e. Visitors to site
  - f. Test records
  - g. New problems, and
  - h. Other pertinent information
2. A similar report shall be submitted for/by each Subcontractor.
3. The report(s) shall be submitted to the County Representative within 2 days of the respective report date. Each report shall be signed by the Contractor's Superintendent or Project Manager. Pay request will not be processed unless daily reports are current.
4. If a report is incomplete, in error, or contains misinformation, a copy of the report shall be returned by the County Representative to the Contractor's Superintendent or Project Manager with corrections noted. When chronic errors or omissions occur, the Contractor shall correct the procedures by which the reports are produced.

#### I. CLEANING

1. During Construction
  - a. During construction of the Work, the Contractor shall, at all times, keep the Site free from material, debris and rubbish as practicable and shall remove the same from any portion of the Site if, in the opinion of the County, such material, debris, or rubbish constitutes a nuisance or is objectionable.

- b. Provide on-site containers for the collection of waste materials, debris and rubbish and remove such from the Site periodically by disposal at a legal disposal area away from the Site.
  - c. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished. Use cleaning materials which will not create hazards to health or property and which will not damage surfaces. Use only those cleaning materials and methods recommended by the manufacturer of the surface material. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
  - d. The Contractor shall remove from the site all surplus materials and temporary structures when no longer necessary to the Work at the direction of the County.
2. Final Cleaning
- a. At the conclusion of the Work, all equipment, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and the Contractor shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances. Employ skilled workmen for final cleaning. Thoroughly clean all installed equipment and materials to a bright, clean, polished and new appearing condition. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
  - b. The Work shall be left in a condition as shown on the Drawings and the remainder of the site shall be restored to a condition equal or better than what existed before the Work.
  - c. Prior to final completion, or County occupancy, Contractor shall conduct an inspection of interior and exterior surfaces, and all work areas to verify that the entire Work is clean. The County will determine if the final cleaning is acceptable.

#### 1.16 CONSTRUCTION NOT PERMITTED

##### A. USE OF EXPLOSIVES

- 1. No blasting shall be done except as approved by the County and the governmental agency or political subdivision having jurisdiction.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01010**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. This Contract includes the Anderson Road Water Main and Force Main Replacements and associated work as shown on the Drawings and specified herein. The Work consists of furnishing all labor, equipment, and materials for the construction of new water main and force main as to allow the replacement, abandonment or removal of existing water main and force main. The work includes connections to existing water and force main systems as well as restoration of the areas impacted by the construction work.
- B. This Project comprises the construction of improvements along a segment of Anderson Road in Orange County as shown on the Drawings and specified herein. The Project generally includes, but is not limited to, the following work:
1. Furnishing and installing approximately 1,120 linear feet of 8-inch diameter potable water main and associated appurtenances including both directional drill and direct bury methods.
  2. Furnishing and installing approximately 1,360 linear feet of 6-inch diameter force main and associated appurtenances including both directional drill and direct bury methods.
  3. Provide Maintenance of Traffic as required during construction.
  4. Install erosion and sedimentation control to protect the environment.
  5. Placing out of service (cap and grouting) and/or removing and disposal of approximately 3,000 linear feet of existing 8-inch asbestos cement water main and force main.
  6. Perform connections to existing water and force main systems including individual water services and meter box relocations.
  7. Removal and replacement of asphalt paving, concrete sidewalks and concrete driveways as required to install water and force mains.
  8. Replacement of solid sodding and associated restoration of areas and improvements impacted by construction work.

**1.02 CONTRACTOR'S USE OF PREMISES**

- A. The Contractor shall assume full responsibility for the protection and safekeeping of products and materials at the job site. If additional storage or work areas are required, they shall be obtained by the Contractor at no additional cost to the Owner.

**1.03 SEQUENCE OF WORK**

- A. The Contractor shall establish his work sequence based on the use of crews to facilitate

completion of construction and testing within the specified Contract Time.

- B. The Contractor shall submit a schedule and work sequence to the Owner at least five (5) days prior to the Notice to Proceed. Work on all utility lines shall be accomplished so that all facilities will stay in operation.

#### 1.04 PUBLIC UTILITY INSTALLATIONS AND STRUCTURES

- A. Some of the utility contacts are listed on the plans for the Contractor's convenience.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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SECTION 01025  
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. This Section specifies administrative and procedural requirements to define pay items and determine payable amounts, and includes but is not limited to:
  - 1. General Provisions
  - 2. Cash Allowances
  - 3. Work Not Paid for Separately
  - 4. Measurement for Payment
  - 5. Partial Payment for Stored Materials and Equipment

1.02 GENERAL PROVISIONS

- A. This specification includes standard descriptions for all bid items. This Contract's specific bid items are listed in the Bid Schedule.
- B. The total Contract Amount shall cover the Work required by the Contract Documents. All costs in connection with the successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.
- C. If used, all estimated quantities stipulated in the Bid Schedule or other Contract Documents are approximate and are to be used only (a) for the purpose of comparing the bids submitted for the Work, and (b) as a basis for determining an initial Contract Amount. The actual amounts of Work completed and materials furnished under unit price items may differ from the estimated quantities. The County does not expressly or by implication represent that the actual quantities involved will correspond exactly to the quantities stated in the Bid Schedule; nor shall the Contractor plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of work performed or material furnished in accordance with the Drawings and other Contract Documents, and it is understood that the quantities may be increased or decreased as provided in the General Conditions.

- D. If used, the unit prices listed in the Bid Schedule shall include all services, obligations, responsibilities, labor, materials, devices, equipment, royalties and license fees, supervision, temporary facilities, construction equipment, bonds, insurance, taxes, clean up, traffic control, control surveys, field offices, close out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work in accordance with the Contract Documents.
- E. Except for mobilization/demobilization and project record documents, payment for Work will be based on the percent of completed work of each item in the Schedule of Values, including stored materials, as determined by the County. Progress of work in each item of the Schedule of Values will be determined separately by the County. However, the County will issue a single payment certificate for progress on the Contract.
- F. The Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise because of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.
- G. Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times and certified. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the County.
- H. All schedules included in the Contract Documents are given for convenience and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in work to be done under this Contract.
- I. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required.
- J. All contracts shall be subject to 10% minimum retainage as defined in the General Conditions and the Agreement.

### 1.03 CASH ALLOWANCES

- A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the County may direct.
- B. The Contractor will obtain the County's written acceptance before providing equipment, materials or other Work under a cash allowance. Payments under a cash allowance will be made based on actual costs, excluding costs of general conditions, handling, unloading, storage, installation, testing, etc., which will be considered to be included within the Contract Price. Payments within the limits of any Allowance will exclude overhead and profit and bond and insurance premiums, since those costs will be considered to be included within the Contract Amount. The Contractor shall submit appropriate documentation to validate the actual cost of the item.

- C. The amount of the allowance shall be adjusted accordingly by Change Order to recognize the allowable cost incurred by the Contractor.

#### 1.04 WORK NOT PAID FOR SEPARATELY

- A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay items including their installation and no other separate payment will be made therefore.
- B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for the Work covered by the required bonds and no separate payment will be made.
- C. Preparation of Site: Payment for preparation of site shall be included in pay items proposed for the various items of Work and no separate payment will be made therefore. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining necessary permits and licenses; payments of fees; general protection, temporary heat and utilities including electrical power; providing shop and working drawings, certificates and schedules; providing required insurance; preconstruction photographs and videos; clearing and grubbing; removal of existing pavements, sidewalks and curbs; trench excavation, sheeting, shoring and bracing; dewatering and disposal of surplus water; structural fill, backfill, compaction and grading; testing materials and apparatus; maintenance of drainage systems; appurtenant work; record drawing and close-out documentation; cleaning up; and all other work regardless of its nature which may not be specifically referred to in a Bid Item but is necessary for the complete construction of the project set forth by the Contract.
- D. Permitting & Permit Fees.
- E. The County reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

#### 1.05 MEASUREMENT FOR PAYMENT

- A. Methods of Measurement - Generally:
  - 1. Units of measurement shall be defined in general terms as follows:
    - a. Linear Feet (LF)
    - b. Square Feet (SF)
    - c. Square Yards (SY)
    - d. Cubic Yards (CY)
    - e. Each (EA)
    - f. Sacks (SK)
    - g. Lump Sum (LS)

2. Unit Price Contracts/Items:
  - a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed material, unless otherwise specified. Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.
  - b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), Each (EA) and Sacks (SK) shall be measured as the amount of the unit of measure installed and compacted within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.

B. Lump Sum Contracts/Items - Generally:

1. Quantities provided in the Schedule of Values are for the purpose of estimating the completion status for progress payments. Payment will be made for each individual item on a percentage of completion basis as estimated by the Contractor and approved by the County.
2. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order.
3. The County reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

## 1.06 MEASUREMENT AND PAYMENT ITEMS

A. ***Only those bid items included in the Bid Schedule are applicable for this Contract.*** The County has standardized the measurement and payment items. Currently, there are approximately 100 measurement and payment items describing approximately 300 bid items. The bid item numbering system comprises five sections that are divided into 23 subsections. The sections and subsections are listed below.

10. General Requirements
  - 10.1 General
11. Site Work
  - 11.1 Miscellaneous
  - 11.2 Road Work
  - 11.3 Install/Replace Fence or Wall
  - 11.4 Bypass Pumping
  - 11.5 Abandon or Remove Pipe/Structure
12. Pressure Pipes
  - 12.1 Pressure Pipe and Fittings and Restrained Joints
  - 12.2 Valves
  - 12.3 Tapping Sleeve and Valve Assembly
  - 12.4 Cut-in Connections to Existing Main
  - 12.5 Piping Appurtenances
  - 12.6 Directional Drill
  - 12.7 Pipe Bursting

- 13. Wastewater Collection System
  - 13.1 Cleaning Sanitary Sewers
  - 13.2 CCTV Sanitary Sewers
  - 13.3 Install/Replace Sanitary Sewer
  - 13.4 Install/Replace Sanitary Manholes
  - 13.5 Sanitary Manhole Rehabilitation
  - 13.6 Sanitary Service Laterals and Cleanouts
  - 13.7 Cured-in-Place Pipe (CIPP) Liner
  - 13.8 Sanitary Sewer Pipe Bursting
- 14. Pump Stations
  - 14.1 Wastewater Duplex Pump Station
  - 14.2 Wastewater Triplex Pump Station

All of the subsections have bid item measurement and payment descriptions. Several bid items in the Project Bid Schedule may be described with the same bid item measurement and payment description in Table A, "Measurement and Payment Items". The bid items in the Project Bid Schedule are related to the Section 01025 measurement and payment items as follows:

1. All of the bid items in the Project Bid Schedule have 8 numerical digits.
2. Table A, "Measurement and Payment Items" for each of the bid items there are five numerical digits followed by ".xxx".
3. The first 5 numerical digits of the bid item in the Project Bid Schedule designate the measurement and payment item found in Table A, "Measurement and Payment Items."

**Table A**

<b>BID ITEM</b>	<b>MEASUREMENT AND PAYMENT ITEMS</b> <small>Pg 1</small>
	<b>10 GENERAL REQUIREMENTS</b>
	<b>10.1 - General</b>
1	<b>Reference ID 10.110.xxx Mobilization, Demobilization, Bonds, and Permits (not to exceed 5% of the total of all bid items except bid items under section 10.1 General)</b>
	<p>a. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment and all items shall be included in the lump sum price. <u>This lump sum price shall not exceed 5% of the total of all bid items except bid items under section 10.1 General.</u></p> <p>b. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations.</p>

	<p>The costs of General Requirements (Section 01001), bonds, permits, and any required insurance, project signs, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including, but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field offices for the duration of the Contract.</p> <p>Payment of the remaining 25 percent of the applicable lump sum price for this item also consists of demobilization or the operations normally involved in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work.</p>
2	<p><b>Reference ID 10.120.xxx Preconstruction Audio-Video Documentation</b></p>
	<p>a. Measurement: Measurement shall be based on the satisfactory submittal of a comprehensive pre-construction video in accordance with the County requirements and specifications (Section 01101).</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create a comprehensive pre-construction video in accordance with the County requirements and specification.</p>
3	<p><b>Reference ID 10.130.xxx Indemnification</b></p>
	<p>a. Payment: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, the County specifically agrees to give the Contractor a maximum of \$100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>
4	<p><b>Reference ID 10.140.xxx Project Record Documents (a minimum of 1% of the total of all bid items except bid items under section 10.1 General)</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory progress of the Contractor to provide Project Record Documents in accordance with the County requirements and specifications (Section 01720). Various items for Project Record Documents shall not be made for individual payment and all items shall be included in the lump sum price. <u>This lump sum price shall be a minimum of 1% of the total of all bid items except bid items under section 10.1 General).</u></p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create the Project Record Drawings, including the certified as-built survey, in accordance with the County requirements and</p>

	<p>specifications. Payment will be made at the lump sum price divided into equal monthly payments based on the Contract Time and acceptance by County of the progressive as-built drawings and tables.</p>
5	<p><b>Reference ID 10.150.xxx Maintenance of Traffic</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Maintenance of Traffic (MOT) in accordance with County requirements and Florida Department of Transportation (FDOT) standards.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian traffic including flag men, uniformed police officers, barricades, warning lights/flashers, and safety ropes. Also included is furnishing, installing and maintaining a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special requirements for the safe and expeditious movements of traffic.</p>
6	<p><b>Reference ID 10.160.xxx Public Information Officer</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Public Information/Relations in accordance with County requirements.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to provide and maintain communication with those individuals having a residence, business, or property adjacent to or within 1,000-feet of the construction area. Payment shall include the rental of venues, preparation of and conducting all meetings, and preparation of and disbursement of printed materials.</p>
	<p><b>11 SITE WORK</b></p>
	<p><b>11.1 – Miscellaneous</b></p>
7	<p><b>Reference ID 11.110.xxx Erosion and Sediment Control</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Erosion and Sediment Control in accordance with the County requirements and specifications (Section 01560).</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment to control and prevent sediment transportation from the Work area to adjacent properties, including installation, maintenance, and removal of temporary erosion and sediment controls.</p>
8	<p><b>Reference ID 11.120.xxx Unsuitable Materials</b></p>
	<p>a. Measurement: Unsuitable Material shall be measured in actual cubic yards removed and disposed of in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual removed quantities.</p>



	<p>b. Payment: Payment will be made at the contract unit price bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to remove and dispose of unsuitable material including the removal of overburden.</p>
9	<p><b>Reference ID 11.130.xxx Fill Dirt</b></p>
	<p>a. Measurement: Fill Dirt shall be measured in actual cubic yards of suitable material placed and compacted in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual placed quantities.</p> <p>b. Payment: Payment will be made at the contract unit prices bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to replace and compact suitable material including the removal of overburden.</p>
	<p><b>11.2 - Road Work</b></p>
	<p><b>Reference ID 11.210.xxx Concrete Base (various thickness)</b></p>
	<p>a. Measurement: Concrete Base shall be measured in actual square yards of high early strength concrete base with prime and tack coats installed in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Concrete Base and shall include all labor, materials and equipment to install, and spread concrete base. No separate payment will be made for prime and tack coats.</p>
	<p><b>Reference ID 11.211.xxx Limerock Base (various thickness)</b></p>
	<p>a. Measurement: Limerock Base shall be measured in actual square yards of limerock base with prime and tack coats installed in accordance with the County requirements and specifications (Section 02571).</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Limerock Base and shall include all labor, materials and equipment to install, spread, and compact limerock base. No separate payment will be made for prime and tack coats.</p>
	<p><b>Reference ID 11.212.xxx Soil Cement Base (various thickness)</b></p>
	<p>a. Measurement: Soil Cement Base shall be measured in actual square yards of limerock base with prime and tack coats installed in accordance with the County requirements and specifications (Section 02571).</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Soil Cement Base and shall include all labor, materials and equipment to install, spread, and compact limerock base. No separate payment will be made for prime and tack coats.</p>

	<b>Reference ID 11.220.xxx Temporary Paving (cold mix overlay) (various thickness)</b>
	<p>a. Measurement: Temporary Paving shall be measured in actual square yards of temporary paving furnished and installed in accordance with the Plans and Specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Temporary Paving and shall include all labor, materials, and equipment to apply the cold mix overlay in accordance with County requirements and specifications. The unit price bid shall also include traffic signalization repair, and temporary striping and markings.</p>
	<b>Reference ID 11.230.xxx Milling and Resurfacing</b>
	<p>a. Measurement: Milling and Resurfacing shall be measured in actual square yards over which the milling and subsequent resurfacing is completed and accepted at the thickness as indicated in the Drawings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Milling and Resurfacing and shall include all labor, materials, and equipment to mill surface; dispose of milled materials; and apply Type S-III asphalt surface overlay in accordance with County requirements and specifications. The unit price bid shall also include traffic signalization repair, and permanent striping and markings.</p>
	<b>Reference ID 11.240.xxx Road Crossing Pavement Restoration</b>
	<p>a. Measurement: Road Crossing Pavement Restoration shall be measured in actual square yards of existing asphalt paving and subgrade removal and replacement furnished and installed in accordance with the County requirements and specifications. The width measured for payment of asphalt surface repair, as measured perpendicular to the centerline of the pipe, shall be limited to the width shown on the Drawings (maximum pay width of 8-feet). The length shall be as measured along the centerline of the pipe.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Road Crossing Pavement Restoration and shall include all labor, materials, and equipment necessary to provide a safe, smooth driving surface. The Work shall include saw cutting, pavement removal and proper disposal of exiting pavement, installing high early concrete and asphalt surface into a properly prepared subgrade, traffic signalization repair, and temporary and permanent striping and markings in accordance with the County requirements and specifications.</p>
10	<b>Reference ID 11.241.xxx Asphalt Roadway Replacement (various thickness)</b>
	<p>a. Measurement: Asphalt Roadway Repair shall be measured in actual square yards of existing asphalt paving and subgrade removal and replacement furnished and installed in accordance with the County requirements and specifications. The width measured for payment of asphalt surface repair, as measured perpendicular to the centerline of the pipe, shall be limited to the</p>

	<p>width shown on the Drawings. The length shall be as measured along the centerline of the pipe.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Asphalt Roadway Replacement and shall include all labor, materials, and equipment necessary to provide a safe, smooth driving surface. The Work shall include saw cutting; pavement removal and proper disposal of existing pavement, installing high early concrete and asphalt surface into a properly prepared subgrade, compaction, traffic signalization repair, and temporary and permanent striping and markings in accordance with the County requirements and specifications.</p>
11 & 12	<p><b>Reference ID 11.250.xxx Concrete Pavement Replacement (various thickness)</b></p>
	<p>a. Measurement: Concrete Pavement Replacement shall be measured in actual square yards of concrete removed and replaced. Width of replaced sidewalk shall match that of existing sidewalk. Replaced portions of driveways shall conform to the lines and grades of removed portions of driveways. Thickness of pavement shall be as indicated in the plans and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Concrete Pavement Replacement and shall include all labor, materials, and equipment for saw-cutting, removal and proper disposal of existing concrete, compaction, form work, concrete replacement, restoration, addition or replacement of detectable warnings, and clean-up for a complete installation.</p>
	<p><b>Reference ID 11.260.xxx Driveway Culvert Storm Pipe Replacement (various sizes)</b></p>
	<p>a. Measurement: Culvert Storm Pipe Replacement shall be measured in actual linear feet satisfactorily removed and replaced, as measured along the length of the centerline of the completed pipeline.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Culvert Storm Pipe Replacement and shall include all labor, materials, and equipment to remove and replace the respective storm pipe including temporary stormwater management, protection of existing utilities and irrigation, dewatering, excavation, pipe replacement, connection to existing storm pipes utilizing collars wrapped in 6-feet of filter fabric, replacement of mitered end sections, backfill, compaction, grading, sod replacement, restoration and clean-up.</p>
	<p><b>Reference ID 11.270.xxx Storm Underdrain Pipe Replacement (various sizes)</b></p>
	<p>a. Measurement: Storm Underdrain Pipe Replacement shall be measured in actual linear feet satisfactorily removed and replaced, as measured along the length of the centerline of the completed pipeline.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Storm Underdrain Pipe Replacement and shall</p>

	include all labor, materials, and equipment to remove and replace the respective storm pipe including temporary stormwater management, protection of existing utilities and irrigation, dewatering, excavation, pipe replacement, connection to existing storm pipes utilizing collars wrapped in 6-feet of filter fabric, replacement of mitered end sections, backfill, compaction, grading, sod replacement, restoration and clean-up.
13 & 14	<b>Reference ID 11.280.xxx Concrete Curb and/or Curb and Gutter Replacement</b>
	<p>a. Measurement: Concrete Curb and/or Curb and Gutter Replacement shall be measured in actual linear feet removed and replaced measured along the centerline of the curb within the excavation of the trench to a maximum width equal to the width of asphalt pavement cut. All additional curb and gutter damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Concrete Curb and Gutter Replacement and shall include all labor, materials, and equipment for saw-cutting, removal and proper disposal of existing concrete curb and gutter, compaction, and concrete curb and gutter replacement for a complete installation.</p>
15	<b>Reference ID 11.290.xxx Sod Replacement</b>
	<p>a. Measurement: Sod Replacement shall be measured in actual square yards of sod furnished, laid, fertilized, watered and maintained for all areas as specified on the Drawings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Sod Replacement and shall include all labor, materials, and equipment necessary to furnish, install, fertilize, water and maintain a healthy stand of grass including any soil amendments or conditioning required to bring the existing soil to within acceptable pH levels as recommended by the sod grower.</p>
	<b>11.3 - Install/Replace Fence or Wall</b>
	<b>Reference ID 11.310.xxx Chain Link Fence Install/Replacement (various heights)</b>
	<p>a. Measurement: Chain Link Fence Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the fence within the construction excavation. All additional fencing damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Chain Link Fence Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing chain link fence and concrete and install new chain link fence including replacement fence, gate, support posts and concrete for a complete installation.</p>

	<b>Reference ID 11.320.xxx Wood Fence Install/Replacement (various heights)</b>
	<p>a. Measurement: Wood Fence Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the fence within the construction excavation. All additional fencing damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Wood Fence Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing wood fence and concrete and install new wood fence including replacement fence, gate, support posts and concrete for a complete installation.</p>
	<b>Reference ID 11.330.xxx Concrete Block Wall Install/Replacement (various heights)</b>
	<p>a. Measurement: Concrete Block Wall Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the wall within the construction excavation. Any additional wall damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Concrete Block Wall Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing concrete block and construct a new concrete block wall including replacement concrete block with concrete fill for a complete installation.</p>
	<b>Reference ID 11.340.xxx Brick Wall Install/Replacement (various heights)</b>
	<p>a. Measurement: Brick Wall Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the wall within the construction excavation.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Brick Wall Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing brick and construct a new brick wall including replacement brick and mortar for a complete installation.</p>
	<b>11.4 - Bypass Pumping</b>
	<b>Reference ID 11.410.xxx Bypass Pumping Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Measurement for this item shall be based on the complete bypass operation and contingency plan in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment of the applicable Contract lump sum price shall be full compensation for furnishing all labor, materials, equipment as necessary for bypass operations and contingency plan as required, including pumps, piping, and hoses; tankers; temporary bypass and service piping; hauling and</p>

	proper disposal of wastewater; plugging; gasoline/diesel fuel; protection of existing facilities, utilities, and property; traffic maintenance; signs and barriers; and all incidental work required to satisfactorily complete this item.
16	<b>Reference ID 11.420.xxx Bypass Pump Station (various flows)</b>
	<p>a. Measurement: Measurement for this item shall be based on the complete bypass operation and contingency plan in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment of the applicable Contract lump sum price shall be full compensation for furnishing all labor, materials, equipment as necessary for bypass operations and contingency plan as required, including pumps, piping, and hoses; tankers; temporary bypass and service piping; hauling and proper disposal of wastewater; plugging; gasoline/diesel fuel; protection of existing facilities, utilities, and property; traffic maintenance; signs and barriers; and all incidental work required to satisfactorily complete this item.</p>
	<b>11.5 - Abandon or Remove Pipe/Structure</b>
17 & 18	<b>Reference ID 11.510.xxx Abandon-in-Place Pipe</b>
	<p>a. Measurement: Abandon-in-Place Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily abandoned-in-place in accordance with the County requirements and specifications (Section 02080). Pipe abandonment shall be measured along the centerline without deduction for valves and fittings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Abandon-in-Place Pipe and shall include all labor, materials, and equipment to excavate, backfill and compact; sheet, shore, and brace; dewater, groundwater treatment, and disposal; completely drain and properly dispose of pipe contents; grout fill, and plug or cap existing pipes of all services and sizes designated "to be abandoned" on the Drawings. Also included in this item is the removal of existing valve boxes located on valves connected to piping designated to be retired. Valve boxes shall be removed, backfilled and compacted with suitable material.</p>
	<b>Reference ID 11.520.xxx Abandon-in-Place Manhole</b>
	<p>a. Measurement: Measurement of Abandon-in-Place Manhole shall be made per actual number of existing manholes satisfactorily abandoned-in-place in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Abandon-in-Place Manhole and shall include all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole top riser, grout fill, and cap existing manhole designated "to be abandoned" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole).</p>

19 & 20	<b>Reference ID 11.530.xxx Remove Existing Pipe</b>
	<p>a. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with the County requirements and specifications (Section 02080). Pipe removal shall be measured along the centerline without deduction for valves and fittings. Also included in this item is the removal and salvage of items including air release valves and vaults, and fire hydrant assemblies.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Remove Existing Pipe and shall include all labor, materials, and equipment to sheet, shore, and brace; dewater, groundwater treatment and disposal; excavate; properly dispose of pipe contents; plug or cap; restoration, clean-up; remove and salvage pipe of all services and sizes designated "to be removed" on the Drawings, backfill and compact. Also included in this item is the removal and salvage of items (as listed in Specification Section 02080) attached to the piping to be removed.</p>
	<b>Reference ID 11.540.xxx Remove Existing Manhole</b>
	<p>a. Measurement: Measurement for Remove Existing Manhole shall be made per actual number of manholes satisfactorily excavated and removed in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment for Remove Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit prices shall be full compensation for furnishing all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole designated "to be removed" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole)</p>
	<b>12 PRESSURE PIPES</b>
	<b>12.1 - Pressure Pipes with Fittings and Restrained Joints</b>
21 & 22	<b>Reference ID 12.110 Water Main with Fittings and Restrained Joints (RJ) (various sizes)</b>
	<p>a. Measurement: Water Main installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Water Main w/Fittings and restrained joints and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing</p>

	<p>utilities including tree protection, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, potable water system protection, disinfection, restoration, and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<p><b>Reference ID 12.120.xxx Reclaimed Water Main with Fittings and Restrained Joints (RJ) (various sizes)</b></p>
	<p>a. Measurement: Reclaimed Water Main installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Reclaimed Water Main w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, disinfection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
23	<p><b>Reference ID 12.130.xxx Forcemain with Fittings and Restrained Joints (RJ) (various sizes)</b></p>
	<p>a. Measurement: Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Forcemain w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including tree protection, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, restoration, and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator,</p>



	identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.
	<b>12.2 – Valves</b>
24	<b>Reference ID 12.210.xxx Gate Valve with Box (various sizes)</b>
	<p>a. Measurement: Measurement for Gate Valve with Box shall be made per actual number of gate valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars. Gate valves included within tapping sleeve and valve, air release valve assembly, and fire hydrant pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment for the Gate Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box extensions, operating nut extensions, test station box and cap, valve wrenches, restraining devices, covers, concrete collars, excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, restoration, and all other items required for a complete, acceptable and operable installation.</p>
25	<b>Reference ID 12.220.xxx Plug Valve with Box (various sizes)</b>
	<p>a. Measurement: Measurement for Plug Valve with Box shall be made per actual number of plug valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars.</p> <p>b. Payment: Payment for the Plug Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box extensions, test station box and cap, operating nut extensions, valve wrenches, restraining devices, covers, concrete collars, excavation, dewatering, sheeting, shoring, bracing, backfill, compaction, restoration and all other items required for a complete, acceptable and operable installation.</p>
	<b>Reference ID 12.230.xxx Blow-Off Valve Assembly (various sizes)</b>
	<p>a. Measurement: Measurement for Blow-Off Valve Assembly shall be made per actual number of blow-off valve assemblies satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Blow-Off Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the blow-off valve, cap, valve sleeve, pipe, fittings, meter box, excavation, dewatering, backfill, compaction, grading adjustment, restoration, and all other items required for a complete, acceptable and operable installation.</p>

	<b>12.3 - Tapping Sleeve and Valve Assembly</b>
26 & 27	<b>Reference ID 12.310.xxx Tapping Sleeve and Valve Assembly (various sizes)</b>
	<p>a. Measurement: Measurement for Tapping Sleeve and Valve Assembly shall be made per actual number of tapping sleeves and valves satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Tapping Sleeve and Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a wet tap to an existing main including excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, tapping sleeve, tapping valve, valve box extensions, operating nut extensions, valve wrenches, restraining devices, protection of potable water system, disinfection, restoration and all other items required for a complete, acceptable and operable installation.</p>
	<b>12.4 – Cut-in Connections to Existing Mains</b>
	<b>Reference ID 12.410.xxx Cut-in Connection to Existing Water Main (various sizes)</b>
	<p>a. Measurement: Measurement for cut-in connections to the existing water main shall be made per number of cut-in connections made complete and in place regardless of the size and type from the constructed water main to the existing water main as authorized in the Contract Documents regardless of the depth of the connection.</p> <p>b. Payment: Payment for the Cut-in Connection to the Existing Water Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials, and equipment to make a cut-in connection from the constructed water main to the existing water main including coordination with existing utilities, protection of existing utilities and service connections, excavation, sheeting, shoring and bracing, dewatering, cutting pipe, completely drain and properly dispose of existing pipe contents, connection to existing main, restraint of existing main in accordance with the County requirements, backfill, compaction, grading, swabbing and disinfection, potable water protection, restoration and clean-up. This item also includes all necessary fittings, reducers, bends, tees, and wyes.</p>
	<b>Reference ID 12.420.xxx Cut-in Connection to Existing Reclaimed Water Main (various sizes)</b>
	<p>a. Measurement: Measurement for cut-in connections to the existing reclaimed water main shall be made per number of cut-in connections made complete and in place regardless of the type and size from the constructed reclaimed water main to the existing reclaimed water main as authorized in the Contract Documents regardless of the depth of the connection.</p>

	<p>b. Payment: Payment for the Cut-in Connection to the Existing Reclaimed Water Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials, and equipment to make a cut-in connection from the constructed reclaimed water main to the existing reclaimed water main including coordination with existing utilities, protection of existing utilities and service connections, excavation, sheeting, shoring and bracing, dewatering, cutting pipe, completely drain and properly dispose of existing pipe contents, connection to existing reclaimed water main, restraint of existing reclaimed water main in accordance with the County requirements, backfill, compaction, grading, swabbing, restoration and clean-up. This item also includes all necessary fittings, reducers, bends, tees, and wyes.</p>
28 & 29	<p><b>Reference ID 12.430.xxx Cut-in Connection to Existing Forcemain (various sizes)</b></p>
	<p>a. Measurement: Measurement for cut-in connections to the existing forcemain shall be made per number of cut-in connections made complete and in place regardless of the type and size from the constructed forcemain to the existing forcemain as authorized in the Contract Documents regardless of the depth of the connection.</p> <p>b. Payment: Payment for the Cut-in Connection to the Existing Forcemain shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials, and equipment to make a cut-in connection from the constructed forcemain to the existing forcemain including coordination with existing utilities, protection of existing utilities and service connections, excavation, sheeting, shoring and bracing, dewatering, cutting pipe, completely drain and properly dispose of existing pipe contents, connection to existing forcemain, restraint of existing forcemain in accordance with the County requirements, backfill, compaction, grading, swabbing, restoration and clean-up. This item also includes all necessary fittings, reducers, bends, tees, and wyes.</p>
	<p><b>12.5 - Piping Appurtenances</b></p>
30 & 31	<p><b>Reference ID 12.510.xxx Line Stop Assembly (various sizes)</b></p>
	<p>a. Measurement: Measurement for Line Stopping Assembly shall be made per actual number of line stops satisfactorily furnished and installed to permanently or temporarily stop the flow within the indicated main at the locations shown on the Drawings.</p> <p>b. Payment: Payment for the Line Stopping Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a permanent or temporary line stop on an existing main including excavation, sheeting,</p>

	shoring, bracing, dewatering, backfill, compaction, grading, tapping sleeve, plug, restraining devices, restraint of existing piping in accordance with the County requirements, swabbing, restoration and clean-up and all other items required for a complete, acceptable and operable installation.
	<b>Reference ID 12.520.xxx Air Release Valve Assembly (various sizes)</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Air Release Valve Assembly shall be made per actual number of air release valves with enclosures satisfactorily furnished and installed to provide a complete and functional unit.</li> <li>b. Payment: Payment for the Air Release Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the valve including saddle, fittings, pipe, concrete pad, pre-cast vault or enclosure, excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, restoration and all other items required for a complete, acceptable and operable installation.</li> </ul>
32	<b>Reference ID 12.530.xxx Offset Air Release Valve Assembly (various sizes)</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Offset Air Release Valve Assemblies shall be made per actual number of offset air release valves with enclosures satisfactorily furnished and installed to provide a complete and functional unit.</li> <li>b. Payment: Payment for the Offset Air Release Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the valve including saddle, fittings, pipe, concrete pad, pre-cast vault or enclosure, excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, restoration and all other items required for a complete, acceptable and operable installation.</li> </ul>
	<b>Reference ID 12.540.xxx Fire Hydrant Assembly</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Fire Hydrant Assemblies shall be made per actual number of fire hydrant assemblies satisfactorily furnished and installed to provide a complete and functional unit. The pipe and necessary restraint system connecting the fire hydrant assembly to the water main shall be included in the unit price, regardless of the length necessary to locate the hydrant at the direction of the County</li> <li>b. Payment: Payment for the Fire Hydrant Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the fire hydrant complete with hydrant tee, hydrant extension, pipe, fittings, isolation valve and box,</li> </ul>

	<p>thrust anchorage, and shear pad. Also included is excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, connection to pipes, restoration, and all other items required for a complete, acceptable and operable installation.</p>
	<p><b>Reference ID 12.550.xxx Adjust Existing Valve Box</b></p>
	<p>a. Measurement: Measurement for Adjust Existing Valve Box shall be made per actual number of existing valve boxes raised or lowered to the finish grade of the proposed road work.</p> <p>b. Payment: Payment for Adjust Existing Valve Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to replace, raise or lower and /or adjust the existing valve boxes to the proposed grade.</p>
33 & 34	<p><b>Reference ID 12.560.xxx Water Service Connection (short and long)</b></p>
	<p>a. Measurement: Measurement for Water Service Connection shall be made per actual number of service connections satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Water Service Connection shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the water service connection including service saddle, corporation stop, water service piping, curb stops, and installing meter boxes. Payment also includes excavation sheeting, shoring and bracing, dewatering, backfill, compaction, grading, pressure testing, restoration and all other items required for a complete, acceptable and operable installation.</p>
	<p><b>Reference ID 12.570.xxx Reroute Water Service on Private Property</b></p>
	<p>a. Measurement: Measurement for the rerouting Water Service on Private Property shall be made per the actual number of services rerouted to provide a complete and functional unit.</p> <p>b. Payment: Payment for rerouting of the Water Service on Private Property shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the water service including the house connection, water service piping, and curb stops. Payment also includes excavation sheeting, shoring and bracing, dewatering, backfill, compaction, grading, pressure testing, restoration, sod and all other items required for a complete, acceptable and operable installation.</p>

	<b>12.6 - Directional Drill</b>
35	<b>Reference ID 12.610.xxx Directional Drill HDPE/PVC Water Main (various sizes, valve to valve)</b>
	<p>a. Measurement: Directional Drill Water Main installation regardless of type material shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed directionally drilled water main in accordance with the County requirements and specifications (Section 02662).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Directionally Drill Water Main and shall include all labor, materials, and equipment necessary for a complete directional drill pipe installation and testing including protection of existing utilities, pipe, fittings, valves, pipe connection assemblies and appurtenances, mechanical restraint, metallic tracer wire, drilling mud, sodding, testing, disinfection, restoration, and clean-up.</p>
	<b>Reference ID 12.620.xxx Directional Drill HDPE/PVC Reclaimed Water Main (various sizes, valve to valve)</b>
	<p>a. Measurement: Directional Drill Reclaimed Water Main installation regardless of type of material shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed directionally drilled reclaimed water main in accordance with the County requirements and specifications (Section 02662).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Directionally Drill Reclaimed Water Main and shall include all labor, materials, and equipment necessary for a complete directional drill pipe installation and testing including protection of existing utilities, pipe, fittings, valves, pipe connection assemblies and appurtenances, mechanical restraint, metallic tracer wire, drilling mud, sodding, testing, restoration, and clean-up.</p>
36	<b>Reference ID 12.630.xxx Directional Drill HDPE/PVC Forcemain (various sizes, valve to valve)</b>
	<p>a. Measurement: Directional Drill forcemain installation regardless of type of material shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed directionally drilled forcemain in accordance with the County requirements and specifications (Section 02662).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Directionally Drill Forcemain and shall include</p>

	<p>all labor, materials, and equipment necessary for a complete directional drill pipe installation and testing including protection of existing utilities, pipe, fittings, valves, pipe connection assemblies and appurtenances, mechanical restraint, metallic tracer wire, drilling mud, sodding, testing, restoration, and clean-up.</p>
	<p><b>12.7 - Pipe Bursting</b></p>
	<p><b>Reference ID 12.710.xxx Pipe Burst Water Main (various sizes)</b></p>
	<p>a. Measurement: Pipe Burst Water Main installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Water Main and shall include all labor, materials, and equipment necessary for a complete pipe installation by pipe bursting and testing including coordination with existing utilities; protection of existing utilities including service connections; tree protection; excavation, sheeting, shoring and bracing; dewatering; backfill, compaction, and grading; pre- and post-installation video; repair of sags in line; all testing; potable water system protection, disinfection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<p><b>Reference ID 12.720.xxx Pipe Burst Reclaimed Water Main (various sizes)</b></p>
	<p>a. Measurement: Pipe Burst Reclaimed Water Main installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Reclaimed Water Main and shall include all labor, materials, and equipment necessary for a complete pipe installation by pipe bursting and testing including coordination with existing utilities; protection of existing utilities including service connections; tree protection; excavation, sheeting, shoring and bracing; dewatering; backfill, compaction, and grading; pre and post-installation video; repair of sags in</p>

	<p>line; all testing; potable water system protection, disinfection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<p><b>Reference ID 12.730.xxx Pipe Burst Forcemain (various sizes)</b></p>
	<p>a. Measurement: Pipe Burst Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Forcemain and shall include all labor, materials, and equipment necessary for a complete pipe installation by pipe bursting and testing including coordination with existing utilities; protection of existing utilities including service connections; tree protection; excavation, sheeting, shoring and bracing; dewatering; backfill, compaction, and grading; pre and post-installation video; repair of sags in line; all testing; potable water system protection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<p><b>13 WASTEWATER COLLECTION SYSTEM</b></p>
	<p><b>13.1 - Cleaning Sanitary Sewers</b></p>
	<p><b>Reference ID 13.110.xxx Light Cleaning Sanitary Sewer Laterals (various sizes)</b></p>
	<p>a. Measurement: Measurement for Light Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 1 pass of the lateral with a cleaning nozzle in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment for Light Cleaning Sanitary Sewer Laterals shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily clean a sanitary sewer lateral to an acceptable condition for CCTV inspection by making a single pass of the main with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>



	<b>Reference ID 13.111.xxx Light Cleaning Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Light Cleaning Sanitary Sewer Mains shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned by making a single pass of the main with a cleaning nozzle as measured along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Light Cleaning Sanitary Sewer Mains and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs by making a single pass of the main with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<b>Reference ID 13.120.xxx Medium Cleaning Sanitary Sewer Laterals (various sizes)</b>
	<p>a. Measurement: Measurement for Medium Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 2 to 4 passes of the lateral with a cleaning nozzle in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment for Medium Cleaning Sanitary Sewer Laterals shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily clean a sanitary sewer lateral to an acceptable condition for CCTV inspection by making 2 to 4 passes of the lateral with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<b>Reference ID 13.121.xxx Medium Cleaning Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Medium Cleaning Sanitary Sewer Mains shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned by making 2 to 4 passes of the main with a cleaning nozzle as measured along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Medium Cleaning Sanitary Sewer Mains and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs by making 2 to 4 passes of the main with a</p>

	cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.
	<b>Reference ID 13.130.xxx Heavy Cleaning Sanitary Sewer Laterals (various sizes)</b>
	<p>a. Measurement: Measurement for Heavy Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 5 or more passes of the lateral with a cleaning nozzle and/or removing roots from the interior of the lateral in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment for Heavy Cleaning Sanitary Sewer Laterals shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily clean a sanitary sewer lateral to an acceptable condition for CCTV inspection by making 5 or more passes of the lateral with a cleaning nozzle and/or removing roots from the interior of the lateral including water, hoses, and nozzles; mechanical methods of root removal; all herbicides or chemical treatment, protection of property, restoration and clean-up.</p>
	<b>Reference ID 13.131.xxx Heavy Cleaning Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Heavy Cleaning Sanitary Sewer Mains shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned by making 5 or more passes of the main with a cleaning nozzle and/or removing roots from the interior of the main and de-scaling the main. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Heavy Cleaning Sanitary Sewer Mains and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs by making 5 or more passes of the main with a cleaning nozzle and/or removing roots from the interior of the main and de-scaling the main including water, hoses, and nozzles, mechanical methods of root removal, all herbicides or chemical treatment, protection of property, restoration and clean-up.</p>
	<b>Reference ID 13.140.xxx Mechanical Root or Grease Removal</b>
	<p>a. Measurement: Mechanical Root or Grease Removal shall be measured in actual linear feet of sanitary sewer mains (&lt; 12-inch diameter) satisfactorily</p>

	<p>cleaned by removing roots from the interior of the main and de-scaling the main. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Mechanical Root or Grease Removal and shall include all labor, materials, and equipment necessary to satisfactorily remove roots from the interior of the main and de-greasing the main including water, hoses, and nozzles; mechanical methods of root removal and grease removal, all herbicides or chemical treatment, protection of property, restoration and clean-up.</p>
	<p><b>Reference ID 13.150.xxx Mechanical Tuberculation/Mineral Deposit Removal</b></p>
	<p>a. Measurement: Mechanical Tuberculation/Mineral Deposit Removal shall be measured in actual linear feet of sanitary sewer mains (&lt; 12-inch diameter) satisfactorily cleaned by mechanically removing tuberculation/mineral deposit from the interior of the main and de-scaling the main. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761)</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Mechanical Tuberculation/Mineral Deposit Removal and shall include all labor, materials, and equipment necessary to satisfactorily remove tuberculation/mineral deposits from the interior of the main including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<p><b>13.2 - CCTV Sanitary Sewers</b></p>
	<p><b>Reference ID 13.210.xxx CCTV Inspection Sanitary Sewer Mains (various sizes)</b></p>
	<p>a. Measurement: CCTV Inspection Sanitary Sewer shall be measured in actual linear feet of satisfactory visual inspection completed utilizing closed-circuit television in accordance with the County requirements and specifications (Section 02762). CCTV inspection shall be measured along the length of the centerline of the inspected sanitary sewer.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for CCTV Inspection Sanitary Sewer and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CCTV visual inspection of the sanitary sewer and</p>

	subsequent report including qualified personnel, DVD, and all incidentals related to sewer main inspection.
	<b>Reference ID 13.220.xxx CCTV Lateral Inspection from Main</b>
	<p>a. Measurement: Measurement for CCTV Lateral Inspection from Main shall be made per actual number of sanitary sewer laterals satisfactorily visually inspected utilizing closed-circuit television panned and tilted from the main in accordance with the County requirements and specifications (Section 02763).</p> <p>b. Payment: Payment for CCTV Lateral Inspection from Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete CCTV visual inspection of the sanitary sewer lateral from the main and subsequent report including qualified personnel, DVD, and all incidentals related to sewer lateral inspection.</p>
	<b>Reference ID 13.230.xxx CCTV Lateral Inspection from Cleanout</b>
	<p>a. Measurement: Measurement for CCTV Lateral Inspection from Cleanout shall be made per actual number of sanitary sewer laterals satisfactorily visually inspected utilizing closed-circuit television in accordance with the County requirements and specifications (Section 02763).</p> <p>b. Payment: Payment for CCTV Lateral Inspection from Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete CCTV visual inspection of the sanitary sewer lateral from the cleanout and subsequent report including qualified personnel, DVD, and all incidentals related to sewer lateral inspection.</p>
	<b>13.3 - Install / Replace Sanitary Sewer Main</b>
	<b>Reference ID 13.310.xxx Sanitary Sewer Main 8-inch Diameter (various depths)</b>
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Sanitary Sewer Main and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, applicable pavement restoration, all testing and clean-up. This item also includes the removal and</p>

	replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.
	<b>Reference ID 13.320.xxx Sanitary Sewer Main 10-inch Diameter (various depths)</b>
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Sanitary Sewer Main and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, applicable pavement restoration, all testing, and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<b>Reference ID 13.330.xxx Sanitary Sewer Main 12-inch Diameter (various depths)</b>
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Sanitary Sewer Main and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction grading, applicable pavement restoration, all testing, and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<b>Reference ID 13.340.xxx Sanitary Sewer Main Point Repair (various depths)</b>
	<p>a. Measurement: Sanitary Sewer Point Repair shall be made per actual number of repairs of sanitary sewer main for various depths satisfactorily repaired, regardless of size in accordance with the County requirements and</p>

	<p>specifications.</p> <p>b. Payment: Payment will be made at the contract lump sum price bid as stated in the Bid Schedule for Sanitary Sewer Point Repair, regardless of size and shall include all labor, materials, and equipment necessary to repair the existing sanitary sewer including coordination with existing utilities; protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, completely drain and properly dispose of existing pipe contents, removal of existing damaged sanitary sewer, piping, fittings, backfill, compaction, and grading, post-installation video, repair of sags in line, applicable pavement restoration, all testing, and clean-up. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<p><b>Reference ID 13.350.xxx Sanitary Sewer Main Connection to Existing Manhole</b></p>
	<p>a. Measurement: Measurement for Sewer Main Connection to Existing Manhole shall be made per actual number of core bores and connections to existing manholes satisfactorily furnished and installed.</p> <p>b. Payment: Payment for Sewer Main Connection to Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete connection to an existing manhole including protection of existing utilities, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, wall seal, core drilling, and bench adjustment.</p>
	<p><b>13.4 – Install/Replace Sanitary Manholes</b></p>
	<p><b>Reference ID 13.410.xxx Sanitary Manhole 4-foot Diameter (various depths)</b></p>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees,</p>

	shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.
	<b>Reference ID 13.420.xxx Sanitary Manhole 5-foot Diameter (various depths)</b>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<b>Reference ID 13.430.xxx Sanitary Manhole 6-foot Diameter (various depths)</b>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions</p>
	<b>13.5 - Sanitary Manhole Rehabilitation</b>
	<b>Reference ID 13.510.xxx Adjust Existing Manhole Frame and Cover (paved and unpaved areas)</b>
	a. Measurement: Measurement for Adjust Existing Manhole Frame and Cover

	<p>shall be made per actual number of sanitary manhole frames and covers raised or lowered to the finish grade of the pavement.</p> <p>b. Payment: Payment for Adjust Existing Manhole Frame and Cover shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to replace, raise or lower and/or adjust the existing manhole frame and cover to the finish grade of the pavement including excavation, backfill, compaction, final grading and applicable sodding/pavement restoration.</p>
	<p><b>Reference ID 13.511.xxx Replace Existing Manhole Frame and Cover (paved and unpaved areas)</b></p>
	<p>a. Measurement: Measurement for Adjust Existing Manhole Frame and Cover shall be made per actual number of sanitary manhole frames and covers raised or lowered to the finish grade.</p> <p>b. Payment: Payment for Adjust Existing Manhole Frame and Cover shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to replace, raise or lower and/or adjust the existing manhole frame and cover to the finish grade including excavation, backfill, compaction, and final grading and applicable sodding or pavement restoration.</p>
	<p><b>Reference ID 13.520.xxx Seal and Recoat Manhole (various diameters)</b></p>
	<p>a. Measurement: Seal and Recoat Manhole shall be measured in vertical feet of manhole sealed and recoated. Manhole seal and recoat shall be measured along the center vertical length of the manhole.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Seal and Recoat Manhole and shall include, but is not necessarily limited to, all labor, equipment, services, supervision and materials for coating existing manholes as shown on the Contract Drawings. The work shall include all surface preparation, leak repair, crack repair, installation of the coating in accordance with the manufacturer's recommendations, and inspection of the finished coating system.</p>
	<p><b>Reference ID 13.530.xxx Line Manhole (Polyethylene or PVC) (various diameters)</b></p>
	<p>a. Measurement: Line Manhole shall be measured in vertical feet of manhole lined with a polyethylene or PVC interior liner system. Lining of manhole shall be measured along the center vertical length of the manhole.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Line Manhole and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete installation of an interior liner system including qualified personnel, sewer structure interior liner system, plugging infiltration, channel</p>



	reconstruction, pressure cleaning, surface preparation, leak repair, and crack repair.
	<b>Reference ID 13.540.xxx Fiberglass Manhole Insert (various sizes)</b>
	<p>a. Measurement: Measurement for Fiberglass Manhole Insert shall be made per actual number of fiberglass manhole insert rehabilitation systems satisfactorily furnished and installed, regardless of depth or diameter of manhole</p> <p>b. Payment: Payment for Furnish and Install Fiberglass Manhole Insert shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for the installation of the complete rehabilitation system as specified, including qualified personnel, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, cleaning and debris removal, removal and replacement of existing manhole corbel and riser section, fiberglass liner installation, benching, grout, pipe connections and stubouts, frame and cover with brick or adjustment rings, protection of existing utilities and structures, clean-up, and adjustment of the manhole rim to finished grade.</p>
	<b>Reference ID 13.550.xxx Re-Construct Manhole Benching</b>
	<p>a. Measurement: Measurement for Re-Construct Manhole Benching shall be made per actual number of manhole benching cleaned and re-constructed in accordance with the Drawings and specifications.</p> <p>b. Payment: Payment for Re-Construct Manhole Benching shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for the cleaning and re-construction of manhole benching including cleaning and debris removal, placement and finishing of concrete, restoration and clean-up.</p>
	<b>Reference ID 13.560.xxx Manhole Cone Replacement (various diameters)</b>
	<p>a. Measurement: Measurement for Manhole Cone Replacement shall be made per actual number of sanitary manhole cone sections satisfactorily removed and replaced.</p> <p>b. Payment: Payment for Remove Manhole Cone Replacement shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove and replace the manhole cone section including excavation, sheeting, shoring and bracing; dewatering, backfill, and compaction; removal and replacement of frame and cover with brick or adjustment rings; polyolefin sheeting for</p>

	exterior joint sealing; jointing material, and adjustment of the manhole rim to finished grade.
	<b>13.6 - Sanitary Service Laterals and Cleanouts</b>
	<b>Reference ID 13.610.xxx Install/Repair/Replace 4-inch Diameter Sanitary Sewer Lateral (various depths)</b>
	<p>a. Measurement: Repair/Replace Sanitary Sewer Lateral shall be made per actual number of sanitary sewer laterals satisfactorily repaired or replaced, depending upon sewer lateral depth.</p> <p>b. Payment: Payment will be made based on the authorized quantity at the unit price indicated in the Bid Schedule and shall include all labor, materials, and equipment necessary to repair or replace the existing sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<b>Reference ID 13.620.xxx Install/Repair/Replace 6-inch Diameter Sanitary Sewer Lateral (various depths)</b>
	<p>a. Measurement: Repair/Replace Sanitary Sewer Lateral shall be made per actual number of sanitary sewer laterals satisfactorily repaired or replaced, depending upon sewer lateral depth.</p> <p>b. Payment: Payment will be made based on the authorized quantity at the unit price indicated in the Bid Schedule and shall include all labor, materials, and equipment necessary to repair or replace the existing sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation mailboxes, sod and other obstructions.</p>
	<b>Reference ID 13.630.xxx Install/Repair/Replace Sanitary Sewer Cleanout (various surfaces)</b>
	<p>a. Measurement: Measurement for Repair/Replace Sanitary Sewer Cleanout shall be made per actual number of sanitary sewer cleanouts satisfactorily repaired or replaced, depending upon cleanout depth.</p> <p>b. Payment: Payment for Repair/Replace Sanitary Sewer Cleanout shall be</p>

	<p>made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to repair or replace the sanitary sewer cleanout including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, all pipe, wyes, bends, sleeves, and plugs necessary to provide a watertight access, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, asphalt, concrete curb, driveway or sidewalk and other obstructions.</p>
	<p><b>Reference ID 13.640.xxx Service Lateral Connection to Manhole</b></p>
	<p>a. Measurement: Measurement for Service Lateral Connection to Manhole shall be made per actual number of sanitary sewer lateral service connections made to manholes satisfactorily furnished and installed.</p> <p>b. Payment: Payment for Service Lateral Connection to Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete connection to an existing manhole including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, core drilling and wall seal, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<p><b>Reference ID 13.650.xxx Reroute Sanitary Sewer Lateral on Private Property</b></p>
	<p>a. Measurement: Measurement for rerouting the Sanitary Sewer Lateral on Private Property shall be made per the actual number of lateral services rerouted to provide a complete and functional unit.</p> <p>b. Payment: Payment for rerouting Sanitary Sewer Lateral on Private Property shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to reroute the sewer lateral including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, all pipe, wyes, bends, sleeves, and plugs necessary to provide a watertight access, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, asphalt, concrete curb, driveway or sidewalk and other obstructions.</p>
	<p><b>13.7 - Cured-In-Place Pipe (CIPP) Liner</b></p>
	<p><b>Reference ID 13.710.xxx Sanitary Sewer Main CIPP Liner (various diameters)</b></p>
	<p>a. Measurement: CIPP Liner shall be measured in actual linear feet of furnished</p>

	<p>and satisfactorily installed cured-in-place liner in the sanitary sewer main from center of manhole to center of manhole, regardless of depth, in accordance with the County requirements and specifications (Section 02771). CIPP liner installation shall be measured along the length of the centerline of the rehabilitated sanitary sewer.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the Bid Schedule for CIPP Liner and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CIPP liner installation including pre and post CCTV inspection, sanitary sewer cleaning (medium cleaning), qualified personnel, providing and processing of liner material, service connection and manhole/wall interface sealing, all costs associated with providing cured CIPP samples for testing, blocking or plugging of incoming lines, grouting, leakage testing, reinstate service laterals, protection of existing utilities, structures, and property, restoration and clean-up.</p>
	<p><b>Reference ID 13.720.xxx Brim Type – CIPP Lateral Liner (various lengths and diameters)</b></p>
	<p>a. Measurement: Measurement for Brim Type – CIPP Lateral Liner - shall be made per actual number of satisfactorily installed cured-in-place brim type liners in the existing sanitary sewer laterals measured from the sewer main to the property clean-out, regardless of depth, in accordance with the County requirement, drawings, and specifications (Section 02772).</p> <p>b. Payment: Payment for Brim Type - CIPP Lateral Liner will be made at the contract unit price indicated in the Bid Schedule for Brim Type CIPP Lateral Liner and shall include, but is not necessarily limited to, all labor, materials and equipment necessary to a complete lateral liner installation including pre and post CCTV inspection, sewer lateral cleaning, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, qualified personnel, providing and processing of liner material, blocking or plugging of lateral, grouting, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<p><b>Reference ID 13.730.xxx FCLRL - CIPP Lateral Liner (various lengths and diameters)</b></p>
	<p>a. Measurement: Measurement for Full Circumference Lateral Reinforced Liner (FCLRL) - CIPP Lateral Liner shall be made per actual number of satisfactorily installed cured-in-place liners in the existing sanitary sewer laterals measured from the sewer main to the property clean-out, regardless of depth, to determine if they are less than or equal or greater than 30’ and in accordance with the County requirement, drawings, and specifications (Section 02772).</p>

	<p>b. Payment: Payment for Full Circumference Lateral Reinforced Liner (FCLRL) - CIPP Lateral Liner shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily install a CIPP lateral liner system including pre- and post-CCTV inspection, sewer lateral cleaning, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, qualified personnel, providing and processing of liner material, blocking or plugging of lateral, grouting, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<b>13.8 - Sanitary Sewer Pipe Bursting</b>
	<b>Reference ID 13.810.xxx Pipe Burst Gravity Sewer Main (various diameters)</b>
	<p>a. Measurement: Pipe Burst Gravity Sewer Main installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline in accordance with the County requirements and specifications (Section 02776).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Gravity Sewer and shall include all labor, materials, and equipment necessary for a complete sewer installation by pipe bursting and subsequent testing including excavation, sheeting, shoring and bracing, dewatering, removal and replacement of manhole cone section, backfill, compaction, and grading, qualified personnel, blocking or plugging of influent lines, protection of existing utilities including service connections, repair of sags in line, connection to manholes, connection and reinstatement of service laterals, all testing, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<b>14 PUMP STATION</b>
	<b>14.1 – Wastewater Duplex Pump Station</b>
	<b>Reference ID 14.110.xxx Duplex Pump Station</b>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory construction of the new Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to construct a pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following:</p>

	<p>pump station improvements including wetwell, top slab, valve vault, pumps, motors, control panel, SCADA control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances as shown on the Drawings. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, masonry walls and gates, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p><b>Reference ID 14.120.xxx Duplex Pump Station Rehabilitation</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to rehabilitate the existing pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following: Pump Station improvements and modifications including fencing and gates, masonry walls and gates, rehabilitate and line the existing wetwell, replacement of the top slab, construct the lined valve vault, pumps, motors, control panel, cables, rails, valves, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p><b>14.2 – Wastewater Triplex Pump Station</b></p>
	<p><b>Reference ID 14.210.xxx Triplex Pump Station</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory construction of the new Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to construct a pump station as indicated on the</p>

	<p>Drawings. Work includes but is not necessarily limited to the following: pump station improvements including wetwell, top slab, valve vault, pumps, motors, control panel, SCADA control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, masonry walls and gates, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p><b>Reference ID 14.220.xxx Triplex Pump Station Rehabilitation</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to rehabilitate the existing pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following: Pump Station improvements and modifications including fencing and gates, masonry walls and gates, rehabilitate and line the existing wetwell, replacement of the top slab, construct the lined valve vault, pumps, motors, control panel, cables, rails, valves, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01027**  
**APPLICATIONS FOR PAYMENT**

**PART 1 - GENERAL**

**1.01 REQUIREMENT**

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. Prior to submitting a monthly payment application, the Contractor's progressive As-Built Drawings, As-Built Asset Attribute Data, Gravity Main, and Pipe Deflection Tables for the period covered by the monthly payment application shall be submitted and accepted by the County.

**1.02 FORMAT**

- A. Format and Content: Use the accepted Schedule of Values.
  - 1. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
    - a. Generic name
    - b. Related specification section
    - c. Name of subcontractor
    - d. Name of manufacturer or fabricator
    - e. Name of supplier
    - f. Dollar value
  - 2. Round amounts off to the nearest whole dollar. The total shall equal the Contract Amount.

**1.03 PREPARATION OF APPLICATION**

- A. Each Application for Payment shall be consistent with previous applications for payments as certified and paid for by the County.
- B. Payment Application Times: As stated in the General Conditions, Payment Applications shall be submitted monthly on a day of the month established by the County at the Pre-Construction Conference.
- C. Application Preparation: Contractor shall complete every entry on the Pay Application form. The form shall be executed by a person authorized to sign legal documents on behalf of the Contractor and the signature notarized. Incomplete applications will be returned without action. The following procedure shall be followed by the Contractor:
  - 1. Submit applications typed on forms provided by the County.
  - 2. Use data on Bid Form and approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.



3. List each authorized Change Order and use additional sheets if necessary, list Change Order number and dollar amount for the original item of work.
  4. Each item shall have an assigned dollar value for the current pay period and a cumulative value for the project to-date.
  5. Submit stored material log, partial waivers of claims and mechanic liens, and Consent of Surety with each application, as further explained below.
- D. Contractor shall submit a stored material log with each application for payment that identifies the type, quantity, and value of all stored material that tracks when the stored materials were installed and deducts the installed material from the stored quantity at that time. Include original invoices for all stored materials for which payment is requested.
- E. Waivers of Claims and Mechanics Lien (Waivers): With each Application for Payment the Contractor shall submit waivers of claims and mechanic liens from Subcontractors, Sub-subcontractors, and suppliers for the construction period covered by the previous application.
1. The Contractor shall submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  2. When an application shows completion of an item, the Contractor shall submit final or full waivers.
  3. The Contractor shall submit the final Application for Payment with, if not already submitted, the final waivers from every entity involved with performance of work covered by the Application that could lawfully be entitled to a payment claim or lien.
  4. Format of Waiver Forms: The Contractor shall submit executed waivers of claims and liens on forms acceptable to the County.
  5. The County reserves the right to designate which entities involved in the Work must submit waivers.
- F. Transmittal of Pay Applications: Contractor shall submit four (4) executed copies of each Application for Payment to the County. One (1) copy shall include all waivers of lien and similar attachments.
1. The Contractor shall transmit each Pay Application package with a transmittal form that lists attachments and all appropriate information related to the application. The transmittal form shall be acceptable to the County.
  2. The Contractor shall include a certification with each application stating that all previous payments received from the County under the Contract have been applied by the Contractor to discharge, in full, all obligations of the Contractor in connection with the Work covered by prior applications for payment. The Contractor shall also certify that all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances.
- G. Initial Application for Payment Submittal: Administrative actions and submittals that must precede or coincide with submittal of the initial Application for Payment include the following:
1. List of Subcontractors
  2. List of principal suppliers and fabricators
  3. Schedule of Values
  4. Contractor's Construction Progress Schedule (accepted)

5. List of Contractor's staff assignments
  6. Copies of building permits
  7. Copies of authorizations and licenses from governing authorities for performance of the Work
  8. Certificates of insurance and insurance policies
  9. Performance and Payment bonds (if required)
  10. Data needed to acquire County's insurance
- H. Monthly Application for Partial Payment Submittals: Administrative actions and submittals that must precede or coincide with submittal of Monthly Applications for Partial Payment include the following, as applicable:
1. Relevant tests
  2. Progressive As-builts (one (1) paper copy and electronic copy)
  3. Table 01050-2 Asset Attribute Data Form Examples (one (1) paper copy and electronic copy)
  4. Table 01050-3 Pipe Deflection Table (one (1) paper copy and electronic copy)
  5. Table 01050-4 Gravity Main Table (one (1) paper copy and electronic copy)
  6. An electronic copy of all survey field notes
  7. Partial Release of Lien
  8. Partial Consent of Surety
  9. Site photographs
  10. Updated Progress Schedule: submit one (1) electronic copy and five (5) copies
  11. Summary of Values
  12. Pay Request
  13. On-Site Storage of materials
- I. Substantial Completion Application for Payment Submittal: Following issuance of the Certificate of Substantial Completion, Contractor shall submit an Application for Payment. This Application shall reflect any Certificates of Partial Substantial Completion issued previously for the County's occupancy of designated portions of the Work.
1. Administrative actions and submittals that shall precede or coincide with this application include:
    - a. Occupancy permits and similar approvals
    - b. Warranties (guarantees) and maintenance agreements
    - c. Test/adjust/balance records
    - d. Maintenance instructions
    - e. Meter readings
    - f. Start-up performance reports
    - g. Change-over information related to the County's occupancy, use, operation and maintenance
    - h. Final Cleaning
    - i. Application for reduction of retainage and consent of surety
    - j. Advice on shifting insurance coverage
    - k. List of incomplete Work, recognized as exceptions to County's Certificate of Substantial Completion

- J. Final Completion Application for Payment Submittal: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
1. Prior to submitting a request for final payment or the County issuing a Certificate of Completion for the Work, the Contractor shall submit the final Record Documents to the County for approval. Retainage funds will be withheld at the County's discretion based on the quality and accuracy of the final Record Documents.
  2. Written signed statements by the Contractor
    - a. Completion of project close-out requirements
    - b. Completion of items specified for completion after Substantial Completion
    - c. Assurance that unsettled claims are settled
    - d. Assurance that work not complete and accepted is now completed
  3. Transmittal of Record Documents to the County
  4. Proof that taxes, fees, and similar obligations have been paid
  5. Removal of temporary facilities and services has been completed
  6. Removal of surplus materials, rubbish, and similar elements
  7. Prepare Application for Final Payment as required in General Conditions

#### 1.04 PAY APPLICATION SUBSTANTIATING DATA

- A. When the County requires substantiating data for a Pay Application, submit data justifying Pay Application line item amounts in question.
- B. Provide one (1) copy of data with a transmittal letter for each copy of Pay Application submittal. The Pay Application number, date, and line item by number and description shall be clearly stated.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01050**  
**SURVEYING AND FIELD ENGINEERING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Professional Surveyor: Provide professional surveying and mapping work required for the execution of the Contract, including verification of existing survey data, construction layout, and production of the As-Built Drawings. This Work shall be performed by a Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.
- B. Professional Engineer: The Contractor shall provide the services of a Registered Professional Engineer currently licensed in the State of Florida for the required field engineering services as applicable to the work.

1.02 REQUIREMENTS

A. Survey Services

- 1. The Contractor shall retain the services of a registered Surveyor and Mapper licensed in the State of Florida to provide professional surveying and mapping services necessary for the construction including a control survey and an as-built survey during construction. The Surveyor will identify control points (monuments and benchmarks noted on the Drawings). The construction layout survey shall be established from the control points shown on the Construction Drawings. The control points shall be confirmed by the contractor prior to start of construction. The accuracy of any method of staking shall be the responsibility of Surveyor. All staking shall be done to provide for easy verification of the work by the County.

B. Field Engineering Services

- 1. The Engineer shall be of the discipline required for the work.
- 2. The Engineer shall be responsible for duties during Construction to include, but not limited to:
  - a. Inspections, testing, witnessing requiring a licensed Professional Engineer.
  - b. Design of temporary shoring, bridging, scaffolding or other temporary construction, formwork and protection of existing structures.
  - c. Other requirements as specified herein.
- 3. Engineering related designs and inspections shall be signed by the licensed Professional Engineer as required by the County.

1.03 SUBMITTALS

A. Provide qualifications of the Surveyor or Engineer.

- 1. A Florida Registered Professional Engineer or Registered Surveyor and Mapper, who is proposed by the Contractor to provide services for the work, shall be acceptable to the County prior to field services being performed.

2. Submit name, address and telephone number of the Surveyor and/or Engineer, as appropriate to the County for acceptance before starting survey or engineering work.
  3. Submit written acknowledgement from the Surveyor stating that he has the hardware, software and adequate scope of services in his agreement with the Contractor to fully comply with the requirements of this specification.
- B. On request, submit documentation verifying accuracy of survey work.
- C. Surveyor shall submit certified Tables 01050 – 2, 3 and 4.

## **PART 2 - PRODUCTS**

### **2.01 SURVEY DOCUMENTS**

- A. Survey documents shall comply with the Minimum Technical Standards of Chapter 5J-17 of the Florida Administrative Code (FAC) and Table 01050-1 Minimum Survey Accuracies, whichever are more stringent. All coordinates shall be geographically registered in the Florida State Plane Coordinate System using the contract Drawings control points for horizontal and vertical controls.
- B. The Surveyor shall not copyright any of their work related to this project.
- C. For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique asset ID for each utility (water, wastewater or reclaimed water) type, numbered sequentially along the pipe run (including changes in direction) from start to finish of the pipe in Table 01050-2 (Pipe Worksheet). Then branches and services of the same utility type can be numbered. It is recommended that each utility numbering format be distinguishable from the other. This will allow organization and convenient sorting after the individual asset table worksheet tabs are combined in the spreadsheet program prior to copying and pasting to the deflection table spreadsheet. The Microsoft Excel spreadsheet template shall be provided by the County.. The numbering system shall be approved by the County before commencing with production of the spreadsheet.

**Table 01050-1  
Minimum Survey Accuracies**

Type	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: Horizontal Center and Vertical Top, unless otherwise specified
Bench Marks	0.01	0.01	Point
Baseline Control Locational Accuracy	0.01	N/A	Point
Tract and Easement Corners	*	N/A	Survey Monuments
Pipe, at 100-foot maximum intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Pipe, (PVC) >16-inch at every pipe joint	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeves, Tapping Saddle, Service Saddles, Cap or Plugs.	0.1	0.1	
Pipe, Restrained	0.1	0.1	Restrained Joint Limits
Connections	0.1	0.1	Pipe
Bore & Jack Casing	0.1	0.1	Top of Casing at the Casing Limits
Directional Drill	0.1	0.1	10-foot intervals during the directional drill operation or intervals not to exceed the drilling rod length
Hydrants	0.1	0.1	Operating Nut
Valves (Operating Nut)	0.1	0.1	Operating Nut
Valve (Pipe Location)	0.1	0.1	Top of Pipe at Valve location
Air Release, Blow off, and Backflow Valves	0.1	0.1	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	0.1	Register
Meter Box	0.1	0.1	
Clean out -	0.1	0.1	
Manhole Rim	0.1	0.1	Manhole – top of rim
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wetwell top of slab and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well – top of casing
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Pipe, abandoned in place or removed	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities and appurtenant structures**	0.1	0.1	underground feature or structure
<p>* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR.</p> <p>** Existing utilities including but not limited to water, wastewater, reclaimed water, stormwater, fiber optic cable, electric, gas and structures within the limits of construction.</p> <p>*** Fittings rotated in X,Y,Z plane or vertical shall be shot to maintain flowline for the horizontal and vertical locations of the coordinate</p>			
<p>Note: All survey values to be reported to second decimal point (x.xx)</p>			

## TABLE 01050-2 Asset Attribute Data Examples

### Hydrants Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments
EH-1	C-7	518456.40	1483743.83	89.53	Brass B	KJ7-B	
EH-2	C-8	518477.68	1483758.85	94.23	Brass B	KJ7-B	

### Valves Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	Actuator Manufacturer	Comments
ARV-1	C300	518000.09	1483231.33	81.72	ARV Composition	Water Main	2	Brand H	100XT						
ARV-1	C303	518063.56	1483260.50	81.15	ARV - Vacuum Backflow Preventer	Reclaimed Water Main	4	Brand G	1000						
BFP-1	C303	518000.09	1483262.88	78.21	Butterfly	Water Main	8	Brand F	2000 tps						
BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E	14 turbo						
BPV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D	230 sh	200	Yes	3 to 1	Yes	Brand C	
GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C	2225846	300	Yes	3 to 1	NO		
LS-W1	C405	518179.38	1539700.97	84.30	Line Stop	Water Main	16	Brand B	70644						
PV-22	C405	518693.80	1539718.32	84.52	Force Main	Force Main	12	Brand A	2100	200	Yes	3 to 1	Yes	Brand A	

### Manhole Worksheet

ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elev N	Invert Elev NE	Invert Elev E	Invert Elev SE	Invert Elev S	Invert Elev SW	Invert Elev W	Invert Elev NW	Manufacturer	Comments
SAN-MH01	AT-2	475216.00	1501637.12	115.89							111.28		Del Zotto	
SAN-MH02	AT-2	474885.63	1501636.02	114.98			110.22			110.12			Del Zotto	
SAN-MH03	AT-2	474849.33	1501600.22	115.18		109.98			109.88				Del Zotto	
SAN-MH04	AT-2	474850.21	1501416.85	115.91	109.19		110.42		108.58				Del Zotto	
SS-1	C1.05A	478117.70	1501622.99	118.13						113.73			Del Zotto Products of Florida Inc.	Del Zotto Products of Florida Inc.
SS-2	C1.05A	478116.77	1501534.19	117.79	113.41					113.38			Del Zotto Products of Florida Inc.	Del Zotto Products of Florida Inc.
SS-3	C1.05	478111.28	1501152.49	116.45	111.98					111.94			Del Zotto Products of Florida Inc.	Del Zotto Products of Florida Inc.
SS-4	C1.05A	478106.19	1500781.07	115.72	110.76								Del Zotto Products of Florida Inc.	Del Zotto Products of Florida Inc.

### Meter Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Comments
MM-1	C-6	576533.84	1539820.08	88.01	Water Main	
RWMM-1	C-6	576937.42	1539898.78	84.84	Reclaimed Water Main	

### Fitting Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments
FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4"	
FM-2	C-3	574840.74	1539858.91	51.73	Force Main	Bend 22-1/2"	
RW-1	C-4	574587.22	1539849.64	51.75	Reclaimed Water Main	Cross	
RW-2	C-4	574904.30	1539849.56	48.98	Reclaimed Water Main	Reducer	
WM-1	C-5	572532.38	1539848.16	54.42	Water Main	Tapping Saddle	
WM-2	C-5	572631.00	1539337.10	45.27	Water Main	Tee	

### Cleanout Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
CO-1	C-6	576533.84	1539820.08	88.01	
CO-2	C-6	576937.42	1539898.42	84.84	Sanitary Service

## Pipes Worksheet

Asset Attribute Table Examples												
	A	C	D	E	F	G	H	I	J	K	L	M
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Construction Method	Material	Pressure Class	Manufacturer	Comments
2	CSNG-1	C-4	517827.57	1482195.46	78.83	Force Main	Bore & Jack (Casing)		PVC	DR18	Brand A	
3	CSNG-2	C-4	517849.20	1482195.31	78.38	Force Main	Bore & Jack (Casing)		PVC	DR18	Brand A	
4	RW-1	C-7	517731.98	1482237.24	80.42	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
5	RW-2	C-7	517732.85	1482338.10	80.94	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.07	1539372.90	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.75	1539375.00	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.20	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.50	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.20	106.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488952.90	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
12												

## Pump Station Worksheet

Asset Attribute Table Examples						
	A	C	D	E	F	G
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
2	PS-1	C-40	517914.35	1482906.56	83.91	
3						

## Well Worksheet

Asset Attribute Table Examples							
	A	C	D	E	F	G	I
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Well Type	Comments
2						Well	
3						Monitoring Well	
4							

## Easements Worksheet

Asset Attribute Table Examples							
	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Boundary Corner Type	Comments
2	Corner-1	C-8	463484.59	1511029.72		Pump Station Tract	N.W. CORNER
3	Corner-2	C-8	463523.24	1511040.01		Pump Station Tract	N.E. CORNER
4	Corner-3	C-8	463480.45	1511015.23		Pump Station Tract	S.W. CORNER
5	Corner-4	C-8	463526.97	1511025.49		Pump Station Tract	S.E. CORNER
6						Easement	
7						Property	
8							

## Existing OC Utility Crossing

Asset Attribute Table Examples								
	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments
2								
3	CR-02	AT-1	474767.95	1500585.09	98.20	108.20	Force Main	
4	CR-03	AT-1	475239.63	1500596.35	99.10	113.88	Force Main	
5	CR-04	AT-1	475239.61	1500588.49	94.30	112.45	Reclaimed Water Main	
6	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
7	Conf-2	C-750	463163.91	1510693.49	96.32	103.57	Storm Main	
8								

## Grease Interceptor

Asset Attribute Table Examples							
	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Volume (Gallons)	Comments
2	GI-1	C-400	506387.30	1487203.18	89.70	1000.00	
3							
4							



**TABLE 01050-3  
Pipe Deflection Data EXAMPLE**

<b>Project</b> <b>Contractor:</b> <b>Progress Mtg Date:</b> <b>Contract #</b> <b>Dwg Sheet #</b> <b>Utility Type</b> <b>Pipe Manufacturer</b> <b>Pipe size &amp; material</b> <b>PVC Manufacturer Deflection</b> <b>County Allowable Deflection</b> 75% <b>Allowable Angle of Offset</b> <b>Allowable Radius of Curvature</b> <b>Laying Length of Pipe</b>	FM National Pipe 16" PVC C905 6 inches 4.5 inches 1.5 degrees 764 feet 20 feet	
--	---	--

ID	Size and Type	Northing	Easting	Elev.	Calculations Including Elevation (XYZ)							
					Distance between points AB	Distance between points BC	Distance between points AC	Total Deflection Ø <sup>*</sup>	Radius of Curve <sup>**</sup>	Average Offset Angle <sup>***</sup>	Average Offset <sup>****</sup>	
					Length AB ft	Length BC ft	Length AC ft	XYZ (w elevation) degrees	XYZ (w elevation) ft	per laying length degrees	per laying length inches	
14041	16" FM	1505131.50	468948.53	107.68	-	-	-	-	-	-	-	-
7000	16" FM	1505059.60	468932.08	108.15	73.76	38.93	112.66	5.48	1,178.35	0.97	4.07	
2128	16" FM	1505022.11	468921.60	108.55	38.93	39.61	78.54	2.29	1,961.65	0.58	2.45	
2127	16" FM	1504983.85	468911.35	108.29	39.61	38.35	77.96	1.78	2,505.50	0.46	1.92	
2126	16" FM	1504946.67	468901.96	107.81	38.35	39.13	77.42	8.79	505.16	2.27	9.51	
2125	16" FM	1504908.11	468895.31	107.48								

Data that has been inputted     
  Values in yellow are over spec

\*Uses law of cosines to determine angle ABC and Ø.  
 $\text{angle } ABC = \arccos((AB^2 + BC^2 - AC^2) / (2 * AB * BC))$   
 $180 - \text{angle } ABC = \text{angle } \phi$   
 Calculate the total deflection Ø.  
 to the outer point (A or C) is equal in angle to the approach from the next point along the

\*\* Uses law of sines, using the chord length AC and radius R.  
 $\text{Since } \sin((\phi/2) * (\pi/180)) = (\text{Chord}/2) / R \text{ and length } AC = \text{Chord}$   
 $R = AC / (2 * \sin(\phi * \pi / 360))$   
 This calculation assumes an average radius over the bend between three points.

\*\*\* Adds the lengths of AB + BC / 20ft to get an approximate number of bends over the span.  
 This value is divided by the total deflection angle to calculate the average bend angle of  
 This assumes that the bend angle consistent across the entire length.

\*\*\*\* Uses average offset angle and laying length of pipe.

**TABLE 01050-4  
Gravity Main Table**

Downstream		Upstream		Length (ft)	Gravity Main Diameter (inches)	Design Slope (%)	Const. Slope (%)	Allowable Minimum Constructed Slope (%)
Manhole Number	Invert Elev.	Manhole Number	Invert Elev.					
					8	0.31		0.28
					10	0.24		0.21
					12	0.20		0.17

**PART 3 - EXECUTION**

**3.01 SURVEY FIELD WORK**

- A. Locate, reference, and preserve existing horizontal and vertical control points and property corners shown on the Drawings prior to starting any construction. If the Surveyor performing the work discovers any discrepancies that will affect the Project, the Contractor must immediately report these findings to the County. All survey work shall meet the requirements as defined in Florida Administrative Code 5J-17. Reference and preserve all survey pins/monuments during Construction. If survey pins/monuments are disturbed, it is the responsibility of the Surveyor to reset the pins/monuments at the Contractor's expense. If the monuments are disturbed, any Work that is governed by these monuments shall be held in abeyance until the monuments are reestablished by the Surveyor and approved by the County. The accuracy of all the Contractor's stakes, alignments and grades is the responsibility of the Contractor. However, the County has the discretionary right to check the Contractor's stakes, alignments, and grades at any time. Copies of the Surveyor's field notes and/or electronic files for point replacement shall be provided to the County.
  
- B. The construction layout shall be established from the reference points shown or listed on the Drawings. The accuracy of any method of staking shall be the responsibility of the Contractor. All construction layout staking shall be done such as to provide for easy verification of the Work.
  
- C. The Surveyor shall locate all improvements for the project As-Built Asset Attribute Data using State Plane Coordinates as the horizontal datum and the benchmark referenced on the Drawings as the vertical datum. The County will provide electronic files of the Drawings to

be used by the Surveyor.

- D. Use survey control points to layout such work tasks including but not limited to:
  - 1. Clearing, grubbing, work limits, right-of-way lines and easements
  - 2. Locations for pipelines and all associated structures and appurtenances
- E. The Surveyor shall reference and replace any project control points, boundary corners, benchmarks, section corners, and right-of-way monuments that may be lost or destroyed, at no additional cost to the County based on the original survey control.

### 3.02 SURVEY DOCUMENTS DELIVERABLES

- A. All survey documents required under Section 01720 Project Record Documents, Part 2 – Products, paragraphs 2.01 and 2.02.

END OF SECTION

**SECTION 01065**  
**PERMITS AND FEES**

**PART 1 - GENERAL**

**1.01 REQUIREMENTS**

**A. General**

1. Upon Notice of Award, obtain and pay for all appropriate and applicable permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Strictly adhere to the specific requirements of the governmental unit(s) or agency(cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.
4. A copy of the permits obtained by the County are furnished in Appendix C "Permits Obtained by County" of these specifications.
5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

**B. Building Permit (Orange County)**

1. The County will pay the general building permit fee and any related impact fees or assessments to be paid to Orange County for the issuance of that permit only.
2. The Contractor shall pay all fees associated with obtaining Orange County trade permits and any and all inspection fees for the Orange County Building Department providing inspections for this project. The Contractor shall apply for and obtain the building permits from Orange County and schedule and obtain final approval from the building inspectors.
3. Information on Orange County Building Department fees is included in the Instructions to Bidders in Division 0.
4. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from Orange County, as required by the building and sub-discipline construction permits.

**C. Construction Dewatering Permit**

The Contractor shall apply and pay for all fees associated with obtaining Florida Department of Environmental Protection District Office construction dewatering permits, if required. The Contractor shall provide all materials and equipment to comply with the permit requirements at no additional cost to the County.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01070**  
**ABBREVIATIONS AND SYMBOLS**

**PART 1 - GENERAL**

1.01 REQUIREMENTS INCLUDED

- A. Reference to the following standards of any technical society, organization or body shall be construed to mean the latest standard, code or specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard. Such reference is hereby made a part of the Contract the same as if herein repeated in full and in the event of any conflict between any of these specifications, standard codes or tentative specifications and the Contract Documents, the most stringent shall govern.

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	American Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASA	American Standards Association (now ANSI)
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWBP	American Wood Preservers Board
AWS	American Welding Society
AWWA	American Water Works Association

CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DOT Spec	Standard Specification for Road and Bridge Construction –
FDOT	Florida Department of Transportation
FAC	Florida Administrative Code
FS	Federal Standard
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electrical Code
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Threads
NSF	National Science Foundation
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
USASI	United States of American Standards Institute (Now ANSI)

B. UNITS OF MEASUREMENT

CU FT	cubic feet
CU IN	cubic inch(es)
CY	cubic yard(s)
DegC	degree(s) Centigrade
DegF	degree(s) Fahrenheit
F	Fahrenheit
FT	feet, foot
G	gram(s)
GA	gage
GAL	gallon(s)
GPH	gallon(s) per hour
GPM	gallon(s) per minute

GPS	gallon(s) per second
HR	hour(s)
IN	inch(es)
IPS	iron pipe size
KG	kilogram(s)
L	liter(s)
LB	pound(s)
LBF-IN	pound (force) inch
LF	linear foot, linear feet
MIN. min.	minute(s), minimum
ml	milliliter
MO	month(s)
OZ	ounce(s)
QT	quart
RH	relative humidity
SF	square foot, square feet
SQ IN	square inch(es)
YD	yard(s)
YR	year(s)

### C. TERMINOLOGY

@	at
AB	anchor bolt
ADJ	adjust, adjustable
ADMIN	administration
AFG	above finished grade
AGGR	aggregate
AL	aluminum
ALT	alternate
APPX	appendix
APX	approximate
ART	article
ASPH	asphalt
ASSY	assembly
AUTO	automatic
AUX	auxiliary
AVE	avenue
AVG	average
AWG	American Wire Gauge
BAR	barrier
BCCMP	bituminous coated corrugated metal pipe
BL	base line
BLDG	building
BLKG	blocking
BM	beam



C to C	center to center
CCB	concrete block, masonry
CEM	cement
CIP	cast iron pipe, cast in place
CJ	construction joint
CL	center line, clearance
CM	Construction Manager
CMP	corrugated metal pipe
CO	cleanout
CONC	concrete
CONN	connection
CONST	construction
CONT	continuous
CONTR	contractor
CU, COP	copper
ORR	corridor
CRIT	critical
CTD	coated
CTR	center
CULV	culvert
d	delta
DBL	double
DEM	demolition, demolish
DEPT	department
DET	detail
DIA, D	diameter
DIAG	diagonal
DIM	dimension
DWG	drawing
FEM	female
FUT	future
FV	field verify
FM	force main
FH, HYD	fire hydrant
ID	inside diameter
MAS	masonry
MATL	material
MAX	maximum
MFD	manufactured
MFG	manufacturing
MFR	manufacturer
MH	manhole, metal hallide
MIN	minimum
MISC	miscellaneous
MTL	material

NAT	natural
NATL	national
NOM	nominal
NTS	not to scale
OD	outside diameter
PP	power pole
R	radius
Rd	road
REIN	reinforce
REL A	relief air
REQD	required
REV	revision
RR	railroad
R/W	right-of-way
RWM	reclaimed water main
RY	railway
SAN	sanitary
SCH	schedule
SECT	section
SLV	sleeve
SQ	square
SST	stainless steel
ST	street
STA	station
STD	standard
SURF	surface
SUSP	suspend(ed)
SYM	Symbol, symmetrical
SYS	system
TEMP	Temperature, temporary
TYP	typical
UTIL	utility
W	West
WLD	welded
WM	water main
W/O	without
WT	weight
YD	yard
YR	year
Y W	wye

END OF SECTION

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**SECTION 01091**  
**REFERENCE SPECIFICATIONS**

**PART 1 - GENERAL**

1.01 GENERAL

- A. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of or omission from said standards or requirements.
  
- B. Assignment of Specialists: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialist or expert entities who must be engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of such referenced documents which are not in conflict with the requirements of these Specifications or applicable codes.
  
- B. References herein to "Building Code" shall mean the Florida Building Code. The latest edition of the code shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.
  
- C. In case of conflict between codes, reference standards, Drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

D. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01200**  
**PROJECT MEETINGS**

**PART 1 - GENERAL**

1.01 REQUIREMENTS INCLUDED

- A. Contractor participation in pre-construction conferences, progress meetings and specially called meetings.

1.02 MEETINGS CALLED BY THE COUNTY

- A. The County will schedule and administer a pre-construction conference, periodic progress meetings and specific topic meetings throughout the progress of the Work. The County will:
  - 1. Prepare and distribute a notification of the meeting to required attendees.
  - 2. Establish, prepare and distribute an agenda with the notification.
  - 3. Make physical arrangements for the meetings.
  - 4. Preside at meetings.
  - 5. Prepare and distribute minutes of meetings including significant proceedings and decisions, within 15 working days after each meeting. Minutes will be forwarded to all participants and to parties affected by decisions made at the meeting.
- B. Representatives of the Contractor, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The meeting location will generally be a central site, convenient for all parties, designated by the County.
- D. All meetings shall be digitally recorded with files provided to all requesting parties.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. Attendance:
  - 1. County
  - 2. Contractor and superintendent
  - 3. Subcontractors as appropriate to the agenda
  - 4. Representatives of suppliers and manufacturers as appropriate to the agenda
  - 5. County MBE/WBE representative
  - 6. Other agency representatives (FDEP, EPA, City, etc.)
  - 7. Surveyor – recommended but required if Surveyor has not previously performed work for the County
  - 8. Others as requested by the County or Contractor

B. Suggested Agenda:

1. Distribution and discussion of:
  - a. List of major Subcontractors and suppliers
  - b. Construction schedules
  - c. Contact information
2. Organizational arrangement of Contractor's forces and personnel, and those of Subcontractors, material and equipment suppliers, and the County
3. Critical work sequencing
4. Major equipment deliveries
5. Project coordination
  - a. Designation of responsible personnel
  - b. Channels and procedures for communication
6. Procedures and processing of:
  - a. Field decisions
  - b. Proposal requests
  - c. Submittals
  - d. Change orders
  - e. Applications for payment/Schedule of Values
  - f. Contractor quality control
  - g. Submittal of Shop Drawings, project data and samples
7. Adequacy of distribution of Contract Documents
8. Procedures for maintaining as built and record documents
9. Use of premises:
  - a. Office, work and storage areas
  - b. County's requirements
  - c. Housekeeping
10. Temporary construction facilities
11. Temporary utilities
12. Safety and first aid procedures
13. Rules and regulations
14. Security procedures
15. Place, date and time for regular progress meetings
16. Completion time for Contract and liquidated damages

1.04 PROGRESS MEETINGS

- A. The County shall schedule progress meetings at least once per month as required by progress of the Work with the first meeting approximately one (1) month after the pre-construction meeting.
- B. Attendance:
  1. County
  2. Contractor
  3. Subcontractors as appropriate to the agenda
  4. Suppliers as appropriate to the agenda
  5. Others as appropriate

- C. The Contractor's representative is to attend the project meetings and have the authority to act on behalf of the entity represented on field related matters. Contractor's representative is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics and provide specific information including but not limited to:
1. Status of submittals and actions necessary to expedite them
  2. Status of activities behind schedule and actions necessary to regain the approved schedule
  3. Status of materials and equipment deliveries and action necessary to expedite materials and equipment and maintain the approved schedule
  4. Status of open RFI's and actions necessary to address them
- D. To the maximum extent practicable, the Contractor is to assign the same personnel to represent the Contractor at Progress Meetings throughout the progress of the work.
- E. The Contractor is to provide a current Shop Drawing submittal log at each progress meeting.
- F. The Contractor is to provide copies of the updated Progress Schedule at each project meeting in accordance with the General Conditions including a 3 week look ahead schedule for upcoming events.
- G. Suggested Agenda:
1. Review and approve minutes from previous meeting
  2. Review of work progress since previous meeting to include current As-Builts
  3. Contractor's/Subcontractor's workforce and equipment
  4. Progressive As-Built Drawings
  5. Surveyor's submittals
  6. Field observations, problems and conflicts
  7. Construction progress and problems which impede construction schedule
  8. Shop Drawing submittal status
  9. Requests for Information (RFI) status
  10. Change Order status
  11. Review of off site fabrication and delivery schedules
  12. Corrective measures and procedures to regain approved schedule
  13. Revisions to construction schedule
  14. Job progress and schedule for succeeding work period
  15. Coordination of schedules
  16. Maintenance of quality standards
  17. Review submittal schedule; expedite as required
  18. Pending requests for information, changes and substitutions
  19. Review proposed changes for effect on construction schedule and completion date
  20. Pay application status
  21. Other business



H. Revision to Minutes:

1. Unless minutes are challenged, in writing, prior to the next regularly scheduled Progress Meeting, they will be accepted as properly summarizing the discussions and decisions of the meeting.
2. Persons challenging minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at next regularly scheduled meeting.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

3.01 PRE-CONSTRUCTION MEETING

- A. Pre-construction Meeting: At the pre-construction meeting the Contractor shall be provided with a blank electronic version of the spreadsheets for: Asset Attribute Data and Pipe Deflection tables. The Contractor's Surveyor shall use these tables to input the data and shall not alter the table format or formulas.

3.02 CONSTRUCTION PROGRESS MEETINGS

A. Contractor shall provide the following:

1. Progressive As-Built Drawings
2. Surveyor submittals
  - a. As-Built Asset Attribute Data Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-2)
  - b. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3)
  - c. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-4)
  - d. Boundary Surveys of fee simple and permanent easements for pump stations, treatment facilities, and constructed pipe in easements
3. Construction Contract, As-Built Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
4. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed as well as any changes made by Field Order, Change Order or other
5. Change orders, verbal orders, and other modifications to Contract
6. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).
7. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
8. Field test records, inspection certificates, manufacturer certificates and construction photographs.

9. As-Built Asset Attribute Data: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements. The monthly submittal shall include the Surveyor's certified statement regarding the constructed improvements being within the specified accuracies as described in Specification Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey Accuracies or if not, indicating the variances.
10. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to include as a minimum the pipe segment identification, pipe lengths, manhole inverts and tops, and slopes for gravity mains. Surveyor shall certify the data entered are correct and indicate if the minimum slopes have not been met.
11. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC manufacturer deflection allowance, allowable angle of offset and radius of curvature, laying length of pipe, and coordinates. Surveyor shall certify the data entered are correct and indicate if the deflection allowance, offset or radius of curvature exceeds the manufacturer's recommendations.

END OF SECTION

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## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

Work completed without approved Shop Drawings and/or samples shall be considered installed at the Contractor's risk.

##### 1.01 SHOP DRAWINGS AND DATA

- A. Shop Drawings defined in the General Conditions, shall complement design and construction Drawings, and shall contain sufficient detail to clearly define all aspects of the Construction. These Drawings shall be complete and detailed.
- B. Contractor and Supplier's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked with specification title and numbers to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. If Shop Drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in the letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, the Contractor shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such Drawings have been reviewed.
- D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction and similar descriptive material. Materials and equipment list shall, for each item, give the name and location of the Supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.
- E. For all equipment furnished, the Contractor shall provide a list including the equipment name and address and telephone number of the Supplier's representative and service company so that service and/or spare parts can be readily obtained.
- F. The Contractor will obtain an installation list from suppliers and equipment suppliers who propose to furnish equipment or products for submittal to County/Professional along with the required Shop Drawings. The installation list shall include at least 5 installations where identical equipment has been installed and has been in operation for a period of at least 1-year.

## 1.02 REVIEW OF SHOP DRAWINGS AND SAMPLES

- A. The County /Professional's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conform(s) to the information in the Contract Documents and is/are compatible with the design concept. The County/Professional's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
  - 1. As permitting any departure from the Contract Documents
  - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
  - 3. As approving departures from details furnished by the County/Professional, except as otherwise provided herein
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the County/Professional finds to be in the interest of the County and to be so minor as not to involve a change in Contract Price or Contract Time, the County/Professional may return the reviewed drawings without noting an exception.
- D. "Approved As Noted": Contractor shall incorporate County/Professional's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the County/Professional acknowledging the comments and their incorporation into the Shop Drawing.
- E. "Amend and Resubmit": Contractor shall resubmit the Shop Drawing to the County/Professional. The resubmittal shall incorporate the County/Professional's comments highlighted on the Shop Drawing.
- F. "Rejected": Contractor shall correct, revise and resubmit Shop Drawing for review by County/Professional.
- G. Resubmittals will be handled in the same manner as first submittals. For resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by County/Professional on previous submissions. The Contractor shall make any corrections required by the County/Professional.
- H. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the County/Professional.

- I. When the Shop Drawings have been completed to the satisfaction of the County/Professional, the Contractor shall carry out the Construction in accordance therewith and shall make no further changes therein except upon written instructions from the County/Professional.
- J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the County/Professional, make all submittals in groups containing all associated items for:
  - 1. Systems
  - 2. Processes
  - 3. As indicated in specific Specifications Sections  
All drawings, schematics, manufacturer's product data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interfaces checking.
- K. Only the County/Professional shall utilize the color "red" in marking Shop Drawing submittals.
- L. Failure to comply with any of the above may result in the rejection of Shop Drawings.

#### 1.03 PRODUCT DATA

- A. Submit not less than 6-copies, unless approved by the County/Professional. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to the Work.

#### 1.04 MANUFACTURERS' INSTRUCTIONS

- A. When required in an individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data.

#### 1.05 SAMPLES

- A. Submit full range of manufacturers' standard colors, textures and patterns for the County's selection. Submit samples for selection of finishes within 30-days after Award of Contract. All color and finish selections must be submitted by the Contractor in a single submission, properly labeled and identified.
- B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

- C. Submit the number of samples specified in the respective Specification section, but no less than two (2). After review one (1) will be retained by the County. Reviewed samples that may be used in the Work are indicated in the Specification Section.
- D. Samples shall be delivered to the County as directed. The Contractor shall prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the County/Professional.
- E. Samples shall be of sufficient size to clearly illustrate:
  - 1. Functional characteristics of the product, with integrally related parts and attachment devices
  - 2. Full range of color, texture and pattern
  - 3. Each sample shall have a label indicating:
    - a. Name of Project
    - b. Name of Contractor and Subcontractor
    - c. Material or equipment represented
    - d. Place of origin
    - e. Name of product and brand (if any)
    - f. Location in Project
    - g. Specification title and number
    - h. Submittal number
    - i. Note: Samples of finished materials shall have additional marking that will identify them under the finished schedules.
- F. The Contractor shall prepare a transmittal letter, in triplicate (3) for each shipment of samples containing the information required in paragraph herein. The Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to the County/Professional. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.
- G. Approved samples not destroyed in testing shall be sent to the County or stored at the site of the Work. Approved samples of the hardware in good condition may be incorporated in the Work if requested in writing by the Contractor and approved in writing by the County/Professional. Samples that failed testing or were not approved will be returned to the Contractor at the Contractor's expense, if so requested at time of submission.

#### 1.06 FIELD SAMPLES

- A. Provide field samples of finishes as required by individual Specifications sections. Install the sample completely and finished. Acceptable samples in place may be retained in completed Work.

#### 1.07 DRAWINGS, PRODUCT DATA AND CERTIFICATES

- A. Each letter of transmittal shall identify each and every item transmitted by title, drawing number, revision number and date.

- B. The County generally will not check dimensions, quantities or schedules, except in cases where the information is lacking in the Specifications.
- C. The following is applicable to submitted drawings, data and certificates:
  - 1. Show relation to adjacent structures or materials.
  - 2. Clearly identify field dimensions.
  - 3. Show required dimensions and clearances.
  - 4. Performance characteristic and capabilities shall accompany original Shop Drawing submittals.
  - 5. Wiring diagrams and controls shall accompany original Shop Drawing submittals.
  - 6. Installation instructions shall accompany original Shop Drawing submittals.
  - 7. Each submittal shall identify applicable Standards, such as ASTM number or Federal Specification number.
  - 8. All information not pertinent shall be removed from the submittal, or shall be crossed out.
- D. When resubmission is required, the County/Professional will return only two (2) marked up copies. A third submission from the same manufacturer will not be accepted.

#### 1.08 SUBSTITUTIONS

- A. The substitution requirements of this Section are in addition to the requirements of the General Conditions and Supplementary Conditions.
- B. When a particular product is specified or called for, it is intended and shall be understood that the proposal tendered by the Bidder includes those products in his Bid. Substitutions will only be considered in cases where original materials are unavailable or in an instance where substitute can be proven superior in its planned application
- C. The intent of these specifications is to provide the County with a quality facility without discouraging competitive bidding. For products specified only by reference standards, performance and descriptive methods, without naming manufacturer's products, the Contractor may provide the products of any manufacturer complying with the Contract Documents, subject to the review of product data by the County/Professional as specified herein.
- D. The County/Professional's approval is required for substitutions.
- E. The Contract is based on the materials, equipment and methods described in the Contract Documents.
- F. The County/Professional will consider proposals for substitution of materials equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by the County/Professional to evaluate the proposed substitution.



- G. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this Work by the County/Professional in writing. The Contractor must provide a submittal per this Section specifically requesting approval of the substitution. Failure to specifically identify the requested substitution may invalidate approval of a submittal.

#### 1.09 AVAILABILITY OF SPECIFIED ITEMS

- A. Verify prior to bidding that all specified items will be available in time for installation during Construction for orderly and timely progress of the Work.
- B. In the event that specified items will not be available, notify the County/Professional prior to receipt of proposals.

#### 1.10 OPERATING MANUALS

- A. Submit all manuals in accordance with requirements of Divisions 2 through 16 of the Contract Specifications and Section 01700 "Project Closeout."

#### 1.11 WARRANTIES, GUARANTEES AND BONDS

- A. Provide as required by Technical Sections of the Specifications and Sections 01700 "Project Closeout" and Section 01740 "Warranties and Bonds."

#### 1.12 CADD FILES

- A. The Professional's CADD files will be available on a limited basis to qualified firms at the County's prerogative. The procedure for requesting such files is noted elsewhere in these documents and there is a cost associated with handling and reproduction. Recipients are cautioned that these files may not accurately show actual conditions as constructed. Users are responsible to verify actual field conditions.
- B. The Professional's Drawings are to be used only for background information. If the Professional's Drawings are just reproduced and resubmitted (e.g. for ductwork drawings) they will be rejected.
- C. Copies of data furnished by the County/Professional to Contractor or Contractor to County/Professional that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

- D. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60-days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- E. When transferring documents in electronic media format, the transferring party makes no representations as to long-term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

### 1.13 PROGRESS PHOTOGRAPHS

- A. Photographs and digital pictures shall be in color. Provide 1 copy of each digital picture on each of three (3) CDs and provide 1 print of each photograph in two (2) separate albums.
- B. Photographs shall be from locations to illustrate the condition of Construction and state of progress adequately.
- C. Provide up to 12 digital photographs of views randomly selected by the County, taken prior to any construction and prior to each scheduled Application for Payment.
- D. Deliver electronic images, prints, and negatives to the County.
- E. Each print shall be single weight paper with glossy finish and the overall dimension shall be 7-1/2-inch x 10-inches (19.05 x 25.4 cm). The print shall be clear, sharp and free of distortion after the enlargement from the negative.
- F. Provide loose-leaf albums for each set of photographs to hold prints with a maximum of 50-leaves per binder.
- G. Each print shall be protected by flexible, transparent acetate or plastic sheet protector leaves with metal reinforced holes. Two (2) extra leaves shall be provided in each binder.
- H. Capture and provide digital, ortho-rectified, true-color, aerial photographs of the complete project site prior to start of Construction and at final completion. A final 6-inch or less ground pixel resolution is required. If using traditional photography, the photos will need to be captured at an appropriate scale and scanned at a high enough dpi to yield a final ground pixel size of 6-inches or less. If captured digitally, a final 6-inches or less ground sample distance is required. The final orthorectified photos shall use a projection of NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet. All orthophoto mosaics shall meet a final accuracy of plus or minus 5-feet.

- I. Provide a total of four (4) true-color, color balanced orthophoto mosaic prints. Three (3) prints each of the pre and post construction (final completion) orthophoto mosaics, for a total of six (6). Each orthophoto mosaic print shall be on double-weight paper with glossy finish and shall have overall dimensions of 36-inches x 58-inches. Two (2) copies of each of the digital orthophoto mosaics shall be supplied in Geotiff format on disk for each time period (pre and post construction). The final color balanced, true-color orthophoto mosaics will be projected in NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet and shall meet a final accuracy of plus or minus 5-feet.
- J. The Contractor shall provide before and after photographs of each portion of the site. The below ground facilities shall include all equipment, walls, floor, piping, supports and entrance. At major locations, photographs shall include before, during, and after prints and all prints shall be placed in binders in ascending date order to show the Work as it progresses.
- K. Descriptive Information:
  - 1. Each photograph shall have a permanent title block on the back and shall contain the typed information and arrangement as follows:
    - a. ORANGE COUNTY, FLORIDA
    - b. (ENTER PROJECT NAME)
    - c. BID No. (Enter Bid Number)
    - d. CONTRACTOR: (Name of Contractor)
    - e. DATE: (When photo was taken)
    - f. PHOTO NO.: (Consecutive Numbers)
    - g. PHOTO BY: (Firm Name of Photographer)
    - h. LOCATION: (Description of Location and View)
  - 2. The Contractor shall provide the Professional with a written description of each photograph. This description shall be included in the binders and a copy shall be submitted with the CDs.

#### 1.14 PROJECT RECORD DOCUMENTS

Project Record Documents shall be submitted in accordance with Section 01720 "Project Record Documents" of these specifications.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### 3.01 SUBMITTAL PROCEDURES

- A. Article 9 of the General Conditions contains additional provisions regarding submittals.

- B. Preliminary Shop Drawing Data: Within 20-days after the Award of the Contract or before the Pre-Construction Meeting, the Contractor shall submit to the County/Professional a complete listing of manufacturers for all items for which Shop Drawings are to be submitted.
- C. Shop Drawing Submittal Schedule: Within 30-days after the Notice to Proceed, the Contractor shall submit to the County/Professional a complete schedule of Shop Drawings submittals with the respective dates for submission, the beginning of manufacture, testing and installation of materials, supplies and equipment, noting those submittals critical to the progress schedule.
- D. Submittal Log: An accurate updated log of submittals will be maintained by the Contractor and subject to review by the County/Professional at each scheduled progress meeting.
- E. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Contract Drawings or specifications, the Contractor shall give written notice thereof to the County/Professional. This does not constitute a change order until accepted by the County.
- F. Shop Drawing and submittal data shall be reviewed by the County/Professional for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor. The Contractor shall reimburse the County for services rendered by the County/Professional at the rate multiplied by the County's Professional multiplier based on the fee schedule provided to the County for this Project. If a County engineer is performing any portion of the review, this fee is based upon the hourly rate of the engineer times the County's multiplier for overhead, benefits, and expenses. The Contractor agrees that the County shall deduct such charges from the Contract Amount by a deductive Change Order.
- G. Contractor Shop Drawing and Sample submittals shall include 5 copies in addition to any other copies that the Contractor wants returned. The County will retain 5 copies of approved submittals.
- H. Identify Project, Project Number, date, dates of previous submittals, Contractor, Sub-Contractors, suppliers with their addresses, pertinent Drawings by sheet and detail number, and Specification Section number, as appropriate. Identify all deviations from the Contract Documents. Provide space for Contractor and Professional review stamps.
- I. Contractor's delivery of Shop Drawings for review shall follow a reasonable sequence, as is necessary to support the dates on the Progress Schedule and avoid an overload of Shop Drawings awaiting review at any one time. Coordinate submittal of related items.

- J. Submit Shop Drawings per the schedule of Shop Drawing submittals, inserted in 1 loose-leaf binder, with tabs and index to the County/Professional. All individual submittal sheets inserted in said binder must be clearly marked and referenced to proper paragraph and subparagraph of specifications. Cross out any items on sheets which constitute information not pertaining to equipment specified. Clearly mark all components that are provided as "optional" by manufacturer. Shop Drawings shall be approved by the Contractor prior to submittal to the County/Professional. Shop Drawings will be reviewed by the County/Professional. After County/Professional approval, reproduce and distribute in accordance with requirements herein.
- K. All submissions of Shop Drawings, brochures and catalog cuts shall be accompanied by a transmittal letter listing the Drawings submitted by number and title.
- L. When engineering calculations and/or professional certification of performance criteria of materials, systems, and/or equipment are required, the County is entitled to rely upon the accuracy and completeness of such calculations and certifications submitted by the Contractor. Calculations, when required, shall be submitted in a neat, clear and in an easy to follow format. Such calculations and/or certifications shall be signed and sealed by a Professional Engineer registered in the State of Florida.
- M. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to promptly report any inability to comply with provisions.
- N. Prior to submission of Shop Drawings and samples, the Contractor shall stamp and sign the submittals. Any submission which, upon examination by the County, shows evidence of not having been thoroughly checked, or is not in compliance with the provisions of this Section will be returned to the Contractor for completion before it will be considered for review.
- O. Notify the County of the need for making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the material or equipment Contractor proposes to supply.
- P. On resubmittals, direct specific attention in writing or on the revised Drawings or sample to revisions other than the corrections required by County on previous submissions.
- Q. All drawings, schematics, manufacturer's product data, certifications and other drawing submittals required for a system specification shall be submitted at one time as a package to facilitate interface checking.
- R. The County will distribute Shop Drawings as follows for the indicated action taken:

## SHOP DRAWING SUBMITTAL DISTRIBUTION

Representative Party	No Exception Taken or Make Correction Noted			Rejected or Revise & Resubmit		
	Submittal Transmittal	Shop Drawing	Review Comment Sheet	Submittal Transmittal	Shop Drawing	Review Comment Sheet
Engineer	2 Copies	File Copy	1 Copy	Original	File Copy	1 Copy
Contractor (see Note 1)	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	All Copies Except Engineers	1 Copy
County	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Inspector	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Project Record Data (see Note 2)	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy

**NOTES:**

1. Contractor shall distribute additional copies to Subcontractors as required.
2. Stored by Contractor to be furnished to County upon closeout.

- S. All Shop Drawings shall be accompanied with a transmittal letter providing the following information:
1. Project Title and Contract Number
  2. Date
  3. Contractor's name and address
  4. The number of each Shop Drawing, project data, and sample required
  5. Notification of Deviations from Contract Documents
  6. Submittal Log Number conforming to specification section numbers
    - a. Submit each specification section separately.
    - b. Identify each Shop Drawing item required under respective specification section.
    - c. Identify resubmittal using specification section followed by A (first resubmittal), B (second resubmittal)...etc.

### 3.02 CONTRACTOR'S REVIEW

- A. Contractor's Responsibility for Coordination: Where the dimension, size, shape, location, capacity or other characteristic affects another item, and where the Contractor selects, fabricates or installs related or adjacent products to be used, the Contractor shall be responsible for coordination of related items. The Contractor shall insure that a proper exchange of information takes place prior to or during preparation of each submittal and that submittals reflect such coordination. The notation "verify" or "coordinate" on the Drawings indicates the necessity for Contractor coordination in the particular instances used.

- B. Contractor's Checking: When checking submittals from Subcontractors and suppliers, the Contractor shall mark all sets, indicating his corrections and comments in blue or green. Copies marked in red may be returned for revision.
- C. The Contractor is responsible to deliver and pick-up all submittals in a timely manner at the County/Professional's designated office. The Contractor is responsible for all related costs and expenses for the transmittal of such submittals.

### 3.03 COUNTY'S / PROFESSIONAL'S REVIEW

- A. Corrections or comments made on Shop Drawings during review do not relieve the Contractor from compliance with the requirements of Drawings and Specifications. This check is only for review of general conformance with the design concept of this Project and general compliance with information given in Contract Documents. Any substitutions or changes shall be properly noted.
- B. No action will be taken on "rough-in" Shop Drawings for plumbing and electrical connections when the items of equipment are not included in the same submittal.
- C. Review Time:
  - 1. On a normal basis, each submittal will be returned to the Contractor within 15 working days of the date it is received. Some submittals may require additional time.
  - 2. If, for any reason, the above schedule cannot be met, the Contractor will be so informed within a reasonable period and the Schedule of Submittals revised. If the specific submittal affects the critical path, the Contractor shall immediately notify the County/Professional in writing. In the event of separate submittals of individual components of a system, these submittals may be held until all components of the system are submitted, and the Contractor will be so notified.

END OF SECTION

**SECTION 01301**  
**PRODUCT SUBSTITUTIONS**

**PART 1 - GENERAL**

1.01 SUMMARY

A. General

1. Base all bids on materials and equipment specified in the Appendix D Orange County Utilities List of Approved Products.
2. Certain types of equipment and kinds of material are described in specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers.
  - a. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are "or-equals," as determined by County/Professional.
3. Other types of equipment and kinds of material may be acceptable substitutions under the following conditions:
  - a. Or-equals are unavailable due to strike, discontinued production of products meeting specified requirements, or other factors beyond control of Contractor; or,
  - b. Contractor proposes a cost and/or time reduction incentive to the Owner.

1.02 QUALITY ASSURANCE

A. In making request for substitution or in using an approved product, Contractor:

1. Has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform the function for which it is intended.
2. Will provide same guarantee for substitute item as for product specified.
3. Waives all claims for additional costs related to substitution which subsequently arise.

1.03 DEFINITIONS

- A. Product: Manufactured material or equipment.

1.04 PROCEDURE FOR REQUESTING SUBSTITUTION

A. Substitution shall be considered only:

1. After award of Contract
2. Under the conditions stated herein

- B. Written request through Contractor only.



C. Transmittal Mechanics

1. Follow the transmittal mechanics prescribed for Shop Drawings in Specification Section 01300 "Submittals."
  - a. Product substitution will include in the transmittal letter, either directly or as a clearly marked attachment, the items listed in Paragraph D below.

D. Transmittal Contents

1. Product identification:
  - a. Manufacturer's name
  - b. Telephone number and representative contact name
  - c. Specification Section or Drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents.
2. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents.
3. Itemized comparison of original and proposed product addressing product characteristics including but not necessarily limited to:
  - a. Size
  - b. Composition or materials of construction
  - c. Weight
  - d. Electrical or mechanical requirements
4. Product experience
  - a. Location of past projects utilizing product.
  - b. Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product.
  - c. Available field data and reports associated with proposed product.
5. Data relating to changes in construction schedule.
6. Data relating to changes in cost.
7. Samples
  - a. At request of County/Professional.
  - b. Full size if requested by County/Professional.
  - c. Held until substantial completion.
  - d. County/Professional is not responsible for loss or damage to samples.

1.05 APPROVAL OR REJECTION

- A. Written approval or rejection of substitution to be given by the Engineer.
- B. Engineer reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.
- C. In the event the substitution is approved, the resulting cost and/or time reduction will be documented by Change Order in accordance with the General Conditions.
- D. Substitution will be rejected if:
  1. Submittal is not through the Contractor with his stamp of approval.
  2. Request is not made in accordance with this Specification Section.

3. In the County/Professional's opinion, acceptance will require substantial revision of the original design.
  4. In the County/Professional's opinion, substitution will not perform adequately the function consistent with the design intent.
- E. Contractor shall reimburse the County for the cost of the evaluation whether or not substitution is approved.

**PART 2 - PRODUCTS - (NOT USED)**

**PART 3 - EXECUTION - (NOT USED)**

END OF SECTION

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**SECTION 01310**  
**PROGRESS SCHEDULES**

**PART 1 - GENERAL**

**1.01 REQUIREMENT**

- A. The Contractor will submit precedence method cost loaded Critical Path Method (CPM) Progress Schedules to the County depicting the approach to prosecution and completion of the Work. This requirement includes, but is not limited to the Contractor's approach to Activity cost loading, recovering schedule and managing the effect of changes, substitutions and Delays on Work sequencing.
- B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work (or Work remaining) conform to the Contract requirements and the sequences of Work indicated in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may affect cost, progress, schedule, furnishing and performance of the Work; and show how the Contractor's Means and Methods translate into Activities and logic.
- C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision Submittals. Upon acceptance by the County, the Initial submittal will become the As-Planned Schedule for the Work. Revision submittals upon acceptance will become the As-Planned Schedule for the Work remaining to be completed as of the submittal date for that Revision.
- D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.

**1.02 GLOSSARY OF TERMS**

- A. The following terms, whether or not already defined elsewhere in the Contract Documents, have the following intent and meanings within this Section:
  - 1. Activity Value (Value): That portion of the Contract Price representing an appropriate level of payment for the part of the Work designated by the Activity.
  - 2. As-Planned Schedule: The first, complete Initial Progress Schedule submitted by the Contractor with the intent to depict the entire Work as awarded and accepted by the County or returned as no resubmittal required.
  - 3. Contract Float: Days between the Contractors anticipated date for completion of the Work, or of a specified portion of the Work, if any, and the corresponding Contract Time.

4. CPM Schedule: The Progress Schedule based on the Critical Path Method (CPM) of scheduling. The term Critical Path means any continuous sequence of Activities in the Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent, specified Contract Time.
5. Early/Late Dates: Early/late times of performance, based on CPM calculations, for an Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part of the Work on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work on the corresponding Contract Time, even if the Contractor plans early completion.
6. Milestones: Key, pre-determined points of progress in the completion of a facility, denoting interim targets in support of the Contract Times. Milestones may pinpoint targets for key excavation and substructure events, significant deliveries, critical path transition from superstructure to piping and electrical rough in and building enclosure. Also, hook-up of mechanical and electrical equipment, availability of power for testing, equipment shakedown, training of County personnel, start-up, Substantial Completion and other events of like import.
7. Official Schedule: The Initial or most recent Revision Submittal accepted by the County or returned as no resubmittal required and the basis for Payment Submittals until another Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-Planned Schedule.
8. Payment Submittal: A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.
9. Total Float: Days by which an activity may slip from its Early Dates without necessarily extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float may also be calculated and reported in working Days. When an activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will impact a Contract Time.

### 1.03 QUALITY ASSURANCE

- A. The Contractor may self-perform the Work covered by this Section or employ a Subcontractor, subject to the County's consent. Employment of a scheduling Subcontractor shall not in any way alter or reduce the Contractor's obligations under the Contract Documents.
- B. The Contractor will obtain a written interpretation from the County, if the Contractor believes that the selection of activities, logic ties and/or restraints requires a written interpretation of the Contract Documents. With each submission, the Contractor will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.
- C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints.

- D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the obligation to comply with the Contract Times and any sequence of Work indicated in or required by the Contract Documents and to complete, within the Contract Times, any Work omitted from that Progress Schedule.
- E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any interpretation of or variation from the Contract Documents, unless expressly approved by the County through a written interpretation or by a separate, written notation on the returned Progress Schedule Submittal.

#### 1.04 MILESTONES AND SCHEDULE RECOVERY

- A. The County will select Milestones and Milestone Dates on the basis of the As-Planned Schedule. As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone Dates will serve as target dates.
- B. Whenever any Activity slips by 14 or more Days from the Late Date for an activity in the Official Schedule, Milestone Dates selected by the County, or a pertinent Contract Time, the Contractor will deliver a Revision Submittal documenting the Contractor's schedule recovery plan and/or a properly supported request for an extension in the Contract Time. The narrative will identify the Delay and actions taken by the Contractor to recover schedule, whether by adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).
- C. Upon evaluation of that Revision Submittal, if the County determines there is sufficient cause, the County may withhold liquidated damages or provide a notice of intent to do so, if schedule is indeed not recovered, and/or may give a notice of default.

#### 1.05 PROGRESS SCHEDULE SOFTWARE

- A. The scheduling software employed by the Contractor to process the Progress Schedule will be the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM scheduling software.
- B. If the Contractor intends to use companion schedule reporting, analysis or graphics software tools, the Contractor will furnish to the County descriptive materials and samples describing such software tools.

#### 1.06 NON-PERFORMANCE

- A. The County may refuse to recommend all or any part of any payment, if the Contractor fails, refuses or neglects to provide the required Progress Schedule information on a timely basis. Partial payments without a properly updated Progress Schedule shall be returned to the Contractor as non-conforming.

- B. If justified under the circumstances, the County also may prepare alternate Progress Schedules, as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or take other action commensurate with the breach.

#### 1.07 REPORTS, SCHEDULES AND PLOTS

- A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float. Separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying logic ties are appended or not.
- B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times, Critical Paths, phases and work areas on 24-inch x 36-inch or smaller sheets. Activities will be shown on the Early Dates with Total Floats noted by Late Date flags. For Payment and Revision Submittals plot a target comparison based on the current Official Schedule.
- C. The Activity Value report will tabulate Activity code and description and Activity Value, percent complete and earned value as calculated by the scheduling software. Cash flow plots shall be provided showing the monthly and cumulative actual and planned earned values with curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule submittals, the cash flow curves shall also plot the most current Official Schedule planned earnings curves.
- D. Each submittal shall include listings of all added and deleted activities, logic, constraints, Activity Value changes and update information vs. the previous Progress Schedule submittal. This list may be manually prepared or generated by accessory software that will generate such listings.

#### 1.08 NARRATIVE REQUIREMENTS

- A. The Initial Submittal narrative will describe the Contractor's approach to prosecution of the Work and the basis for determination of activity durations, sequence and logic, including the Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor's phasing of the Work; use of crewing and construction equipment; identification of non-work County/Professional's, shifts, weekend Work and multiple calendars applied to activities and an explanation of the basis for restraint dates.
- B. Revision and Payment Submittal narratives will explain any changes to the approach or planning referred to in Paragraph A above on account of any change, delay, schedule recovery, substitution and/or Contractor-initiated revision occurring since the previous submittal.
- C. Each narrative will list the Critical Path Activities and compare Early and Late Dates against Contract Times and Milestone Dates. Narratives shall also recap progress and Days gained or lost vs. the current Official Schedule, and identify delays, their extent and causes.

- D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all pending and anticipated "or equal" and substitution proposals. Payment and Revision Submittal narratives will describe any new delays and shall certify that the Contractor has not been delayed, as of the cut off date, by any acts or omissions of the County, except as otherwise specifically stated.

#### 1.09 ACTIVITY REQUIREMENTS

- A. Separate activities will identify permits, design when included in the Work, construction, Submittal preparation and review (and resubmission and re-review), deliveries (site or storage), testing, start-up, commissioning and Punch List.
- B. Activities will be detailed to the extent required to show the transition of trade Work. Activities will delineate the progression of the Work.
- C. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work.
- D. Activity durations will equal the Work Days required to sufficiently complete the Work designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity is not quite 100% complete). Installation Activities will last from 10 to 40 workdays. Submittal review activity durations shall conform to specified timeframes.
- E. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by meaningful schemes.
- F. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the Contract Amount to the time periods that they will be earned and eligible for payment based on the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify cost loading of the Progress Schedule. When used, pay activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots.

#### 1.10 FLOAT TOLERANCES AND FLOAT OWNERSHIP

- A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative 20-days of Float will be returned as "Revise and Resubmit," unless a time extension is requested or the County assesses liquidated damages or gives notice of intent to do so, in the event schedule is not recovered.
- B. Float calculated from the definitions given in this Section supersede any conflicting Float values in any early completion Progress Schedule.



- C. Neither the County nor the Contractor own the Float time, the Project owns the Float time. Neither the County nor the Contractor use of positive Total Float will impact a Contract Completion Date or justify an extension of Contract Time.

#### 1.11 SUBMITTALS

- A. Each Progress Schedule Submittal will consist of a narrative, 5 copies of the required reports and plots and an optical ROM data disk with the Contractor's corresponding schedule and schedule layout files in Primavera ".XER" format.
- B. The County will review Progress Schedule Submittals and return a review copy within 14-days after receipt and the Contractor shall, if required, resubmit within 7-days after return of the review copy.
- C. Requirements for the Initial Submittal:
  - 1. Within 20-days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the County the Initial Submittal of the Progress Schedule for the Work. The Initial Submittal will show the Work as awarded, without delays, Change Orders or substitutions.
    - a. Activity Values will prorate Schedule of Values costs and/or pay items through to Activities. Provide a cross-reference listing with two parts; a part that will list each activity with the respective amounts allocated from each Schedule of Values and Unit Price Item making up the total value of each activity and a second part that will list the Schedule of Values and Unit Price Items with the respective amounts allocated from each activity that make up the total value of each item.
  - 2. After the As-Planned Schedule is established, the County will select Milestones and record the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.
  - 3. If the County refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the Contractor will continue to submit Payment and Revision Submittals reflecting progress and the Contractor's approach to remaining Work. The County will rely on the available Payment and Revision Submittals, subject to whatever adjustments it determines appropriate.
- D. Requirements for Payment Submittals:
  - 1. Payment Submittals with progress up to the closing date and updated Early Dates and Late Dates for progress and remaining Activities will be due with each Progress Payment. As-built data will consist of actual dates, percent complete, earned payment, changes, Delays and other significant events occurring before the closing date.
  - 2. Activity percent complete and earned value should indicate a level of completion that corresponds to the Application for Progress Payment for the same period. The earned value should be calculated by the scheduling software as Activity Value times percent complete. Explanation should be provided whenever the cumulative earned value of activities in a Payment Submittal is not within 10% of the value of Work completed as represented in the corresponding Application for Progress for Payment.

3. At the Contractor's option, a Payment Submittal may overlay minor adjustments on activities and sequencing for Work remaining. This excludes Activity re-scoping to reflect Delays, changes, schedule recovery or substitutions.

E. Requirements for Revision Submittals:

1. Revision Submittals will be submitted when necessary because of major changes or delays affecting activities, sequencing or restraints for Work remaining and/or to put forth a schedule recovery plan. Revision Submittals may also be required because of Contractor-initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence that will require additional testing or inspection personnel, or when requested by the County when Work is performed out-of-sequence from the current Official Schedule such that the number of Days gained or lost can not be determined or the scheduled dates of completion of the Work in a Payment Submittal are not viewed as reliable.
2. If requesting a time extension, the Revision Submittal should show the impact of the delay after incorporating reasonable mitigation to minimize the impact and illustrate how the number of Days requested time extension was determined. The delay should be determined as the change in the forecast Contract Completion Date(s) resulting solely from delays that entitle the Contractor to a time extension as provided in the General Conditions. Any and all Contractor slippage and delay occurring prior to and concurrent with the delay potentially entitling the Contractor to a time extension shall be incorporated in the Revision and explained such that the concurrent and non-concurrent periods of delay are indicated. If the Contractor does not follow the procedures contained in this Section or, if the Contractor's analysis is not verifiable by an independent, objective evaluation by the County using the electronic files and data furnished by the Contractor, any such extension in Contract Time will not be granted.

F. Retrospective Delay Analysis.

1. If the County/Professional refuses to endorse any Revision Submittal as "Resubmittal Not Required," the Contractor and County will use the latest Official Schedule when evaluating the effect of Delays on Contract Time and/or Contract Price. The procedure to be used will consist of progressively updating the latest Official Schedule at key closing dates corresponding to starting and finishing dates of the delays and/or dates the delays became critical or dates the Critical Path may have changed for other reasons. For each Progress Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will be correlated to Delays occurring solely in that iteration.
2. For each iteration, revisions in Activities, logic ties and restraints affecting Work after the closing date will be included in that Progress Schedule only if they meet any of the following conditions. First, they are Progress Schedule revisions that the County consented to contemporaneously (i.e., before the closing date) in writing. Second, they reflect comments or objections raised by or on behalf of the County and that were actually confirmed by the as-built progress. Lastly, they represent Contractor's schedule recovery plans or other Progress Schedule revisions that were actually confirmed by the as-built progress.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01370**  
**SCHEDULE OF VALUES**

**PART 1 - GENERAL**

1.01 DEFINITION

- A. Schedule of Values: Schedule that divides the Contract Amount into pay items, such that the sum of all pay items equals the Contract Amount for the Work, or for any portion of the Work having a separate specified Contract Amount.

1.02 REQUIREMENT

- A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the County. Progress payments on account of Unit Price Work will be based on the number of units completed.
- B. No payment will be made for Work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the County.
- C. The equitable value of Work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.03 SUBMITTALS

- A. Submit 3 copies of a Preliminary Schedule of Values within 15-days after the recommended award of the Contract.
- B. Submit 3 copies of a proposed final Schedule of Values within 20-days after receipt of Notice to Proceed as per the General Conditions.
- C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by County. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.
- D. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- E. Coordinate listings with the Progress Schedule.
- F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid.
- G. Submit a sub-schedule for each separate stage of Work specified in Section 01010 "Summary of Work."

- H. The sum of values listed shall equal the total Contract Amount for the Work or the Contract Amount for a part of the Work with a separate Contract Amount provided for by the Contract Documents.
- I. When the County requires substantiating information, submit data justifying line item amounts in question.

#### 1.04 UNIT PRICE CONTRACTS

- A. For unit price contracts, the bid item prices on the Project Bid Schedule shall be used as the basis for the schedule of values. The Contractor shall resubmit the bid item prices in the format described herein, and may, at its option, or if requested by the County, divide the items in the Project Bid Schedule into sub-items to provide a more detailed basis of payment.

#### 1.05 LUMP SUM CONTRACTS

- A. For lump sum contracts, if the Work involves separate facilities, e.g. multiple pump stations, the cost of the Work shall be separated by each facility and into schedule of value items. Break principal subcontract amounts down into these items; The lump sum cost for each facility shall be submitted individually and split into the schedule of values listed in items 1 through 14.
  1. Demolition of existing pump station
  2. Bypass pumping
  3. Wetwell structure, liner, top slab, hatch covers and appurtenances
  4. Valve vault structure, hatch covers and appurtenances, drain piping and appurtenances
  5. Wetwell (mechanical): 316 stainless steel piping and appurtenances, pumps and base plates
  6. Valve vault (mechanical): piping, valves, and appurtenances
  7. Yard piping, fittings, valves, and appurtenances (outside of structures)
  8. Site work and access drive
  9. Chain link fence and gates
  10. Masonry walls and gates
  11. Odor control equipment, piping, monitoring equipment, etc
  12. Generator, fuel storage tank and related piping
  13. Electrical control panel, wiring, and connections
  14. Start-up and testing

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01380**  
**AUDIO – VISUAL DOCUMENTATION**

**PART 1 - GENERAL**

1.01 PURPOSE AND DESCRIPTION OF WORK

- A. The purpose of the audio - visual documentation is to provide the County with regularly documented audio - visual records of the Construction process from the existing conditions through final completion.

1.02 PRE-CONSTRUCTION VIDEO REQUIREMENTS INCLUDED

- A. The Contractor shall employ a professional videographer to take a Pre-Construction video of the entire site including the areas of adjacent properties within 100-feet of the limits of Work and shall be made within 30-days of Work beginning. Special attention shall be made to show the existing paved roads, shoulders, signs, and other existing features.
- B. The Contractor shall submit a quality audio-video recording documenting Pre-Construction field conditions for the entire project. When the Work includes construction of water, wastewater, reuse, or other lines in the vicinity of any street or road, the Contractor shall take digital audio-video recordings of existing conditions along both sides of the street or road. The Pre-Construction video shall be submitted to the County and accepted prior to commencing any Work or using any Contractor laydown areas.
- C. Electronic digital photography shall also be used as necessary to record and facilitate resolution of on-site issues through the transmission of electronic photographs by e-mail from the site to the Professional's and County's offices.

**PART 2 - PRODUCTS**

2.01 AUDIO-VIDEO RECORDING

- A. Each audio-video recording shall be saved on appropriate DVD media viewable on standard DVD players or computer.

- B. Each DVD shall contain the following information and arrangement at the beginning as a title screen:
- Orange County, Florida
  - PROJECT NAME
  - PROJECT NUMBER
  - CONTRACTOR: (Name of Contractor)
  - DATE: (When photo was taken)
  - VIDEO BY: (Firm Name of Videographer)
  - LOCATION: (Description of Location(s) and View(s))
- C. Each DVD recording section shall begin with an audio description of the County's name, Contract name and number, Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.
- D. Information appearing on the video recording must be continuous and run simultaneously by computer generated transparent digital information. No editing or overlaying of information at a later date will be acceptable.
- E. Digital information to appear in the upper left corner shall be as follows:
1. Name of Contractor
  2. Day, date and time
  3. Name of Project & Specification Number
- F. Time must be accurate and continuously displayed on the video record
- G. Written documentation must coincide with the information on the DVD so as to make easy retrieval of locations at a later date.
- H. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints or photographic negatives.
- I. Audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.
- J. All DVDs and boxes shall bear labels with the following information:
1. DVD Number
  2. County's Name
  3. Date of Recording
  4. Project Name and Number
  5. Location and Standing Limit of Video

## 2.02 CONSTRUCTION PHOTOGRAPHS

- A. The Contractor shall employ a competent photographer to take construction record photographs periodically during the course of the Work.

- B. Prints: Date imprinted 8-inch x 10-inch high resolution glossy single weight color print paper; 5 sets, bound in 3-ring binders to be provided to the County with each respective Application for Payment and distributed by the County as follows:
  - 1. County (2 sets)
  - 2. Engineer (1 set)
  - 3. Contractor (1 set)
  - 4. Project Record Data (1 set stored by Contractor to be furnished to County upon Closeout)

## **PART 3 - EXECUTION**

### **3.01 VIDEO VIEWS REQUIRED**

- A. Complete coverage shall include all surface features within 100-feet of the Work area to be used by the Contractor and shall be supported by appropriate audio description made simultaneously with video coverage. Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts, headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults, handrails, etc. located within the work zone. Video coverage shall extend to the maximum height of all structures within this zone.
- B. The video recorder shall take special efforts to point out and provide audio commentary on cracking, breakage, damage, and other defects in existing features.
- C. All video recording shall be done during times of good visibility. No video recording shall be done during periods of visible precipitation, or when more than 10% of the ground area is covered with standing water, unless otherwise authorized by County.
- D. Prior to commencement of audio-video recording, the Contractor shall notify the County in writing within 48-hours of the audio-video recording. The County may provide a designated representative to accompany and observe all video recording operations. Audio-video recording completed without a County Representative present will be unacceptable unless specifically authorized by the County.

### **3.02 AUDIO-VIDEO REQUIREMENTS**

- A. Major Locations:
  - 1. The Contractor shall provide color digital video of each major facility and structures and facilities adjacent to the Construction before construction starts.
  - 2. All videos shall be recorded with character generator operating with date, time, and location on screen. During video recording, the Contractor shall narrate video explaining what is being shown. All master videos shall be delivered to the County.



3. The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views of all visible house and business addresses shall be used. In areas where the proposed construction location will not be readily apparent to the video recording viewer, highly visible yellow flags shall be placed, by the Contractor, in such a fashion as to clearly indicate the proposed centerline of Construction. When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10-feet. The camera shall be firmly mounted such that transport of the camera during the recording process will not cause an unsteady picture.
4. All video recording shall be done during time of good visibility. No video recording shall be done during precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.
5. The average rate of travel during a particular segment of coverage shall be directly proportional to the number, size and value of the surface features within that construction area's zone of influence. The rate of speed in the general direction of travel of the vehicle used during taping shall not exceed 44-feet per minute.

### 3.03 PHOTOGRAPHS

- A. A minimum of 3 views (top, upstream, and downstream) each shall generally be taken prior to backfilling pipelines or structures. Photographs shall be provided for:
  1. Utility conflicts/relocations
  2. Manholes
  3. Pump stations
  4. Boring and jacking
  5. Directional drilling pipe entrance and exit
  6. Valve installation
  7. Air release valve installation
  8. Fire hydrant assembly
- B. Photo Identification
  1. Name of Project
  2. Name of Structure
  3. Orientation of View
  4. Date & Time of Exposure
  5. Film numbered identification of exposure

END OF SECTION

**SECTION 01400**  
**QUALITY CONTROL**

**PART 1 - GENERAL**

**1.01 SITE INVESTIGATION AND CONTROL**

- A. Contractor shall verify all dimensions in the field and check field conditions continuously during construction. Contractor shall be solely responsible for any inaccuracies built into the Work due to Contractor's failure to comply with this requirement.
- B. Contractor shall inspect related and appurtenant Work and report in writing to County any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at Contractor's sole cost and expense.

**1.02 INSPECTION OF THE WORK**

- A. The Work shall be conducted under the general observation of representatives of the County acting on behalf of the County to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The County shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated. Inspection by the County are in addition to the inspections required of Contractor by his QC Representatives.
- B. The presence of the County, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the County. Further, no requirement of this Contract may be waived or modified except by change order or formal (written) substitution approval.
- C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the County. No Work shall be backfilled, buried, cast in concrete, hidden, or otherwise covered until it has been inspected. Any Work so covered in the absence of inspection shall be subject to uncovering. Where uninspected Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection and no additional payment will be allowed therefore.

- D. The Contractor is responsible for the Quality of his own work and shall designate a qualified individual, to be approved by the County, who will ensure that all work is performed in strict accordance with the Contract Documents. This quality representative shall inspect the work for the Contractor and provide to the County and the Contractor a report outlining all work accomplished, all inspections, and all testing performed for all days when work is performed. The objective of this report is to provide "Objective Evidence of Compliance" by the Contractor with the requirements of the Contract.

#### 1.03 TIME OF INSPECTION AND TESTS

- A. Samples and testing required under these Specifications shall be furnished and prepared in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the Contractor and all costs therefore will be borne by the Contractor at no cost to the County. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under this Contract, the County shall be notified not less than 24-hours in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the County at least 24-hours in advance of any such inspections shall be reasonable cause for the County to order a sufficient delay in the Contractor's schedule to allow time for such inspection, any remedial, or corrective work required, and all costs of such delays, including its impact on other portions of the Work, shall be borne by the Contractor.

#### 1.04 SAMPLING AND TESTING

- A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered. However, the County reserves the right to use any generally accepted system of inspection which, in the opinion of the County, will ensure the County that the quality of the workmanship is in full accord with the Contract Documents.
- B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the County shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the Work to meet any of the qualitative requirements of the Contract Documents, shall be reasonable cause for the County to require the removal or correction and reconstruction of any such Work.

- D. In addition to any other inspection or quality assurance provisions that may be specified, the County shall have the right to independently select, test, and analyze, at the expense of the County, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed provided that wherever any portion of the Work is discovered, as a result of such independent testing or investigation by the County which fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such Work shall be borne by the Contractor.

#### 1.05 RIGHT OF REJECTION

- A. The County shall have the right at all times and places to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the County or inspector, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected by County.
- B. Contractor shall promptly remove rejected articles or materials from the site of the Work after notification or rejection.
- C. All costs of removal and replacement of rejected articles or materials, as specified herein, shall be borne by the Contractor.
- D. If the Contractor fails to remove or replace defective work after notification to do so, the County may have the work removed and replaced by others and deduct all costs from the Contractor's pay requests.

#### 1.06 TESTING LABS

- A. All geotechnical testing laboratory services for field testing will be paid by the County. The lab(s) shall function as independent lab(s) and report independently to the County and the Contractor. The test lab(s) may not approve or allow any deviation from the Contract Documents.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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**SECTION 01410**  
**TESTING AND TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

A. Scope of Work:

1. County will employ and pay for services of an Independent Testing Laboratory to perform Testing specifically indicated on the Contract Documents or specified in the Specifications and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.
2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
3. Employment of laboratory by County shall in no way relieve Contractor's obligations to perform the Work.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.
2. Respective section of Specifications: Certification of products.
3. Each Specification section listed: Laboratory tests required and standards for testing.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with County's personnel; provide access to work and manufacturer's operations.
- B. Secure and deliver to the County adequate representational samples of materials proposed to be used and which require testing.
- C. Provide to the County the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. The County may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the County shall be allowed on account of such testing and certification.
- E. Contractor shall not have direct contact with laboratory or laboratory personnel. All testing shall be coordinated through County.
- F. Furnish incidental labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at the Project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

G. Notify County sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse County for laboratory personnel and travel expenses incurred.. The following field testing schedule summarizes the responsibilities of various tests that may be required by the Contract Documents.

<b>TEST</b>	<b>NOTES</b>	<b>PAID FOR</b>
Soil Compaction	A. Pipe Work: Every 300 ft. at each lift of compaction B. Structures: As a minimum one test per 2000 SF of fill area per lift, or at least 2 tests per structure, per lift. As specified in material specifications sections	County
Low Pressure Air Exfiltration	Each section of gravity sewer pipe between manholes or lift station	Contractor
Hydrostatic Pressure	All segments of pressure piping (24-hour test).	Contractor
Hydrostatic Leakage	All segments of pressure piping (2-hour test).	Contractor
Bacteriological	As required by local and state agencies	County
Asphaltic Concrete Paving	As required by County	County
LBR	Each 600 SY of pavement	County
Concrete	Slump test each delivery, cylinders every 20 CY	County
Asbestos	Environmental testing of materials	County
All Other Testing	As specified in various sections of the Project Manual	As Indicated

H. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

I. If the test results indicate the material or equipment complies with the Contract Documents, the County shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall pay for the laboratory costs directly to the County or the total costs shall be deducted from any payments due to the Contractor.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01516**  
**COLLECTION SYSTEM BYPASS**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. The Work covered by this section consists of providing all temporary bypassing to perform all operations in connection with the flow of wastewater around pipe segment(s) or pump stations. The purpose of bypassing is to prevent wastewater overflows and provide continuous service to all wastewater customers. The Contractor will maintain wastewater flow in the construction area in order to prevent backup and/or overflow and provide reliable wastewater service to the users of the wastewater system at all times.

1.02 SUBMITTALS

- A. Prior to implementation of any bypass, the Contractor will submit and receive County acceptance of a bypass plan. The Contractor will submit to the County a comprehensive written plan for approval and acceptance that describes the intended bypass for the maintenance of flows during construction. The Contractor will also provide a sketch showing the location of bypass pumping equipment for each pump station or line segment(s) around which flows are being bypassed. The plan will include proposed tanker(s), pump(s), bypass piping, backup plan and equipment, work schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation, and maintenance of traffic plan.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. The Contractor will provide and maintain adequate equipment, piping, tankers, and other necessary appurtenances in order to maintain continuous and reliable wastewater service in all wastewater lines as required for construction. The Contractor will have tankers, backup pump(s), piping, and appurtenances ready to deploy immediately.
- B. All piping will be designed to withstand at least twice the maximum system pressure or a minimum of 50-psi, whichever is greater.
- C. When bypassing a pump station, 1 back-up pump equal to the primary unit will be provided by the Contractor. Bypass pumps must comply with sound requirements.



## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall have all materials, equipment and labor necessary to complete the repair, replacement, or rehabilitation on the job site prior to isolating the gravity main segment, manhole, or pump station. The Contractor will demonstrate that the temporary bypass pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24-hours prior to beginning the Work.

### **3.02 TRAFFIC CONSIDERATIONS**

- A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways, and alleys, to include the possible temporary trenching of piping at critical intersections. Additional traffic maintenance requirements are found in Section 01570 "Maintenance of Traffic".

### **3.03 BYPASS OPERATION**

The County shall accept the bypass plan prior to implementation of the bypass operation. Contractor will plug off and pump down the sewer manhole or line segment in the immediate work area and will maintain the wastewater system so that surcharging does not occur. A successful 3-day test period shall be performed during normal County workdays (no weekend).

- A. Where Work requires the line to be blocked after normal working hours and bypass pumping is being used, the Contractor shall be responsible for monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic monitoring in lieu of on-site monitoring must be detailed in the comprehensive written plan and approved by the County.
- B. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. The Contractor will complete the Work as quickly as possible and satisfactorily pass all tests, inspections, repair all deficiencies prior to discontinuing bypassing operations, and returning flow to the sewer manhole or line segment.
- C. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system.
- D. The Contractor shall immediately notify the County should a sanitary sewer overflow occur and take the necessary action to clean up and disinfect the spillage to the satisfaction of the County or other governmental agency. If sewage is spilled onto public or private property, the Contractor will wash down, clean up and disinfect the spillage to the satisfaction of the County and or other governmental agencies.

- E. When bypassing a pump station, 1 back-up pump equal to the primary unit shall be required. Bypass pumps shall have a maximum rating of 55 decibels for sound attenuation.
- F. The Contractor shall cease bypass operations and return flows to the new and/or existing sewer when directed by the County. When bypass operations are complete, all bypass piping shall be drained into the wastewater system prior to disassembly.

#### 3.04 CONTRACTOR LIABILITY

- A. The Contractor shall be responsible for all required pumping, equipment, piping, and appurtenances to accomplish the bypass and for any and all damage that results directly or indirectly from the bypass pumping equipment, piping and/or appurtenances. The Contractor shall also be liable for all County personnel labor and equipment costs, penalties and fines resulting from sanitary sewer overflows. It is the intent of these specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

END OF SECTION

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**SECTION 01560**  
**EROSION AND SEDIMENTATION CONTROL**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary to protect the Work and prevent sedimentation from the Contractor's activities from entering water bodies or enter other parts of the County's or other property owners sites outside the Construction limits.
- B. Temporary erosion controls include, but are not limited to; grassing, mulching, netting, watering and reseeded on-site surfaces and soil and borrow area surfaces, and providing interceptor ditches at end of berms and at those locations which will ensure that erosion during Construction will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.
- C. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.

1.02 REQUIREMENTS

- A. The Contractor is responsible for providing effective temporary erosion and sediment control measures during Construction or until final controls become effective.
- B. The Contractor shall be responsible for filing Notice of Intent for Construction Activities with regulatory agencies (SJRWMD, SFWMD, and FDEP) as required by law, if thresholds are expected to be exceeded.
- C. The areas of unstabilized soil cover shall be minimized at all times to limit erosion and sedimentation.

1.03 SUBMITTALS:

- A. The Contractor shall prepare and submit an Erosion and Sedimentation Control Plan (Stormwater Pollution Prevention Plan) for County review and approval. The Plan shall be in effect throughout the Construction duration.

## **PART 2 - PRODUCTS**

### **2.01 EROSION CONTROL**

- A. Seed: Scarified Argentine Bahia.
- B. Sod: Bermuda grass, Argentine Bahia grass, Pensacola Bahia grass or St. Augustine. Grassing and Sodding Materials: As specified in Section 981 FDOT Specification for Road & Bridge Construction.
- C. Netting: Polypropylene mesh netting 5/8-inch x 3/4-inch (16 x 19mm) mesh with interwoven curlex fibers as manufactured by American Excelsior Company or equal. Netting: Fabricated of material in conformance with Section 985 FDOT Specification for Road & Bridge Construction.

### **2.02 SEDIMENTATION CONTROL**

- A. Bales: Clean, synthetic hay type. Minimum dimensions of 14-inch by 18-inch by 36-inches at the time of placement.
- B. Netting: Fabricated of material in conformance with Section 985 FDOT Specification for Road & Bridge Construction.
- C. Sediment Control Fencing (Silt Fencing): As manufactured by American Excelsior Company or equal.
- D. Filter stone: Crushed stone conforming to Florida Department of Transportation Specifications.
- E. Concrete block: Hollow, non-load bearing type.
- F. Concrete: Exterior grade not less than 1-inch thick.
- G. Turbidity Barriers: Floating or staked as required.

## **PART 3 - EXECUTION**

### **3.01 TEMPORARY EROSION CONTROL**

- A. See Section 02578 "Solid Sodding."

### **3.02 SEDIMENTATION CONTROL**

- A. Install and maintain silt fences and dams, traps, barriers, and appurtenances as shown on the approved descriptions and working Drawings. Replace deteriorated hay bales and dislodged filter stone. Repair portions of any devices damaged at no additional expense to the County.

- B. Install all sediment control devices in a timely manner to ensure the control of sediment. At sites where exposure to sensitive areas is likely, complete installation of all sediment control devices before starting earthwork.
- C. Use approved temporary erosion control features to correct conditions that develop during Construction that were not foreseen when the Erosion and Sedimentation Control Plan was first approved.

### 3.03 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results that comply with the requirements of the Regulatory agency having jurisdiction, the County or the Professional, the Contractor shall immediately take whatever steps necessary to correct the deficiency at its own expense to protect the Work and any adjacent property to the site, as well as to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal or other water impoundments.
- B. The side slope areas with unstabilized or unprotected soil cover shall be minimized at all times to limit erosion and sedimentation.
- C. Incorporate permanent erosion control features into the Project at the earliest practical time.
- D. Remove temporary erosion and sedimentation controls when the Work is complete and in accordance with the Erosion and Sedimentation Control Plan (Stormwater Pollution Prevention Plan) and the Notice of Intent for Construction Activities filed with regulatory agencies.

### 3.04 MAINTENANCE OF EROSION AND CONTROL FEATURES

- A. Provide routine maintenance of permanent and temporary erosion control features, at no expense to the County, until the Project is complete and accepted.

END OF SECTION

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**SECTION 01570**  
**MAINTENANCE OF TRAFFIC**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

This section includes identifying safety hazards and then furnishing all necessary labor, materials, tools, and equipment including, but not limited, to signs, barricades, traffic drums, cones, flashers, construction fencing, flag persons, warning devices, temporary pavement markings, delineators, etc., to control vehicular and pedestrian traffic through and adjacent to the project area. These measures and actions shall be taken to safely maintain the accessibility of public and construction traffic by preventing potential construction hazards. This Work shall also include all costs associated with the erecting, maintaining, moving, adjusting, cleaning, relocating, and storing the materials necessary to ensure safe movement of vehicular and pedestrian traffic throughout the project area. The Contractor may request that the County approve the detouring of traffic around the Construction area if it is in the best interest of public safety and the County. Detouring shall be limited to normal construction hours and two-way traffic patterns shall be re-established at the end of each workday.

**1.02 REQUIREMENTS**

- A. Traffic planning and control for the maintenance and protection of pedestrian and vehicular traffic affected by the Contractor's Work includes, but is not limited to:
  - 1. Construction and maintenance of any necessary detour equipment and facilities.
  - 2. Providing necessary facilities for access to residences and businesses.
  - 3. Furnishing, installing, and maintenance of traffic control and safety devices (e.g. signage, barricades, barriers, message boards, etc.), and flag persons as appropriate during Construction.
  - 4. Control of water runoff, dust and any other special requirements for safe and expeditious movement of traffic.
- B. Planning, maintenance and control of traffic shall be provided at the Contractor's expense. The Contractor will bear all expense of maintaining the vehicle and pedestrian traffic throughout the work area.
- C. The Contractor will ensure all personnel involved in traffic control are properly trained and capable of communicating with the public during closures and detours. The Contractor may be required to hire off-duty uniformed police officers, in addition to flag persons, to direct and maintain traffic on heavily traveled thoroughfares on which traffic is subject to delays or detours caused by the Contractor's operations. Locations and conditions requiring such uniformed police officers shall be as directed by the County.



- D. The Contractor will remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

### 1.03 SUBMITTALS

- A. Submit at Contractor's own expense a Traffic Control Plan for approval by the County. Sequence the Work in a manner that will minimize disruption of vehicular and pedestrian access through and around the construction area.
- B. The Traffic Control Plan will detail procedures and protective measures proposed by the Contractor to provide for protection and control of traffic affected by the Work consistent with the following applicable standards:
  - 1. Standard Specifications for Road and Bridge Construction, latest edition including all subsequent supplements issued by the Florida Department of Transportation, (FDOT Spec.).
  - 2. Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations, FDOT.
  - 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- C. All references to the respective agencies in the above referenced standards shall be construed to also include the municipality as applicable for this Work.
- D. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered in the state of Florida and shall include proposed locations and time durations of the following, as applicable:
  - 1. Pedestrian and public vehicular traffic routing.
  - 2. Lane and sidewalk closures, other traffic blockage and lane restrictions and reductions anticipated to be caused by construction operations. Show and describe the proposed location, dates, hours and duration of closure, vehicular and pedestrian traffic routing and management, traffic control devices for implementing pedestrian and vehicular movement around the closures, and details of barricades.
  - 3. Location, type and method of shoring to provide lateral support to the side of an excavation or embankment parallel to an open travel-way.
  - 4. Allowable on-street parking within the immediate vicinity of worksite.
  - 5. Access to buildings immediately adjacent to worksite.
  - 6. Driveways blocked by construction operations.
  - 7. Temporary traffic control devices, temporary pavement striping and marking of streets and sidewalks affected by construction
  - 8. Temporary commercial and industrial loading and unloading zones.
  - 9. Construction vehicle reroutes, travel times, staging locations, and number and size of vehicles involved.

- E. Obtain and submit prior to erection, or otherwise impacting traffic, all required permits from all authorities having jurisdiction, including Orange County Public Works, if applicable.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

- A. The Contractor will furnish barricades, warning signs, delineators, pilot cars and other traffic control materials and equipment in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways published by the United States Government Printing Office.

### **2.02 FLAG PERSONS**

- A. All flag persons used on this Project will adhere to the following requirements:
  1. Any person acting as a flag person on this Project will have attended a training session taught by a Contractor's qualified trainer before the start date of this Contract.
  2. The Contractor's qualified trainer will have completed a "Flag person Train the Trainer Session" in the 5-years previous or before the start date of this Contract and will be on file as a qualified flag person trainer.
  3. The flag person trainer's name and Qualification Number will be furnished by the Contractor at the Pre-Construction meeting. The Contractor will provide all flag persons with the Flag Person Handbook and will observe the rules and regulations contained therein. This handbook will be in the possession of all flag person while flagging on the Project.
  4. Flag persons will not be assigned other duties while working as authorized flag persons.
  5. Any person replacing flag person for break shall have the same training.

## **PART 3 - EXECUTION**

### **3.01 NOTIFICATIONS**

- A. The Contractor will notify individual owners, owner's agents, and tenants of buildings adjacent to worksite in writing, with copies to the county, 72-hours in advance of any disruption to their access to those buildings and/or use of public ways adjacent to the buildings or prohibiting the stopping and parking of vehicles.
- B. Before closing any vehicle or pedestrian thoroughfare, the Contractor will give written notice to the County. Notice will be given no less than 72-hours in advance of the proposed closure, or as may be otherwise provided in the accepted Traffic Control Plan, so that the final approval of such closings can be obtained at least 48-hours in advance.

- C. The Contractor is responsible for notifying Fire and Ambulance Departments whenever roads are impassable.
- D. The Contractor will immediately notify the County of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the Project.

### 3.02 GENERAL TRAFFIC CONTROL

- A. The Contractor will sequence and plan construction operations and will generally conduct Work in such a manner as not to unduly or unnecessarily restrict or impede normal traffic.
- B. Unless otherwise provided, all roads within the limits of the Work will be kept open to all traffic by the Contractor. The Contractor will keep the portion of the project being used by public traffic, whether it is through or local traffic, in such condition that traffic will be adequately accommodated.
- C. The Contractor will be responsible for installation and maintenance of all traffic control devices and requirements for the duration of the construction period. Necessary precautions for traffic control will include, but not be limited to, warning signs, signals, lighting devices, markings, barricades, canalizations and hand signaling devices.
- D. The Contractor will provide and maintain in a safe condition temporary approaches or crossings and intersections with trails, roads, streets, businesses, parking lots, residences, garages and farms.
- E. The Contractor will provide emergency access to all residences and businesses at all times. Residential and business access will be restored and maintained at all times outside of the Contractor's normal working hours.
- F. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a combination thereof. Alternating one-way traffic may be utilized and limited to a maximum length of 500-feet during construction hours. Lane width for alternating one-way traffic will be kept to a minimum width of 10-feet, or as directed by the County.
- G. Travel lanes and pedestrian passways will be drained and kept reasonably smooth, and in a suitable condition at all times in order to provide minimum interference to traffic consistent with the prosecution of the Work.
- H. The Contractor will make provisions at all "open cut" street crossings to allow for free passage of vehicles and pedestrians, either by bridging or other temporary crossing structures. Such structures will be of adequate strength and proper construction and will be maintained by the Contractor in such a manner as not to constitute an undue traffic hazard.

- I. The Contractor will keep all signs in proper position, clean, and legible at all times. Care will be taken so that weeds, shrubbery, construction materials, equipment, and soil are not allowed to obscure any sign, light, or barricade. Signs that do not apply to construction conditions should be removed or adjusted so that the legend is not visible to approaching traffic.
- J. The County may determine the need for, and extent of, additional striping removal and restriping.
- K. Excavated material, spoil banks, construction materials, equipment and supplies will not be located in such a manner as to obstruct traffic, as practicable. The Contractor will immediately remove from the site all demolition material, exercising such precaution as may be directed by the County. All material excavated shall be disposed of so as to minimize traffic and pedestrian inconvenience and to prevent damage to adjacent property.
- L. During any suspension, the Contractor will make passable and open to traffic such portions of the Project and/or temporally roadways as directed by the County for accommodation of traffic during the anticipated period of suspension. Passable conditions will be maintained until issuance of an order for the resumption of construction operations. When Work is resumed, the Contractor will replace or renew any Work or materials lost or damaged because of such temporary use in every respect as though its prosecution had been continuous and without interferences.

### 3.03 TEMPORARY SHORING

- A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side of an excavation or embankment parallel to an open travel-way. Provide shoring when a theoretical 2:1 or steeper slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5-feet (1.5 m) from the edge of pavement of the open travel-way.
- B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary to maintain traffic at locations shown on the Traffic Control Plan and other locations determined during construction.

END OF SECTION

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**SECTION 01580**  
**PROJECT IDENTIFICATION AND SIGNS**

**PART 1 - GENERAL**

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish, install, and maintain all sign materials including sign posts, weighted stands, brackets, any required mounting hardware, and miscellaneous materials required for temporary signs for the purpose of:
  - 1. Project Identification.
  - 2. Informational signs to direct traffic
  - 3. On-site safety signs as appropriate for the Work
- B. Remove temporary signs on completion of Construction prior to obtaining Certificate of Occupancy and Substantial Completion.
- C. Allow no other signs to be displayed without written approval of the County.

1.02 SUBMITTALS

- A. Submit complete Shop Drawings identifying locations, material, layout, sign content, font type and size, and sample colors. Make sign and lettering to scale, clearly indicating condensed lettering if used. The sign details will be submitted to the County for approval prior to fabrication.
- B. Submit method of erection to include materials, fasteners, and other items to assure compliance with the requirements for wind pressures as required by the authorities having jurisdiction.
- C. Submit signs in accordance with any details provided in the Drawings.
- D. Prior to erection obtain and submit all required permits from the authorities having jurisdiction.

1.03 PROJECT IDENTIFICATION SIGN

- A. Provide 1 painted sign at the site, or at each end of the Work if a linear project, or at each of the separate sites of Work, if applicable. The sign will be not less than 32-square feet area, with a minimum dimension of 4-feet and painted graphics with content to include:
  - 1. Title of Project
  - 2. Orange County Government name and logo
  - 3. Names and titles of the Board of County Commissioners, County Administrator, Director of Orange County Utilities Department, the Consulting Engineer, and the Contractor

- B. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the County. The sign must be located 5-feet from all rights-of-way and 20-feet from all property lines.

#### 1.04 INFORMATIONAL SIGNS

- A. All signs and other traffic control devices shall conform to the requirements for shape, color, size, and location as specified in the latest Manual on Uniform Traffic Control and Safe Streets and Highways and the Florida Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations. Information as to the above may be obtained from FDOT Division engineers.

### **PART 2 - PRODUCTS**

#### 2.01 SIGN MATERIALS

- A. Structure and Framing: New construction grade lumber, structurally adequate and suitable for exterior application and specified finish.
- B. Sign Panels: New A-B Grade, exterior type, APA DF plywood with inset hardwood edges and mitered corners, standard large sizes to minimize joints.
  - 1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles, minimum 3/4-inch.
- C. Rough Hardware: Galvanized steel, of sizes and types to enable sign assemblies to resist wind pressures as required by the authorities having jurisdiction but not less than a wind velocity of 50-mph.
  - 1. Use minimum 1/2-inch diameter button head carriage bolts to fasten sign panels to supporting structures. Bolt heads to be painted to match sign face.
- D. Paint: Exterior quality, as specified in Division 9 or as a minimum as specified herein.
  - 1. Primer and finish coat: exterior, semi-gloss, alkyd enamel.
  - 2. Colors for structure, framing, sign surfaces, and graphics: As shown on the Drawings or as selected by the County.
- E. Safety Sign Number Tags
  - 1. Removable aluminum or galvanized steel, with 4-inch high, blue numerals and steel tag hooks.

### **PART 3 - EXECUTION**

#### 3.01 PROJECT IDENTIFICATION SIGN

- A. Install project identification signs within 10-days of the Notice to Proceed date. Failure to erect the signs may be reason to delay approval of the initial Application for Payment.

- B. Paint exposed surfaces of supports, framing, and surface material; one (1) coat of primer and two (2) coats of finish paint.
- C. Set signs plumb and level and solidly brace as required to prevent displacement during the Construction period. If mounted on posts, sink posts 3-feet to 4-feet below grade, leaving a minimum of 8-feet of each post above grade for mounting the sign.
- D. Install informational signs at a height for optimum visibility, on ground mounted poles or attached to temporary structural surfaces.

### 3.02 MAINTENANCE

- A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing, or sign.
- B. Relocate informational signs as required by the progress of the Work.
- C. Poorly maintained, defaced, damaged, or dirty signs shall be replaced, repaired, or cleaned without delay.
- D. Special care must be taken to ensure that construction materials and dust are not allowed to obscure the face of a sign.
- E. Signs not in effect shall be covered or removed.

### 3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at Substantial Completion of the Work.
- B. Leave areas clean and patch as required to remove any traces of temporary signs.

END OF SECTION



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**SECTION 01590**  
**CONSTRUCTION FIELD OFFICE**

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Contractor provision of temporary utilities to include electricity, lighting, internet connectivity, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Contractor provision of temporary controls to include barriers, enclosures and fencing, and water control.
- C. Contractor provision of temporary facilities to include access roads, parking, and temporary buildings.
- D. Contractor provision of field offices for the County.
- E. Restrictions on the use of existing adjacent facilities.

1.02 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required for Construction and testing from local utility source.
- B. Provide temporary electric feeder from existing electrical service at location as directed by utility company. Power consumption will not disrupt the County's need for continuous service. Coordinate with the County before making taps or disturbing existing service.
- C. Provide separate metering and pay for cost of energy used until substantial completion. If electric service is turned over to and paid for by the County prior to substantial completion, reimburse the County for energy used up to substantial completion.
- D. Provide power outlets for Construction operations, with branch wiring and distribution boxes located as required. Provide OSHA approved flexible power cords as required.
- E. Contractor-installed permanent convenience receptacles may be used during Construction.

1.03 TEMPORARY LIGHTING

- A. Provide and maintain adequate lighting for Construction operations to achieve a minimum lighting level of one (1) watt/sq ft.
- B. Provide and maintain two (2) foot-candle lighting to exterior staging and storage areas after dark for security purposes.

- C. Provide and maintain 0.25-watt/sq ft H.I.D. lighting to interior Work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be used during Construction.

#### 1.04 TEMPORARY HEAT AND COOLING

- A. Provide and pay for heating and cooling as required to maintain specified conditions for Construction operations or as required for proper conduct of operations included in the Work.
- B. Prior to operation of permanent equipment for temporary purposes, verify that installation is approved for operation, equipment is lubricated and temporary filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- C. Maintain minimum ambient temperature of 50°F and maximum relative humidity of 50% in areas where Construction is closed in and final finishes are to be placed, unless indicated otherwise in specifications.

#### 1.05 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

#### 1.06 TEMPORARY WATER SERVICE

- A. Provide, maintain, and pay for suitable quality water service required for Construction operations. Coordinate with the County if water supply is not separately metered. Pay all costs and expenses associated with such use.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

#### 1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures on-site. Maintain daily in clean and sanitary condition. Adjacent County office building toilet facilities are not to be used by Contractor.

#### 1.08 BARRIERS

- A. Provide barriers to prevent unauthorized entry to Construction areas and to protect existing facilities and adjacent properties from damage from Construction operations.

- B. Provide barricades required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

#### 1.09 FENCING

- A. Unless directed otherwise in other sections of the Contract Documents, provide a 6-foot high fence completely around Construction site; provided with hinged vehicular and pedestrian gates with locks. Fencing will be galvanized, 2-inch mesh, chain link with solid top rail. Provide line posts and end posts as needed to maintain stretched and uniform fencing with no sags.
- B. Fencing plan will be approved by the County for each phase of the project. Submit fencing layout diagram prior to the Pre-Construction meeting.
- C. Provide visual fabric barrier at least 6-foot high on all fencing separating parking areas from Construction activities. Submit barrier fabric for approval before starting fencing. Barrier fabric will be capable of retaining physical integrity and color during the entire Construction period.

#### 1.10 ACCESS ROADS

- A. Provide and maintain uninterrupted public access to existing buildings. Construction activities will not interfere with access. If Contractor fails to maintain public access after 2 written notices within a 24-hour period, the County reserves the right to correct such situation and back charge the Contractor.
- B. Construct and maintain temporary roads accessing public thoroughfares to serve Construction area.
- C. Extend and relocate access roads as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- D. Provide and maintain access to fire hydrants, free of obstructions.
- E. Designated existing on-site roads may be used for Construction traffic. Repair or restore any damaged areas caused as a result of Construction activity. Such repair will be to a like-new condition.

#### 1.11 PARKING

- A. Provide temporary surface parking areas to accommodate Construction personnel.
- B. Do not allow Construction vehicle parking on existing pavement unless approved by County.

## 1.12 FIELD OFFICES (FOR UTILITIES DEPARTMENT)

- A. Promptly after starting Work, the Contractor will provide and maintain 1 field office for the use of the County until Substantial Completion.
- B. The field offices will be an appropriate size required for the use of the County, as well as contain two offices and three desks. The field office structure will be a minimum of 10-feet x 40-feet. The layout of the County's field office will include adequate space to hold project meetings (minimum seating for 15).
- C. Installation of the field offices will meet all local codes and ordinances. The Contractor will as a minimum install the structures on a level, well-drained area. Structures will be designed and installed to resist 130-mph winds or applicable State of Florida code, whichever is more stringent.
- D. The field offices will be provided with structurally sound and safe steps and landings for each door. The doors will have secure locks. Construct appropriate walkway and landings. Construct covers over each door that extends 3-feet from the building and the full width of the landing.
- E. The field offices will be designated as a "No Smoking Area."
- F. The windows will be arranged for cross ventilation with screens.
- G. Provide air conditioning and heating systems with thermostat control.
- H. Provide electric power for the duration of the Work.
- I. The Contractor will provide the following with the field office, at a minimum:
  - 1. Electric lights (fifty (50) foot-candles at desktop height) and power supply outlets.
  - 2. When available, provide high-speed Internet access to all desks for the duration of the Work.
  - 3. Acceptable toilet facilities with appropriate signage that meet all of the local and State health codes and regulations.
  - 4. Fire extinguisher (Halon type, minimum 4 lb. capacity).
  - 5. Water coolers, bottled water and paper cups.
  - 6. Tables for viewing the Project Drawings.
  - 7. Standard office supplies.
  - 8. Weekly janitorial services.

## 1.13 SPECIFIC REQUIREMENTS FOR THE FIELD OFFICES

Provide the following for the exclusive use of the County: (Unless otherwise noted, the quantity should be sufficient for the duration of the Work.)

- A. Office Furnishings: The furniture will be delivered and placed as directed by the County.
- B. Desks: Flat top, double pedestal, with one box and one file drawer in each pedestal, 60-inches by 30-inches. Total quantity will be three (3).

- C. Chairs: Three (3) office-type chairs, adjustable heights, on rollers, with armrests.
- D. Conference Table and Chairs: One (1) table (3-feet by 8-feet minimum), scratch and stain resistant and 15 meeting-type chairs.
- E. Drawing Table: Two (2) plywood or standard drawing tables, 3-feet by 6-feet, with all required appurtenances and 2 extended height stools suitable for use at the drawing tables.
- F. Printer: One(1) - All in one color inkjet printer capable of printing, scanning and coping Ledger, Legal and Letter sizes. Standard interfaces shall include Hi-Speed USB 2.0, Wireless (802.11b/g/n), Ethernet. Minimum requirements include: 35 page automatic document feeder, printing 20 color copies per minute at 6000 x 1200 dpi resolution, scan resolution 2400 x 2400 dpi, flat bed document glass size Ledger (11" x 17") with standalone copy features, minimum of 250 sheet input capacity cassettes and 2 additional complete set of ink cartridges. Brother MFC-J6710DW or equal. Printers to be retained by the County.. All warranties, maintenance, servicing and sufficient appropriate ink/toner cartridges and paper for the duration of the Work.
- G. One (1) each refrigerator, microwave, coffee machine, and toaster oven.
  - 1. Provide Internet connection in each of the four offices in the field trailer. The connection shall be at least 5.0 Mbps of download speed or greater. Provide office with a wireless network 802.11 n with minimum of 8 concurrent users in addition to the network requirements. Wireless network shall allow additional portable computers to gain internet access within the office.
- H. File Cabinets, Storage, Bookcases:
  - 1. Three (3) Lateral Files: HON 600 Series, or equal, 42-inch wide, four-drawer.
  - 2. Two (2) steel vertical, hanging mobile plan stands, with approximately 12-hanging clamps. Provide all required clamps, of sufficient length to hold the Contract Drawings.
  - 3. Storage: Two (2) industrial grade steel cabinets, locking handles, 36-inches wide by 18-inches deep by 72-inches high.
  - 4. Bookcases: Three (3) HON metal bookcases, or equal, 34-1/2-inches wide by 12-5/8-inches deep by 71-inches high, color to be selected by the Engineer.
- I. Miscellaneous Field Supplies:
  - 1. One (1) minimum/maximum digital thermometer, with batteries for the duration of the Work.
  - 2. One (1) rain gauge.

#### 1.14 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove all temporary utilities, equipment, facilities, and materials prior to submitting Final Application for Payment.
- B. Remove temporary underground installations to minimum depth of 2-feet and re-grade site.
- C. Clean and repair damage caused by installation or use of temporary Work.

- D. Restore any existing facilities used during Construction to original condition, unless otherwise directed in other sections of Contract Documents. Restore existing landscaping, drainage, paving, etc. to an "as-was" condition, unless otherwise directed in other sections of Contract Documents.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01700**  
**PROJECT CLOSEOUT**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

The term "Project Closeout" is defined to include requirements near the end of the Contract Time, in preparation for Substantial Completion acceptance, occupancy by the County, release of retainage, final acceptance, final payment, and similar actions evidencing completion of the Work. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single period for the entire Work or a series of time periods for individual elements of Work that has been certified as substantially complete at different dates. This time variation, if any, will be applicable to the other provisions of this section.

**1.02 SCOPE OF WORK**

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Final Cleaning
  - 2. Substantial Completion
  - 3. Final Acceptance

**1.03 RELATED WORK**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.
- C. Section 01720 "Project Record Documents"
- D. Section 01740 "Warranties and Bonds"

**1.04 PREREQUISITES FOR SUBSTANTIAL COMPLETION.**

When the Contractor considers the Work as substantially complete, submit to the County a written notice stating so and requesting an inspection to determine the status of completion. The Contractor will attach to the notice a list of items known to be incomplete or yet to be corrected. Complete the following before requesting the County's inspection for certification of substantial completion.



- A. In the progress payment request that coincides with or is the first request following, the date substantial completion is claimed, show 100% completion or list incomplete items, the value of incomplete Work, and reasons for the Work being incomplete. Inspection procedures include supporting documentation for completion as indicated in these Contract Documents.
- B. Submit a statement showing an accounting of changes to the Contract Sum.
- C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents in accordance with Section 01740 "Warranties and Bonds."
- D. Obtain and submit lien releases enabling the County's full, unrestricted use of the Work and access to services and utilities.
- E. Consult with County before submitting Record Documents in accordance with Section 01720 "Project Record Documents."
- F. Submit Operation and Maintenance Manuals.
- G. Make final changeover of permanent locks. Submit keys and keying schedule.
- H. Deliver tools, spare parts, extra stock, and similar items.
- I. Complete final cleaning requirements necessary for Substantial Completion.

#### 1.05 FINAL CLEANING.

Complete the following cleaning operations prior to Substantial Completion or Owner occupancy.

- A. Remove from job site all tools, surplus materials, construction equipment, storage sheds, debris, waste and temporary services.
- B. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- C. Structures:
  - 1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
  - 2. Remove all traces of splashed materials from adjacent surfaces.
  - 3. Ensure exterior surfaces have a uniform degree of cleanliness.
  - 4. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
  - 5. Remove paint droppings, spots, stains and dirt from finished surfaces.
  - 6. Remove labels that are not permanent labels.
  - 7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

8. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
9. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
10. Clean permanent filters of ventilating systems and replace disposable filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

#### 1.06 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor will submit the proposed format, content and tab structure for all Operating and Maintenance Manuals for the County's review and approval. The tab structure for Operating and Maintenance Manuals will follow specification division format as accepted by the Construction Specification Institute. After the County approves the proposed format, content, and tab structure for the Operating and Maintenance Manuals, the Contractor will create and deliver 5 complete sets.
- B. Operation and Maintenance documentation is required for each piece of mechanical, electrical, communications, instrumentation and controls, pneumatic, hydraulic, conveyance, and special construction. If required by the technical specifications, provide Operation and Maintenance documentation for any other product not listed in the foregoing.
- C. The requirements of this Section are separate, distinct and in addition to product submittal requirements that may be established by other Sections of the Specifications. Owner's manuals, manufacturer's printed instructions, parts lists, test data and other submittals required by other Sections of the Specifications may be included in the Operating and Maintenance Manuals provided that they are approved and are formatted in a manner consistent with the requirements of this Section.
- D. Deliver Operation and Maintenance Manuals directly to the County.
- E. Operating and Maintenance Manual documents must include, but are not limited to, table of contents, approved submittals, manufacturer's operating and maintenance instructions, brochures, Shop Drawings, performance curves and data sheets annotated to indicate equipment actually furnished (e.g. identifying impeller size, model, horsepower, etc), procedures, wiring and control diagrams, records of factory and field tests and device/controller settings and calibration, program lists or data compact discs, maintenance and warranty terms and contact information, spare parts listings, inspection procedures, emergency instructions, and other Operating and Maintenance documentation that may be useful to the County. The material and equipment data required by this Section must include all data necessary for the proper installation, removal, normal operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment, calibration, lubrication, assembly, disassembly, repair, inspection, trouble-shooting, and warranty service of the equipment or materials.

- F. The Contractor must bind the Operating and Maintenance Manual documents in heavy-duty, 3-ring vinyl-covered binders including pocket folders for folded sheet information. Mark binder identification on both the front and spine of each binder. Binder information must list the project title, identify separate structures or locations as applicable, identify the general subject matter covered in the manual and must include the words "OPERATING AND MAINTENANCE INSTRUCTIONS".
  - 1. The Contractor must submit the Operating and Maintenance documents on three-hole punched, 8-1/2-inch x 11-inch sheets or on three-hole punched sheets that are foldable in multiples of 8-1/2-inch x 11-inch. The three-hole punched edge will be the left 11-inch edge.
  - 2. The Contractor may request waivers to the size requirement for specific instances. The Contractor's waiver request must be in writing to the County. The Contractor's waiver request must include a justification for seeking the waiver.
  
- G. The Contractor must provide an electronic version of the complete and final Operating and Maintenance Manuals in original electronic file format on compact disc or DVD. The Contractor must also provide one (1) electronic pdf file of each bound Operating and Maintenance Manual that represents each Manual's content. The electronic pdf file must match the Operating and Maintenance Manual content and organizational structure.

#### 1.07 SUBSTANTIAL COMPLETION INSPECTION PROCEDURES

- A. Upon receipt of the Contractor's request for inspection, the County will either proceed with inspection or advise the Contractor of incomplete prerequisites.
  
- B. Following the initial inspection, the County will either prepare the certificate of Substantial Completion, or advise the Contractor of Work which must be performed before the certificate will be issued. The County will repeat the inspection when requested in writing and when assured that the Work has been substantially completed.
  
- C. Results of the completed inspection will form the initial "punch list" for final acceptance.

#### 1.08 PREREQUISITES FOR FINAL ACCEPTANCE.

Complete the following before requesting the County's final inspection for certification of final acceptance, and final payment. List known exceptions, if any, in the request.

- A. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates for insurance for products and completed operations where required.
  
- B. Submit written certification that:
  - 1. The County's final punch list of itemized Work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
  - 2. The Contract Documents have been reviewed and Work has been completed in accordance with Contract Documents.

3. Equipment and systems have been tested in the presence of the County and are operational.
4. Work is completed and ready for final inspection.

C. Submit consent of surety.

D. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

#### 1.09 FINAL ACCEPTANCE INSPECTION PROCEDURES

A. The County will re-inspect the Work upon receipt of the Contractor's written notice that the Work, including punch list items resulting from earlier inspections, has been completed, except for those items for which completion has been delayed because of circumstances that are acceptable to the County.

B. Upon completion of re-inspection, the County will either prepare a certificate of final acceptance or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, which are required for final acceptance.

C. If necessary, the re-inspection procedure will be repeated.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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**SECTION 01720**  
**PROJECT RECORD DOCUMENTS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. The purpose of the Project Record Documents is to provide the County with factual information regarding all aspects of the Work, both concealed and visible.
- B. To insure the Work was constructed in conformance with the Contract Drawings, the following survey documents are required to be prepared and certified by a Surveyor as per Spec Section 01050 Surveying and Field Engineering:
  - 1. Asset Attribute Data Form
  - 2. Pipe Deflection Table
  - 3. Gravity Main Data
  - 4. Boundary Survey and Survey Map Report for pump stations and easements with constructed improvements

The Asset Attribute Data and Pipe Deflection Table forms can be found on the County's web site:

<http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx>

1.02 DEFINITIONS

- A. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.
- B. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

1.03 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of the Record Documents to one person on the Contractor's staff as approved by the County.
- B. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of Drawings and other documents where such entry is required to show progress and changes properly.
- C. Make entries within 24-hours after receipt of information has occurred.

## 1.04 RECORD DOCUMENTS AT SITE

- A. Maintain at the site and always available for County's use one (1) record copy of:
  - 1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
  - 2. Change Orders, Verbal Orders, and other modifications to Contract
  - 3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs)
  - 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests
  - 5. Field test records, inspection certificates, manufacturer certificates and construction photographs
  - 6. Paper copies of the Progressive As-Built Drawings
  - 7. Current Surveyor's tables for the Assets Attribute Data, Pipe Deflection Data, and Gravity Main Data
- B. Maintain the documents in an organized, clean, dry, legible condition and protected from deterioration, loss and damage until completion of the Work, transfer of all record data to the final As-built Drawings for submittal to the County.
- C. Store As-Built Documents and samples in Contractor's office apart from documents used for construction. Do not use As-Built document for construction purposes. Label each document "AS-BUILT" in neat large printed letters. File documents and samples in accordance with CSI/CSC format.
- D. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded.

## PART 2 - PRODUCTS

### 2.01 AS-BUILT SURVEY DRAWINGS

- A. Maintain the electronic As-Built Drawings to accurately record progress of Work and change orders throughout the duration of the Contract.
- B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.
- C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected or other means. In the event of overlapping changes, use different colors for entries of the overlapping changes.
- D. Design call-outs shall have a thin strike line through the design call-out and all As-Built information must be labeled (or abbreviated "AB") and be shown in a bolder text that is completely legible.
- E. Entries shall consist of graphical representations, plan view and profiles, written comments, dimensions, State Plane Coordinates, details and any other information as required to document field and other changes of the actual Work completed. As a

minimum, make entries to also record:

1. Depths of various elements of foundation in relation to finish floor datum and State Plane Coordinates and elevations.
2. As-Built Asset Attribute Data tables shall be completed in the Drawings.
3. When electrical boxes, or underground conduits and plumbing are involved as part of the Work, record true elevations and locations, dimensions between boxes.
4. Actually installed pipe or other work materials, class, pressure-rating, diameter, size, specifications, etc. Similar information for other encountered underground utilities, not installed by Contractor, their owner and actual location if different than shown in the Contract Documents.
5. Details, not on original Contract Drawings, as needed to show the actual location of the Work completed in a manner that allows the County to find it in the future.
6. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar items shown schematically on the construction documents and show on the As-Built Drawings the actual horizontal and vertical alignments and locations.
7. Major architectural and structural changes including relocation of doors, windows, etc. Architectural schedule changes according to Contractor's records and Shop Drawings.

## 2.02 RECORD DOCUMENTS

- A. Three (3) paper copy sets and three (3) digital media sets of the following final Record Documents below.
  1. The following documents shall be signed and sealed by the Surveyor:
    - a. As-built survey drawings as previously described in paragraph 2.01.
    - b. As-built Asset Attribute Data (see Specification Section 01050 "Surveying and Field Engineering," Table 01050-2 for an example)
    - c. Boundary Survey on a 8 1/2"x11" format of fee simple and/or permanent easement sites for pump stations, treatment facilities, etc.. As a minimum the Boundary Survey shall show all above ground and underground structures or equipment, pipe, and conduit. All property or easement corners and the center of wetwell shall be shown with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed.
    - d. Boundary Survey on a 8 1/2"x11" format for Work related to constructed pipes within any permanent easements. As a minimum the Boundary Survey shall show the location of the pipe centerline and property corners with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed within the easements.
    - e. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering", Table 01050-4 for an example)
    - f. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3 for an example). An electronic blank table will be supplied by the County.
  2. Provide an encompassing digital AutoCAD file in the Engineer's current version of AutoCAD and the file shall be saved under in the format dwg. The file includes all the information of the As-Built Survey and any other graphical information in the As-Built Drawings. It shall include the overall Work, utility system layout and associated parcel boundaries and easements. Feature point, line and polygon information for new or



altered Work and all accompanying geodetic control and survey data shall be included. The Surveyor's certified As-Built Asset Attribute Data shall be added to the As-Built Drawings.

3. Provide Scanned "As-Built" Drawing sets complete and include the title sheet, plan/profile sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-Built Drawings shall be included in the electronic drawings, with each sheet being converted into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4 at minimum of 400 dpi resolution to maintain legibility of each drawing. Then, the tif images shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set.
4. Provide Scanned Record Documents reflecting changes from the Contract Documents.

### **PART 3 - EXECUTION**

#### **3.01 FINAL RECORD DOCUMENTS SUBMITTAL**

- A. Submit the Final Record Documents within 20-days after Substantial Completion.
  1. Participate in review meetings as required and make required changes and promptly deliver the Final Record Documents to the County.

END OF SECTION

**SECTION 01740**  
**WARRANTIES AND BONDS**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 "Project Closeout."
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.

1.03 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the County.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the County.

1.04 SUBMITTALS

- A. Submit written warranties to the County prior to requesting a Substantial Completion Inspection as outlined in Section 01700 "Project Closeout." If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the County.
- B. When a designated portion of the Work is completed and occupied or used by the County, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the County within 15-days of completion of that designated portion of the Work.

- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the County for approval prior to final execution.
- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- E. Prior to Substantial Completion Inspection, submit to the County two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-1/2-inch by 11-inch three-hole punched paper.
  - 2. Table of Contents will be neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified and the name of the product or work item.
  - 3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.
  - 4. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the Contractor.
  - 5. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

#### 1.05 WARRANTY REQUIREMENT

- A. The Contractor will warrant all equipment in the Contractor's one-year warranty period even though certificates of warranty may not be required. For all major pieces of equipment, the Contractor shall submit a warranty from the equipment manufacturer. "Major" equipment is defined as a device having a 5 HP or larger motor or which lists for more than \$1,000.00.
- B. In the event that an equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at Substantial Completion, the Contractor will obtain from the manufacturer a warranty of sufficient length commencing at the time of equipment delivery to the job site, such that the warranty will extend to at least 1-year past substantial completion.
- C. If an individual specification section requires a particular warranty more stringent than that required by this Section or the General Conditions, the more stringent requirements will govern for the applicable portion of the Work.

- D. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty will be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the County has benefited from use of the Work through a portion of its anticipated useful service life.
- G. County's Recourse: Written warranties made to the County are in addition to implied warranties, and will not limit the duties, obligations, rights and remedies otherwise available under the law, nor will warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: The County reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- I. The County reserves the right to refuse to accept Work for the project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.
- J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 DELIVERABLES**

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors, and bind into a commercial quality standard 3-ring binder; submit 5 copies of the warranties and bonds to the County for review.
  - 1. The warranties and bonds shall include:
    - a. Equipment or product description
    - b. Manufacturer's name, principal, address and telephone number

- c. Contractor, name of responsible principal, address and telephone number
- d. Local supplier's or representatives name and address
- e. Scope of warranty or bond
- f. Proper procedure in case of failure
- g. Instances which might affect the validity of warranty or bond
- h. Date of beginning of warranty, bond or service and maintenance contract
- i. Duration of warranty, bond or service maintenance contract

B. Warranties

1. Furnish an extended warranty for sanitary sewer main liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the County.
2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the County.

END OF SECTION

## SECTION 02080

### ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: This section specifies the furnishing of all labor, materials, equipment, and incidentals required to abandon, remove, salvage, and/or dispose of existing pipelines and appurtenances as shown on the Drawings and as specified herein.

##### 1.02 QUALITY ASSURANCE

- A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary permits and licenses for performing the Work and shall furnish a copy of same to the County prior to commencing the Work. The Contractor shall comply with the requirements of the permits. All removal or abandonment of asbestos pipe material shall be performed by a licensed asbestos abatement Contractor or Subcontractor registered in the State of Florida.
- B. Notices: Contractor shall issue written notices of planned Work to companies or local authorities owning utility conduit, wires, or pipes running to or through the project site. Copies of said notices shall be submitted to the County.
- C. Standards:
  - 1. Florida Administrative Code, Chapter 62-204.800
  - 2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart M, latest revision
  - 3. Occupational Safety and Health Act, 29 CFR
  - 4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule
  - 5. Florida Statute 455.300
  - 6. Asbestos pipe handling best management practices provided at the end of this section
- D. Quality Control
  - 1. It shall be the responsibility of the Contractor to provide supervision and inspections to ensure that the existing piping is removed and disposed, salvaged, or abandoned as designated in the Drawings and as specified herein.
  - 2. Asbestos Pipe
    - a. All removal or abandonment of pipe material containing asbestos shall be performed by a licensed asbestos abatement Contractor or Subcontractor.

- b. The asbestos abatement Contractor or Subcontractor shall contact the Orange County Environmental Protection Division (407-836-1400) prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices as required by the Orange County Environmental Protection Division. The Contractor shall be responsible for all fees associated with permits, licenses, and notices to the governing regulatory agencies.
- c. The asbestos abatement Contractor shall perform Work in accordance with all applicable standards referenced in paragraph 1.02.C of this section.
- d. The asbestos abatement Contractor shall have experience performing asbestos removal similar to this Project.

### 1.03 SHOP DRAWINGS AND SUBMITTALS

#### A. Shop Drawings

1. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
2. Shop Drawings shall be submitted to the County for review and acceptance prior to construction in accordance with these specifications for the following:
  - a. Grout
  - b. Caps and plugs
  - c. Credentials of licensed asbestos abatement Contractor including current certification.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### 3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

- A. General: Existing piping designated on the Drawings to be removed shall be exposed and removed by the Contractor.
- B. Removal and Disposal
  1. Pipe designated to be removed shall be completely drained and the contents properly disposed. The piping system including fittings and valves shall then be completely removed from the site.
  2. Existing services and/or connections not shown on the Drawings shall be removed in accordance with this section at no additional cost. Existing live services encountered shall be maintained.
  3. Asbestos: Pipe material containing asbestos shall be removed and disposed by a licensed asbestos abatement Contractor or Subcontractor.

4. Structures shall be removed in accordance with Section 02050 "Demolition of Existing Structures."

C. Removal of material to be salvaged

1. Pipe designated on the Drawings to be removed and salvaged shall be completely drained and the contents properly disposed. The pipe shall then be thoroughly pressure washed, palletized on wooden skids to a dimension not exceeding the recommendation of the manufacturer, and conveyed to the County at the location designated by the County.
2. Items to be salvaged:
  - a. Air release valves
  - b. Sanitary manhole rings and covers
  - c. Isolation valves
  - d. Valve boxes
  - e. Fire hydrant and valve assemblies

D. Abandonment

1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in place, drained, and its contents properly disposed. Pipe requires end caps or plugs. All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole rings and covers shall be removed and disposed of or salvaged as specified above.
2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with grout and each end of the pipe shall be plugged in a manner acceptable to the County.
3. Grout: Where designated on the Drawings, pipe to be abandoned shall be filled with grout in accordance with Section 03600 "Grouting."
4. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint fitting that will prevent soil or other deposits from entering the pipe.

E. Asbestos Pipe Handling Best Management Practices

1. Projects will require worker documentation before entering the regulated Work area. A copy of: their current training certificate (workers and their supervisor); current medical condition showing the doctor approved their working with asbestos and wearing a respirator; signed acknowledgment forms; and current record (6-months) of each workers respirator fit test will be required from all workers.
2. Projects also require air monitoring. OSHA will accept historic data on air monitoring within 12-months of the Project, provided the data is from a project of like material and conditions with a crew of the same experience, supervision, and training. Otherwise, monitoring is required throughout the Project. OSHA requires two (2) types of personnel air monitoring, full shift and 30-minute excursion level (when highest levels are anticipated).
3. Some provisions should be made for worker showering or otherwise washing following work before removing respirators, etc. Even if direct exposure is not anticipated, and at a minimum, a source of water to rinse the respirators, wash workers faces and hands, and (in the event of unanticipated direct exposure) some place to shower is required. The workers will also need a change room and some place to keep their street clothes and personal possessions.



4. Proposals to remove asbestos pipe sections by cutting must address how the cutting debris will be captured and kept from becoming airborne. Soil that could be considered contaminated may also have to be removed.
5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution endorsement in their liability insurance in case of asbestos fiber release. A contingency plan, in case the project does not run as smoothly as expected, should be developed and include emergency phone numbers kept on site during the Project.
6. Daily logs of the asbestos removal work should be kept, and should include sign in sheets for the workers and whatever air monitoring was done. Accident reports and other reports or correspondence if something unusual happened should also be included.
7. Waste receipts must be kept through all stages of transport from the site to, and including, the acceptance at the dumpsite where the material will be abandoned. Amount of material removed must be equal to the amount of material to be turned into to the dump.
8. The primary Contractor will give "approval for tear down" at project completion, indicating that all asbestos removal operations are complete and whether there is a need for any air monitoring. Air monitoring, if not required by any governing agency or approved permit as discussed previously, may also be required by the County if documentation to the general public pertaining to contamination is deemed necessary. This air monitoring is normally done by collecting area samples downwind of the project at the barrier tape or just inside it. It requires a source of electricity to run the pumps, which is often provided by a generator.

END OF SECTION

## **SECTION 02140**

### **DEWATERING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: This Section specifies the furnishing of equipment; labor and materials necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth, as shown on the Drawings, and/or geotechnical report.

##### **1.02 QUALITY ASSURANCE**

- A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the State of Florida, to design the temporary dewatering system. The Contractor shall submit conceptual plan for the dewatering system prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan and certification of this shall be provided by the Geotechnical Engineer. The dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems.
- B. The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations.
- C. Permits: The Contractor shall obtain and pay respective fees for all local, state, and federal permits (including the Orange County, St. Johns River Water Management District, and/or South Florida Management District discharge permits) required for the withdrawal, treatment and disposal/discharge of water from the dewatering operation, prior to start of work.
- D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

##### **1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified laboratory for the parameters listed in the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" to the FDEP and the County. The submitted information shall show the location of the work, where the water will be going to, as well as an estimate for the amount, rate and duration of discharge being proposed.

- C. Provide notification to all jurisdictional permitting agencies in accordance with the requirements of the respective agency.
- D. Provide a detailed plan and operation schedule for dewatering of excavations.
  - 1. Provide descriptive literature of the dewatering system.
  - 2. Provide a plan for erosion and sedimentation control during dewatering.
  - 3. Provide copies of all permits/approvals for disposal/discharge of water during dewatering.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall have on-site and available the analytical test results performed in accordance with the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" (FAC 62-621.300(2)).
- B. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate within the excavation.
- C. The Contractor's attention is directed to the water surface elevations discussed in the report(s) on subsurface investigations. Water levels will normally vary from season to season.
- D. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the Work and make such modifications as may be required to assure that the systems will perform satisfactorily. The dewatering system shall be designed in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at the bottom of the trench or excavation.
- E. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the County. Approval of the dewatering plan shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
- F. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation. A wellpoint system or other County acceptable dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying. Within and adjacent to residential areas and other areas as required by the County, engines driving dewatering pumps shall be equipped with residential type mufflers and the noise shall not exceed 55 decibels within 50-feet.

### 3.02 DEWATERING AND DISPOSAL

- A. The Contractor shall construct and place all pipelines, structures, concrete work, structural fill, backfill and bedding material in-the-dry. In addition, the Contractor shall make the final 24-inches of excavation in-the-dry and not until the water level is a minimum of 2-foot below proposed bottom of excavation. For purposes of this Contract, in-the-dry is defined as  $\pm 2\%$  of the optimum moisture content of the soil.
- B. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of all water entering excavations. Contractor shall keep excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- D. It is expected that dewatering will be required for pre-drainage of the soils prior to final excavation for most of the in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed so that the structure, pipeline or fill will not be floated or otherwise damaged.
- E. If wellpoints are used, Contractor shall adequately space wellpoints to maintain the necessary dewatering. Provide suitable filter sand and/or other means to prevent pumping of fine sands and silts. A continual check shall be maintained by the Contractor to ensure that the subsurface soil is not being removed by the dewatering operations. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
- F. The Contractor's proposed method of dewatering shall include groundwater observation wells to determine the water level during construction. Observation wells shall be installed along pipelines as required to verify depth to water level and at locations approved by the County.
- G. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from the surface shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity to maintain an excavation bottom free from standing water.
- H. Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible for all damages which may result from failure to adequately keep excavations dewatered.
- I. The Contractor shall dispose of water from the Work in a suitable manner without damage to adjacent properties or facilities. No water shall be discharged without appropriate treatment for adverse contaminants. No water shall be drained in work built or under construction without prior consent from the County. Water shall be filtered to remove sand and fine soil particles before disposal into any drainage system.

- J. Dewatering of excavations shall be considered incidental to the construction of the Work and all costs shall be included in the various Contract prices in the Bid Form, unless a separate bid item has been established for dewatering.

### 3.03 GROUNDWATER TREATMENT (IF REQUIRED)

- A. If concentrations of tested groundwater quality parameters exceed those allowable in the FDEP Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2), F.A.C.), the Contractor shall treat the effluent.
- B. The Contractor shall immediately notify the County and discuss the parameters that exceed allowable limits.
- C. The Contractor shall meet with the FDEP to determine alternatives that are acceptable to the FDEP.
- D. The Contractor shall apply for and obtain any and all permits and/or treatment approvals that FDEP requires including but not limited to:
  - 1. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)). Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or diesel fuel contamination; or
  - 2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The coverage is available only through the individual NPDES permit issued by FDEP, allows discharges from sites with general contaminant issues i.e. ground water and/or soil contamination other than petroleum fuel contamination; or
  - 3. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity (62-621.300(2), F.A.C.); or
  - 4. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-621.300(4)(a), F.A.C.); or
  - 5. An Individual Wastewater Permit (62-604.300(8) (a))
- E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and County to attain compliance for all excess limits encountered during dewatering activities. Treatment may include, but is not limited to: Chemical, Biological, Electrolysis or any combination of the three.
- F. The Contractor shall make every effort to minimize the spread of contamination into uncontaminated areas. Provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provision adhere to all applicable laws, rules or regulations covering hazardous conditions and will be in a manner commensurate with the level of severity of the conditions.
- G. If necessary, provide contamination assessment and remediation personnel to handle site assessment, determine the course of action necessary for site security and perform the necessary steps under applicable laws, rules and regulations for additional assessment and/or remediation work to resolve the contaminations issue.

- H. Delineate the contamination area(s) and any staging or holding area required and develop a work plan that will provide the schedule of projected completion dates for the final resolution of the contamination issue.
- I. Maintain jurisdiction over activities inside any delineated contamination areas and any associated staging or holding areas. Be responsible for the health and safety of workers within the delineated areas. Provide continuous access to representatives of regulatory or enforcement agencies having jurisdiction.

### 3.04 REMOVAL

Immediately upon completion of the dewatering system, the Contractor shall remove all of his equipment, materials, and supplies from the site of the Work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the County.

END OF SECTION

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**SECTION 02215**  
**FINISH GRADING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Provide finish grading to all areas within the limits of construction.
- B. Grade sub-soil. Cut out areas to receive stabilizing base course materials for paving and sidewalks. Place, finish grade, and compact topsoil.

1.02 PROTECTION

- A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks, pavement, and utility lines. Correct damage at no cost to the County.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.
- B. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. The topsoil shall be suitable for the proposed plant growth shown on the Drawings and specified. Use topsoil stockpiles on site if conforming to these requirements. If there is not sufficient topsoil available at the project site, the Contractor shall furnish additional topsoil as required to complete the Work at no additional cost to the County.

**PART 3 - EXECUTION**

3.01 SUB SOIL PREPARATION

- A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. Remove sub-soil that has been contaminated with petroleum products.



- B. Cut out areas to subgrade elevation which are to receive stabilizing base for paving and sidewalks.
- C. Bring sub soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- D. Slope grade away from building a minimum of 2-inches in 10-feet unless indicated otherwise on the Drawings.
- E. Cultivate subgrade to a depth of 3-inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.

### 3.02 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to the following minimum depths, up to finished grade elevations.
  - 1. 6-inches for seeded areas
  - 2. 4-1/2-inches for sodded areas
  - 3. 24-inches for shrub beds
  - 4. 18-inches for flower beds
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.
- D. Remove stones, roots, grass, weeds, debris, and other foreign material while spreading.
- E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may be caused by grading equipment.
- F. Lightly compact placed topsoil.

### 3.03 SURPLUS MATERIAL

- A. Remove surplus sub soil and topsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION

**SECTION 02220**  
**EXCAVATING, BACKFILLING, AND COMPACTING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Excavate, backfill, and compact as required for the construction of the utility system consisting of piping and appurtenances, and structural construction as shown on the Drawings and specified herein. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, compaction, grading, and slope protection to complete the Work. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, all under ground utilities locations and appurtenances shown on the construction Drawings.
- B. Definitions:
1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material as determined by AASHTO T-180 (ASTM D155).
  2. Optimum Moisture: Percentage of water in a specific material at maximum density.
  3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
  4. Suitable: Suitable materials for fills shall be non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt, or muck. The Contractor shall furnish all additional fill material required.
  5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.
- C. Plan For Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations, including maintenance of traffic, to the County for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Proposal for the Work to be done will reflect all costs pertaining to the Work.

## 1.02 QUALITY ASSURANCE

- A. Testing laboratory employed by the County will make such tests as are deemed advisable. The Contractor shall schedule his work to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for initial testing shall be paid by the County; however, tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the Contractor and the cost of re-testing shall be deducted from payments due the Contractor.
- B. Standards
  - 1. AASHTO: American Association of State Highway and Transportation Officials
  - 2. ANSI: American National Standards Institute
  - 3. ASCE: American Society of Civil Engineers
  - 4. ASTM: American Society for Testing and Materials
  - 5. AWWA: American Water Works Association
  - 6. OSHA 29 CFR Subpart P – Excavations and Trenches a) 1926.650, 1926.651, 1926.652
  - 7. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry

## 1.03 JOB CONDITIONS

- A. Existing Utilities
  - 1. The Contractor is responsible for subsurface verification of existing utilities prior to construction. Locate existing utilities in the area of work in accordance with Sunshine State One Call regulations, Chapter 556, "Underground Facility Damage Prevention and Safety Act", FS.
  - 2. Should uncharted or incorrectly charted piping or other utility be encountered during excavation, notify the County. Keep all facilities in operation and repair damaged utilities to the satisfaction of the County.
  - 3. Damage and repair costs to such piping or utilities are the Contractor's responsibility.
  - 4. If utilities are to remain in place, the Contractor shall provide adequate means of protection.
- B. Test borings and the sub-surface exploration data if previously done on the site will be made available upon request and are for the Contractor's information only.

## 1.04 PROTECTION

- A. Sheet piling and Bracing
  - 1. Requirements of the Trench Safety Act shall be adhered to at all times.

2. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, to protect adjacent structures and power poles from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other acceptable methods. If the County is of the opinion that at any point sufficient or proper supports have not been provided, the County may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the County.
3. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at their own expense so as to provide the necessary clearances and dimensions.
4. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and the Professional Engineer shall provide certification of this.
5. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
6. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the County may direct him in writing to leave in place at any time during the progress of the Work for the purpose of preventing damage to structures, utilities, or property, whether public or private. The County may direct that timber used for sheeting and bracing be cut off at any specified elevation.
7. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the County.
8. The right of the County to order sheeting and bracing left in place shall not be construed as creating any obligation on the County's part to issue such orders, and their failure to exercise this right shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the Work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

9. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1-foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing the water level to return to the natural level as stipulated in Section 02140 "Dewatering." The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida to design the dewatering systems. The Contractor shall submit to the County for a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and the Professional Engineer shall provide certification of this. The Professional Engineer shall be required to monitor the performance of the dewatering systems during the progress of the Work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the proposed bottom of excavation and to preserve the integrity of adjacent structures. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, sidewalls, or bedding material will occur.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
5. Permission to use any storm sewers or drains for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the County or the authority having jurisdiction, at no cost to the County.
6. The Contractor shall prevent flotation by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Removal of dewatering equipment shall be accomplished after compaction/density testing has been completed and the system is no longer required. The Contractor shall remove the material and equipment constituting the system.
8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, or other contaminants in order to prevent adverse effects on groundwater quality.

## 1.05 TESTING AND INSPECTION SERVICE

- A. The County will provide a geotechnical testing and inspection service. The services include testing soil materials and quality control testing during filling and backfilling operations. Samples of soil materials shall be furnished to the testing service by the Contractor. The County shall pay costs of initial geotechnical testing. The Contractor shall pay for any subsequent testing required due to failure and laboratory stand-by charges incurred.
- B. The Contractor shall provide monthly density testing reports to the County during backfilling activities. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractors expense.
- C. Density testing scheduled subsequent to backfilling activities shall be coordinated with, and witnessed by the County. Failure by the Contractor to coordinate or have the County present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense.
- D. Dewatering systems shall not be removed until compaction/density testing has been completed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. General:
  - 1. All fill material shall be subject to the review and acceptance of the County.
  - 2. All fill material shall be free of organic material, trash, or other objectionable material. The Contractor shall remove excess or unsuitable material from the job site.
- B. Common Fill Material: 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 than 3-1/2-inches in any dimension in the top 12-inches or 6-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 that allow it to be easily spread and compacted during filling. Additional common fill shall be no more than 12 % by weight finer than the No. 200 mesh sieve, unless finer material is approved for use in a specific location by the County. Select Common Fill shall be as specified as above from common fill, except that the material shall contain no stones larger than 1/2-inches in largest dimension, and shall be no more than 5 % by weight finer than the No. 200 mesh sieve.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

US Sieve Size	Percent Passing By Weight
No. 1	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	0 - 12

D. Class 1 Soils\*: Manufactured angular, granular material, 1/4 to 1-1/2-inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming to ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	% Passing By Weight
1/2	100
3/8	100
No. 4	20 - 25
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 2

E. Class II Soils\*\*:

1. GW: Well graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
3. SW: Well graded sands and gravelly sands, little or no fines. More than passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 % passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.

\*Soils defined as Class I materials are not defined in ASTM D2487.

\*\*In accordance with ASTM D2487, less than 5 % pass No. 200 sieve.

- F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
3/8	100
No. 10	85 – 100
No. 40	20 – 40
No. 200	0 - 12

- G. Other Material: All other material, not specifically described, but required for proper completion of the Work shall be selected by the Contractor and acceptable by the County.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Clearing:
1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth within 10-feet of the lines of the excavation.
  2. Strip and stockpile topsoil on the site at the location to be determined by the County.

### **3.02 EXCAVATION**

- A. General: Excavations for roadways, structures, and utilities must be carefully executed in order to avoid interruption of utility service.
- B. Excavating for Roadways/Structures/Utilities:
1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.
    - a. Excavation for precast or prefabricated structures shall be carried to an elevation 2-feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be measured by the County to verify that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.
    - b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.
    - c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation.
  2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.



3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the Work.
4. Encounters with subsurface obstructions shall be hand excavated.
5. Excavation and dewatering shall be accomplished by methods that preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the County at the Contractor's expense.
6. The bottom of excavations shall be rendered firm and dry before placing any piping or structure.
7. All pavements shall be cut with saws or approved power tools prior to removal.
8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

### 3.03 DRAINAGE

- A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.
- B. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.
- C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24-hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.
- D. The Contractor will be required at his expense to excavate below grade and refill with crushed stone (gradation 57 or 89) or other acceptable fill material if the County determines that adequate dewatering has not been provided.

### 3.04 UNDERCUT

- A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be approved by the County.

### 3.05 FILL AND COMPACTION

- A. Compact and backfill excavations and construct embankment according to the following schedule. (Modified Proctor standard shall be ASTM D-1557):

#### STRUCTURES AND ROADWORK

Area	Material	Compaction
Beneath Structures	Structural Fill	12-inch lifts, compacted to 98% maximum density as determined by AASHTO T-180. Fill Should not be placed over any in-place soils until those deposits have been compacted to 98% Modified Proctor.
Around Structures	Structural Fill	12-inch lifts, 95% of maximum density as determined by AASHTO T-180. Rubber Tire or vibratory plate compactors shall be used
Beneath Paved Surfaces	Common Fill	12-inch lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12-inch lifts, 95% by maximum density as determined by AASHTO T-180.

- B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.
- C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. The backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.
- D. Embankments shall be constructed true to lines, grades, and cross sections shown on the plans or ordered by the County. Embankments shall be placed in successive layers of not more than 8-inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the Work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.
- E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the County. Acceptance will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The County's acceptance shall be in writing.
- F. One compaction test location shall be required for each 300 linear feet of pipe and for every 100 square feet of backfill around structures as a minimum. The County may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of the compaction tests within the trench shall be in conformance with the following schedule:
1. At least 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 1-foot above the top of pipe.
4. One test for each 2-feet of backfill placed from 1-foot above the top of the pipe to finished grade elevation.
5. Density testing is required for sanitary sewer manholes. Tests shall be staggered around the manhole within 3-feet of the structure's outside diameter.
  - a. First test shall be 1-foot above the structure base.
  - b. Second test shall be 2-feet above the first test and subsequent tests every 2-feet up the finished grade.
6. The Contractor shall provide additional compaction and testing prior to commencing further construction if the County's testing reports and inspection indicate that the fill has been placed below specified density.
7. The Contractor shall coordinate testing with the County approved testing laboratory and shall provide monthly test results to the County in a timely manner during construction activities. Density testing scheduled subsequent to backfilling activities shall be coordinated with the County and witnessed by the County representative. Failure by the Contractor to coordinate or have the County representative present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractor's expense as deemed necessary by the County's representative.
8. Dewatering systems shall not be removed until compaction/density testing has been completed.

END OF SECTION

**SECTION 02570**  
**STABILIZED SUBGRADE**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: All labor, materials, and equipment required to install stabilized subgrade.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:
  - 1. AASHTO T-180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in Drop
- B. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition:
  - 1. Section 914 – Stabilization Materials

1.03 QUALITY ASSURANCE

- A. Field compaction density, stability, and thickness testing frequencies of the subgrade shall be tested once every 300 linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300 linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the County.

1.04 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Materials certificates signed by material producer and Contractor, certifying that each material item complies with specified requirements.

1.05 SYSTEM DESCRIPTION

- A. Stabilize the roadbed below the proposed base to provide a firm and unyielding subgrade.
- B. Provide a finished roadbed section that meets the bearing value requirements regardless of the quantity of stabilizing materials necessary to be added.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.
- B. The Contractor may choose the type of stabilizing material.
- C. Materials may be lime rock, shell rock, cemented coquina, or shell-base sources approved by the FDOT.
- D. At least 97% by weight of the total material shall pass a 3-1/2-inch (90-mm) sieve. Material having a plasticity index greater than 10 or a liquid limit greater than 40 shall not be used as a stabilizer.

### **2.02 LIMEROCK**

- A. For limerock, carbonates of calcium and magnesium shall be at least 70%.

### **2.03 CRUSHED SHELL**

- A. Crushed shell for this use shall be mollusk shell (i.e., oysters, mussels, clams, cemented coquina). Steamed shell will not be permitted.
- B. At least 50% by weight of the total material shall be retained on the No. 4 (4.75 µm) sieve.
- C. Not more than 20% by weight of the total material shall pass the No. 200 (75 µm) sieve. The determination of the percentage passing the No. 200 (75 µm) sieve shall be by washing only.

### **2.04 LOCAL MATERIALS**

- A. Local materials used for this stabilizing may be soils or recyclable materials such as crushed concrete, roof tiles, asphalt coated base, or reclaimed pavement. However, no materials that deteriorate over time, cause excessive deformations, contain hazardous substances, contaminates, or do not improve the bearing capacity of the stabilized material may be used.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

- B. Process the subgrade to be stabilized in 1 course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the County will direct that the processing be done in more than 1 course.

### 3.02 APPLICATION OF STABILIZING MATERIAL

- A. When additive stabilizing materials are required, spread the designated quantity uniformly over the area to be stabilized.
- B. When materials from an existing base are to be used in the stabilizing at a particular location, place and spread all of such materials prior to the addition of other stabilizing additives.
- C. Spread commercial stabilizing material by the use of mechanical material spreaders, except that where use of such equipment is not practicable, use other means of spreading, but only upon written approval of the proposed alternate method.

### 3.03 MIXING

- A. Perform mixing using rotary tillers or other equipment meeting the approval of the County. The Contractor may mix the materials in a plant of an approved type suitable for this Work. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.
- B. Perform the mixing operations as specified (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

### 3.04 MAXIMUM PARTICLE SIZE OF MIXED MATERIALS

- A. At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3-1/2-inch sieve and that the material does not have a plasticity index greater than 8 or liquid limit greater than 30. Note that clay balls or lumps of clay size particles (2 microns or less) cannot be considered as individual particle sizes. Remove any materials not meeting the plasticity requirements from the stabilized area. The Contractor may break down or remove from the stabilized area materials not meeting the gradation requirements.

### 3.05 COMPACTION

- A. Compact the materials at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

### 3.06 FINISH GRADING

- A. Shape the completed stabilized subgrade to conform to the finished lines, grades, and cross-section indicated in the Drawings. Check the subgrade using elevation stakes or other means approved by the County.

### 3.07 CONDITION OF COMPLETED SUBGRADE

- A. After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Drawings.
- B. Remove all soft and yielding material, and any other portions of the subgrade that will not compact readily. Replace yielding material with suitable material so that the whole subgrade is brought to line and grade with proper allowance for subsequent compaction.

### 3.08 MAINTENANCE OF COMPLETED SUBGRADE

- A. After completing the subgrade, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, and tools. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs or replacement of curb and gutter or sidewalk which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the County. Construct and maintain ditches and drains along the completed subgrade section.

### 3.09 FIELD QUALITY CONTROL

- A. When proper moisture conditions are attained, compact the material to not less than 98% of maximum density determined by AASHTO T-180, and a minimum LBR of 40.

END OF SECTION

**SECTION 02571**  
**LIMEROCK BASE**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Furnish and install a base course composed of limerock.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:
- B. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, latest implemented edition.

1.03 QUALITY ASSURANCE

- A. Density, thickness, and moisture content shall be determined and tested in accordance with this specification.

1.04 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Lime rock design mix.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MATERIALS

- A. The minimum of carbonates of calcium and magnesium in the limerock material shall be 70%.
- B. The maximum percentage of water-sensitive clay mineral shall be 3%.



- C. The liquid limit shall not exceed 35 and the material shall be non-plastic.
- D. Limerock material shall not contain cherty or other extremely hard pieces, lumps, balls, or pockets of sand or clay size material in sufficient quantity as to be detrimental to the proper bonding, finishing, or strength of the limerock base.
- E. At least 97% (by weight) of the material shall pass a 3-1/2-inch sieve and the material shall be graded uniformly to dust. The fine material shall consist entirely of dust of fracture. All crushing or breaking-up which might be necessary in order to meet such size requirements shall be done before the material is placed on the road.
- F. Limerock shall have an average LBR of not less than 100.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. The limerock shall be transported to the point where it is to be used, over rock previously placed if practicable, and dumped on the end of the preceding spread. Hauling over the subgrade and dumping on the subgrade will be permitted only when, in the County's opinion, these operations will not be detrimental to the base.

#### **3.02 SPREADING LIMEROCK**

- A. The limerock shall be spread uniformly. All segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.
- B. When the specified compacted thickness of the base is greater than 6-inches, the base shall be constructed in 2 courses. The thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough to bear the weight of the construction equipment without disturbing the subgrade.
- C. All operations for constructing limerock base for shoulder construction at any particular location shall be done prior to placing the final course of pavement on the traveled roadway. In the construction of limerock base on the shoulders, the Contractor shall assure that the dumping of the limerock material shall be at such points and in such manner, that no significant material is allowed on the adjacent pavement, to scar or contaminate the pavement surface. Any limerock material which is deposited on the surface course for any reason shall be immediately swept off.

#### **3.03 COMPACTING AND FINISHING BASE**

- A. For single course base, after the spreading is completed the entire surface shall be scarified and then shaped so as to produce the required grade and cross section after compaction.

- B. For double course base, the first course shall be cleaned of foreign material and bladed and brought to a surface cross section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, the density tests for the lower course shall be made and the County shall have determined that the required compaction has been obtained. After the spreading of the material for the second course is completed, its surface shall be finished and shaped so as to produce the required grade and cross section after compaction, and free of scabs or laminations.
- C. When the material does not have the proper moisture content to insure the required density, wetting or drying will be required. When water is added it shall be uniformly mixed in by disking to the full depth of the course which is being compacted. Wetting or drying operations shall involve manipulation, as a unit, of the entire width and depth of the course which is being compacted.
- D. As soon as proper conditions of moisture are attained the material shall be compacted to a density of not less than 98% of maximum density as determined by AASHTO T-180. The minimum density which will be acceptable at any location outside the traveled roadway (such as intersections, crossovers, turnouts, shoulders, etc.) shall be 98% of such maximum.
- E. At least 3 density determinations shall be made on each day's final compaction operations on each course, and the density determinations shall be made at more frequent intervals if deemed necessary by the County. During final compaction operations, if grading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density tests on the finished base.

#### 3.04 CORRECTION OF DEFECTS

- A. If at any time the subgrade material should become mixed with the base course material, the Contractor shall without additional compensation dig out and remove the mixture, reshape and compact the subgrade, and replace the materials removed with clean base material.
- B. If cracks or checks appear in the base, either before or after priming, which in the opinion of the County would impair the structural efficiency of the base, the Contractor shall remove the cracks or checks by re-scarifying, reshaping, adding base material where necessary, and re-compacting.

#### 3.05 TESTING SURFACE

- A. The finished surface of the base course shall be checked with a template cut to the required crown and a 15-foot straightedge placed parallel to the center line of the road. Both templates shall be provided by the Contractor. All irregularities greater than 1/4-inch shall be corrected by scarifying and removing or adding limerock as required, after which the entire area shall be re-compacted.

### 3.06 PRIMING AND MAINTAINING

- A. The prime coat shall be applied when the base meets the specified density requirements and moisture content in the top half of the base does not exceed 90% of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding, and in such condition that no undue distortion will occur.
- B. The Contractor shall be responsible for assuring that the true crown and template are maintained, with no rutting or other distortion, and the base meets all the requirements at the same time the surface course is applied.

### 3.07 THICKNESS REQUIREMENTS

- A. Thickness of the base shall be measured in intervals of not more than 200-feet. Measurements shall be taken at various points on the cross section, through holes not less than 3-inches in diameter.
- B. Where the compacted base is deficient by more than 3/8-inches from the thickness called for in the Drawings, the Contractor shall correct such areas by scarifying and adding limerock. The base shall be scarified and limerock added for a distance of 100-feet in each direction from the edge of the deficient area. The affected areas shall then be brought to the required state of compaction and to the required thickness and cross section.

END OF SECTION

## SECTION 02573

### ASPHALT PAVEMENT REMOVAL AND REPLACEMENT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: Mill or remove existing asphalt pavement and base materials and install asphalt paving on a prepared base or as an overlay to existing asphalt pavement sections. Provide Maintenance of Traffic and coordinate and install temporary and permanent replacement of traffic signalization and pavement striping and markings.

##### 1.02 REFERENCES

- A. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, 2000 and 2004 editions.
  - 1. Section 300 – Prime and Tack Coats for Base Courses (2000 and 2004 Editions)
  - 2. Section 320 – Hot Bituminous Mixtures – Plant, Methods, and Equipment (2000 and 2004 Editions)
  - 3. Section 327 – Milling of Existing Asphalt Pavement (2000 and 2004 Editions)
  - 4. Section 330 – Hot Bituminous Mixtures – General Construction Requirements (2000 and 2004 Editions)
  - 5. Section 331 – Type S Asphalt Concrete (2000 Edition)
  - 6. Section 334 – Superpave Asphalt Concrete (2004 Edition)
  - 7. Section 901 – Coarse Aggregate (2000 and 2004 Editions)
  - 8. Section 902 – Fine Aggregate (2000 and 2004 Editions)
  - 9. Section 916 – Bituminous Materials (2000 and 2004 Editions)
  - 10. Section 917 – Mineral Filler (2000 and 2004 Editions)
- B. Florida Department of Transportation (FDOT) Design Standards, 2000 and 2004 editions.

##### 1.03 QUALITY ASSURANCE

- A. Asphalt pavements shall be plant-mixed hot bituminous mixtures. Plant operations shall not begin unless all weather conditions are suitable for laying operations. A prime and tack coat shall be first applied to newly constructed bases. A tack coat shall be applied on existing pavements that are to be overlaid with an asphalt mix and between successive layers of asphalt mix. Apply prime and tack coats when ambient or base surface temperature is above 40°F, and when temperature has been above 35°F for 12-hours immediately prior to application. Construct asphaltic concrete paving when ambient temperature is above 45°F. Do not apply when base is wet, contains excess moisture, or during rain. Establish and maintain required lines and elevations.

- B. Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.
- C. Field compaction density and thickness testing frequencies of the asphalt shall be tested once every 300-linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300-linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the County.
- D. Asphalt extraction gradation shall be tested from grab samples collected once every 1,800-square yards of asphalt delivered to the site, or a minimum of once per day. Obtain the results in a timely manner (no later than the end of the day) so that adjustments can be made if necessary.
- E. On initial use of a Type S mix design at a particular plant, as a minimum, run an additional extraction gradation analysis if more than 500-tons [450-metric tons] of mixture are produced on the first day of production.
- F. Tolerances for Quality Control Tests (Extraction Gradation Analysis) shall be in accordance with FDOT Specification Section 331.

#### 1.04 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Submit for each proposed design mix the Gradation analysis; Grade of asphalt cement used; and Marshall Stability in pounds flow.
  - 2. Provide a single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%. For structural mixes (S-1, S-3) establish the optimum asphalt content at a level corresponding to a minimum of 4.5% air voids. Provide the laboratory density of the asphalt mixture for all mixes except Open-Graded Friction Courses.
  - 3. Identify source and description of the materials to be used.
  - 4. Provide certification that the mix design conforms to specification requirements.
  - 5. Field compaction density and thickness testing.
  - 6. Field asphalt extraction gradation.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

- B. Type S Asphalt Concrete (Type S-1 or S-3) is required. The equivalent fine Type SP (Superpave) Asphalt Concrete mixture (Traffic Level C) meeting the requirements of FDOT Specification Section 334 may be selected as an alternate at no additional cost to the County. The equivalent mixes are as follows:
  1. Type S-1: Type SP-12.5
  2. Type S-3: Type SP-9.5
- C. Asphalt plant and equipment shall meet the requirements in FDOT Specification Section 320.

2.02 AGGREGATE

- A. Coarse Aggregate, Stone, Slag, or Crushed Gravel shall meet the requirements in FDOT Specification Section 901.
- B. Fine Aggregate shall meet the requirements in FDOT Specification Section 902.
- C. Aggregate gradation shall meet the following:

**Table 02573-1  
Bituminous Concrete Mixtures  
(Gradation Design Range)**

Type	Total Aggregate Passing Sieves <sup>1</sup>							
	3/4-inch [19.0 mm]	1/2-inch [12.5 mm]	3/8-inch [9.5 mm]	No. 4 [4.75 mm]	No. 10 [2.0 mm]	No. 40 [425 μm]	No. 80 [180 μm]	No. 200 [75 μm]
S-1 <sup>4</sup>	100	88-98	75-93	47-75	31-53	19-35	7-21	2-6
S-3 <sup>4</sup>		100	88-98	60-90	40-70	20-45	10-30	2-6
ABC-1		100						0-12
ABC-2		100			55-90			0-12
ABC-3 <sup>2</sup>	70-100			30-70	20-60	10-40		2-10
FC-2 <sup>3</sup>		100	85-100	10-40	4-12			
FC-3 <sup>4</sup>		100	88-98	60-90	40-70	20-45	10-30	2-6
1. In inches [mm] or sieves [μm]. 2. 100% passing 1-1/2-inch [37.5 mm] sieve. 3. The County may increase the design range for the No. 10 [200 mm] sieve for lightweight aggregates. 4. The County may retain up to 1% on the maximum sieve size.								

- D. Use clean aggregate containing no deleterious substances. Do not use coarse or fine aggregate which contains more than 0.5% of phosphate.
- E. In laboratory tests, and for the purpose of proportioning the paving mixture, consider all material passing the No. 10 [2.00-mm] sieve and retained on the No. 200 [75 μm] sieve as fine aggregate, and the material passing the No. 200 [75 μm] sieve as mineral filler.

- F. Do not use any screenings in the combination of aggregates containing more than 15% of material passing the No. 200 [75 µm] sieve. When two screenings are blended to produce the screening component of the aggregate, one of such screenings may contain up to 18% of material passing the No. 200 [75 µm] sieve, as long as the combination of the two does not contain over 15% material passing the No. 200 [75 µm] sieve. Screenings may be washed to meet these requirements.

## 2.03 ASPHALT CEMENT

- A. Superpave PG Asphalt Binder or Recycling Agent shall meet the requirements in FDOT Specification Section 916.
- B. Mineral Filler shall meet the requirements in FDOT Specification Section 917.
- C. Marshall design mix shall be in accordance with the following:

**Table 02573-2  
Marshall Design Properties For Bituminous Concrete Mixes**

Mix Type	Minimum Marshall Stability (lbs.)	Flow* (0.01 in)	Minimum VMA (%)	Air Voids (%)	Minimum Effective Asphalt Content (%)	VFA Voids Filled with Asphalt (%)
S-1	1,500	8-13	14.5	4-5	**	65-75
S-3	1,500	8-13	15.5	4-6	**	65-75
ABC-1	500	7-15	15	5-16	6.0	-
ABC-2	750	7-15	15	5-14	5.5	-
ABC-3	1,000	8-13	14	4-7	**	65-78
FC-2	-	-	-	-	-	-
FC-3	1,500	8-13	15.5	4-6	**	65-75

\* The maximum Flow value during production shall not exceed one point more than shown in the Table.  
 \*\* The ratio of the percentage by weight of total aggregate passing the No. 200 sieve to the effective asphalt content expressed as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.

## 2.04 BITUMINOUS MIXTURE

- A. Use a bituminous mixture composed of a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and bituminous material. Ensure that no more than 20% by weight of the total aggregate used is silica sand or local materials as defined in FDOT Specification Section 902. Size, grade, and combine the several aggregate fractions in such proportions that the resulting mixture meets the grading and physical properties of the verified mix design.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Set up, install and maintain temporary traffic control devices and detours as necessary in accordance with Specification Section 1570 "Maintenance of Traffic."
- B. Asphalt pavements, including all surface courses and base courses, where shown to be open cut and removed on the Drawings or specified in the Project Manual, shall be removed to a line back from each edge of the trench, other excavation, or to the limits indicated on the Drawings. Pavements shall be cut straight, clean and square with a power saw or other tools and equipment suitable for the Work.
- C. Asphalt pavements, where shown to be milled on the Drawings or specified in the Project Manual, shall be milled according to FDOT Specification Section 327.
- D. Asphalt mixtures shall meet the general construction requirements specified in FDOT Specification Section 330.
- E. Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is dry. Do not spread mixture that cannot be finished and compacted during daylight hours.
- F. Deliver the asphalt cement from the asphalt plant at a temperature not to exceed 350°F and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of FDOT. Maintain the asphalt cement in storage within a range of 230°F to 350°F in advance of mixing operations. Maintain constant heating within these limits, and do not allow wide fluctuations of temperature during a day's production.
- G. Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements for the mixture, including compliance with the Marshall Properties. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

### **3.02 PREPARATION OF APPLICATION SURFACES**

- A. Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.
- B. Where an asphalt mix is to be placed on an existing pavement or old base that is irregular, and wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses.
- C. Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.



- D. Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.
- E. Apply a prime and tack coat on newly constructed bases and apply a tack coat, as specified in FDOT Specification Section 300, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

### 3.03 PLACING MIXTURE

- A. Lay all asphaltic concrete mixtures, including leveling courses, other than adjacent to curb and gutter or other true edges, by the string line method to obtain an accurate, uniform alignment of the pavement edge.
- B. For each paving machine operated, use a separate crew, each crew operating as a full unit. The Contractor's Certified Paving Technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the County at all times when placing mix.
- C. Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32-feet to stabilize before the second check is made to determine the effects of the adjustment.
- D. In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.
- E. Straightedge and back-patch after obtaining initial compaction and while the material is still hot.
- F. Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the Work is completed, the required weight of mixture per square yard [square meter], or the specified thickness, is secured. Carry an excess amount of mixture ahead of the screed at all times. Hand-rake behind the machine as required.
- G. Construct each course in layers of the thickness as shown on FDOT Design Standards Index No. 513.
- H. Before starting any rolling, check the surface; correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

### 3.04 APPLICATION OF LEVELING COURSES

- A. Before spreading any leveling course, fill all depressions in the existing surface more than 1-inch deep by spot patching with leveling course mixture, and then compact them thoroughly.
- B. Place all courses of leveling by the use of two (2) motor graders; equip one with a spreader box. Use other types of leveling devices after they have been approved by the County.
- C. When the total asphalt mix provided for leveling exceeds 50-lb/yds<sup>2</sup> [27-kg/m<sup>2</sup>], place the mix in two or more layers, with the average spread of any layer not to exceed 50-lb/yd<sup>2</sup> [27-kg/m<sup>2</sup>]. When using Type S-3 Asphaltic Concrete for leveling, do not allow the average spread of a layer to be less than 50-lb/yd<sup>2</sup> [27-kg/m<sup>2</sup>] or more than 75-lb/yd<sup>2</sup> [40-kg/m<sup>2</sup>]. The Contractor may vary the rate of application throughout the Project as directed by the County. When leveling in connection with base widening, the County may require placing all the leveling mix prior to the widening operation.

### 3.05 COMPACTING MIXTURE

- A. The coverage is the number of times the roller passes over a given area of pavement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops below 160°F.
- B. Seal Rolling: Provide two (2) coverages with a tandem steel-wheeled roller (either vibratory or static), weighing 5 to 12-tons, following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use vibratory rollers in the static mode for layers of 1-inch or less in thickness.
- C. Intermediate Rolling: Provide five (5) coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.
- D. Final Rolling: Provide one (1) coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12-tons, after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops below 160°F.
- E. Operate the self-propelled, pneumatic-tired roller at a speed of 6 to 10-mph. For each roller, do not exceed an area of coverage of 4,000 yd<sup>2</sup>/hour; if rolling Type S Asphaltic Concrete, do not exceed an area of coverage of 3,000 yd<sup>2</sup>/hour.
- F. Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

- G. Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, manholes, etc.
- H. Use self-propelled pneumatic-tired rollers to roll all patching and leveling courses. Where placing the initial leveling course over broken concrete pavement, use a pneumatic-tired roller that weighs at least 15-tons. For Type S-3 Asphaltic Concrete leveling courses, use a steel-wheeled roller to supplement the traffic rollers. On other leveling courses, use a steel-wheeled roller to supplement the traffic rollers on all passes after the first pass.
- I. Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the County. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements. Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all high spots, high joints, and honeycombing as directed by the County. Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.
- J. Use a self-propelled pneumatic-tired roller on the first structural layer placed on a milled surface. Compact with a minimum of three passes.

### 3.06 JOINTS

- A. Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled. When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.
- B. For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6-inches to 12-inches laterally between successive layers.
- C. When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided above), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

### 3.07 SURFACE REQUIREMENTS

- A. Obtain a smooth surface on all pavement courses placed, and then straightedge all intermediate and final courses with a 15-foot rolling straightedge. Furnish a 15-foot [4.572-m] manual straightedge, and make it available at the job site at all times during the paving operation for checking joints and surface irregularities.

- B. Produce a finished surface of uniform texture and compaction with no pulled, torn, or loosened portions and free of segregation, sand streaks, sand spots, or ripples.

### 3.08 ACCEPTANCE REQUIREMENTS

- A. Upon completion of the final surface or friction course, the County will test the finished surface with a 15-foot rolling straightedge. Correct all deficiencies in excess of 3/16-inch.
- B. If correction is made by removing and replacing the pavement, remove the full depth of the course and extend at least 50-feet on either side of the defective area for the full width of the paving lane.
- C. If correction is made by overlaying, cover the length of the defective area and taper uniformly to a featheredge thickness at a minimum distance of 50-feet on either side of the defective area. Extend the overlay the full width of the roadway. Maintain the specified cross slope. The County may adjust, as necessary, the mix used for the overlay for this purpose.
- D. The maximum deficiency from the specified thickness as follows:
  - 1. For pavement of a specified thickness of 2-1/2-inches or more: 1/2-inch
  - 2. For pavement of a specified thickness less than 2-1/2-inches: 1/4-inch
- E. Where the deficiency in thickness is: (1) in excess of 3/8-inch for pavement of less than 2-1/2-inches in specified thickness, or (2) in excess of 3/4-inch for pavement of specified thickness of 2-1/2-inches or more, correct the deficiency either by replacing the full thickness for a length extending at least 50-feet from each end of the deficient area.
- F. For any case of excess deficiency of the pavement, if approved by the County for each particular location, correct the deficient thickness by adding new surface material, and compact it to the same density as the adjacent surface. The County will determine the area to be corrected and the thickness of new material added.

### 3.09 REPAIR AND RESTORATION

- A. Replace asphalt pavement or roadway surfaces cut or damaged to equal or better condition than the original, including stabilization, base course, surface course, curb and gutter, and other appurtenances.

### 3.10 SIGNALIZATION, PAVEMENT STRIPING AND MARKING

- A. The Contractor shall be responsible for coordinating, repairing or replacing all traffic signalization devices and traffic loops damaged during the pavement milling, removal and replacement process.

- B. The Contractor shall be responsible for coordinating, inventorying, and replacing all temporary and permanent pavement striping and markings damaged during the asphalt pavement milling, removal, and replacement process.
- C. Temporary pavement striping and markings shall be paint or reinforced retro-reflective removal tape. Foil back tape is not acceptable. Permanent pavement striping and markings shall be alkyd thermoplastic tape and raised reflective pavement markers.

END OF SECTION

**SECTION 02576**  
**CONCRETE SIDEWALKS AND DRIVEWAYS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Constructing new concrete sidewalks, driveways, and curb and gutters as shown on the Drawings.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with applicable sections of F.D.O.T. Specifications and local governing regulations.
- B. The mixture, placement, and curing of all concrete work shall be in accordance with F.D.O.T. Specifications.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Furnish manufacturer's product data, design mixes, test reports, and materials certifications.

1.04 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities, as specified under Section 01570 "Maintenance of Traffic."
- B. Utilize flagman, barricades, warning signs, and warning lights as required.

1.05 GUARANTEE

- A. All restored areas within the public right-of-way shall be guaranteed for 1-year after final acceptance. In the event of cracked or broken concrete surfaces, the Contractor shall make the necessary repairs to restore the concrete within 10-calendar days after notification by the County. The cost of such repairs shall be paid by the Contractor.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### **2.02 CONCRETE MATERIALS**

- A. Forms: Steel or wood for each type of use of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
  - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
  - 2. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.
- B. Fibermesh Reinforcement: Fibermesh reinforcement fibers shall be 2-inches to 3-inches collated polypropylene fibers. Fibers shall be in strict accordance with the manufacturer recommendations and within the time as specified in ASTM C94, Type III 4.13 and applicable building codes.
- C. Concrete Materials: Comply with requirements of F.D.O.T. Section 347 for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- D. Epoxy Resin Grout: Type N as specified in F.D.O.T. Section 926.
- E. Aggregate, brick, or other material required to match existing driveway or walk shall be as approved by the County.

### **2.03 CONCRETE MIX, DESIGN, AND TESTING**

- A. Comply with requirements of applicable F.D.O.T. Section 347 for concrete mix design, sampling and testing, and quality control, and as herein specified.
- B. Design the mix to produce standard weight concrete consisting of Portland cement, aggregate, air entraining admixture, and water to produce the following properties.
  - 1. Compressive Strength: Class B, 3,000 psi for walks and curbs.
  - 2. Compressive Strength: Class A, 4,000 psi for driveways.
  - 3. Air Content: 3% to 6% .
- C. Concrete slump shall not exceed plus or minus 1-inch from approved design slump.

## PART 3 - EXECUTION

### 3.01 CONCRETE SIDEWALK, DRIVEWAY, AND CURB AND GUTTER

#### A. Surface Preparation:

1. Remove loose material from the compacted sub base surface immediately before placing concrete.
2. Proof-roll prepared sub base surface to check for unstable areas and the need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

#### B. Form Construction:

1. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the Work and so that forms can remain in place at least 24-hours after concrete placement.
2. Check completed form work for grade alignment to the following tolerances:
  - a. Top of forms not more than 1/8-inch in 10-feet.
  - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10-feet.
3. Clean forms for reuse immediately after use, and coat with form release agent as often as required to ensure separation from concrete without damage.

#### C. Concrete Placement:

1. Do not place concrete until sub base and forms have been checked for line and grade. Moisten if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are completed to required finish elevation and alignment. Use special colors or aggregate as required to match existing material.
2. Place concrete using methods which prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices. Do not use vibrators to push or move concrete in forms or chute.
3. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.
4. An automatic machine may be used for sidewalk or curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed the minimum herein specified. Machine placement must produce sidewalks and/or curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.



5. Joints: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures place transverse joints to align with previously placed joints, unless otherwise indicated.
  - a. Weakened-Plane Joints: Provide weakened-plane (contraction) joints sectioning concrete into areas as shown on the Drawings. Construct weakened plane joints for a depth equal to at least 1/4 concrete thickness, by sawing within 24-hours of placement or formed during finishing operations. Place joints at intervals not to exceed 10-feet if not otherwise indicated.
  - b. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such pours terminate at expansion joints. Construction joints shall be as shown or, if not shown, use standard metal keyway-section form of appropriate height.
  - c. Expansion Joints:
    - (1) Provide premolded joint filler for expansion joints abutting concrete curbs, catch basin, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
    - (2) Locate expansion joints at 12-feet on center for concrete walks unless otherwise indicated.
    - (3) Extend joint fillers full-width and depth of joint, and not less than 1/2-inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
    - (4) Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Pieces shorter than 4-inches shall not be used unless specifically shown as such.
    - (5) Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
    - (6) Fillers and Sealants: Comply with the requirements of these specifications for preparation of joints, materials installation, and performance, and as herein specified.

D. Concrete Finishing:

1. After striking-off and consolidating concrete, smooth the surface by screening and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
2. After floating, test surface for trueness with a 20-foot straightedge. Variations exceeding 1/3-inch for any two points within 10-feet shall not be acceptable. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
3. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round 10-1/2-inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.

4. After completion of floating and when excess moisture or surface sheen has disappeared, broom finish sidewalks by drawing a fine-hair broom across concrete surface, perpendicular to a line of pedestrian traffic. If the existing material has another finish, match existing finish.
5. Do not remove forms for 24-hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas.

E. Curing:

Protect and cure finished concrete paving and walks, complying with applicable requirements of F.D.O.T. Section 350. Use moist-curing methods for initial curing of approved concrete curing compounds whenever possible.

F. Repairs and Protections:

1. Repair or replace broken or defective concrete, as directed by the County.
2. Drill test cores where directed by the County, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy resin grout.
3. Protect concrete from damage until acceptance of work. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
4. Sweep concrete pavement and wash free of stains and discolorations, dirt, and other foreign material just prior to final inspection.

### 3.02 FIELD QUALITY CONTROL

- A. General: Repair or remove and replace unacceptable concrete sidewalk, driveways, or curb and gutter as directed by the County.
- B. Surface Elevation: Actual surface elevations shall be within  $\pm 0.05$  feet of specified or indicated elevations at any given point. Surface elevations between any 2 given points shall be interpolated from a direct line between the 2 points. Surfaces exceeding actual elevation tolerances of more than  $\pm 0.05$  feet at any 2 points within a distance of 15-feet will not be acceptable.

END OF SECTION

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## **SECTION 02578**

### **SOLID SODDING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: Establishing a stand of grass by furnishing and placing grass sod. Included are fertilizing, watering, and maintenance as required to assure a healthy stand of grass. Solid sodding shall be placed on all slopes greater than 4:1, within 10-feet of all proposed structures, and in all areas where existing grass or sod (regardless of it's condition) is removed or disturbed by Contractor's operation unless otherwise specified or shown on the Drawings.

##### **1.02 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. A certification of sod quality by the producer shall be delivered to the County ten days prior to use.

#### **PART 2 - PRODUCTS**

##### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

##### **2.02 GRASS SOD**

- A. Grass sod for the road rights-of-way shall be of variety to match the existing adjacent area and shall be well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.
- B. Grass sod for restoration of new construction sites and/or areas disturbed by construction on existing sites shall be St. Augustine well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.

- C. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

## 2.03 FERTILIZER

- A. Commercial fertilizers shall comply with the state fertilizer laws.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 6-6-6. At least 50% of the nitrogen shall be derived from organic sources. At least 50 % of the phosphoric acid shall be from normal super phosphate or an equivalent source, which will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

## 2.04 WATER FOR GRASSING

- A. The water used in the sodding operations shall be by the Contractor as approved by the County.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION OF GROUND

- A. The area over which the sod is to be placed shall be scarified or loosened to a depth and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the County, at its discretion, may authorize the elimination of ground preparation.

### 3.02 APPLICATION OF FERTILIZER

- A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 - 7.0.
- B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700-pounds per acre, or 16-pounds per 1,000 square feet, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4-inches.
- C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2-inches.

### 3.03 PLACING SOD

- A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of the pieces shall be staggered to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6-inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.
- C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth at suitable intervals.
- D. Sod which has been cut for more than 72-hours shall not be used unless specifically authorized by the County after the inspection thereof. Sod which is not planted within 24-hours after cutting shall be stacked in an approved manner, maintained, and properly moistened. Any pieces of sod that, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.
- E. Sodding shall not be performed when weather and soil conditions are, in the County's opinion, unsuitable for proper results.

### 3.04 WATERING

- A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the County, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2-weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60-days (or until final acceptance, whichever is latest).

### 3.05 MAINTENANCE

- A. The Contractor shall maintain, at his expense, the sodded areas in a satisfactory condition until final acceptance of the Project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
- B. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

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**SECTION 02660**  
**POTABLE WATER SYSTEM**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Provide a complete system for water transmission/distribution pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements

1. Piping shall be laid with a minimum cover of 36-inches below finished grade for mains sized 12-inch and below and a minimum cover of 48-inches for mains sized 16-inch and greater. Pipe located within Local roadways (subdivisions) or within an easement, shall be laid with a minimum cover of 30-inches.
2. Pipelines shall be constructed of the materials indicated in this specification and on the Drawings.

B. Pipe Inspection:

1. The Contractor shall obtain a certificate of inspection from the pipe manufacturer stating that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications.
2. The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.
3. All pipe and fittings shall be subjected to a visual inspection at the time of delivery and before being lowered into the trench. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.
4. The County reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

C. Prevention of electrolysis is required in accordance with AWWA C105 and when crossing, or adjacent to, a power easement, gas easements, any location where induced currents may be present, in areas where aggressive soils exist, and where shown on Drawings. Electrolytic action through the contact of dissimilar metals shall be prevented by either:

1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
2. The use of alternative materials, as directed by the County.



### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Mill test certificates or certified test reports on pipe
  - 2. Details of restrained and flexible joints
  - 3. Detailed laying schedule for pipe
  - 4. Valves and valve boxes

### 1.04 JOB CONDITIONS

- A. Water in Excavation
  - 1. Dewatering shall be in accordance with. Section 02140 "Dewatering." Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of the County. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working.
  - 2. In no case shall the pipelines being installed be used as drains. The ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment.
  - 3. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the Work any such material has entered the pipelines, it must be cleaned as directed by the County so that the entire system will be left clean and unobstructed.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 MATERIALS

- A. Pipe, Fittings, Valves, and Ancillary Equipment shall be installed as shown on the Drawings and as specified in Division 15.
- B. Additional Work: Additional items of construction, necessary for the complete installation of the systems, shall conform to specific details shown on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.

## PART 3 - EXECUTION

### 3.01 PREPARATION

#### A. Bedding:

1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified in Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
2. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other methods approved by the County. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

### 3.02 INSTALLATION

#### A. Pipe Identification/Location

1. All PVC water mains shall be solid blue. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
2. All ductile iron water mains shall be color coded blue with tape. The tape (minimum 2-inches) shall be permanently affixed to the top and each side of the pipe (3 locations parallel to the axis of the pipe). For pipes less than 24-inches in diameter, a single tape may be used along the top of the pipe.
3. All HDPE water mains shall be a solid blue or black with 4 co-extruded equally spaced blue stripes of the same material as the pipe. Stripes painted on the pipe outside surface shall not be acceptable.
4. If main is located over 30-feet from the edge of the pavement or in an easement, the Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers shall include a decal and shall be colored blue for water service.
5. All mains (PVC, HDPE, and DI) shall be installed with a continuous, insulated 10-gauge copper wire installed directly above the pipe for location purposes. Locate wire shall terminate in a test station box and be capable of extending 12-inches above the top of the box. Directionally drilled pipe shall be installed with 2 insulated 10-gauge copper wires.

- B. Pipe: The color stripe and pipe text shall be located on the top of the pipe when installed. When installing PVC pipe, no additional joints will be installed until the preceding pipe joint has been completed and the pipe carefully embedded and secured in place.
1. Gradient: Pipe shall be laid straight and depth of cover shall vary to provide uniform gradient or slope to pipe, whether grading is completed or proposed at time of pipe installation. When a grade or slope is shown on the Drawings, batter boards with string line paralleling design grade, or other previously approved means, shall be used by the Contractor to assure conformance to required grade.
  2. Pipe Joint Deflection
    - a. Ductile Iron Pipe: Whenever it is desirable to deflect pipe, the amount of deflection shall not exceed 75% of the maximum limits as shown in AWWA Standard C600 for ductile iron pipe.
    - b. PVC Pipe: Joint deflection or pipe bending shall not be permitted. The maximum allowable tolerance in the joint due to variances in installation is  $0.75^{\circ}$  (degrees) (3-inches per joint per 20-foot stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment change shall be made only with sleeves and fittings.
  3. Rejects: Any pipe found defective shall be immediately removed and replaced with sound pipe at the Contractor's expense.
  4. Joint Compounds: No sulfur base joint compound shall be used.
  5. Thrust restraints shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein. Restraining devices shall be specified in Sections 15062 "Ductile Iron Pipe and Fittings" and 15064 "Polyvinyl Chlorine (PVC) Pipe and Fittings", respectively.
- C. Installing Valves and Boxes
1. Valves: Valves shall be carefully inspected, fully opened, and then tightly closed and the various nuts and bolts shall be tested for tightness. Any valve that does not operate correctly shall be removed and replaced.
  2. Valve Boxes: Valve boxes shall be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The letter "V" shall be etched in the curb at each valve location. The valve box shall not transmit surface loads to the pipe or valve but be supported by bedding rock as shown on the Drawings. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of D.I. or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.
  3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or collar as shown in the Drawings.

4. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in the concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch by 18-inch long concrete post set flush with the pavement surface in improved areas. The disc shall be stamped with the following information as shown on the Drawings:
  - a. Size of the valve
  - b. Type of valve
  - c. Service
  - d. Direction and number of turns to open

D. Concrete Encasement

1. Concrete encasement shall be constructed in accordance with details shown on the Drawings and shall be constructed of Class C concrete. Encasement shall be constructed where;
  - a. Indicated on the Drawings
  - b. The County orders the pipe encased
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

E. Flush Out Connections: Flush out connections shall be installed at the locations as determined by the County and be full pipe size.

F. Service Connections: Service connections shall be installed at the locations determined by the County and in the manner shown on the Drawings. No service line shall terminate under a driveway.

G. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating, Backfilling and Compacting" of these specifications.

### 3.03 CLEANING

A. General: At the conclusion of the Work, the Contractor shall thoroughly clean the new pipelines by flushing with water or other means to remove all dirt, stones, or other material which may have entered the line during the construction period. Flushing is permitted for pipes less than or equal to 12-inch diameter.

B. Correction of Non-Conforming Work: All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the County. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage, or failure to pass any specified test or inspection.

### 3.04 FIELD QUALITY CONTROL

#### A. Flushing

1. All pipelines less than or equal to 12-inches shall be flushed to remove all sand and other foreign matter. After initial slow-fill, pipe shall sit full for 24-hours to facilitate cleaning and collection of debris from interior of pipe. Flushing shall be accomplished through full pipe size connections at full pipe depth. The velocity of the flushing water shall be at least 2.5-feet per second. Flushing shall be terminated at the direction of the County. The Contractor shall dispose of the flushing water without causing a nuisance or property damage. The Contractor shall arrange with the County and pay for the source of flushing water.
2. In lieu of flushing, new water mains may be hydraulically or pneumatically cleaned with a polypropylene swabbing device in accordance with "Orange County Utilities Standards and Construction Specifications Manual."
  - a. The Contractor is responsible to provide temporary access and egress points.
  - b. Passage of the cleaning swabs through the system shall be constantly monitored, controlled, and all poly swabs entered into the system shall be individually marked and identified.
  - c. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test.
  - d. The Contractor is responsible for collection of debris, water, and the swab. Considerations shall be made for protecting surrounding property and personnel.
  - e. Swabbing speed shall range between 2 and 5-feet per second.

#### B. Pressure and Leakage Tests of Pressure Piping

1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping. Tests shall be made between valves and shall not exceed 2,000-feet. Each side of all valves shall be pressure tested. Multiple sections of main may be tested simultaneously providing there are non-pressurized sections in between each pressure-tested section.
2. Standard: AWWA C600, Section 4, with the exceptions required herein and the exception that the Contractor shall furnish all gauges, meters, pressure pumps, and other equipment needed to test the lines.
3. Hydrostatic Pressure Test
  - a. Test Pressure: Pressure test at 50% above the normal working pressure, but not less than 150-psi, unless otherwise noted on the Drawings.
  - b. Test Duration: Duration is 2-hours. If during the test, the integrity of the tested line is in question, the County may require a 6-hour pressure test.
  - c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser, and angle globe valves shall be provided at each dead-end to bleed air from the line.
4. Hydrostatic Leakage Test
  - a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.
  - b. Test Pressure: Maximum operating pressure as determined by the County but not less than 150-psi unless otherwise noted.
  - c. Test duration: 2-hours.

d. Allowable leakage: 
$$L = \frac{SD(P)0.5}{148,000}$$

L = Allowable leakage (gallons per hour)

S = Length of pipe tested (feet)

D = Nominal diameter of pipe (inches)

P = Average test pressure maintained (psig)

- e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measured total leakage.
- f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.

C. Wire Continuity Check: The Contractor shall perform a continuity check of the 10-gauge locating wire for the entire length of the main by performing a continuity test at each valve test station box.

### 3.05 DISINFECTING POTABLE WATER PIPELINES

A. General: Before being placed in service, all potable water pipelines shall be disinfected by chlorination. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required. The disinfection procedure shall be approved by the County.

B. Standard: AWWA 651, "Standard Procedures for Disinfecting Water Mains."

C. Procedure

1. Flush all dirty or discolored water from the line and introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line.
2. The chlorine solution shall remain in the pipeline for 24-hours.
3. Following the chlorination period, all treated water shall be flushed from the line and replaced with water from the distribution system.
4. Bacteriological sampling and analysis shall be made in full accordance with AWWA Manual C651 and the appropriate FDEP permit. If necessary, the Contractor will be required to re-chlorinate.
5. Sampling and analysis shall be done by the County.

D. Approval: The line shall not be placed in service until the requirements of the State and County Public Health Department are met and the bacteriological test results are approved by the Department of Environmental Protection.

### 3.06 CONNECTION TO EXISTING SYSTEM

A. All connections to existing mains shall be made after complete disinfection of the proposed system and shall be made under the direction of the County. Valves separating the mains being installed from existing mains shall be operated by or under the direction of the County. The cost of the Work in making the connections shall be paid for by the Contractor.

- B. In the event the proposed main is to be connected to a main which has one or more active services between the point of connection and the first existing line valve, a temporary plug or cap shall be installed on the new main until the pressure tests and disinfecting are completed. Upon satisfactory completion, the cap or plug shall be removed from both mains and the connection made with pipe which has been swabbed out with a solution of chlorine and water. The connection shall be made as swiftly as possible and any water in the ditch shall be kept below the level of the pipe. The pipeline shall then be placed in service by the County's personnel.
- C. In the event any existing users will be without water while a connection is being made, the Contractor shall notify the County 72-hours prior to disconnection. The County shall notify the affected user(s) when the water will be turned off and when the service is estimated to be resumed. In some instances, these connections may have to be made at night. No user shall be without water service for more than 3-hours.

3.07 SUPPLIER'S FIELD SERVICE:

- A. The Contractor shall, at no additional cost to the County, arrange for a pipe supplier's field representative to be on-site to provide instruction to each crew working on the installation for a minimum of 4 push-on joints (PVC, DIP). The supplier's field representative shall certify that the installations observed were satisfactorily completed and all pipe installation crews were familiar with the proper methods and procedures for the pipeline installations.

3.08 WATER FOR USE IN FLUSHING, TESTING, AND DISINFECTION:

- A. The Contractor shall arrange with the County for water required for pressure testing, flushing, and disinfection required by the Contractor. The Contractor shall provide meter and backflow preventer.

END OF SECTION

**SECTION 02661**  
**WASTEWATER FORCE MAINS**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. The work under this Section includes providing a complete system for wastewater transmission pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements

1. Piping shall be laid with a minimum cover of 36-inches below finished grade, unless otherwise indicated.
2. Pipelines shall be constructed of the materials indicated on the Drawings.
3. All force mains shall be installed with a continuous insulated 10-gauge copper wire. Wire shall terminate at the top of each valve and be capable of extending 18-inches above the top of the box.
4. All PVC force mains shall be solid green. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
5. Flanged ductile iron used in valve vaults or above ground piping at pump stations shall be Protecto 401 lined and coated per specification Section 09901, "Coatings and Linings." Flanged DIP shall be epoxy coated from the factory and shall not be coated with bitumastic or asphaltic exterior coatings.

- B. Pipe Inspection: The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this contract have been inspected at the plant and that they meet the requirements of these specifications. All pipe and fittings shall be subjected to visual inspection at time of delivery and just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor. The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used produce inferior pipe or fittings.

- C. Prevention of Electrolysis: Where shown on Drawings or deemed necessary, electrolytic action through the contact of dissimilar metals shall be prevented by either;

1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
2. The use of alternative materials, as directed by the County



### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Certified test reports on pipe
  - 2. Details of restrained and flexible joints
  - 3. Detailed laying schedule for pipe
  - 4. Valves and valve boxes
- B. Acceptance of Material: The County reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

### 1.04 JOB CONDITIONS

- A. Water in Excavation: Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trenches than the available pumping facilities are able to dewater to the satisfaction of the County. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of acceptable stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the Work any such material has entered the pipelines, it must be cleaned as directed by the County so that the entire system will be left clean and unobstructed.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 MATERIALS

- A. Pipe Fittings, Valves, and Ancillary Equipment shall be installed as shown on the Drawings and as specified in Division 15.
- B. Additional Work: Additional items of construction, necessary for the complete installation of the systems, shall conform to specific details shown on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Bedding: Upon satisfactory installation of the pipe bedding material as specified in Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. The pipe shall be laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
- B. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other methods acceptable by the County. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

### 3.02 INSTALLATION

- A. Pipe Identification/Location
  1. All PVC wastewater mains shall be solid green in color. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
  2. All HDPE wastewater mains shall be either a solid green or black with four co-extruded equally spaced green stripes of the same material as the pipe. Stripes painted on the pipe outside surface shall not be acceptable.
  3. If main is located over 30-feet from the edge of the pavement or in an easement, the Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers shall include a decal and shall be colored purple for reclaimed water service.
  4. All mains (PVC and HDPE) shall be installed with a continuous, insulated 10-gauge copper wire installed directly above the pipe for location purposes. Locate wire shall terminate in a test station box and be capable of extending 12-inches above the top of the box. Directionally drilled pipe shall be installed with two insulated 10-gauge copper wires.
- B. Pipe:
  1. Gradient: Lines shall be laid straight, and depth of cover shall vary to provide uniform gradient or slope to pipe, whether grading is completed or proposed at time of pipe installation. When a grade or slope is shown on the Drawings, batter boards with string line paralleling design grade, or other previously approved means, shall be used by the Contractor to assure conformance to required grade.

2. Pipe Joint Deflection: No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees), (3-inches per joint per 20-ft stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment changes shall be made with sleeves and fittings as shown in Drawings. Deflection in fittings and sleeves shall not exceed 75% of the limits recommended by the fitting manufacturer.
3. Rejects: Any pipe found defective shall be immediately removed from the site and replaced with sound pipe at the Contractor's expense.
4. Joint Compounds: No sulfur base joint compound shall be used.
5. Thrust restraints shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein. Restraining devices are specified in Section 15064 "Polyvinyl Chlorine Pipe and Fittings", respectfully.

#### C. Installing Valves and Boxes

1. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Plug valves shall have the disc shaft installed horizontally with the plug rotating upward to the top of the valve. Any valve that does not operate correctly shall be removed and replaced.
2. Valve Boxes: Valve boxes and riser shall be centered over the operating nuts of the valves with a centering ring or disc so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The valve box shall not transmit surface loads to the pipe or valve. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of D.I. or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.

#### D. Concrete Encasement

1. Concrete encasement shall be constructed in accordance with details shown on the Drawings and shall be constructed of Class C concrete. Encasement shall be constructed where
  - a. As indicated on the Drawings
  - b. As directed by the County
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.
3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks) shall require a 24-inch x 24-inch x 6-inch concrete pad or collar as shown in the Drawings.

- E. Flush Out Connections: Flush out connections shall be installed at the locations as determined by the County and be full pipe size to accommodate a full diameter flush for pipes 12-inches and smaller or a swab for pipes greater than 12-inches.

- F. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating, Backfilling and Compacting" of these specifications.

### 3.03 CLEANING

- A. General: At the conclusion of the Work the Contractor shall thoroughly clean the new pipe lines by flushing with water or other means to remove all dirt, stones or other material which may have entered the line during the construction period.
- B. Flushing 12-inch pipes and less: Flushing to remove all sand and other foreign matter from pipelines shall only be permitted for mains 12-inches and smaller. Flushing shall be accomplished through full pipe size connections at full pipe depth. The velocity of the flushing water shall be at least 4-feet per second. Flushing shall be terminated at the direction of the County. The Contractor shall dispose of the flushing water without causing a nuisance or property damage. The Contractor shall arrange and pay for the source of flushing water with the County or others.
- C. Swabbing in lieu of flushing: New mains may be hydraulically or pneumatically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the Contractor to provide temporary access and egress points for the cleaning, as required. 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. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test. After initial slow-fill, pipe shall sit full for 24 hours to facilitate cleaning and collection of debris from interior of pipe. The Contractor shall insert flexible polyurethane foam swabs (2-pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. The line to be cleaned shall only be connected to the existing distribution system at a single connection point. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation. 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. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab. Only County 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.

### 3.04 FIELD QUALITY CONTROL

- A. Correction of Non-Conforming Work: All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the County. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the Drawings, including but not limited to pipe not laid true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage and failure to pass any specified test or inspection.
- B. Pressure and Leakage Tests of Pressure Piping
1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping. Tests shall be conducted on segments between valves and no more than 2,000 linear feet is to be tested at one time unless otherwise acceptable by the County.
  2. Standard: AWWA C600, Section 5 (DI pipe) and AWWA C605 Section 7 (PVC pipe) with the exceptions required herein and the exception that the Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the lines.
  3. Hydrostatic Pressure Test
    - a. Test Pressure: Test pressure will be 50% above the normal working pressure, but not less than 100-psi, unless otherwise noted on the Drawings.
    - b. Test Duration: Test shall be for a period of 2-hours. If during the test, the integrity of the tested line is in question, the County may require a 6-hour pressure test.
    - c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser and angle globe valves shall be provided at each dead-end to bleed air from the line.
  4. Hydrostatic Leakage Test
    - a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.
    - b. Test Pressure: Maximum operating pressure as determined by the County but not less than 100-psi unless otherwise noted.
    - c. Test duration: 2-hours.
    - d. Allowable leakage: 
$$L = \frac{SD(P)^{0.5}}{148,000}$$

L = Allowable leakage (gallons per hour)  
S = Length of pipe tested (feet)  
D = Nominal diameter of pipe (inches)  
P = Average test pressure maintained (psig)
    - e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measured total leakage.
    - f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.

END OF SECTION

## SECTION 02665

### HORIZONTAL DIRECTIONAL DRILLING OF PRESSURE MAINS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: Furnish and install underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring for pressure pipe. 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.

##### 1.02 QUALITY ASSURANCE

- A. Qualifications
  1. Directional drilling Contractor or Subcontractor shall have a minimum of 4-years 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.

##### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  1. Work Plan
  2. Pipe
  3. Couplings
  4. HDPE mechanical joint adapters
  5. Training and experience of directional boring machine operator
  6. Directional drilling equipment Specifications including calibration records
- B. Prior to beginning Work, the Contractor must submit a work plan to the County detailing the procedure and schedule to be used to execute the Project. The Work plan should include the following:
  1. A description of all equipment to be used
  2. Down-hole tools
  3. A list of personnel and their qualifications and experience
  4. List of Subcontractors
  5. A schedule of work activity
  6. A safety plan and traffic control plan (if applicable)

7. An environmental protection plan and
8. Contingency plans for possible problems

C. Equipment

1. 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

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.
- B. The directional drilling equipment shall consist of the following:
  1. A directional drilling rig of sufficient capacity to perform the bore and pullback operations.
  2. A drilling fluid mixing, delivery, and recovery system of sufficient capacity to complete the crossing.
  3. A drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused.
  4. A magnetic guidance system to accurately guide boring operations.
  5. A vacuum truck of sufficient capacity to handle the drilling fluid volume and
  6. Trained and competent personnel shall operate the system.
- C. 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.

### 2.02 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.

2.03 PIPE

A. Pipe shall be PVC or HDPE pipe with ductile iron pipe outside diameters in accordance with AWWA C900 (C905) or C906 respectively. 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 pipe shall have maximum dimension ratios equal to the following table:

**Table 02665-1  
Maximum Dimension Ratios for PVC Pipe**

Type of Pipe System	Maximum Dimension Ratio
Wastewater	18
Reclaimed Water	18
Water	18

2. PVC pipe shall meet the requirements of AWWA C900. The pipe shall be 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 02665-2.

**Table 02665-2  
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



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 code designation with maximum dimension ratios equal to the following.

**Table 02665-3  
Maximum Dimension Ratios for HDPE Pipe**

Type of Pipe System	Maximum Dimension Ratio
Wastewater	11
Water	11
Reclaimed Water 11	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.
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)
  - 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 length or shall be 1 solid-color, per the applicable service.

**Table 02665-4  
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 02665-5.

**Table 02665-5  
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

2.04 LOCATING WIRE

- A. Locating wire shall be 10-gauge continuous single strand solid core copper wire with non-metallic insulation.
- B. Color-coding shall be similar to pipeline identification colors.
- C. A minimum of 3 locating wires shall be attached with nylon wire ties at different radial locations around the pipe to ensure continuity in at least 1 wire subsequent to installation. Contractor shall be required to provide as many wires as necessary to maintain continuity throughout the length of the directional bore. Failure of continuous continuity in the locating wire shall result in abandonment and reinstallation of the directional drill, at the discretion of the County.

2.05 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 a slurry of custard-like consistency.

**PART 3 - EXECUTION**

3.01 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.

### 3.02 WORK PLAN

- A. Work plan should be comprehensive, realistic, and based on actual working conditions for this particular Project. Plan should document the requirements to complete the Project.
  - 1. 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.

### 3.03 COORDINATION OF THE WORK

- A. The Contractor shall notify the County at least 3-days in advance of starting Work. In addition, the actual crossing operation shall not begin until the County is present at the project site and agrees that proper preparations for the crossing have been made. The County's approval for beginning the crossing shall in no way relieve the Contractor from the ultimate responsibility for the completion of the Work.
- B. The Contractor and the County shall select a mutually convenient time for the crossing operation to begin in order to avoid schedule conflicts.

### 3.04 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.

### 3.05 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 shall 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 the County 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 2% of depth over a length of 100-feet. In the event that pilot does deviate from bore path more than 2% of depth in 100-feet, the Contractor shall notify the County. The County may require the Contractor to pullback 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% 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 shall put the pipe through the borehole. In front of the pipe shall 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. As-built variance from the designed bore path shall not exceed  $\pm$  (plus or minus) 1-foot in the vertical plane and  $\pm$  2-feet in the horizontal plane. 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 the County has been consulted.
- H. The pipe shall be pulled back through the borehole using the wet insertion construction technique. The pipe shall be installed full of water.
- I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- J. A boring log shall be kept with horizontal and vertical location every 10-feet. The horizontal location of the bore shall be marked in the field during the bore. The Surveyor shall locate these marks and include this information with the bore depths in the Record Drawings. The Surveyor may make a note on the drawing page containing the directional drill and provide an exception for the directional drill only, as the directional drill route cannot be uncovered and physically located.
- K. The pipe shall be installed at a depth of no more than 15-feet below pavement, as measured from the top of pipe.

### 3.06 FIELD TESTING

#### A. PVC Pipe

Perform hydrostatic testing for leakage following installation in accordance with the applicable test sections.

#### B. HDPE Pipe

1. Perform hydrostatic testing for leakage following installation of the directional drill.
  - a. Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure must not exceed 8-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 8-hours before it is brought back up to test pressure. The test procedure consists of the initial expansion phase and leakage test phase.
  - b. Initial Expansion Phase: During the initial expansion phase, the test section is pressurized to the test pressure and enough make-up liquid is added each hour for 3-hours to return to test pressure.
  - c. Leakage Test Phase: The leakage test phase follows immediately and shall be either 2 or 3-hours in duration. At the end of the time test, the test section shall be returned to test pressure by adding a measured amount of liquid. The amount of make-up liquid added shall not exceed the values provided in Table 02665-6 plus allowable leakage.

**Table 02665-6  
Allowance for Make-up Water Under Pressure\***

Test Duration (hours)	2	4	6	8	12	16	20	24
	Allowance/100-feet of Pipeline (gallons)							
2	0.11	0.25	0.60	1.00	2.30	3.30	5.50	8.90
3	0.19	0.40	0.90	1.50	3.40	5.50	8.00	13.30

\*Applies to test period and not to initial expansion phase

#### C. Pressure Testing

1. The test pressure for the pipe shall be 150-psi for water and reclaimed water and 100-psi for wastewater.

#### D. Mandrel Testing

1. Perform mandrel testing through the entire length of the installed pipe. The mandrel size shall be 90% of the inside diameter of the pipe.

END OF SECTION

## **SECTION 03600**

### **GROUTING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: This Section specifies the grouting of the annular space between the host pipe and the new liner and the grouting of the space left void in the abandonment of the existing pipelines and structures. The Work consists of furnishing all labor, equipment and materials, and performing all Work connected with the placement of the cementaceous grout to fill the void.

##### **1.02 QUALITY ASSURANCE**

- A. Grouting shall be performed by a crew under the direct supervision of a superintendent that has experience in grouting of this nature.
- B. Storage, mixing, handling and placement shall be in accordance with manufacturer's instructions and specifications.

##### **1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. In addition, the following shall be submitted to the County for review and acceptance prior to construction.
  - 1. A detailed description of equipment and operational procedures to accomplish the grouting operation.
  - 2. Grout mixture design data, grout mixer type, grout samples, and test data.
  - 3. A detailed description of the grouting time schedule.

#### **PART 2 - PRODUCTS**

##### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 GROUT MATERIAL

- A. The grout shall be a "flowable fill" consisting of a mixture of Type 1 Portland Cement, Type "F" Flyash (ASTM 618), sand and water.

The following is a suggested trial grout mixture for a 1-cubic yard yield:

Cement: 500-pounds  
Fly Ash: 500-pounds  
Water: 350-pounds (42-gallons)  
Sand: 2,248-pounds  
Darex (W.R. Grace): 3-ounces (Air Entrainment Additive or equivalent)

The actual grout mixture to be used shall meet the minimum requirements specified below.

- B. The mixture shall contain a minimum of 500-pounds cement and minimum of 400-pounds flyash per cubic yard of grout.
- C. Samples of the grout mixture when set aside in a standard concrete test mold shall show less than 1% of the mixture height of free water on the surface after standing not less than 12-hours.
- D. One (1) set of 3 (three) 3-inch by 6-inch sample test cubes shall be made for each mix preparation. The minimum 28-day strength shall be no less than 1,000-psi. The minimum required slump is 5-inches. The maximum allowable slump is 9-inches. Slump should be as low as practical to maintain viscosity, proper flow, and still retain the ability to pump.

## 2.03 EQUIPMENT

- A. All grout shall be mixed with a high shear, high-energy colloidal type mixer to achieve the best uniform density.
- B. The grout shall be pumped with a non-pulsating centrifugal or tri-plex pump.
- C. The mixer shall be capable of continuous mixing. Batch mixing shall not be permitted.

## PART 3 - EXECUTION

### 3.01 GROUTING OF ABANDONED PIPE

- A. Where utility pipes are to remain in place (inactive) they shall be filled with a sand/cement grout as specified herein.
- B. The grouting program shall consist of pumping sand-cement grout with suitable chemical additives at pressures necessary to fill the pipe sections in order to prevent the potential for future collapse.

- C. Grouting of pipes shall be in sections not exceeding 300 linear feet.
- D. Grout shall be placed in a maximum of 3 stages, with the initial stage volume equal to or greater than 50% of the total volume for that section of pipe being grouted. The maximum time wait between grouting stages shall be 24-hours.
- E. For each stage, mix and pump the material in one continuous process so as to avoid partial setting of some grout material during that stage; thus, eliminating voids and possible subsequent surface damage due to cave-ins.
- F. Each section shall be grouted by injecting grout from the lowest point and allowing it to flow toward the highest point to displace water from the annulus and assure complete void-free coverage. Grout shall be placed through tubes installed in the bulkheads at the insertion pits or manholes. Grout tubes shall be at least 2-inch nominal diameter.
- G. After the ends of each section of pipe are exposed, the entire space, not to exceed 300 linear feet end to end, shall be sealed by controlled pumping of grout until it flows from the pipe at the opposite end of the grouting. Grouting shall be carried out until the entire space is filled. The ends of these sections shall be capped and/or plugged.
- H. Grout pressure in the void space is not to exceed 5-psi above maximum hydrostatic groundwater level. An open ended, highpoint tap or equivalent vent must be provided and monitored at the bulkhead opposite to the bulkhead through which grout is injected. This bulkhead will be blocked closed as grout escapes to allow the pressuring of the annular space.

### 3.02 FIELD QUALITY CONTROL

- A. The quality of the grout, application of the equipment, and installation techniques are the responsibility of the Contractor. The review and acceptance or approval of specific mix design, equipment, or installation procedures shall in no way relieve the Contractor of his obligation to provide the final product as specified herein.
- B. The County may stop the grouting operations at any time if the operation does not comply with these Specifications.

END OF SECTION



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**SECTION 15062**  
**DUCTILE IRON PIPE AND FITTINGS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install, all ductile iron piping, ductile iron fittings, and appurtenances as shown on the Drawings and as specified herein.
- B. General Design: The equipment and materials specified herein are intended to be standard types of ductile iron pipe and cast or ductile iron fittings for use in transporting wastewater, potable water, and reclaimed water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All of the ductile iron pipe and ductile or cast iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
  - 1. ANSI A 21.50/AWWA C150
  - 2. ANSI A-21.51/AWWA C151
  - 3. ANSI A-21.41/AWWA C104
- C. Factory Tests: The manufacturer shall perform the factory tests described in ANSI A-21.51/AWWA C151.
- D. Quality Control
  - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards. All pipe on this Project shall be supplied by a single manufacturer unless otherwise accepted in writing by the County.
  - 2. In addition to the manufacturer's quality control procedures, the County may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the County will be paid for by the County.

### 1.03 SUBMITTALS

#### A. Materials and Shop Drawings

1. Submit Shop Drawings and piping layouts, including areas within and under buildings and structures. Shop Drawings shall include dimensioning, methods and locations of supports and all other pertinent technical specifications. Show locations of all field cuts. Shop Drawings shall be prepared by the pipe manufacturer. Shop Drawings for piping within and under buildings and structures shall be submitted within 30-days of Execution of Contract.

#### B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with Section 01001 "General Work Requirements."

#### C. Manufacturer's Certification

1. Submit manufacturer's sworn certification of factory tests and test results.

### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

The Contractor shall be responsible for all materials furnished and stored 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 the County, 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.

#### A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. Stored pipe shall be covered for protection against contamination and UV light. Joint gaskets shall be stored in clean, dark and dry location until immediately before use.

#### B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe and fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the County or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe 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 the County, is damaged beyond repair by the Contractor shall be removed from the site.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

#### A. Ductile Iron Pipe

1. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151
2. Thickness/Pressure Class:
  - a. Below ground piping: Class 350 (4-inch to 12-inch), Class 250 (16-inch to 24-inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.
  - b. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or specified.
3. Joints
  - a. Push-on or Mechanical Joints (below ground piping)
    - (1) Standards: ANSI A21.11, AWWA C111
    - (2) Class: 350-psi working pressure rating
    - (3) Gaskets
      - (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type.
      - (b) Wastewater Service: Neoprene rubber ring type.
  - b. Flanged (above ground or inside below ground vaults)
    - (1) Standards: ANSI A21.15, ANSI B16.1
    - (2) Class: 125-pound factory applied screwed long hub flanges, plain faced without projection.
    - (3) Gaskets
      - (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber
      - (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American Cast Iron Pipe or acceptable equal.
  - c. Restrained Joints
    - (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems (for 16-inch diameter and smaller) as manufactured by American Ductile Iron Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable equal.
    - (2) Class: 250-psi minimum design pressure rating.
    - (3) Standard mechanical joint retainer glands shall not be acceptable.
  - d. Joint Accessories
    - (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.
    - (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.
  - e. Pipe Length (below ground installation): 20-foot maximum nominal length.
4. Pipe Identification
  - a. 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.

## B. Fittings

1. Ductile iron fittings 4-inch through 24-inch shall be pressure rated at 350-psi minimum, except flanged joint type fittings which shall be rated at 250-psi minimum. All 30-inch and larger fittings shall be pressure rated to 250-psi minimum. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron only. All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline. All fittings shall be designed to be capable to withstand, without bursting, hydrostatic tests of three times the rated water working pressure. All fittings shall have a date code cast (not printed or labeled) with identification of date, factory, and the factory unit from which it was cast and machined. Fittings shall have the pressure rating, nominal diameter of openings, manufacturer's name, and the country where cast and number of degrees or fraction of the circle distinctly cast on them. Ductile iron fittings shall have the letter "DI" or "Ductile" cast on them.
2. Joints shall be as described for ductile iron pipe for above ground/exposed and buried service.
3. All potable water main fittings shall have NSF 61 certification, and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.

## 2.02 COATINGS, LININGS AND IDENTIFICATION MARKINGS

### A. Exterior Coatings

1. Below ground/buried or in a casing pipe:
  - a. Type: Asphaltic coating, 1.0-mil DFT in accordance with ANSI/AWWA A21.51/C151.
  - b. Markings: (continuous 3-inch wide strip within top 90 degrees of pipe - min. drying time 30-minutes before backfill).
  - c. Color:
    - (1) Raw Wastewater: Safety Green
    - (2) Reclaimed Water: Purple (Pantone 522C)
    - (3) Potable Water: Safety Blue
2. Above ground/Exposed/In vaults
  - a. Coatings and coating testing for ductile iron pipe and fittings for above ground/exposed applications shall be accordance with Division 9. Primer, intermediate and final coats whether shop or field applied shall be compatible and applied in accordance with the coating system manufacturer's recommendations. Refer to Appendix D "List of Approved Products" for approved coating system suppliers. Asphaltic seal coat applied to the exterior of above ground piping and fittings shall be blasted and completely removed prior to coating per NACE-3/SSPC-SP6 commercial blast cleaning minimum angular anchor profile of 1.5-mils.

- b. Color
    - (1) Raw Wastewater: Safety Green
    - (2) Reclaimed Water: Purple (Pantone 522C)
    - (3) Potable Water: Safety Blue
  - 3. Inside Wetwell
    - a. All piping inside of wastewater wetwell shall be 316 stainless steel.
- B. Interior Lining (Applied by pipe manufacturer)
- 1. Wastewater: Interior coating shall be Protecto 401 (amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment) for all pipe and fittings. All ductile iron pipe and fittings shall be delivered to the manufacturer certified applicator without asphalt, cement lining, or any other lining on the interior surface and no coating shall have been applied to the first 6-inches of the exterior of the DIP spigot ends. Minimum surface preparation shall be SSPC-SP 1 Solvent Cleaning method to remove oil and grease followed by NACE-4 / SSPC-SP7 Brush-Off Blast Cleaning. Protecto 401 shall be applied within 12-hours of surface preparation to the interior of the pipe and fittings so as to obtain a continuous and relatively uniform and smooth integral lining with a total minimum dry film thickness of 40-mils for the complete system. No lining shall take place when the substrate or ambient temperature is below 40°F. The lining shall not be used on the face of the flange of fittings or flanged pipe. The system shall be holiday free and holiday testing (minimum 2000 volts) shall be conducted and pinholes shall be repaired prior to shipping.
  - 2. Potable Water and Reclaimed Water: Interior coating shall be fusion-bonded epoxy (FBE) or Cement Mortar lined with asphaltic seal coat.
    - a. FBE for Fittings: Fittings shall be supplied with a FBE coating, both inside and outside for total protection including flanged and buried fittings. The exterior of flanged fittings for above ground assemblies shall adhere to final exterior coating requirements per 3119 2.04 A. The FBE coating system shall meet or exceed ANSI/AWWA C-550 and C116/A21.116 requirements and shall have NSF 61 certification. FBE coating thickness shall be 6 to 8-mils dry film thickness, shall be applied for secure adhesion, shall have a smooth surface and shall be holiday free.
    - b. Cement mortar lining with a seal coat of asphaltic material shall be in accordance with ANSI/AWWA A21.4/C104.
- C. Polyethylene Encasement is required when pipe is within 10-feet of a gas main or as indicated on the Drawings:
- 1. Standard: ANSI A 21.5/AWWA C105, 8-mil minimum thickness.

## 2.03 LOCATION MARKERS AND LOCATION WIRE

### A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.
2. Locator System: Marker locator set shall be the Scotch Mark EM II Electronic Marker Locator Path Tracing Receiver, or acceptable equal. The Contractor shall furnish 1-locator set for each type of service piping installed on the project (i.e.: reclaimed water, wastewater) to the County. Each unit shall incorporate the following features and accessories:
  - a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
  - b. Field strength meter that provides visual indication of the return signal.
  - c. Function switch for selection of operation mode.
  - d. Sensitivity control to adjust the receiver gain.
  - e. Audio speaker for signal response.
  - f. Battery access panel containing condensed operating instructions.
  - g. Auxiliary headset and heads set jack.
  - h. Permanently attached shoulder straps.
  - i. Rugged shockproof and weatherproof storage/carrying case.
3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

### B. Location Detection Wire

1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).
2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 12-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.
3. Continuity: Continuity of wire to be tested using Metrotech 810/9860 or acceptable equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA Manual M-42. When a restraining type gasket is used, the bell shall be painted red.
- B. Underground Ductile Iron Pipe and Fittings.
  - 1. Bedding firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
  - 2. Placement
    - a. Alignment: In accordance with lines and grades shown on the Drawings. Deflection of joints shall not exceed 75% of the values recommended by the pipe manufacturer.
    - b. The Contractor shall provide line and grade stakes at a 100-foot maximum spacing and at all line and/or grade change locations. The Contractor shall provide temporary benchmarks at a maximum of 1,000-foot intervals. The minimum pipe cover shall be 30-inches below the finished grade surface or 30-inches below the elevation of the edge of pavement of the road surface whichever is greater.
    - c. 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 or over homing of connected pipe. Homing marks incorrectly marked greater than 1-inch shall result in rejection of pipe and removal from site. 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.
    - d. 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.
    - e. Trench Dewatering and Drainage Control: 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.
    - f. 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. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the County to ensure absolute cleanliness inside the pipe. The pipe shall be installed with the color stripe and pipe text on the top of pipe.



3. Cutting: When required, cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of the pipe to be used with a push-on bell shall be beveled. Bare metal exposed at ends of the pipe shall be field coated in accordance with pipe manufacturer's recommendations. Cut pipe for wastewater service shall have exposed bare metal ends repaired with Protecto 401 using the coating system manufacturer's field repair kit.

4. Joints

- a. Joint Placement

- (1) Push on joints: Pipe shall be laid with the bell facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.
    - (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.

- C. Thrust Restraint

1. General: Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.
  2. Length of Restrained Joints: In accordance with the lengths listed in the table as shown on the Drawings.

- D. Installation of Pipes on Curves

1. Maximum deflections at pipe joints, fittings and laying radius for the various pipe lengths shall not exceed 75% (percent) of the pipe manufacturer's recommendation.

### 3.02 CLEANING AND FIELD TESTING

- A. General: At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in other related sections of these specifications.

END OF SECTION

**SECTION 15064**  
**POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown on the Drawings and specified herein.
- B. General Design: The equipment and materials specified herein are intended to be standard types of PVC pipe and ductile iron fittings for use in transporting wastewater, reclaimed water, and water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All of the PVC pipe and ductile iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
  - 1. AWWA C900/C905
  - 2. ASTM D1784 / D1785 / D2241 / D2466 / D2564 / D2729 / D2774 / D3034 / D3139 / D3212
  - 3. NSF 14
  - 4. UNI-B-1 through 5
- C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 - AWWA C900/C905.
- D. Quality Control:
  - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.
  - 2. In addition to the manufacturer's quality control procedures, the County may select an independent testing laboratory to inspect the material at the production facility for compliance with these specifications. The County will pay for the cost of facility inspection requested by the County.

### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Materials and Shop Drawings
- C. Manufacturer's Certification
  - 1. Submit sworn certification of factory tests and their results.

### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. PVC pipe shall be covered with black plastic with a minimum thickness of 15-mil. Joint gaskets shall be stored in a clean, dark and dry location until use.
- B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of County or it shall be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe length. When being transported, the pipe shall be supported at all times in a manner to prevent distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the Contractor shall be removed from the site.
- C. The Contractor shall be responsible for all materials furnished and stored 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 the County, 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.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 MATERIALS

### A. Polyvinyl Chloride (PVC) Pipe

1. Standards: AWWA C900/C905 and ASTM D1784/D3034/F679 (Gravity Sewer)
2. Compounds: Class 12454-A or Class 12454-B
3. PVC Gravity Pipe and Fittings: PVC gravity pipe (6-inch to 15-inch), shall conform to ASTM D3034, maximum SDR 35. PVC gravity pipe (18-inch to 36-inch), shall conform to ASTM F679 and uniform minimum "pipe stiffness" at 5% (percent) deflection shall be 46-psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI Bell Plastic Pipe Association standard is UNI B.
4. PVC Pressure Pipe and Fittings: All PVC pipe of nominal diameter 4 to 12-inches shall be manufactured in accordance with AWWA Standard C900 and greater than 12-inches shall be manufactured in accordance with AWWA Standard C905. The PVC pipe shall have a minimum working pressure rating of 100-psi and shall have a maximum dimension ratio of 18. Pipe shall be the same outside diameter as ductile iron pipe.
5. Dimension Ratio/Thickness: (unless otherwise shown on the Drawings)
  - a. Raw Wastewater:
    - (1) Pressure Systems: DR 18
    - (2) Gravity Systems: DR 35 (ASTM D3034) or PS 46 (ASTM F679)
  - b. Treated Wastewater: DR 18
  - c. Reclaimed Water: DR 18
  - d. Raw Water: DR 18
  - e. Potable Water: DR 18
  - f. Irrigation Piping: Schedule 40 or SDR 21
6. Joints:
  - a. Push-on integral bell elastomeric gasket joints:
    - (1) Standards: ASTM D3212/D3139/F477 and UNI-B-1
    - (2) Gaskets:
      - (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) rieber type.  
Wastewater Service: Styrene Butadiene Rubber (SBR) rieber type for C900 / C905 pipe. Styrene Butadiene Rubber (SBR) ring type for gravity systems.
      - (b)
      - (3) Pipe Markings: Pipes shall have a manufacturer's home-mark on the spigot. On field cut pipe, the Contractor shall provide home-mark on the spigot in accordance with manufacturer's recommendations.
  - b. Solvent weld (nominal diameter less than 4-inches):
    - (1) Standards: ASTM D2466/D2564
    - (2) Type: Slip Fitting Socket (tapered)
    - (3) Exclusions: Plastic saddle and flange joints will not be used.

- c. Restrained Joints:
    - (1) Restrained joint devices shall be made specifically for PVC pipe and meet or exceed the requirements in ASTM F-1674.
    - (2) Manufacturers: Uni-flange mechanical joint restraints and bell restraints (for all sizes); Meg-a-lug system as manufactured by EBBA Iron (sizes 12-inches or less), or acceptable equal.
    - (3) Design pressure rating equal to or above test pressure as specified herein.
  - d. Pipe Length:
    - (1) Pressure systems: 20-feet maximum nominal length
    - (2) Gravity systems: 13-feet minimum nominal length
- B. Fittings - Pressure Systems (nominal diameter 4-inches and greater):
- 1. Materials: Ductile iron
  - 2. Joints: Mechanical Joint, Minimum 350-psi pressure rating
  - 3. Gaskets:
    - a. Water and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type
    - b. Wastewater Service: Neoprene rubber ring type
  - 4. Exclusions: Standard double bell couplings will not be acceptable where the pipe will slip completely through the coupling.
  - 5. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron.
  - 6. All fittings shall have a date code cast (not printed or labeled), with identification of the date, factory and unit at which it was cast and machined. Fittings shall have distinctly cast on them the pressure rating, nominal diameter of openings, manufacturer's name, the country where cast, and deflection angle. Ductile iron fittings shall have the letters "DI" or "Ductile" cast on them.
  - 7. All potable water main fittings shall have NSF certification and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.
  - 8. All ductile iron fittings shall have exterior coatings, including markings and colors, and interior linings in conformance with Section 15062 "Ductile Iron Pipe and Fittings."
- C. Fittings - Pressure Systems (nominal diameter less than 4-inches)
- 1. Material: Polyvinyl Chloride (PVC)
  - 2. Joints: Slip fitting tapered socket with solvent weld
  - 3. Solvent: Sure Guard 12 or acceptable equal
  - 4. Exclusions: Plastic saddle and flange joint fittings shall not be used

## 2.03 LOCATION MARKERS, LOCATION WIRE AND IDENTIFICATION MARKINGS

### A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with the American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.
2. Locator System: Marker locator set shall be the 3M Dynatel 1420 or 3M Dynatel 1420E Electronic Marker System Marker Locator, or acceptable equal. The Contractor shall furnish 1 locator set for each type of service piping installed on the Project (i.e.: reclaimed water, wastewater.) to the County. Each unit shall incorporate the following features and accessories:
  - a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
  - b. Field strength meter that provides visual indication of the return signal
  - c. Function switch for selection of operation mode
  - d. Sensitivity control to adjust the receiver gain
  - e. Audio speaker for signal response
  - f. Battery access panel containing condensed operating instructions
  - g. Auxiliary headset and heads set jack
  - h. Permanently attached shoulder straps
  - i. Rugged shockproof and weatherproof storage/carrying case
3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

### B. Location Detection Wire

1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).
2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 18-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.

### C. Identification Markings:

1. Pipe furnished in solid color or white with color lettering as indicated below.
  - a. Lettering along top 90° (degrees) of pipe, minimum 3/4-inch in height with appropriate wording appearing 1 or more times every 21-inches along the entire length of the pipeline.

- (1) Raw Wastewater: Safety Green
- (2) Reclaimed Water: Purple (Pantone 522C)
- (3) Potable Water: Safety Blue

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Standards: AWWA C900/C905/UNI-B 3 and 4
- B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings
  - 1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
  - 2. Placement/Alignment:
    - a. Installation shall be in accordance with lines and grades shown on the Drawings. For pressure systems, deflection of joints shall not exceed 75% of that recommended by the manufacturer.
    - b. 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 or over homing of connected pipe. Homing marks incorrectly marked on pipe shall result in rejection of pipe and removal from site. 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.
    - c. 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.
    - d. Trench Dewatering and Drainage Control: 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.
    - e. 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. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the County to ensure absolute cleanliness inside the pipe. The color stripe and pipe text shall be viewed from the top of pipe when installed. When installing PVC pipe, no additional joints will be installed until the preceding pipe joint has been completed and the pipe carefully embedded and secured in place.

- f. Locating Wire: Locating wire, for electronically locating pipe after it is buried, or installed by trenchless technology shall be attached along the length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. At a minimum, the tracing wire is to be attached to the pipe with nylon wire ties. The wire itself shall be 10-gauge single strand solid core copper wire with non-metallic insulation. The insulation 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 wire connectors approved for underground applications as listed in the uniform electric code handbook. The coiled wire shall extend to a minimum of 12-inches above the surface and be connected to a test station box at valve locations.
- g. PVC Pressure Pipe Installation and Training: 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 spigot end be allowed to go past the "insertion line" or "homing mark" for pressure pipe applications and homing mark shall be visible.
- h. Field Cutting: PVC pipe can be cut with a handsaw or power driven abrasive disc making a square cut. The end shall be beveled with a beveling tool, wood rasp or power sander to the same angle as provided on the factory-finished pipe. The insertion line on the spigot shall be remarked to the same dimensions as the factory-marked spigot.
- i. All Contractor pipe crews utilizing PVC pressure pipe shall be trained on an annual basis by Uni-Bell in coordination with the County and attended by the manufacturer's representative of the respective approved Manufacturers in Appendix D "List of Approved Products." The Uni-Bell PVC training session will consist of proper handling, storage, installation, and compaction as well as County requirements regarding PVC pipe and deflection. Every person handling, installing or backfilling PVC pipe shall not be permitted to install County owned and / or maintained pipe without training.
- j. Approved manufacturers representatives (Appendix D "List of Approved Products"), not present at the hosted Uni-Bell training session or individuals of pipe crews not in attendance shall be trained on every project site. On-site project training shall be for each manufacturer of pipe utilized on-site, per crew and per project. Specifically each crewmember shall be trained on every project by every pipe manufactures representative regardless of previous on-site training. Every person handling, installing or backfilling PVC pipe shall not be permitted to install County owned and / or maintained pipe without training.
- k. PVC Gravity Pipe Installation: Gravity sewer pipe shall be installed to the homing mark, no tolerance. Any noticeable separation shall be removed and reinstalled. The homing mark may be disregarded to meet the maximum of 1-inch separation between bell and spigot requirement. Joints:



1. Joint Placement:
  - (1) Push on joints: Pipe shall be laid with the bell ends facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.
  - (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.
- C. Thrust Restraint
  1. Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.
  2. Length of restrained joints shall be in accordance with the lengths listed in the table as shown on the Drawings.
- D. Installation of Pipes on Curves:
  1. No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees) (3-inches per joint per 20-foot stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment change shall be made only with sleeves and fittings.

### 3.02 CLEANING AND FIELD TESTING

- A. At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in associated sections of these specifications.

END OF SECTION

**SECTION 15066**  
**HIGH-DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

Scope of Work: Provide and install high-density polyethylene (HDPE) pipe and fittings of the sizes and in the locations shown on the Drawings and as specified for use in directional drilling.

1.02 STANDARDS

- A. Pipe 1/2-inches (13-mm) through 3-inches (76-mm) shall conform to AWWA C901 and the Specifications.
- B. Pipe and fittings 4-inches (102-mm) through 60-inches (1,524-mm) shall conform to AWWA C906 and the Specifications.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and Section 01300 "Submittals."
- B. Submit manufacturers recommended method for butt-fusing joints.
- C. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. Certification shall include a stress life curve per ASTM D2837.
- D. Provide certification that the material is listed by the Plastic Pipe Institute in PPI TR-3 with a hydrostatic design basis of 1,600-psi (11 MPa) at 73°F. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D2837 and PPI TR-3 testing and validation of samples of the pipe manufacturer's production pipe.
- E. The manufacturer's certification shall state that the pipe was manufactured from 1 specific resin in compliance with these Specifications. The certificate shall state the specific resin used, its source, and list its compliance to these specifications.
- F. Submit certified lab data to verify specified physical properties. Certify that tests are representative of pipe supplied for this project.
- G. Submit affidavit of compliance with referenced standards (e.g., AWWA C901, C906, etc.).
- H. Submit qualification certificates for operators of heat fusion equipment.

- I. Submit schedule for placement of and removal of test bulkheads.
- J. Submit certification that materials intended to contact potable water are listed under NSF 61.

#### 1.04 INSPECTION

All materials and installation furnished under this specification are subject to inspection by the County.

#### 1.05 QUALITY AND WORKMANSHIP

- A. The pipe and fitting manufacturer's production facilities shall be open for inspection by the County or his designated agents. During inspection, the manufacturer shall demonstrate that the facilities are capable of manufacturing the pipe and fittings required by this specification, that a quality control program meeting the minimum requirements of ASTM D3035 and ASTM F714 is in use, and that facilities for performing the tests required by this specification are in use.

#### 1.06 QUALIFICATION OF FUSION OPERATORS

- A. Each operator performing fusion joining shall be qualified in the use of the manufacturer's recommended fusion procedure(s) by the following:

Appropriate training or experience in the use of the fusion procedure.

- 1. Making a sample joint according to the procedure that passes the following inspections and tests:
  - a. The joint shall be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the procedure; and
  - b. The joint shall be tested or examined by 1 of the following methods:
    - (1) Pressure and tensile test as described in 49 CFR 192.283
    - (2) Ultrasonic inspection and found to be free of flaws that would cause failure
    - (3) Cut into at least 3 longitudinal straps, each of which is:
      - (a) Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint, and
      - (b) Deformed bending, torque, or impact and if failure occurs, it must not initiate in the joint area.
- 2. Each operator shall be re-qualified under the procedure if during any 12-month period:
  - a. Operator has not made any joints under the procedure; or
  - b. Operator has 3 joints or 3% of the joints made, whichever is greater, that are found unacceptable by testing according to 49 CFR 192.513.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. On site pipe storage shall meet all manufacturers' requirements.

- B. Transport individual pipe lengths to the job site on padded bunks with nylon tie-down straps or padded bonding to protect the pipe. Coiled HDPE pipe shall be stored in a manner to ensure safety. Protect the pipe from sharp objects. Anchor pipe securely to prevent slippage.
- C. Store individual pipe lengths on earth berms or timber cradles in the numerical order of installation. Stack the heaviest series of pipe at the bottom. Do not stack pipe in excess of 20-rows high.
- D. Protect the pipe from stones and sharp objects.
- E. Store fittings in their original cartons.
- F. Lift pipes with handling beams or wide belt slings near the middle of joints as recommended by the pipe manufacturer. Do not use cable slings, chains, or hooks.
- G. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting. Remove any pipe section containing defects by cutting out the damaged section in a complete cylinder.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 PIPE

- A. Pipe shall have a nominal IPS (iron pipe size) or ductile iron pipe size OD. The dimension ratio shall be verified by the Contractor based on the pipe pull strength and the pressure rating of the pipe supplied shall be (DR 9) pressure class 160 for water main and reclaimed water main, and (DR 11) 100 for wastewater force main, in accordance with Table 5 of AWWA C906. The pipe shall be homogenous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties throughout.
- B. Pipe shall have a minimum hydrostatic design basis (HDB) of 1,600-psi (11 MPa), as determined in accordance with ASTM D2837.
- C. Pipe Material
  1. Pipes shall be marked in accordance with AWWA requirements (C901 Section 2.4 or C906 Section 3.1, as appropriate).
  2. AWWA C901 pipe (1/2-inch (13-mm) through 3-inches (76-mm)) shall be PE 3408 DR 9, colored blue for water, purple (Pantone 522C lavender) for reclaimed water, and green for wastewater. AWWA C901 pipe shall be as manufactured by Endot Endopure or equal.

3. AWWA C906 pipe [(4-inches (102-mm) through 60-inches (1,524-mm)] shall be color coded as above with 4 co-extruded equally spaced stripes of the same material as the pipe. Stripes printed on the pipe outside surface shall not be acceptable.
4. Materials used for the manufacture of polyethylene pipe and fittings shall be very high molecular weight, high-density ethylene/hexene copolymer PE 3408 polyethylene resin meeting the requirements of Table 15066-1.

**Table 15066-1  
Physical Property and Pipe Performance Requirements**

<u>Property</u>	<u>Specification</u>	<u>Units</u>	<u>Minimum Values</u>
Material Designation	PPI/ASTM	---	PE3408
Material Classification	ASTM D1248	---	III C 5 P34
Cell Classification	ASTM D3350	---	345434C
Hardness	ASTM D2240	Shore D	64
Compressive Strength (Yield)	ASTM D695	psi	1,600
Tensile Strength @ Yield (Type IV Spec.)	ASTM D638 (2%/min)	psi	3,200
Elongation @ Yield	ASTM D638	%, min	8
Tensile Strength @ Break (Type IV Spec.)	ASTM D638	psi	3,500
Elongation @ Break	ASTM D638	%, min.	600
Modulus of Elasticity	ASTM D638	psi	110,000
ESCR:			
(Cond A, B, C: Mold. Slab)	ASTM D1693	Fo, Hrs	Fo>5,000
(Compressed Ring)	ASTM F1248	F50, Hrs	F50>1,000
Slow Crack Growth	Battelle		Fo>32
	<u>Method</u>	<u>Days to Failure</u>	<u>Minimum Values</u>
Impact Strength			
(IZOD) (0.125-inch thick)	ASTM D256	in-lb/in	
	(Method A)	Notch	42
Linear Thermal			
Expansion Coef	ASTM D696	in/in/°F	1.2 x 10-4
Thermal Conductivity	ASTM C177	BTU, in/ Ft2/hrs/°F	2.7
Brittleness Temp	ASTM D746	°F	<-180
Vicat Soft. Temp	ASTM D1525	°F	+257
NSF Listing	Standard 61	---	Listed

Note: \* Standard deviation 0.01.

5. The pipe shall be extruded from pre-compounded resin. In-plant blending of resin is unacceptable.

### 2.03 NIPPLES AND FLANGED STUB ENDS

Short nipples and stub ends shall be of the same material as the HDPE pipe.

## 2.04 FITTINGS

- A. Fittings shall be made from material meeting the same requirements as the pipe. Fittings shall be fabricated by the manufacturer of the pipe.
- B. Fittings shall meet the appropriate AWWA standard for the size involved (C901 or C906) and shall be Pressure Class 160 for water main and reclaimed water main and Pressure Class 100 for wastewater force main.
- C. Molded fittings shall be manufactured in accordance with ASTM D3261 and shall be so marked.
- D. Mechanical fittings, when used, shall be specifically designed for, or tested and found to be acceptable for use with HDPE pipe.
- E. Fittings used to connect with dissimilar pipe materials shall be provided as per Section 15062 "Ductile Iron Pipe and Fittings."

## 2.05 JOINTS

- A. Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer.
- B. Butt fusion joining shall result in joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of HDPE shall not be used. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to connect HDPE pipe mechanically without butt-fusion only where shown in the Drawings.
- C. Ductile Iron to HDPE Connections
  - 1. Flanged connections between ductile iron pipe or fittings and HDPE pipe or fittings shall meet all requirements of Section 15062 "Ductile Iron Pipe and Fittings."
  - 2. Mechanical joint connections between ductile iron pipe or fittings and HDPE pipe or fittings shall use ductile iron mechanical joint glands conforming to AWWA C111 and AWWA C153. Mechanical joints shall be fully thrust restrained. Gaskets, bolts, and hexagonal nuts shall be standard rubber gaskets conforming to AWWA C111. Follower gland shall match class 350 compact fittings.
  - 3. HDPE pipe stiffeners shall be constructed of stainless steel and shall be flanged on one end to prevent over-insertion into the receiving pipe.

## 2.06 LOCATION DETECTION WIRES

- A. Materials: Two continuous, insulated 10-gauge copper wires.

- B. Installation: Wires shall be attached to the centerline of the HDPE pipe every 5-feet. Wires shall terminate at top of each valve box and be capable of extending 12-inches (305-mm) above the top of the box in a manner so as not to interfere with valve operation.

## **PART 3 - EXECUTION**

### **3.01 HEAT FUSION**

- A. Use fusion equipment specially designed for heat fusion of HDPE. The equipment utilized shall be regulated for the different melt strength materials. Compatibility fusion techniques shall be used when polyethylene of different melt indexes are fused together.
- B. Use the following procedure to butt fused HDPE pipe. If a procedure noted below contradicts manufacturer's recommendations, follow the manufacturer's recommendation.
  1. Maintain the proper temperature of the heater plate as recommended by the pipe manufacturer. Check it with a tempilstik or pyrometer for correct surface temperature.
  2. Clean pipe ends inside and outside with a clean cotton cloth to remove dirt, water, grease, and other foreign materials.
  3. Square (face) the pipe ends using the facing tools on the fusion machine. Remove all burrs, chips, and fillings before joining pipe or fittings.
  4. Check the line-up of pipe ends in the fusion machine to see that pipe ends meet squarely and completely over the entire surface to be fused. The clamps shall be tight so that the pipe does not slip during the fusion process.
  5. Insert the clean heater plate between the aligned ends and bring the ends firmly in contact with the plate but do not apply pressure while achieving the melt pattern. Allow the pipe ends to heat and soften. Softening depths shall be per the manufacturer's recommendation.
  6. Carefully move the pipe ends away from the heater plate and remove the plate (if the softened material sticks to the heater plate, discontinue the joint, clean heater plate, square pipe ends, and start over).
  7. The melted ends shall be connected rapidly but not slammed together. Apply enough pressure to form a double rollback bead to the body of the pipe around the entire circumference of the pipe about 1/8-inch (3.175-mm) to 3/16-inch (4.763-mm) wide. Pressure is necessary to cause the heated material to flow together.
  8. Allow the joint to cool and solidify properly. Remove the pipe from the clamps and inspect the joint appearance.

### **3.02 OPERATIONS INCIDENTAL TO JOINT COMPLETION**

- A. Plan joint completion to accommodate temporary test bulkheads for hydrostatic testing on the day of installation.

### 3.03 ASSEMBLING JOINTS

#### A. Flanged Joints

1. Flange adapters shall be pressure rated the same as the pipe. Flange adapters shall be heat fused to the pipe as outlined in the heat fusion section.
2. Gaskets shall be used between the polyethylene flange adapters when recommended by the HDPE pipe manufacturer. Sufficient torque shall be applied evenly to the bolts to prevent leaks. After initial installation and tightening of flanged connections, allow the connections to set for a few hours then conduct a final tightening of the bolts.
3. Lubricate nuts and bolts with oil or graphite prior to installation.
4. Check operation of valves connected to molded stub end flange adapters. Insert polyethylene spacer if recommended by pipe manufacturer for clearance.

#### B. Mechanical Joints

1. Wipe the socket and the plain end clean. Lubrication and additional cleaning should be provided by brushing both the gasket and plain end with an approved pipe lubricant just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
2. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
3. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after assembly but before tightening bolts.
4. Tighten the bolts to the normal range of bolt torque as indicated in AWWA C-600 while maintaining approximately the same distance between the gland and the face of the flange at all points around the socket.
5. When connection is being made to HDPE pipe or fittings use a welded flange to connect to fittings.

### 3.04 INSTALLATION

#### A. Installation of High-Density Polyethylene Pipe

1. All high-density polyethylene (HDPE) pipe shall be handled, stored, assembled, and installed in accordance with AWWA C906, manufacturer's recommendations, and these Specifications.
2. HDPE pipe shall be installed using directional drilling method of construction in accordance with Section 02665 "Horizontal Directional Drilling of Pressure Mains."

#### B. Installation of HDPE Service Connections

1. HDPE AWWA C901 (1/2-inch through 3-inch) water and reclaimed water service connections crossing roads shall be installed in a PVC casing pipe. PVC casing pipe may be installed by push/pull (reaming) methods as approved by the County. PVC casing pipe shall be Schedule 40 and meet the requirements of ASTM D1785. PVC fittings shall be Schedule 40 and shall meet the requirements of ASTM D2466. Casing pipe/carrier pipe size shall be as follows:



Carrier Pipe (Nominal Dia.)	Casing Pipe (Nominal Dia.)			
	Size	O.D	Wall	I.D
1-inch	2-1/2-inches	2.875	0.203	2.469
1-1/4-inch	3-inches	3.50	0.216	3.068
1-1/2-inch	3-1/2-inches	4.00	0.226	3.548
2-inch	4-inches	4.5	0.237	4.026

2. Casing pipe shall be air pressure tested for leaks immediately upon completion of each crossing at a minimum test pressure of 20-psi (.138 MPa).
3. Following installation of carrier pipe within casing, install a plug in each open end of casing. Plugs shall be suitable for restraining against external earth load.

### 3.05 DISINFECTION OF PIPE

- A. Flush and disinfect potable water pipe in accordance with Section 02660 "Potable Water System."

### 3.06 HYDROSTATIC TESTING

- A. Perform hydrostatic testing for leakage prior to installation and following installation in accordance with manufacturer's written recommendations.
- B. All pressure piping shall be hydrostatically tested at a pressure equivalent to 1-1/2 times the working pressure, but not less than 150-psi (1.034 MPa), unless otherwise noted. No high-density polyethylene pipe section under test will be accepted if the make-up water amount is greater than that specified in applicable specification Section 02660 "Potable Water System", Section 02661 "Wastewater Force Mains", and Section 02662 "Reclaimed Water System."

### 3.07 MANDREL TESTING

- A. Perform mandrel testing through the entire length of the installed HDPE pipe. The mandrel size shall be 90% of the inside diameter of the pipe.

END OF SECTION

**SECTION 15110**  
**PLUG VALVES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

Wastewater force mains shall have plug valves installed as shown on the Drawings. This Section specifies plug valves, manual actuators and associated valve boxes.

1.02 QUALITY ASSURANCE

A. References

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A436	Austenitic Gray Iron Castings
ASTM A536	Ductile Iron Castings
AWWA C504	Rubber Seated Butterfly Valves

B. Proof-of-Design Tests

The Contractor shall furnish the County three (3) certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing conducted in accordance with AWWA C504, Section 5.2, except that where the word "disc" appears in the standard, it is understood to mean "plug." In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory, and all test reports must be certified by the laboratory representative. Proof-of-design testing shall have been performed on at least 3 (three) 6-inch diameter valves, with all 3 (three) test units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

- B. **PRODUCT DATA:** The following information shall be provided in accordance with 1.03 of Section 01300 "Submittals."
1. Manufacturer's product data
  2. Proof-of-design test reports specified in paragraph 1.02 B

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MANUFACTURERS

Plug valves meeting the requirements of this Section shall be supplied from the approved manufacturers as listed in Appendix D "List of Approved Products."

2.03 MATERIALS

Materials of construction shall be as follows:

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, Class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene
Body seats	
3-inches and larger	Nickel
Packing	Buna V-flex or TFE

2.04 MANUFACTURE

- A. **Plug Valves:** Valves shall be straight-flow non-lubricated resilient plug type suitable for drip tight, bi-directional shutoff at the specified valve design pressure.
1. Plug valves shall be eccentric, ball centric or full port. All valves shall open counter-clockwise.
  2. All buried valves shall be fitted with valve boxes as specified in Paragraph 2.03.B of this Section. One 2-inch square tee-handled valve wrench, made by the valve manufacturer, of suitable length to operate all valves within valve boxes shall be furnished for every 5 valves installed.
  3. Plug valves shall be installed complete with extension stems, buried gear actuators, and 2-inch operating nuts (buried) or operating hand wheels (exposed), as required for normal operation. All valve nuts shall be brought up to 1-foot below the proposed finish grade.

4. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body. A permanent plate shall be attached to the valve or operator indicating serial number, order number, accessories, operator model and manufacturer.
5. Ball centric/eccentric plug valves shall be of the non-lubricated type. The port area for valves 4-inches to 20-inches shall have a minimum 80% nominal pipe diameter and valves 24-inches and larger shall have a minimum port area of 70% of nominal pipe diameter unless noted on the Drawings as "full port". Plug valves denoted as full port shall have a port area equal to the full area of the nominal pipe diameter.
6. Minimum pressure rating of valves 4-inches to 12-inches shall be 175-psi; valves 14-inches to 72-inches shall be 150-psi. Valve bodies shall be cast iron ASTM A126, Class B and fusion-bonded epoxy coated.
7. Valve ends shall be mechanical joint (buried) or flanged (exposed) as indicated on the Drawings. Valve flange drilling for valves 3-inches and larger shall be per ANSI B16.1, Class 125. Plugs shall be cast iron or ductile iron with neoprene facing and shall be of the single piece design. The plug shall be of the same configuration for all valves and shall require no stiffening member opposite the plug for balance or support. Valve body seats shall have a welded-in overlay of not less than 90% nickel. Packing shall be adjustable and safely replaceable without disassembling the valve. Bushing shall be 316 stainless steel in both upper and lower journals and shall be protected from foreign matter with the use of a grit seal or similar. The valve should be capable of drip tight shut off with flow in either direction at the full pressure of the valve. All exposed nuts, bolts, springs and washers on buried service valves shall be 304 stainless steel. All above- grade valves shall have 316 stainless steel hardware.
8. Actuators: Manual valves shall have lever or gear actuators and tee wrenches, extension stems, and floor stands as indicated on the Drawings. Valves 6-inch and larger shall be equipped with buried service rated gear actuators. Buried valves shall have a 2-inch square operating nut. All gearing shall be enclosed in a steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. Actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Exposed nuts, bolts and washers shall be 316 stainless steel. Valve packing adjustment shall be accessible without disassembly of the actuator.
9. Valve Testing: Plug valves shall be tested in accordance with AWWA C504. Each valve shall meet the performance, leakage, and hydrostatic tests described in AWWA C504. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof-of-design testing as described in AWWA C504.

#### B. Valve Boxes

1. All valves installed underground shall have cast iron 2-piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the County. The barrel shall be screw type only, with 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 locking cast iron covers. Covers shall have "SEWER" cast into the top for all wastewater mains which shall be so constructed as to prevent tipping or rattling.

2. A valve box with an operating nut extension is required for any size main that is 6-feet or greater below finished grade. The extension shall be high strength, corrosion resistant steel construction and permanently attached to the operating nut. The operating nut extension insert shall be one complete assembled unit with a self-adjusting extension stem system that fits inside a standard valve box. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. A valve box-centering device designed to eliminate the shifting of the valve box against the operating nut of the valve shall be used. The valve box assembly shall be adjustable to accommodate variable trench depths 6-foot and greater as shown in the Drawings.
3. 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 foot-pounds without failure.
4. The valve boxes shall have locking lids.
5. Extension sections shall be cast or ductile iron only.
6. Valve boxes in non-paved areas shall be installed with a valve collar as shown in the Drawings. The protective concrete collar with a bronze identification disc shall be constructed of Class B concrete as shown on the Drawings.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLING VALVES AND BOXES**

- A. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Plug valves shall have the plug shaft installed horizontally with the plug rotating upward to the top of the valve. Any valve that does not operate correctly shall be removed and replaced. Seats shall face in the direction as recommended by the manufacturer.
- B. Valve Boxes: Valve boxes and risers shall be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The valve box shall not transmit surface loads to the pipe or valve. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of ductile iron or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.

END OF SECTION

## SECTION 15111

### GATE VALVES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: Furnish and install gate valves of the type and size and in the locations as shown on the Drawings and/or specified herein.
- B. General Design
  - 1. Resilient seat non-rising stem (NRS) gates valves shall be used for underground service and for aboveground service where shown on the Drawings.
  - 2. Resilient seat Outside Stem and Yoke (OS&Y) gate valves shall be used for aboveground service only where shown on the Drawings.

##### 1.02 QUALITY ASSURANCE

- A. All gate valves of same type and style shall be manufactured by one (1) manufacturer.

##### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Shop Drawings and submittals shall be submitted to the County/Professional Engineer for review and acceptance prior to construction for the following:
  - 1. Certified Shop Drawings showing details of construction, dimensions (including laying length), and weight.
  - 2. Descriptive literature, bulletins, and/or catalogs showing all valve parts and describing material of construction by material and specification, e.g., AISI.
  - 3. Valve coatings and linings, if any.
  - 4. A complete bill of materials for all equipment.
  - 5. See individual sections for additional requirements.

##### 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Shipping
  - 1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed.
  - 2. Factory assembled parts and components shall be dismantled for shipment unless permission is received in writing from the County/Professional Engineer.

3. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built and securely bolted thereto.
4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.
6. Each box or package shall be properly marked to show its net weight in addition to its contents.

B. Storage

1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.
2. Do not store valves or accessories directly on the ground.

C. Handling

1. Handle valves and accessories to prevent damage of any nature.
2. Carefully inspect all materials for:
  - a. Defects in workmanship and materials.
  - b. Removal of debris and foreign material in valve openings and seats.
  - c. Proper functioning of all operating mechanisms.
  - d. Tightness of all nuts and bolts.

#### 1.05 WARRANTY AND GUARANTEES

- A. The manufacturer's warranty period shall be concurrent with the Contractor's for 1-year, unless otherwise specified, commencing at the time of final acceptance by the County.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all equipment which lists for more than \$500.00 (major equipment). The County reserves the right to request warranties for equipment not classified as "major". The Contractor shall still warrant equipment not considered to be "major" in the Contractor's 1-year warranty period even though certificates of warranty may not be required.
- C. In the event that the equipment manufacturer or supplier is unwilling to provide a 1-year warranty commencing at the date of substantial completion, the Contractor shall obtain from the manufacturer a 2-year warranty commencing at the time of equipment delivery to the job site. This 2-year warranty from the manufacturer shall not relieve the Contractor of the 1-year warranty starting at the time of County acceptance of the equipment.
- D. The County shall incur no labor or equipment cost during the guarantee period.
- E. Guarantee shall cover all necessary labor, equipment, and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage, or other failure of equipment or components furnished by the manufacturer.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 MATERIALS

- A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C509/C515, latest revision, and these Specifications. All valves are to be tested in strict accordance with AWWA C509/C515.
- B. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- C. The minimum design working water pressure shall be minimum 250-psig.
- D. Gate valves shall be installed vertically per the Drawings and with minimum depth of cover per Table 15111-1.

**Table 15111-1  
Minimum Pipe Cover Required for Valves**

Pipe Diameter (Inches)	Vertical Gate Valve Cover	
	LOCAL Roadway	Non-LOCAL Roadway*
4-inch – 8-inch	30-inch	36-inch
12-inch	36-inch	36-inch
16-inch	44-inch	48-inch
20-inch	-	50-inch
24-inch	-	54-inch
* Additional 12-inches of cover is required for all vertical valves 16-inches and greater located in the pavement		

- E. Valves 16-inches and larger shall be AWWA C515 resilient seated only (16-inches through 24-inches no gearing required).
- F. The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class B for C509 valves and ductile iron ASTM A536 for C515 valves. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550.
- G. A 2-inch wrench nut shall be provided for operating the valve. Valves 30-inches and larger shall be provide with spur gear actuators. Side actuated gate valves are not acceptable. All valves shall open left or counter clockwise.
- H. The valves shall have non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C509. Two (2) stem seals shall be provided and shall be of the O-ring type. The stem nut must be independent of the gate.



- I. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the flow from either direction.
- J. Tapping valves shall be placed vertical where possible for Water and Reclaimed Water. When tapping existing mains, valves 24-inches and above shall be furnished with NPT pipe plugs for flushing the tracks.
- K. All materials shall be in accordance with Appendix D "List of Approved Products."

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. Valves 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 buried gate valves shall be connected using restrained joints. 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 the County before installation.

### **3.02 INSTALLATION**

- A. Install valves and accessories in strict accordance with manufacturer's instruction and recommendations as shown on the Drawings and as directed by the County.
- B. Carefully erect all valves and support them in their respective positions free from distortion and strain.
- C. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- D. Support all valves connected to pumps and equipment and in piping systems that cannot support valves.
- E. Repair any scratches, marks and other types of surface damage with original coating as supplied by the factory.
- F. Valves shall be carefully inspected, opened wide and then tightly closed and the nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Any valve that does not operate correctly shall be removed and replaced.

### 3.03 INSPECTION AND TESTING

- A. Check and adjust all valves and accessories for smooth operation.
- B. Test valves for leakage at the same time that connecting pipelines are tested. See Section 02660 "Potable Water Distribution Piping" for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrument systems whose pressure rating is less than the pressure tests.

END OF SECTION

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# **APPENDIX A**

## **GEOTECHNICAL REPORT**

**Dated June 30, 2015**

## **GROUND WATER SAMPLING AND ANALYSIS RESULTS – ANDERSON ROAD**

**Dated March 23, 2015**

The attached Geotechnical Engineering Investigation and dewatering ground water sampling was accomplished for the utilization of the Design Engineer during the design phases of this project. The criteria and recommendations stated herein are not to be construed as direction from the Design Engineer to the Contractor and are hereby provided only as general information, furnished as a courtesy to the Contractor.

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**GEOTECHNICAL INVESTIGATION REPORT  
ANDERSON ROAD WATER MAIN and  
FORCE MAIN REPLACEMENTS  
ORANGE COUNTY, FLORIDA  
AEA PROJECT No. 201112-6**

Antillian Engineering Associates, Inc.  
3331 Bartlett Boulevard  
Orlando, Florida 32811  
(407) 422-1441



June 30, 2015

BFA Environmental, Inc.  
1230 Hillcrest Street  
Orlando, Florida 32803

Attention: Richard Burgan

Reference: Geotechnical Investigation Report  
Anderson Road Water Main and Force Main Replacements  
Orange County, Florida  
AEA Project No. 201112-6

Dear Mr. Burgan:

Antillian Engineering Associates, Inc. has completed a geotechnical engineering investigation for the proposed water main and sanitary force main replacement project along Anderson Road in Orange County, Florida. The work on this project was done in general accordance with the scope of services presented in our proposal dated November 15, 2013. This report contains the results of our investigations, our recommendations for design and installation of the water main, the force main and related buried structures, and other concerns as appropriate.

It has been our pleasure to serve BFA and Orange County on this project. Please let us know if you have any questions or if you need additional information.

Respectfully submitted,

**ANTILLIAN ENGINEERING ASSOCIATES, INC.**  
State of Florida Authorization No. EB6685



Peter G. Suah, P.E.  
Principal Engineer  
Florida P.E. No. 46910

Attachments: Figures  
Appendix A: Field and Laboratory Investigations  
Appendix B: Important Information About Your Geotechnical Engineering Report  
Appendix C: Constraints and Restrictions

## **PROJECT DESCRIPTION**

Orange County Utilities (“OCU”) is planning to replace an existing water main along Anderson Road beginning at a point near Kew Gardens Lane and extending east for about 1,500 feet. The approximate location of this project is shown on Figure 1. It is our understanding that a sanitary sewer force main near the water main route will also be replaced as part of this project. The new mains most likely will be installed within ten feet of the existing ground surface using conventional “cut-and-cover” construction techniques. Directional drilling may be used for some street crossings.

OCU assigned this project to BFA Environmental, Inc. (“BFA”) as a task under Continuing Utility Engineering Services Contract Y-11-902A. BFA assigned the geotechnical engineering investigation to Antillian Engineering Associates, Inc. as their subconsultant on that contract.

## **AVAILABLE INFORMATION**

The United States Geological Survey (USGS) quadrangle topographic map for the area and the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey of Orange County were reviewed for general information about the project area. A preliminary plan furnished by BFA was also examined for relevant, project-specific information.

The USGS map showed the project vicinity as a gently sloping area near the top of a broad knoll. Anderson Road, Conway Road, Conway Gardens Road and other local streets could be identified even though none of them was labeled. Land use in the area was mapped as urban residential. Ground surface elevations were mapped between the Elevation 90 feet NGVD (El. 90) and El. 110 contours. A spot on Anderson Road beyond the western end of the project route was mapped at El. 94, while another spot at the intersection with Conway Road was mapped at El. 108.

The NRCS Soil Survey showed soils in the project area that are often found on knolls in central Orange County. Seffner fine sand was mapped toward the western end of the area while Florahome-Urban land complex was the predominant soil unit toward its eastern end. The appellation “-Urban land complex” is used in areas where the natural soils (Florahome fine sand in this case) have been modified or covered by streets, buildings and other urban facilities to the extent that they are barely discernible. Rural, undisturbed areas of these soils are reported to be somewhat poorly drained to moderately well drained, with seasonal high groundwater levels between one-and-a-half feet and six feet below the natural ground surface.

The preliminary BFA plan showed proposed pipe routes labeled “PROP 8” DI WM” and “PROP 6” PVC FM” along a short section of Kew Gardens Drive and the northern side of Anderson Road. Handwritten notations “10’ SPT” or “15’ SPT” were shown at five places along Anderson Road; they were not otherwise identified. BFA advised that those were test boring locations and depths that they had selected.



## **FIELD INVESTIGATION**

A field reconnaissance was conducted on February 2, 2015 to observe the surface conditions along the proposed water main and force main routes and prepare for the drilling program. Test boring locations "B-1" through "B-5" were established near the five locations shown on the preliminary plan furnished by BFA. Those locations were adjusted as needed to avoid overhead and underground utility service lines, trees, paved surfaces and other visible obstructions. Approximate locations are shown on Figure 2. The boring locations were staked for underground utility location and marking in accordance with Florida statutes and to facilitate subsequent identification by the drilling crew.

The test borings were drilled on February 5, 2015. The uppermost four feet of most boreholes were drilled by hand in general accordance with ASTM D 1452, using a bucket auger to avoid damage to unmarked underground utility facilities. The borings were advanced beyond four feet by split-spoon sampling and mud-rotary drilling, and were completed at depths of either ten feet or 15 feet below the existing ground surface. The Standard Penetration Test (SPT) was conducted with the split-spoon sampling in general accordance with ASTM D 1586.

Soils recovered in the auger bucket and the split-spoon samplers were logged by the field crew. Representative samples were sealed in clean, airtight containers for transportation to our Orlando office. The depth to groundwater in each borehole was measured when encountered, and recorded on the field logs. At the completion of the drilling program, the boreholes were backfilled with soil cuttings.

## **LABORATORY TESTING**

The recovered soil samples were examined in our office by a geotechnical engineer who confirmed the descriptions on the field logs, classified the soils visually in general accordance with ASTM D 2488 and developed a representation of the soil stratigraphy encountered at each boring location. Representative soil samples were selected for laboratory testing, which consisted of eight single-sieve soil gradation analyses (ASTM D 1140). Test results are presented on the boring logs and the Summary of Laboratory Test Results sheet in Appendix A.

[END OF SECTION]

## **SURFACE CONDITIONS**

Anderson Road was a two-lane roadway in a suburban, residential area about four miles southeast of downtown Orlando. The roadway was aligned from west to east and its profile within the project limits appeared to be nearly level to level. Narrow concrete sidewalks were observed a few feet behind the edge of the pavement along the northern side of the road, while a few storm drain inlet grates were observed in the grass on the southern side. There were no concrete curbs or gutters. Flagging and paint markings on the pavement surface and in adjacent, unpaved areas indicated the presence of numerous underground utility lines. Vegetation was mostly grass turf, landscaped shrubs and a few large trees, especially toward the eastern end of the route. Some trees had branches hanging over the roadway.

## **SUBSURFACE CONDITIONS**

The stratigraphy, soil types and groundwater levels described in the following paragraphs were based on the appearance and physical attributes of the materials encountered in the test borings and the results of a limited number of laboratory tests, so those descriptions are general. Detailed subsurface characteristics at each boring location are shown on the boring logs in Appendix A.

All five boreholes encountered very dark brown, dark grayish brown and olive brown to light olive brown, yellow and pale yellow fine sand. Encountered thicknesses were ten feet and 15 feet. Actual thicknesses could not be confirmed because all five boreholes had been terminated before fully penetrating these soils. SPT N-values ranged from 1 blow per foot (bpf) to 12 bpf, indicating that the soils were very loose to medium dense. Single-sieve soil gradation analyses of eight samples indicated fines contents (fraction by dry weight passing the U.S. Standard No. 200 sieve) that ranged from 1 percent to 5 percent. Based on visual classification and the laboratory test results, these soils were given the Unified Soil Classification System (USCS) designation "SP" for poorly graded sand.

Groundwater was encountered at depths between seven feet and 14 feet below the existing ground surface in boreholes B-1 through B-4. It was not encountered in B-5, which had been terminated at a depth of ten feet.

[END OF SECTION]

## **GENERAL COMMENTS ON RECOMMENDATIONS**

The following recommendations are based upon a review of the available information, the field and laboratory test results, our understanding of the proposed construction and our experience with similar projects and subsurface conditions. If plans for the proposed construction change from those discussed in this report, we request the opportunity to review our recommendations and amend them as needed to accommodate those changes. The project plans and specifications should be reviewed by this office before being submitted to the owner to confirm that the geotechnical recommendations and concerns expressed in this report have been appropriately conveyed to those documents. In addition, if subsurface conditions encountered during construction differ significantly from those encountered in the boreholes, those conditions should be reported to us for our observation and comment.

## **GENERAL ASSESSMENT OF ENCOUNTERED SOILS**

As discussed in the SUBSURFACE CONDITIONS section of this report, the soils encountered during this investigation were very loose to medium dense, poorly graded sands. Groundwater was encountered in four of the five boreholes, at depths between nine feet and 11 feet below the existing ground surface.

In our opinion, the soils encountered within the limits defined by the test borings and their depths should be suitable for installation of the water main and the force main along the proposed routes, provided the recommendations presented later in this report are followed.

## **DESIGN HIGH WATER LEVEL**

During the rainy season in Florida (normally between June and September), groundwater levels are generally higher than those observed at other times of the year. The extent of the variation depends on several factors, including the terrain, the intensity and duration of rainfall, the hydrogeologic properties of the soils and the presence and proximity of artificial drainage facilities.

Based on our observations in the boreholes, the time of year of the investigation, our review of the Soil Survey of Orange County, and the urban nature of the project area, it is our opinion that the natural, seasonal variation in groundwater level should not be relied on to estimate high groundwater levels. Instead, we recommend setting the water level at the ground surface for design of the pipe and any buried structures, as well as any temporary excavation support systems and dewatering systems that will be needed.

## **DESIGN OF PIPES AND BURIED STRUCTURES**

Pipes, manholes and other buried structures should be designed to resist the vertical and lateral loads imposed by the soils, as well as possible hydrostatic pressures, surcharge and traffic loads. For calculating soil loading on buried structures, we recommend using a saturated soil unit weight of 125 pounds per cubic foot (pcf) and a lateral earth pressure coefficient of 0.5. That same coefficient should be applied to loads on the ground surface from construction equipment and other vehicular traffic in the vicinity of the excavations. Typical traffic loads should be represented by a uniformly distributed surcharge of 250 pounds per square foot (psf).

## **FOUNDATION SUPPORT**

Manholes, thrust blocks, anchor blocks and other underground structures should be supported on natural soil or backfill compacted to achieve an in-place dry density not less than 95 percent of the maximum obtained by the Modified Proctor method (ASTM D 1557) to a depth of at least one foot below the base of each structure. Soils compacted to that condition should support bearing pressures up to 1,500 pounds per square foot (psf) with very little settlement. Even when full, installed pipe weighs less than the soil it displaced, which means it imposes little if any additional vertical stress on the underlying soil. Under those conditions, settlement of the pipe is not anticipated.

## **UPLIFT RESISTANCE**

Groundwater levels can rise and submerge parts of some structures, resulting in uplift forces from buoyancy. Uplift forces are resisted by the self-weight of the affected structure (divided by an appropriate factor of safety) and the buoyant weight of backfill directly above any parts of the base of the structure that project beyond its walls. Soil shear along vertical planes extending upward from the edges of the base of the structure should not be included in uplift resistance calculations.

## **SOIL RESISTANCE TO HORIZONTAL PIPELINE FORCES**

Changing fluid pressure inside a pipeline can induce horizontal forces at junctions with buried structures and in locations where the pipe changes direction. Those forces can cause the pipe to move uncontrollably and eventually lead to distress, so anchor blocks or thrust blocks are typically provided to restrain the pipe. Those blocks resist horizontal forces by virtue of their mass as well as the ability to mobilize the shear resistance of the soil beneath their bases and the passive resistance of the soil in contact with their vertical faces.

In order to provide effective resistance, the soil needs to be in a medium dense to dense condition. Naturally loose soils (and all fill or backfill materials) should be compacted to achieve an in-place dry density not less than 95 percent of the maximum obtained by the Modified Proctor method (ASTM D 1557). This condition should extend at least two feet below the base of any block or

structure and at least five feet beyond the vertical face in contact with the soil. The soils should be continuous with no voids or other discontinuities.

Shear resistance beneath the base of any block or structure may be estimated using the following expression:

$$S = \frac{(W + \gamma_s H_t A - U) \tan (0.67\phi)}{FS_b}$$

where

- S = allowable shear resistance, in pounds
- W = total weight of the block, in pounds
- $\gamma_s$  = unit weight of the soil above the block, in pounds/ft<sup>3</sup>
- H<sub>t</sub> = depth from ground surface to the top of the block, in feet
- A = base area of the block
- U = total uplift force, in pounds
- $\phi$  = soil friction angle (30 degrees typically assumed)
- FS<sub>b</sub> = desired factor of safety for base shear (1.5 typically assumed)

For design of thrust blocks or anchor blocks, the unit weight for moist, compacted soil in central Florida is often estimated at about 110 pounds per cubic foot (pcf). Saturated soils are estimated at about 120 pcf. Passive soil resistance against the face of any block or structure may be calculated conventionally using the estimated soil properties and the desired factor of safety for passive resistance. Surcharges, wheel loads and the weight of construction equipment should not be considered in these analyses.

## **GROUNDWATER CONTROL**

Based on the encountered depth to groundwater, the estimated design high groundwater level and the anticipated depths of installation of the new mains, groundwater should be expected to influence construction. As a result, the Contractor should be prepared to lower and maintain the groundwater at least two feet below the bottoms of all excavations in order to facilitate excavations and enable the proper working of the subgrade soils and backfill as recommended in this report. The contract documents should require the Contractor to verify the groundwater level before starting construction, and be responsible for all dewatering, regardless of the groundwater level during construction.

To prevent instability, groundwater should be drawn down before starting work. Dewatering should be conducted in accordance with applicable state and local regulations and should be maintained for the duration of all below-grade activity. Water from dewatering pumps should be discharged as far as practically possible away from the work areas, to prevent return flow or erosion. The Contractor should have submersible pumps ready to intercept and remove any localized inflows.

## **EXCAVATION SAFETY**

The sides of all excavations more than four feet deep must be inclined or supported to withstand lateral forces exerted by the existing soils in accordance with the latest regulations promulgated by the Occupational Safety and Health Administration (OSHA). The design of temporary excavation support systems should be conducted in conjunction with the design of the dewatering systems. As discussed earlier in this report, groundwater should be maintained at least two feet below the bottoms of all excavations. If a dewatering system fails, groundwater can return to its pre-construction level and possibly fill the excavation. Uncontrolled pumping of water from a flooded excavation could create a “rapid drawdown” condition which can reduce soil strength to its minimum. This condition should be analyzed with the groundwater level set at the ground surface.

## **EARTHWORK FOR CUT-AND-COVER CONSTRUCTION**

Pavement materials, grass and other vegetation, topsoil, roots or any other materials unsuitable for earthwork within the limits of the proposed construction should be removed and either discarded or stockpiled away from the immediate work areas for reuse as appropriate. Some materials may be reused as landscaping material, if needed. Any organic materials encountered deeper beneath the surface should be treated in a similar fashion.

Conventional construction equipment should be able to excavate the soils that were encountered during this investigation. However, the Contractor should select equipment capable of maintaining effective operations even if less-favorable conditions are encountered during construction. For example, abandoned utilities may still remain beneath the streets. Roots should be anticipated even where tree branches presently do not overhang the street, because large trees and their stumps may have been removed in the past.

Excavations should be dug to the required depths and to the width needed to provide working room for proper installation of pipes, buried structures and any excavation support that may be needed. This work should be supervised by a suitably qualified member of the Contractor’s staff. All below-grade construction activity should be conducted in accordance with the recommendations for excavation safety and groundwater control presented earlier in this report.

Pipes and buried structures should be bedded on firm, stable soil compacted to exceed the minimum criteria selected by OCU for this project, to a depth of at least one foot below the bearing surface. Soils should be tested for adequate compaction as required by OCU before placing any pipes or structures. Soils that cannot be improved should be removed and replaced with compacted backfill.

Backfill material should be free from mud, muck, stumps, roots and other vegetable matter, debris, rubbish or other materials that might decompose or otherwise cause excessive settlement. It should consist of sand with fines content lower than 12 percent. The sands that are likely to be excavated during this project should satisfy that condition.

Backfill should be placed in loose, level, uniform lifts approximately one foot thick. It should be placed uniformly and equally on both sides of the pipe and around all sides of buried structures before initiating compaction.

Each lift of backfill should be compacted to exceed the minimum criteria selected by OCU for this project. Although in-place dry density not less than 95 percent of the maximum obtained by the Modified Proctor method (ASTM D 1557) is widely accepted throughout the industry, some agencies have more stringent requirements for utilities installed near and beneath streets. As a result, standard specifications from other agencies should not be adopted for this project without consultation with OCU. Backfill should be tested for adequate compaction at the frequency required by OCU.

Typical vibratory equipment used to compact trench backfill should not affect adjacent structures. However, some vibratory equipment can cause loose to very loose soils to settle. If any disturbance, or other undesirable effects are noted on more than an isolated or random basis, compaction should be halted immediately. If necessary, procedures should be modified so that satisfactory compaction can still be achieved at no additional cost to OCU.

## **REUSE OF EXCAVATED MATERIALS**

As discussed earlier in the “SUBSURFACE CONDITIONS” section of this report, the soils that are likely to be excavated should be suitable for reuse as backfill. A general discussion of the suitability of the soil types that are likely to be encountered during excavation is presented below.

### **Poorly Graded Sands (SP)**

These soils had fines contents of 5 percent or less. They are highly desirable for use as fill because they drain freely, which allows these soils to be placed and compacted readily, even when excavated from below the groundwater level. Satisfactory densification can be achieved using a wide variety of compaction equipment and across a relatively broad range of moisture contents. Because of the relatively small size, sub-rounded shape and near-uniform distribution of the soil particles, some instability or “pumping” can be expected if efforts are made to compact these sands near saturation.

### **Sands with Silt or Clay (SP-SM, SP-SC)**

These soils consisted of sands with fines contents between 5 percent and 12 percent. Although these sands drain less freely than poorly graded sands, they are still suitable for use as fill. If excavated from below the groundwater surface, they may have to be stockpiled and allowed to drain (or spread to dry) before being placed as fill. Satisfactory densification can be achieved using a variety of compaction equipment and across a moderate to wide range of moisture contents, but efforts should be made to maintain the moisture content during compaction below the optimum moisture content. As with the poorly graded sands, some instability or “pumping” can be expected when trying to compact these soils near and above saturation.

## **HORIZONTAL DIRECTIONAL DRILLING OVERVIEW**

As discussed earlier in this report, the pipes beneath some street crossings may be installed by horizontal directional drilling (“HDD”). The method utilizes a rotary drill rig with its axis inclined at a shallow angle to the horizontal. The operator uses specialized cutting tools at the end of the rods while drilling to change the inclination and direction of the borehole. A pilot hole is initiated by drilling into the ground at a shallow angle and advanced incrementally by adding drill rods at the rig. The cutting tool inclination is decreased slightly as each rod is added to create a curved borehole that becomes horizontally oriented at the intended drilling depth. The drill is then advanced horizontally to an interim target location, where the inclination is increased incrementally until the tool emerges from the ground at the far end.

The cutting tool is removed and replaced with a reaming tool, which is drawn back through the pilot hole while rotating with the drilling rods to increase the hole diameter (“ream and pullback”). As the rods are being retracted, a continuous polymer casing connected to the back of the reaming tool is pulled into the enlarged borehole to become the conduit for the utility line to be installed.

During drilling, specially formulated drilling fluid (usually a bentonite-water slurry) is pumped through the hollow drill rods to the face of the cutting tool. The fluid flushes soil cuttings away from the tool face, lubricates the rods and stabilizes the borehole as it returns to the rig in the annular space between the rods and the borehole wall. At the rig, the fluid passes through a series of screens to remove the suspended cuttings before being reconditioned as needed and pumped back through the rods into the hole. In the drilling industry, this process is known as “circulation”.

## **MINIMUM DRILLING FLUID PRESSURE**

In order to establish and maintain circulation in the borehole, the drilling fluid pump on the rig must develop a certain minimum pressure to overcome the shear resistance of the fluid inside the drill rods and in the annulus plus the static head between the drilling tool and the rig. Additional pressure is needed to circulate the drilling fluid fast enough to return the cuttings to the rig for screening. Otherwise, they can fall out of suspension and accumulate in the borehole, possibly obstructing it.

Minimum pump pressure is a function of the borehole length (which increases as drilling progresses) the shearing resistance of the drilling fluid (a function of dynamic fluid viscosity, borehole wall characteristics and circulation rate) and the difference in elevation between the drill tool and the rig. None of those variables is known at this time, so minimum fluid pressure cannot be estimated. However, most of the variables affecting minimum drilling pressure can be selected by the HDD contractor and some can be adjusted during drilling.



## **MAXIMUM DRILLING FLUID PRESSURE**

Under certain conditions (including obstruction of the borehole or unanticipated reduction in soil strength) drilling fluid pressure in the borehole can exceed the ability of the soil to contain it. The resulting rupture of the soil is known as a “hydraulic fracture” during which drilling fluid usually escapes from the borehole. Escaping fluid can invade and damage nearby underground facilities, cause ground subsidence, erupt at the surface, create a nuisance and incur additional costs and delays for cleanup. Lost circulation can also cause an otherwise serviceable borehole to become obstructed, which can complicate drilling operations even further.

## **DRILLING FLUID PRESSURE ANALYSIS**

The contract documents should require the contractor to conduct minimum and maximum fluid pressure analyses based on the anticipated hole geometry (length and depth of each run), properties of the encountered soils and the intended drilling fluid, anticipated circulation rates and operating fluid pressures for the drill rig that will be used. Those analyses should be submitted for review at least two weeks before the anticipated start of construction. The Contractor should be required to submit additional analyses before changing any of those variables during installation.

As mentioned earlier in this report, minimum fluid pressure increases with increasing borehole length. Maximum fluid pressure should be compared with the anticipated variation of minimum fluid pressure along the borehole length to ensure that each hole can be drilled efficiently without causing hydraulic fracture. If not, borehole lengths should be decreased, hole depth should be increased or the hole should be routed through more resistant soils.

During drilling - and especially during the initial stages of each borehole attempt - fluid pressures and drill rig performance should be monitored closely to ensure that the operating pressures established by the analyses are not exceeded. Since the limiting drilling fluid pressures are estimates, the contractor may adjust them during drilling to improve performance provided he understands clearly that his responsibility for maintaining the integrity of the borehole will not be relaxed. The contractor should be reminded that drilling fluid can also be lost through natural and man-made discontinuities in the soil, and that favorable pressure analyses should not be considered as assurance of problem-free drilling. Regardless of the circumstances, the contractor should be responsible for containing and recovering all fluid losses promptly and at no additional expense to the owner.

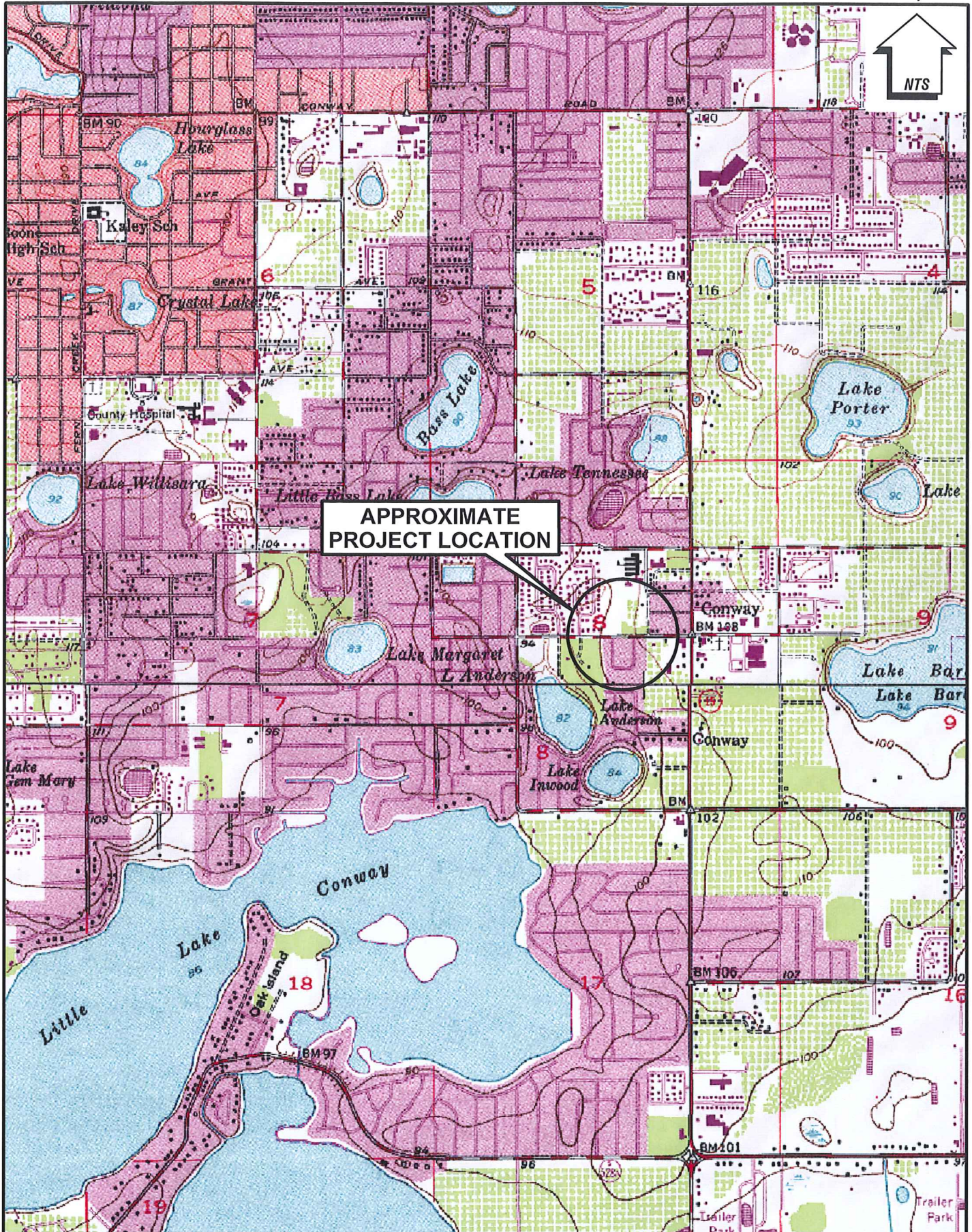
## **LIMITATIONS**

This report presents an evaluation of the subsurface conditions on the basis of accepted geotechnical procedures for site characterization. The recovered soil samples were not examined or tested in any way for chemical composition or environmental hazards. The investigation was confined to the zone of soil which is likely to be affected by the proposed construction, and did not address the potential of surface expression of deep geologic activity such as sinkholes. This type of evaluation requires a more extensive range of services than those performed for this study.

Soils are natural materials, so variations in composition and other physical characteristics are normal and should be expected. Because of those natural variations, the broad spacing between the boring locations and the fact that portions of the pipe routes are beyond the limits defined by the boring locations and depths, materials other than those encountered by the test borings, (including materials that are less favorable for underground utility construction) may exist along the pipe routes, and although not encountered during this investigation, should still be anticipated. If encountered during construction they should be treated as directed by OCU representative, at no additional cost to OCU.

Because of the natural limitations inherent in working with the subsurface, a geotechnical engineer cannot predict and address all possible problems. During construction, geotechnical issues not addressed in this report may arise. The bulletin "Important Information About Your Geotechnical Engineering Report" published by the Geoprofessional Business Association (GBA) is presented in Appendix B to help explain the nature of geotechnical issues. Additional information is presented in Appendix C to discuss the potential concerns and the basic limitations of a typical geotechnical investigation report.

## **FIGURES**



APPROXIMATE PROJECT LOCATION

SITE LOCATION MAP

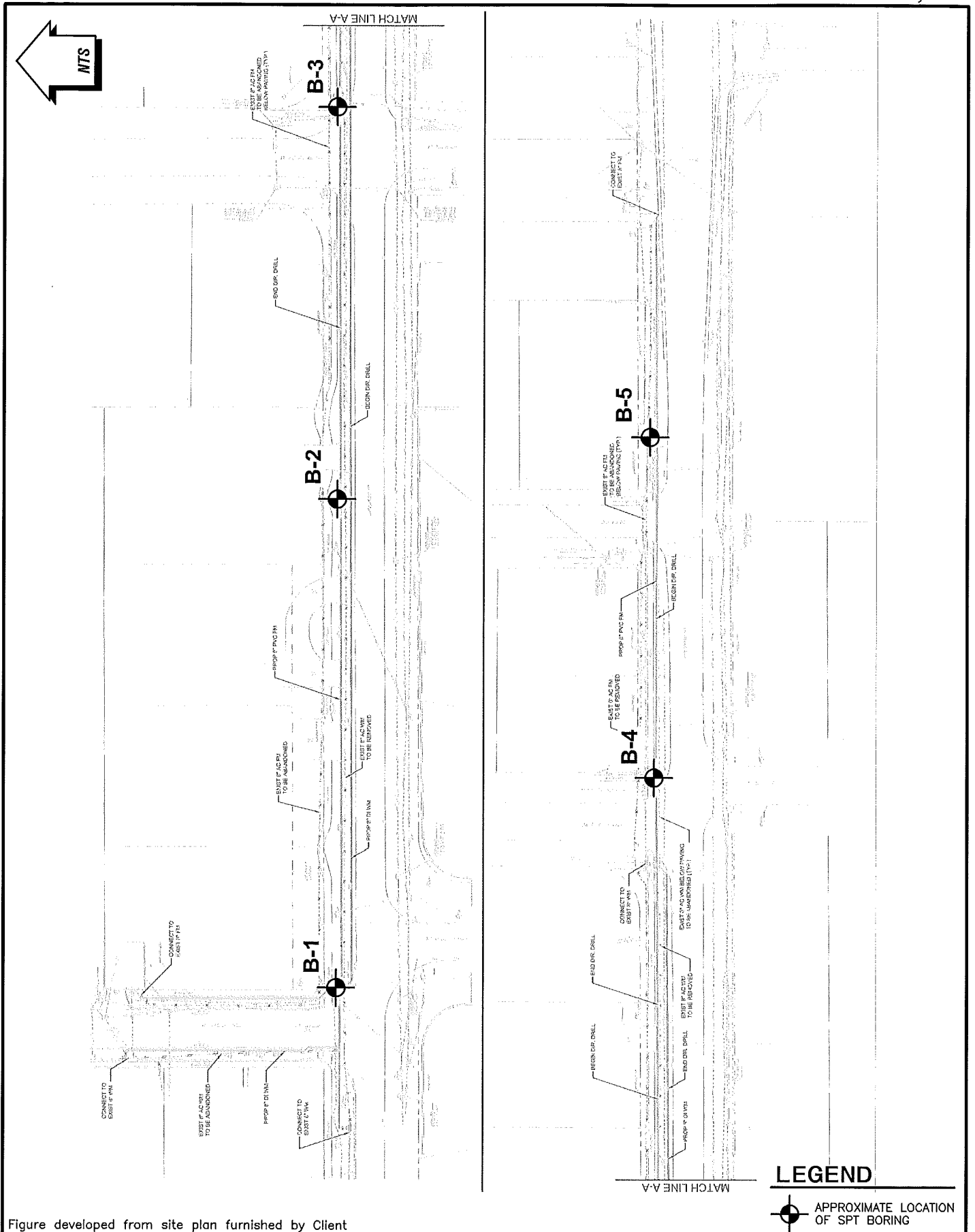


Figure developed from site plan furnished by Client

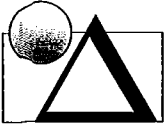
**BORING LOCATION PLAN**

201112-6

**ANDERSON ROAD WM AND FM REPLACEMENTS**

**FIG. 2**

## **APPENDIX A**



## KEY TO BORING LOGS

### SYMBOLS

10 SPT N-Value (number of blows a 140-lb weight falling 30 inches required to drive a Standard Split-Spoon sampler one foot into otherwise undisturbed soil)

WR Penetration of sampler under weight of drill rods

WH Penetration of sampler under weight of drill rods and hammer

SS Split Spoon sample

ST Undisturbed thin-walled Shelby Tube sample

Observed change in soil type

Unobserved change in soil type

▽ Estimated seasonal high groundwater level

▼ Encountered groundwater level

### SOIL CONSISTENCY

(Based on empirical correlation with SPT N-Value)

#### GRANULAR SOILS

Very Loose - Less Than 4 blows/ft.

Loose - 4 to 10 blows/ft.

Medium Dense - 10 to 30 blows/ft.

Dense - 30 to 50 blows/ft.

Very Dense - More Than 50 blows/ft.

#### FINE-GRAINED SOILS

Very Soft - Less Than 2 blows/ft.

Soft - 2 to 4 blows/ft.

Firm - 4 to 8 blows/ft.

Stiff - 8 to 15 blows/ft.

Very Stiff - 15 to 30 blows/ft.

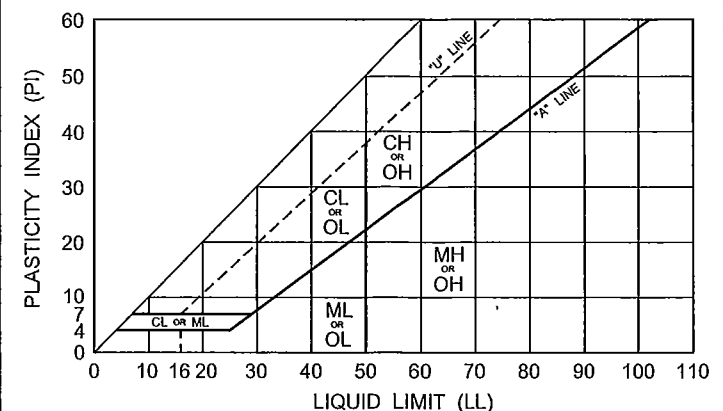
Hard - More Than 30 blows/ft.

## UNIFIED SOILS CLASSIFICATION SYSTEM ASTM D 2487

(Based on material passing the 3-inch (75-mm) sieve)

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW Well-graded gravels and gravel-sand mixtures, little or no fines	
			GP Poorly graded gravels and gravel-sand mixtures, little or no fines	
		GRAVELS WITH FINES	GM Silty gravels, gravel-sand-silt mixtures	
			GC Clayey gravels, gravel-sand-clay mixtures	
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW Well-graded sands and gravelly sands, little or no fines	
			SP Poorly graded sands and gravelly sands, little or no fines	
		SANDS WITH FINES	SM Silty sands, sand-silt mixtures	
			SC Clayey sands, sand-clay mixtures	
		FINE-GRAINED SOILS More than 50% passing No. 200 sieve	SILTS AND CLAYS Liquid limit 50% or less	ML Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
				CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL Organic silts and organic silty clays of low plasticity				
SILTS AND CLAYS Liquid limit greater than 50%	MH Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CH Inorganic clays or high plasticity, fat clays			
	OH Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS	Pt	Peat, muck and other highly organic soils		

## PLASTICITY CHART





# LOG OF BORING B-1

SHEET 1 OF 1

PROJECT NO: <b>201112-6</b>	SURFACE ELEVATION: <b>Unknown</b>
PROJECT: <b>Anderson Road WM &amp; FM Replacements</b>	GROUNDWATER DEPTH: <b>7.0</b>
DATE: <b>2/5/15</b>	COMPLETION DEPTH: <b>10.0</b>
LOCATION: <b>See Figure 2</b>	DRILLING METHOD: <b>Continuous Split-Spoon</b>

DEPTH, ft.	SAMPLES SPT N-VALUE (bpcf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	kv (ft/day)
0		HA	Dark grayish brown fine SAND (SP) - olive brown			3				
4	4	SS	- very loose							
8	8	SS	- loose, brown							
10	10	SS	- light olive brown							
6	6	SS								
10				10.0						





# LOG OF BORING B-2

SHEET 1 OF 1

PROJECT NO: <b>201112-6</b>	SURFACE ELEVATION: <b>Unknown</b>
PROJECT: <b>Anderson Road WM &amp; FM Replacements</b>	GROUNDWATER DEPTH: <b>9.5</b>
DATE: <b>2/5/15</b>	COMPLETION DEPTH: <b>10.0</b>
LOCATION: <b>See Figure 2</b>	DRILLING METHOD: <b>Continuous Split-Spoon</b>

DEPTH, ft.	SAMPLES SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	kv (ft/day)	
0		HA	Very dark grayish brown fine SAND (SP)								
			- light olive brown								
4	4	SS	- very loose								
4	4	SS	- light yellowish brown								
4	4	SS	- olive yellow				1				
4	4	SS	- brownish yellow								
10				10.0							



# LOG OF BORING B-3

SHEET 1 OF 1

PROJECT NO: <b>201112-6</b>	SURFACE ELEVATION: <b>Unknown</b>
PROJECT: <b>Anderson Road WM &amp; FM Replacements</b>	GROUNDWATER DEPTH: <b>13.5</b>
DATE: <b>2/5/15</b>	COMPLETION DEPTH: <b>15.0</b>
LOCATION: <b>See Figure 2</b>	DRILLING METHOD: <b>Cont SS &amp; Mud-Rotary</b>

DEPTH, ft.	SAMPLES SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	kv (ft/day)
0		HA	Very dark grayish brown fine SAND (SP)			3				
2	2	SS	- very loose, light olive brown							
4	4	SS	- light yellowish brown							
6	6	SS	- loose							
8	5	SS	- pale yellow							
12	12	SS	- medium dense, yellow			2				
15.0				15.0						



# LOG OF BORING B-4

SHEET 1 OF 1

PROJECT NO: <b>201112-6</b>	SURFACE ELEVATION: <b>Unknown</b>
PROJECT: <b>Anderson Road WM &amp; FM Replacements</b>	GROUNDWATER DEPTH: <b>14.0</b>
DATE: <b>2/5/15</b>	COMPLETION DEPTH: <b>15.0</b>
LOCATION: <b>See Figure 2</b>	DRILLING METHOD: <b>Cont SS &amp; Mud-Rotary</b>

DEPTH, ft.	SAMPLES SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	kv (ft/day)
0		HA	Very dark grayish brown fine SAND (SP)			5				
7		SS	- loose							
2		SS	- very loose, light olive brown							
1		SS								
4		SS								
5		SS	- loose, pale yellow							
7		SS				1				
9		SS				2				
15.0				15.0						



# LOG OF BORING B-5

SHEET 1 OF 1

PROJECT NO: <b>201112-6</b>	SURFACE ELEVATION: <b>Unknown</b>
PROJECT: <b>Anderson Road WM &amp; FM Replacements</b>	GROUNDWATER DEPTH: <b>GNE</b>
DATE: <b>2/5/15</b>	COMPLETION DEPTH: <b>10.0</b>
LOCATION: <b>See Figure 2</b>	DRILLING METHOD: <b>Continuous Split-Spoon</b>

DEPTH, ft.	SAMPLES SPT N-VALUE (bpf)	SAMPLE TYPE	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	- 200	MC %	LL	PI	kv (ft/day)
0		HA	Very dark grayish brown fine SAND (SP)			3				
			- olive brown							
2	2	SS	- very loose, light olive brown							
4	4	SS	- brownish yellow							
5	5	SS	- loose, light yellowish brown							
7	7	SS								
10				10.0						

Project: **Anderson Road WM & FM Replacements**

Job Number: **201112-6**

Sheet **1** of **1**

Manager: \_\_\_\_\_ Client: \_\_\_\_\_ Project Description: \_\_\_\_\_  
 Location: See Figure 2 \_\_\_\_\_  
 \_\_\_\_\_

Boring Depth	Sample Description					Fines #200	Water Content	LL	PI	Organic Content	k (ft/day)	AASHTO	USCS
	#4	#10	#40	#60	#100								
B-1 0.0	Dark grayish brown fine sand					3.3							SP
B-2 7.0	Olive yellow fine sand					1.2							SP
B-3 0.0	Very dark grayish brown fine sand					3.1							SP
B-3 13.5	Yellow fine sand					1.7							SP
B-4 0.0	Very dark grayish brown fine sand					4.7							SP
B-4 8.5	Pale yellow fine sand					1.0							SP
B-4 13.5	Pale yellow fine sand					1.6							SP
B-5 3.0	Olive brown fine sand					2.7							SP

**Summary Of  
Laboratory Test Results**



## **APPENDIX B**

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

## Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

## Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

## Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

## A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

## A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

### **Do Not Redraw the Engineer's Logs**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

### **Give Constructors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

### **Read Responsibility Provisions Closely**

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### **Environmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

### **Obtain Professional Assistance To Deal with Mold**

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

### **Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance**

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBC-Member geotechnical engineer for more information.



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## **APPENDIX C**

# ANTILLIAN ENGINEERING ASSOCIATES, INC. CONSTRAINTS AND RESTRICTIONS

## WARRANTY

Antillian Engineering Associates, Inc. has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

## UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

## CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Antillian Engineering Associates, Inc., as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Antillian Engineering Associates, Inc. of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Antillian Engineering Associates, Inc. to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

## MISINTERPRETATION OF SOIL ENGINEERING REPORT

Antillian Engineering Associates, Inc. is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Antillian Engineering Associates, Inc..

## CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Antillian Engineering Associates, Inc..

## USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Antillian Engineering Associates, Inc. cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

## STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

## OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

## WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

## LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Antillian Engineering Associates, Inc. to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Antillian Engineering Associates, Inc. to locate any such buried objects. Antillian Engineering Associates, Inc. cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

## TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

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# ***Barnes, Ferland, and Associates, Inc.***

***1230 Hillcrest Street  
(407) 896-8608***

***Orlando, Florida 32803  
Fax (407) 896-1822***

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## **MEMORANDUM**

BFA #2011-11.24

**TO:** Pierre Cadely, E.I, Project Manager, Orange County Utilities Engineering

**FROM:** Katie Ballew, Environmental Scientist, BFA Environmental Consultants

**DATE:** March 23, 2015

**SUBJECT:** Anderson Road Water Main and Force Main Replacement Project

**RE:** Ground Water Sampling and Analysis Results – Anderson Road

This memo is to present the results of Barnes Ferland and Associates, Inc.'s (BFA) ground water sampling and analysis performed for part of Orange County Utilities' Anderson Road Water Main and Force Main Replacement Project. The project will replace approximately 1,100 feet of existing 8-inch asbestos cement (AC) water main and 1,340 feet of existing 8-inch AC force main along Anderson Road and Kew Gardens Lane due to concerns related to age, AC pipe material, and service connections. The force main replacement will extend 500 feet past the east end of Monika Circle.

### **Objective:**

The Contractor selected for the Anderson Road Water Main and Force Main Replacement Project will need to be prepared to perform construction dewatering in order to excavate and install the proposed water mains "in the dry" as will be required by the contract documents. Therefore, at least 30 days prior to performing construction dewatering for the project, the Contractor is required by FDEP to submit a *Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity - FDEP Document No. 62-621.300(2)* (attached to this memorandum). As part of this Generic Permit, the Contractor shall first sample, test and report to FDEP that the groundwater to be discharged does not contain contaminants above the maximum acceptable parameters listed in Table 1 of the Generic Permit. However, if any of the analytical test results exceed the screening values listed in Table 1, except TOC, the project will not qualify under the Generic Permit and the Contractor will be required to apply for an Individual Wastewater Application at least 90 days prior to the date of discharge to surface waters of the State.

Orange County recognizes the potential delays this permitting process may have on the Project. The actual start date of construction of the proposed water mains is dependent on the quality of the groundwater to be discharged during construction dewatering. The

# **Anderson Road Water Main and Force Main Replacement Project**

## **Groundwater Sampling and Analysis Results**

**Page 2**

**March 23, 2015**

objective of BFA's ground water sampling and analysis during this preliminary phase of the project is to determine the quality of the groundwater in advance of construction and provide Orange County Utilities with the results prior to bidding the construction project.

### **Methodology:**

BFA obtained two ground water samples labeled as TW-1 and TW-2 in this report. Sample TW-1 was taken on the north side of Anderson Road approximately 200 feet west of the west corner of Monika Circle and sample TW-2 was taken on the north side of Anderson Road approximately 200 feet east of the east corner of Monika Circle.

For both sample locations along Anderson Road, BFA first manually excavated to the ground water table with a post-hole digger, then beyond with a manual stainless steel hand auger. We then inserted a 1-inch diameter ten-slot per inch 1/100" screened well point into the excavation and below the water table. Once sampling activities were complete BFA filled in each well location with excavated soil until the ground was level and stable. Utilizing a peristaltic pump, we drew ground water through the well point at a relatively high volume for approximately 15 minutes followed by a low volume withdrawal until each well met FDEP Groundwater Monitoring Well stabilization criteria and recorded a turbidity of less than 10 NTU. Once the groundwater met all sampling criteria, samples were collected, labeled, placed in a cooler with ice and delivered to a certified testing laboratory for analysis with respect to the parameters listed in Table 1 of the Generic Permit.

### **Results:**

BFA performed a site search for contaminated sites using the FDEP Contamination Locator Map (CLEM) and also obtained a FirstSearch radius report from GeoSearch, Inc. Three sites were identified within a half mile radius of this portion of Anderson Road. Sunshine Food Mart located at 3200 S. Conway Road and Mobil #02 located at 3328 S. Conway Road both received Site Rehabilitation Completion Orders from the FDEP stating that they are released from any further obligation to conduct site rehabilitation at the facilities for petroleum discharges. Cleanup is ongoing at former Orange County Fire Station #72, located at 3410 S. Conway Road. However, the direction of groundwater flow is south of Anderson Road and any contamination present at the old fire station is not likely to reach the project location.

The samples from Anderson Road were tested and analyzed by Accutest Laboratories Southeast, Inc. Attached is a summary table of laboratory results, followed by laboratory reports prepared by Accutest. No FDEP screening values were exceeded at TW-2. For TW-1, with regard to general chemistry, total organic carbon was below the FDEP screening values but a low pH was recorded. The pH is likely to occur naturally and may be exempt from the Generic Permit if demonstrated by the permittee. All metals including Mercury, Zinc, Cadmium, Copper, and Lead, were below the FDEP screening levels with the exception of Chromium at TW-1 which exceeded screening values. With regard to volatile organic compounds, all samples were below the FDEP screening values.

## Laboratory Water Quality Results

### Anderson Road Improvements

FDEP Parameters	FDEP Screening Value	Units	Sample ID Number	
			TW-1	TW-2
<b>General Chemistry</b>				
Total Organic Carbon	10.0	mg/l	1.6	1.7
pH	6.0 - 8.5	su	5.77	6.79
<b>Metals</b>				
Mercury	0.012	ug/l	.03 U	0.03 U
Cadmium	9.3	ug/l	.2 U	.2 U
Copper	2.9	ug/l	1.0 U	1.0 U
Lead	30	ug/l	5.9	1.1 U
Zinc	86.0	ug/l	16.8 I	4.4 I
Chromium (Hex.)	11.0	ug/l	11.4	1.5 I
<b>Volatile Organic Compounds</b>				
Benzene	1.0	ug/l	0.2 U	.2 U
Naphthalene	100.0	ug/l	1 U	1 U

Notes:

indicates a value in excess of the FDEP Screening Value in Table 1 of the Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity

Subscripts:        U        Indicates that the compound was analyzed for but not detected.  
                           I        The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

**Technical Report for**

**BFA Environmental Consultants**

11-11.24 Anderson Rd, FL

Accutest Job Number: FA22664

Sampling Date: 03/10/15

**Report to:**

**BFA Environmental Consultants**  
1230 Hillcrest St Suite 100  
Orlando, FL 32803  
jwatson@bfaenvironmental.com; kballew@bfaenvironmental.com  
**ATTN: Katie Ballew**

**Total number of pages in report: 34**



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.



**Norm Farmer**  
**Technical Director**

**Client Service contact: Jean Dent-Smith 407-425-6700**

Certifications: FL (E83510), LA (03051), KS (E-10327), IA (366), IL (200063), NC (573), NJ (FL002), SC (96038001)  
DoD ELAP (L-A-B L2229), CA (2937), TX (T104704404), PA (68-03573), VA (460177),  
AK, AR, GA, KY, MA, NV, OK, UT, WA

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.  
Test results relate only to samples analyzed.

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2

3

4

5

6

7





## Sample Summary

BFA Environmental Consultants

Job No: FA22664

11-11.24 Anderson Rd, FL

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
FA22664-1	03/10/15	13:10 KB	03/10/15	AQ	Ground Water	TW-1
FA22664-2	03/10/15	15:55 KB	03/10/15	AQ	Ground Water	TW-2

## Summary of Hits

**Job Number:** FA22664  
**Account:** BFA Environmental Consultants  
**Project:** 11-11.24 Anderson Rd, FL  
**Collected:** 03/10/15

Lab Sample ID	Client Sample ID	Result/ Qual	PQL	MDL	Units	Method
<b>FA22664-1</b>	<b>TW-1</b>					
Calcium		11200	1000	50	ug/l	SW846 6010C
Chromium		11.4	10	1.0	ug/l	SW846 6010C
Lead		5.9	5.0	1.1	ug/l	SW846 6010C
Magnesium		812 I	5000	35	ug/l	SW846 6010C
Zinc		16.8 I	20	4.4	ug/l	SW846 6010C
Hardness, Total as CaCO <sub>3</sub> <sup>a</sup>		31.3	23	0.27	mg/l	SM19 2340B
Total Organic Carbon		1.6	1.0	0.23	mg/l	SM5310 B-11/SW9060A
<b>FA22664-2</b>	<b>TW-2</b>					
Calcium		28900	1000	50	ug/l	SW846 6010C
Chromium		1.5 I	10	1.0	ug/l	SW846 6010C
Magnesium		1130 I	5000	35	ug/l	SW846 6010C
Zinc		4.4 I	20	4.4	ug/l	SW846 6010C
Hardness, Total as CaCO <sub>3</sub> <sup>a</sup>		76.8	23	0.27	mg/l	SM19 2340B
Total Organic Carbon		1.7	1.0	0.23	mg/l	SM5310 B-11/SW9060A

(a) Calculated as: (Calcium \* 2.497) + (Magnesium \* 4.118)

Sample Results

---

Report of Analysis

---

# Report of Analysis

3.1  
3

<b>Client Sample ID:</b> TW-1		
<b>Lab Sample ID:</b> FA22664-1		<b>Date Sampled:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water		<b>Date Received:</b> 03/10/15
<b>Method:</b> SW846 8260B		<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	J0964790.D	1	03/19/15	KM	n/a	n/a	VJ4935
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	PQL	MDL	Units	Q
71-43-2	Benzene	0.20 U	1.0	0.20	ug/l	
91-20-3	Naphthalene	1.0 U	5.0	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	99%		83-118%
17060-07-0	1,2-Dichloroethane-D4	98%		79-125%
2037-26-5	Toluene-D8	103%		85-112%
460-00-4	4-Bromofluorobenzene	97%		83-118%

U = Not detected      MDL = Method Detection Limit  
 PQL = Practical Quantitation Limit  
 L = Indicates value exceeds calibration range

I = Result > = MDL but < PQL    J = Estimated value  
 V = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

31  
3

<b>Client Sample ID:</b> TW-1	<b>Date Sampled:</b> 03/10/15
<b>Lab Sample ID:</b> FA22664-1	<b>Date Received:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water	<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL	

### Total Metals Analysis

Analyte	Result	PQL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Cadmium	0.20 U	5.0	0.20	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Calcium	11200	1000	50	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Chromium	11.4	10	1.0	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Copper	1.0 U	25	1.0	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Lead	5.9	5.0	1.1	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Magnesium	812 I	5000	35	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Mercury	0.030 U	0.50	0.030	ug/l	1	03/12/15	03/12/15 JL	SW846 7470A <sup>1</sup>	SW846 7470A <sup>3</sup>
Zinc	16.8 I	20	4.4	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>

- (1) Instrument QC Batch: MA12265
- (2) Instrument QC Batch: MA12270
- (3) Prep QC Batch: MP28646
- (4) Prep QC Batch: MP28659

PQL = Practical Quantitation Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 I = Indicates a result > = MDL but < PQL

## Report of Analysis

<b>Client Sample ID:</b> TW-1	<b>Date Sampled:</b> 03/10/15
<b>Lab Sample ID:</b> FA22664-1	<b>Date Received:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water	<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL	

### General Chemistry

Analyte	Result	PQL	MDL	Units	DF	Analyzed	By	Method
Hardness, Total as CaCO <sub>3</sub> <sup>a</sup>	31.3	23	0.27	mg/l	1	03/16/15 15:20 LM	SM19	2340B
Total Organic Carbon	1.6	1.0	0.23	mg/l	1	03/13/15 00:27 FN	SM5310	B-11/SW9060A

(a) Calculated as: (Calcium \* 2.497) + (Magnesium \* 4.118)

PQL = Practical Quantitation Limit  
MDL = Method Detection Limit

U = Indicates a result < MDL  
I = Indicates a result > = MDL but < PQL

## Report of Analysis

32  
3

<b>Client Sample ID:</b> TW-2	
<b>Lab Sample ID:</b> FA22664-2	<b>Date Sampled:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water	<b>Date Received:</b> 03/10/15
<b>Method:</b> SW846 8260B	<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL	

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	J0964791.D	1	03/19/15	KM	n/a	n/a	VJ4935
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

CAS No.	Compound	Result	PQL	MDL	Units	Q
71-43-2	Benzene	0.20 U	1.0	0.20	ug/l	
91-20-3	Naphthalene	1.0 U	5.0	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	105%		83-118%
17060-07-0	1,2-Dichloroethane-D4	99%		79-125%
2037-26-5	Toluene-D8	103%		85-112%
460-00-4	4-Bromofluorobenzene	98%		83-118%

U = Not detected      MDL = Method Detection Limit      I = Result > = MDL but < PQL      J = Estimated value  
 PQL = Practical Quantitation Limit      V = Indicates analyte found in associated method blank  
 L = Indicates value exceeds calibration range      N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b> TW-2	<b>Date Sampled:</b> 03/10/15
<b>Lab Sample ID:</b> FA22664-2	<b>Date Received:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water	<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL	

### Total Metals Analysis

Analyte	Result	PQL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Cadmium	0.20 U	5.0	0.20	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Calcium	28900	1000	50	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Chromium	1.5 I	10	1.0	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Copper	1.0 U	25	1.0	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Lead	1.1 U	5.0	1.1	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Magnesium	1130 I	5000	35	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>
Mercury	0.030 U	0.50	0.030	ug/l	1	03/12/15	03/12/15 JL	SW846 7470A <sup>1</sup>	SW846 7470A <sup>3</sup>
Zinc	4.4 I	20	4.4	ug/l	1	03/16/15	03/16/15 LM	SW846 6010C <sup>2</sup>	SW846 3010A <sup>4</sup>

- (1) Instrument QC Batch: MA12265
- (2) Instrument QC Batch: MA12270
- (3) Prep QC Batch: MP28646
- (4) Prep QC Batch: MP28659

PQL = Practical Quantitation Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 I = Indicates a result > = MDL but < PQL



## Report of Analysis

<b>Client Sample ID:</b> TW-2	<b>Date Sampled:</b> 03/10/15
<b>Lab Sample ID:</b> FA22664-2	<b>Date Received:</b> 03/10/15
<b>Matrix:</b> AQ - Ground Water	<b>Percent Solids:</b> n/a
<b>Project:</b> 11-11.24 Anderson Rd, FL	

### General Chemistry

Analyte	Result	PQL	MDL	Units	DF	Analyzed	By Method
Hardness, Total as CaCO <sub>3</sub> <sup>a</sup>	76.8	23	0.27	mg/l	1	03/16/15 15:56 LM	SM19 2340B
Total Organic Carbon	1.7	1.0	0.23	mg/l	1	03/13/15 00:42 FN	SM5310 B-11/SW9060A

(a) Calculated as: (Calcium \* 2.497) + (Magnesium \* 4.118)

PQL = Practical Quantitation Limit  
MDL = Method Detection Limit

U = Indicates a result < MDL  
I = Indicates a result > = MDL but < PQL

## Misc. Forms

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### Custody Documents and Other Forms

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Includes the following where applicable:

- Chain of Custody



**ACCUTEST LABORATORIES SAMPLE RECEIPT CONFIRMATION**

ACCUTEST'S JOB NUMBER: FA22664 CLIENT: BFA PROJECT: 11-11-24 Anderson Road  
 DATE/TIME RECEIVED: 03/10/15 1652 (MM/DD/YY 24:00) NUMBER OF COOLERS RECEIVED: 1  
 METHOD OF DELIVERY: FEDEX UPS ACCUTEST COURIER DELIVERY OTHER: \_\_\_\_\_  
 AIRBILL NUMBERS: \_\_\_\_\_

**COOLER INFORMATION**

- CUSTODY SEAL NOT PRESENT OR NOT INTACT
- CHAIN OF CUSTODY NOT RECEIVED (COC)
- ANALYSIS REQUESTED IS UNCLEAR OR MISSING
- SAMPLE DATES OR TIMES UNCLEAR OR MISSING
- TEMPERATURE CRITERIA NOT MET

**TRIP BLANK INFORMATION**

- TRIP BLANK PROVIDED
- TRIP BLANK NOT PROVIDED
- TRIP BLANK NOT ON COC
- TRIP BLANK INTACT
- TRIP BLANK NOT INTACT
- RECEIVED WATER TRIP BLANK
- RECEIVED SOIL TRIP BLANK

**MISC. INFORMATION**

NUMBER OF ENCORES ? 25-GRAM \_\_\_\_\_ 5-GRAM \_\_\_\_\_  
 NUMBER OF 5035 FIELD KITS ? \_\_\_\_\_  
 NUMBER OF LAB FILTERED METALS ? \_\_\_\_\_

pH PAPER LOT# WIDE RANGE A036122 NARROW RANGE HC421754 OTHER (specify) 405-230010

SUMMARY OF COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**TEMPERATURE INFORMATION**

IR THERM ID 3 CORR. FACTOR -0.2  
 OBSERVED TEMPS: 3.2  
 CORRECTED TEMPS: 3.0

**SAMPLE INFORMATION**

- INCORRECT NUMBER OF CONTAINERS USED
- SAMPLE RECEIVED IMPROPERLY PRESERVED
- INSUFFICIENT VOLUME FOR ANALYSIS
- DATES/TIMES ON COC DO NOT MATCH SAMPLE LABEL
- ID'S ON COC DO NOT MATCH LABEL
- VOC VIALS HAVE HEADSPACE (MACRO BUBBLES)
- BOTTLES RECEIVED BUT ANALYSIS NOT REQUESTED
- NO BOTTLES RECEIVED FOR ANALYSIS REQUESTED
- UNCLEAR FILTERING OR COMPOSITING INSTRUCTIONS
- SAMPLE CONTAINER(S) RECEIVED BROKEN
- 5035 FIELD KITS NOT RECEIVED WITHIN 48 HOURS
- BULK VOA SOIL JARS NOT RECEIVED WITHIN 48 HOURS
- % SOLIDS JAR NOT RECEIVED
- RESIDUAL CHLORINE PRESENT LOT# \_\_\_\_\_

(APPLICABLE TO EPA 600 SERIES OR NORTH CAROLINA ORGANICS)

TECHNICIAN SIGNATURE/DATE RW 03-11-15

REVIEWER SIGNATURE/DATE Jay Lee 3-11-15

NF 10/14

receipt confirmation 102914.xls

**FA22664: Chain of Custody**

**Page 2 of 2**

## GC/MS Volatiles

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### QC Data Summaries

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Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

## Method Blank Summary

**Job Number:** FA22664  
**Account:** BFACFLO BFA Environmental Consultants  
**Project:** 11-11.24 Anderson Rd, FL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
VJ4935-MB	J0964789.D	1	03/19/15	KM	n/a	n/a	VJ4935

The QC reported here applies to the following samples:

Method: SW846 8260B

FA22664-1, FA22664-2

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.20	ug/l	
91-20-3	Naphthalene	ND	5.0	1.0	ug/l	

CAS No.	Surrogate Recoveries	Limits	
1868-53-7	Dibromofluoromethane	106%	83-118%
17060-07-0	1,2-Dichloroethane-D4	100%	79-125%
2037-26-5	Toluene-D8	104%	85-112%
460-00-4	4-Bromofluorobenzene	101%	83-118%

# Blank Spike Summary

**Job Number:** FA22664  
**Account:** BFACFLO BFA Environmental Consultants  
**Project:** 11-11.24 Anderson Rd, FL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
VJ4935-BS	J0964787.D	1	03/19/15	KM	n/a	n/a	VJ4935

The QC reported here applies to the following samples:

Method: SW846 8260B

FA22664-1, FA22664-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
71-43-2	Benzene	25	25.0	100	81-122
91-20-3	Naphthalene	25	23.3	93	63-132

CAS No.	Surrogate Recoveries	BSP	Limits
1868-53-7	Dibromofluoromethane	100%	83-118%
17060-07-0	1,2-Dichloroethane-D4	97%	79-125%
2037-26-5	Toluene-D8	99%	85-112%
460-00-4	4-Bromofluorobenzene	101%	83-118%

\* = Outside of Control Limits.

# Matrix Spike/Matrix Spike Duplicate Summary

**Job Number:** FA22664  
**Account:** BFACFLO BFA Environmental Consultants  
**Project:** 11-11.24 Anderson Rd, FL

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
FA22821-7MS	J0964810.D	10	03/20/15	KM	n/a	n/a	VJ4935
FA22821-7MSD	J0964811.D	10	03/20/15	KM	n/a	n/a	VJ4935
FA22821-7	J0964802.D	10	03/20/15	KM	n/a	n/a	VJ4935

The QC reported here applies to the following samples:

Method: SW846 8260B

FA22664-1, FA22664-2

CAS No.	Compound	FA22821-7 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD	
71-43-2	Benzene	4.4	J	250	243	95	250	240	94	1	81-122/14
91-20-3	Naphthalene	ND		250	226	90	250	245	98	8	63-132/25

CAS No.	Surrogate Recoveries	MS	MSD	FA22821-7	Limits
1868-53-7	Dibromofluoromethane	99%	101%	100%	83-118%
17060-07-0	1,2-Dichloroethane-D4	98%	98%	95%	79-125%
2037-26-5	Toluene-D8	99%	101%	104%	85-112%
460-00-4	4-Bromofluorobenzene	99%	100%	103%	83-118%

\* = Outside of Control Limits.

5.3.1  
 5



## Metals Analysis

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## QC Data Summaries

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Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY  
Part 2 - Method Blanks

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28646  
Matrix Type: AQUEOUS

Methods: SW846 7470A  
Units: ug/l

Prep Date: 03/12/15

Metal	RL	IDL	MDL	MB raw	final
Mercury	0.50	.03	.03	-0.022	<0.50

Associated samples MP28646: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
(\* ) Outside of QC limits  
(anr) Analyte not requested

6.1.1  
6

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28646  
 Matrix Type: AQUEOUS

Methods: SW846 7470A  
 Units: ug/l

Prep Date: 03/12/15 03/12/15

Metal	FA22679-4F Original	DUP	RPD	QC Limits	FA22679-4F Original MS	Spikelot HGFLWS1	% Rec	QC Limits	
Mercury	0.0	0.0	NC	0-20	0.0	3.2	3	106.7	80-120

Associated samples MP28646: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes

(\*) Outside of QC limits

(N) Matrix Spike Rec. outside of QC limits

(anr) Analyte not requested

6.1.2

6

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28646  
 Matrix Type: AQUEOUS

Methods: SW846 7470A  
 Units: ug/l

Prep Date: 03/12/15

Metal	FA22679-4F Original MSD	Spikelot HGFLWS1	% Rec	MSD RPD	QC Limit
Mercury	0.0	3.2	3	106.7	0.0 20

Associated samples MP28646: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (N) Matrix Spike Rec. outside of QC limits  
 (anr) Analyte not requested

6.1.2

6

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28646  
Matrix Type: AQUEOUS

Methods: SW846 7470A  
Units: ug/l

Prep Date: 03/12/15

Metal	BSP Result	Spikelot HGFLWS1	% Rec	QC Limits
Mercury	3.1	3	103.3	80-120

Associated samples MP28646: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
(\* ) Outside of QC limits  
(anr) Analyte not requested

6.1.3

6

SERIAL DILUTION RESULTS SUMMARY

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28646  
Matrix Type: AQUEOUS

Methods: SW846 7470A  
Units: ug/l

Prep Date: 03/12/15

Metal	FA22679-4F Original	SDL 1:5	%DIF	QC Limits
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Mercury 0.00 0.00 NC 0-10

Associated samples MP28646: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
(\* ) Outside of QC limits  
(anr) Analyte not requested

6.1.4

6

BLANK RESULTS SUMMARY  
Part 2 - Method Blanks

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
Matrix Type: AQUEOUS

Methods: SW846 6010C  
Units: ug/l

Prep Date: 03/16/15

Metal	RL	IDL	MDL	MB raw	final
Aluminum	200	14	14		
Antimony	6.0	1	1		
Arsenic	10	1.3	1.3		
Barium	200	1	1		
Beryllium	4.0	.2	.2		
Cadmium	5.0	.2	.2	0.0	<5.0
Calcium	1000	50	50	6.2	<1000
Chromium	10	1	1	-0.10	<10
Cobalt	50	.2	.2		
Copper	25	1	1	-1.0	<25
Iron	300	17	17		
Lead	5.0	1	1.1	-0.40	<5.0
Magnesium	5000	35	35	12.1	<5000
Manganese	15	.5	1		
Molybdenum	50	.3	.3		
Nickel	40	.4	.4		
Potassium	10000	200	200		
Selenium	10	2.4	2.9		
Silver	10	.7	.7		
Sodium	10000	500	500		
Strontium	10	.5	.5		
Thallium	10	1.1	1.4		
Tin	50	.9	1		
Titanium	10	.5	1		
Vanadium	50	.5	.6		
Zinc	20	3	4.4	0.20	<20

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
(\* ) Outside of QC limits  
(anr) Analyte not requested

6.2.1  
6

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
 Matrix Type: AQUEOUS

Methods: SW846 6010C  
 Units: ug/l

Prep Date: 03/16/15 03/16/15

Metal	FA22664-1 Original	DUP	RPD	QC Limits	FA22664-1 Original MS	Spikelot MPFLICP2	% Rec	QC Limits	
Aluminum									
Antimony	anr								
Arsenic	anr								
Barium	anr								
Beryllium	anr								
Cadmium	0.0	0.0	NC	0-20	0.0	49.8	50	99.6	80-120
Calcium	11200	11300	0.9	0-20	11200	38500	25000	109.2	80-120
Chromium	11.4	11.8	3.4	0-20	11.4	226	200	107.3	80-120
Cobalt									
Copper	0.0	0.0	NC	0-20	0.0	271	250	108.4	80-120
Iron	anr								
Lead	5.9	6.1	3.3	0-20	5.9	509	500	100.6	80-120
Magnesium	812	811	0.1	0-20	812	27500	25000	106.8	80-120
Manganese	anr								
Molybdenum									
Nickel	anr								
Potassium									
Selenium	anr								
Silver	anr								
Sodium									
Strontium									
Thallium	anr								
Tin									
Titanium									
Vanadium									
Zinc	16.8	17.0	1.2	0-20	16.8	532	500	103.0	80-120

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (N) Matrix Spike Rec. outside of QC limits  
 (anr) Analyte not requested



MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
 Matrix Type: AQUEOUS

Methods: SW846 6010C  
 Units: ug/l

Prep Date: 03/16/15

Metal	FA22664-1 Original MSD		SpikeLot MPFLICP2 % Rec	MSD RPD	QC Limit	
Aluminum						
Antimony	anr					
Arsenic	anr					
Barium	anr					
Beryllium	anr					
Cadmium	0.0	50.4	50	100.8	1.2	20
Calcium	11200	38700	25000	110.0	0.5	20
Chromium	11.4	228	200	108.3	0.9	20
Cobalt						
Copper	0.0	273	250	109.2	0.7	20
Iron	anr					
Lead	5.9	516	500	102.0	1.4	20
Magnesium	812	27800	25000	108.0	1.1	20
Manganese	anr					
Molybdenum						
Nickel	anr					
Potassium						
Selenium	anr					
Silver	anr					
Sodium						
Strontium						
Thallium	anr					
Tin						
Titanium						
Vanadium						
Zinc	16.8	538	500	104.2	1.1	20

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (N) Matrix Spike Rec. outside of QC limits  
 (anr) Analyte not requested

6.2.2  
 6

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
 Matrix Type: AQUEOUS

Methods: SW846 6010C  
 Units: ug/l

Prep Date: 03/16/15

Metal	BSP Result	Spikelot MPFLICP2	% Rec	QC Limits
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Cadmium	50.0	50	100.0	80-120
Calcium	27500	25000	110.0	80-120
Chromium	213	200	106.5	80-120
Cobalt				
Copper	268	250	107.2	80-120
Iron	anr			
Lead	496	500	99.2	80-120
Magnesium	26900	25000	107.6	80-120
Manganese	anr			
Molybdenum				
Nickel	anr			
Potassium				
Selenium	anr			
Silver	anr			
Sodium				
Strontium				
Thallium	anr			
Tin				
Titanium				
Vanadium				
Zinc	518	500	103.6	80-120

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (anr) Analyte not requested

6.2.3  
 6

SERIAL DILUTION RESULTS SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
 Matrix Type: AQUEOUS

Methods: SW846 6010C  
 Units: ug/l

Prep Date: 03/16/15

Metal	FA22664-1 Original	SDL 1:5	%DIF	QC Limits
Aluminum				
Antimony	anr			
Arsenic	anr			
Barium	anr			
Beryllium	anr			
Cadmium	0.00	0.00	NC	0-10
Calcium	11200	11200	0.3	0-10
Chromium	11.4	8.40	26.3 (a)	0-10
Cobalt				
Copper	0.00	0.00	NC	0-10
Iron	anr			
Lead	5.90	5.20	11.9 (a)	0-10
Magnesium	812	722	11.2 (a)	0-10
Manganese	anr			
Molybdenum				
Nickel	anr			
Potassium				
Selenium	anr			
Silver	anr			
Sodium				
Strontium				
Thallium	anr			
Tin				
Titanium				
Vanadium				
Zinc	16.8	16.5	1.8	0-10

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes

(\*) Outside of QC limits

(anr) Analyte not requested

(a) Percent difference acceptable due to low initial sample concentration (< 50 times IDL).

POST DIGESTATE SPIKE SUMMARY

Login Number: FA22664  
 Account: BFACFLO - BFA Environmental Consultants  
 Project: 11-11.24 Anderson Rd, FL

QC Batch ID: MP28659  
 Matrix Type: AQUEOUS

Methods: SW846 6010C  
 Units: ug/l

Prep Date:

03/16/15

Metal	Sample ml	Final ml	FA22664-1 Raw	FA22664-1 Corr.**	PS ug/l	Spike ml	Spike ug/ml	Spike ug/l	% Rec	QC Limits
Aluminum										
Antimony										
Arsenic										
Barium										
Beryllium										
Cadmium	9.8	10			52.4	0.2	2.5	50	104.8	80-120
Calcium	9.8	10	11220	10995.6	16370	0.2	250	5000	107.5	80-120
Chromium	9.8	10	11.4	11.172	66.6	0.2	2.5	50	110.9	80-120
Cobalt										
Copper	9.8	10			112.9	0.2	5	100	112.9	80-120
Iron										
Lead	9.8	10	5.9	5.782	57.7	0.2	2.5	50	103.8	80-120
Magnesium	9.8	10	812.2	795.956	5772	0.2	250	5000	99.5	80-120
Manganese										
Molybdenum										
Nickel										
Potassium										
Selenium										
Silver										
Sodium										
Strontium										
Thallium										
Tin										
Titanium										
Vanadium										
Zinc	9.8	10	16.8	16.464	285	0.2	12.5	250	107.4	80-120

Associated samples MP28659: FA22664-1, FA22664-2

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (\*\*) Corr. sample result = Raw \* (sample volume / final volume)  
 (anr) Analyte not requested

6.2.5  
6

## General Chemistry

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### QC Data Summaries

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Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

Analyte	Batch ID	RL	MB Result	Units	Spike Amount	BSP Result	BSP %Recov	QC Limits
Total Organic Carbon	GP25630/GN65509	1.0	0.0	mg/l	15	15.3	102.0	90-110%

Associated Samples:

Batch GP25630: FA22664-1, FA22664-2

(\*) Outside of QC limits

DUPLICATE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Total Organic Carbon	GP25630/GN65509	FA22590-1	mg/l	0.25	0.0	200.0(a)	0-20%

Associated Samples:

Batch GP25630: FA22664-1, FA22664-2

(\*) Outside of QC limits

(a) RPD acceptable due to low duplicate and sample concentrations.

MATRIX SPIKE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: FA22664  
Account: BFACFLO - BFA Environmental Consultants  
Project: 11-11.24 Anderson Rd, FL

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	%Rec	QC Limits
Total Organic Carbon	GP25630/GN65509	FA22590-1	mg/l	0.25	15	15.6	102.3	90-110%

Associated Samples:

Batch GP25630: FA22664-1, FA22664-2

(\*) Outside of QC limits

(N) Matrix Spike Rec. outside of QC limits

7.3

7



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# **APPENDIX B**

## **ORANGE COUNTY UTILITIES**

### **FORMS**

#### **Pressure Test**

**APPENDIX B**

**FORMS**

**Pressure Test**

February 11, 2011

<b>Project Name:</b> _____						<input type="checkbox"/> <b>Force Main</b> <input type="checkbox"/> <b>Reclaimed Main</b> <input type="checkbox"/> <b>Water Main</b>		<b>Allowable Loss – 2 Hours</b> $L = \frac{SD(P)}{1/2}$ 148,000 <i>See Note Below</i>										
<b>Constructed by:</b> _____																		
DATE	LINE SEGMENT	STATION		LENGTH	N	D	START		END		LOSS (gal)		Pass /Fail STATUS					
		From	To				Time	PSI	Time	PSI	Allow	Actual						
<b>COUNTY Inspector's Name:</b>						<b>Signature:</b>						<b>Date:</b>						
<b>Tester's Name:</b>						<b>Signature:</b>						<b>Date:</b>						
<b>Comments:</b>																		

**Note:** L - Allowable leakage in gallons per hour.  
 S - Length of pipe tested, in feet.  
 D - Nominal diameter of the pipe in inches.  
 P - Average test pressure during leakage test in pounds per square inch gauge.

# **APPENDIX C**

## **ORANGE COUNTY UTILITIES**

### **PERMITS OBTAINED BY COUNTY**

**FDEP – DOMESTIC WASTEWATER COLLECTIONS SYTEM  
CONSTRUCTION PERMIT, 10/6/2015**

**FDEP – POTABLE WATER DISTRIBUTION SYSTEM  
CONSTRUCTION PERMIT, 10/5/2015**

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# Florida Department of Environmental Protection

Central District  
3319 Maguire Boulevard, Suite 232  
Orlando, Florida 32803-3767

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Jonathan P. Steverson  
Secretary

## NOTIFICATION OF ACCEPTANCE OF USE OF A GENERAL PERMIT

**PERMITTEE:**

Orange County Utilities  
9150 Curry Ford Road  
Orlando, FL 32825  
Jose Hernandez, Chief Engineer

Email: [jose.hernandez2@ocfl.net](mailto:jose.hernandez2@ocfl.net)

**PERMIT NUMBER:**

0182579-066

**ISSUE DATE:**

October 6, 2015

**EXPIRATION DATE:**

October 5, 2020

**COUNTY:**

Orange

**PROJECT NAME:**

Anderson Road Force Main

**CONNECTED TO:**

OCUD Eastern

**FACILITY ID:**

FL0038849

Dear Mr. Hernandez:

This letter acknowledges receipt of your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System for the subject project. Our office received the Notice on October 1, 2015.

*This is to advise you that the Department does not object to your use of such General Permit.*

Please note the attached requirements apply to your use of this General Permit for constructing the proposed domestic wastewater collection/transmission system.

You are further advised that the construction activity must conform to the description contained in your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System and that any deviation will subject the permittee to enforcement action and possible penalties.

Sincerely,

A handwritten signature in cursive script that reads "Charles LeGros".

Charles LeGros  
Engineer  
Wastewater Permitting

CRL/ohm

cc: Cynthia Malone, PE, BFA Environmental Consultants (email: [cmalone@bfaenvironmental.com](mailto:cmalone@bfaenvironmental.com))  
Osama Mahmoud, DEP (via email: [osama.mahmoud@dep.state.fl.us](mailto:osama.mahmoud@dep.state.fl.us))

**REQUIREMENTS FOR USE OF THE GENERAL PERMIT FOR DOMESTIC WASTEWATER COLLECTION/TRANSMISSION SYSTEMS:**

1. This general permit is subject to the general permit conditions of Rule 62-4.540, F.A.C., as applicable. This rule is available at the Department's Internet site at:  
<http://www.dep.state.fl.us/legal/Rules/shared/62-4/62-4.pdf> [62-4.540]
2. This general permit does not relieve the permittee of the responsibility for obtaining a dredge and fill permit where it is required. [62-604.600(6)(b)1]
3. This general permit cannot be revised, except to transfer the permit. [62-604.600(6)(b)2]
4. This general permit will expire five years from the date of issuance. If the project has been started and not completed by that time, a new permit must be obtained before the expiration date in order to continue work on the project. [62-4.030]
5. Upon completion of construction of the collection/transmission system project, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the Department's Central District Office Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation. This form is available at the Department's Internet site at: <http://www.dep.state.fl.us/water/wastewater/forms.htm> [62-604.700(2)]

**Please submit the entire clearance document package in electronic format to [DEP\\_CD@dep.state.fl.us](mailto:DEP_CD@dep.state.fl.us) with a copy to [osama.mahmoud@dep.state.fl.us](mailto:osama.mahmoud@dep.state.fl.us), and [Charles.LeGros@dep.state.fl.us](mailto:Charles.LeGros@dep.state.fl.us).** If the file is very large, you may post it to the Wastewater Electronic Applications folder on the following ftp site at:

<ftp://ftp.dep.state.fl.us/pub/wastewater>

After posting the document, send an e-mail to [DEP\\_CD@dep.state.fl.us](mailto:DEP_CD@dep.state.fl.us), with a copy to , and [Charles.LeGros@dep.state.fl.us](mailto:Charles.LeGros@dep.state.fl.us), alerting us that it has been posted. [osama.mahmoud@dep.state.fl.us](mailto:osama.mahmoud@dep.state.fl.us).

Any submitted drawings (should be sized 11" x 17") and the engineer of record's signed seal and dates on the required document must be legible for acceptance. Documents requiring signing and sealing must be certified as required by FBPE for electronic submittals. Please refer to the DEP SOP found on our website for procedures:

<http://www.dep.state.fl.us/water/wastewater/dom/forms/ElectronicSubmissionInstructionsDOM.pdf>  
<http://www.dep.state.fl.us/water/wastewater/docs/InstructionsIndependentDocumentsEngineerLetter.pdf>

For further clarification contact:  
(Osama Mahmoud), (407) 897-4125  
3319 Maguire Blvd, Suite 232  
Orlando, Florida 32803-3767

6. The new or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. [62-604.700(3)]
7. Abnormal events shall be reported to the Department's Central District Office in accordance with Rule 62-604.550, F.A.C. For unauthorized spills of wastewater in excess of 1000 gallons per incident, or where information indicates that public health or the environment may be endangered, oral reports shall be provided to the STATE WATCH OFFICE TOLL FREE NUMBER (800)320-0519 as soon as practical, but no later than 24 hours from the time the permittee or other designee becomes aware of the circumstances. Unauthorized releases or spills less than 1000 gallons per incident are to be reported orally to the Department's Central District Office within 24 hours from the time the permittee, or other designee becomes aware of the circumstances. [62-604.550]



# Florida Department of Environmental Protection

Central District  
3319 Maguire Boulevard, Suite 232  
Orlando, Florida 32803-3767

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Jonathan P. Steverson  
Secretary

## Notification of Acceptance of Use of a General Permit

**Permittee:**

Jose Hernandez, P.E., Chief Engineer  
Orange County Utilities  
9150 Curry Ford Road  
Orlando, FL 32825  
[Jose.hernandez2@ocfl.net](mailto:Jose.hernandez2@ocfl.net)

**Permit Number:** 0080780-1033-DSGP

**Issue date:** October 5, 2015

**Expiration Date:** October 04, 2020

**County:** Orange

**Project Name:** Anderson Road WM Upgrade

**Water Supplier:** OCUD Eastern

**PWS ID:** 3484132

**PWS Type:** Community

Dear Mr. Hernandez:

On October 1, 2015, the Florida Department of Environmental Protection received a "Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs" [DEP Form No. [62-555.900\(7\)](#)], under the provisions of Rule [62-4.530](#) and Chapter [62-555](#), Florida Administrative Code (F.A.C.). The proposed project includes the installation of 800 linear feet (LF) of eight-inch DIP and 320 LF of HDPE water mains to upgrade and replace the existing asbestos cement water mains. The project is located along Anderson Road (Conway Area) between Kew Gardens Lane and Conway Road, Orlando, Florida.

Based upon the submitted Notice and accompanying documentation, this correspondence is being sent to advise that the Department does not object to the use of such general permit at this time. Please be advised that the permittee is required to abide by Rule [62-555.405, F.A.C.](#), all applicable rules in Chapters [62-4](#), [62-550](#), [62-555](#), F.A.C., and the General Conditions for All General Drinking Water Permits (found in [62-4.540, F.A.C.](#)).

The permittee shall comply with all sampling requirements specific to this project. These requirements are attached for review and implementation.

Pursuant to Rule [62-555.345, F.A.C.](#), the permittee shall submit a certification of construction completion [DEP Form No. [62-555.900\(9\)](#)] to the Department and obtain approval, or clearance, from the Department before placing any water main extension constructed under this general permit into operation for any purpose other than disinfection or testing for leaks.

Within 30 days after the sale or legal transfer of ownership of the permitted project that has not been cleared for service in total by the Department, both the permittee and the proposed permittee shall sign and submit an application for transfer of the permit using Form [62-555.900\(8\), F.A.C.](#), with the appropriate fee. The permitted construction is not authorized past the 30-day period unless the permit has been transferred.



Permittee:  
Orange County Utilities  
Jose Hernandez, P.E., Chief Engineer  
Page 2

DEP File No.:  
0080780-1033-DSGP

**When any existing asbestos cement (AC) pipes are replaced under this permit, the permittee shall do so in accordance with the applicable rules of the Federal Asbestos Regulation and Florida DEP requirements. For specific requirements applicable to AC pipes, the permittee should contact Mary Lawrence of the Central District Compliance and Assurance Program at (407).897.4179 prior to commencing any such activities. Please be aware that a notification is required to be submitted to the Department for a regulated project.**

This permit will expire five years from the date of issuance. If the project has been started and not completed by that time, a new permit must be obtained before the expiration date in order to continue work on the project, per Rule [62-4.030, F.A.C.](#)

Sincerely,



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*For:* Caroline Shine, Environmental Administrator  
Drinking Water/Environmental Resource Permitting  
Permitting and Waste Cleanup Program  
FDEP, Central District  
(407) 897-2927

cc: Cynthia K. Malone, P. E., BFA Environmental Consultants Inc.  
[\[cmalone@BFAEnvironmental.com\]](mailto:cmalone@BFAEnvironmental.com)  
Mala C. Choksi, FDEP

## CLEARANCE REQUIREMENTS

Requirements for clearance upon completion of projects are as follows:

### 1) Clearance Form

Submission of a fully completed Department of Environmental Protection (DEP) Form [62-555.900\(9\)](#) *Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation* and a copy of this general permit notification.

### 2) Record Drawings, if deviations were made

Submission of the portion of record drawings showing deviations from the DEP construction permit, including preliminary design report or drawings and specifications, if there are any deviations from said permit (Note that it is necessary to submit a copy of only the portion of record drawings showing deviations and not a complete set of record drawings.).

### 3) Bacteriological Results

Copies of satisfactory bacteriological analysis (a.k.a. Main Clearance), taken within sixty (60) days of completion of construction, from locations within the distribution system or water main extension to be cleared, in accordance with Rules [62-555.315\(6\)](#), [62-555.340](#), and [62-555.330](#), F.A.C. and American Water Works Association (AWWA) Standard C 651-92, as follows:

- *At the proposed four (4) sample locations shown on the submitted drawing.*

Each location shall be sampled on two consecutive days, with sample points and chlorine residual readings clearly indicated on the report. A sketch or description of all bacteriological sampling locations must also be provided.

**Please submit the entire clearance document package in electronic format to [DEP\\_CD@dep.state.fl.us](mailto:DEP_CD@dep.state.fl.us), with a copy to [Mala.Choksi@dep.state.fl.us](mailto:Mala.Choksi@dep.state.fl.us), and [Caroline.Shine@dep.state.fl.us](mailto:Caroline.Shine@dep.state.fl.us).** If the file is very large, you may post it to the Water Electronic Submittal folder on the Central District's ftp site at:

[ftp://ftp.dep.state.fl.us/pub/incoming/Central\\_District/Water%20Electronic%20Applications](ftp://ftp.dep.state.fl.us/pub/incoming/Central_District/Water%20Electronic%20Applications).

After posting the document, send an e-mail to [DEP\\_CD@dep.state.fl.us](mailto:DEP_CD@dep.state.fl.us), with a copy to [Mala.Choksi@dep.state.fl.us](mailto:Mala.Choksi@dep.state.fl.us), and [Caroline.Shine@dep.state.fl.us](mailto:Caroline.Shine@dep.state.fl.us), alerting us that it has been posted.

Any submitted drawings (should be sized 11" x 17") and the engineer of record's signed seal and dates on the required document must be legible for acceptance. Documents requiring signing and sealing must be certified as required by FBPE for electronic submittals. Please refer to the DEP SOP found on our website for procedures:

<http://www.dep.state.fl.us/water/drinkingwater/forms/ElectronicSubmissionInstructions-SDW.pdf>

<http://www.dep.state.fl.us/water/wastewater/docs/InstructionsIndependentDocumentsEngineerLetter.pdf>

Forms: <http://www.dep.state.fl.us/water/drinkingwater/forms.htm>

**For further clarification contact:** Mala C. Choksi, 3319 Maguire Blvd, Suite 232  
Orlando, Florida 32803-3767 (407) 897-4159

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## **APPENDIX D**

### **ORANGE COUNTY UTILITIES Standards and Construction Specification Manual**

## **LIST OF APPROVED PRODUCTS**

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Air Release	ARV Enclosure	<b>All ARV above ground enclosures shall be vented with tamper proof locking device</b>						
		Water Plus Polyethylene Enclosure	131632 H30-B	Blue 44" Tall	131632 H30-P	Pantone 44"	131632 H30-G	Green 44" Tall
			171730 H40-B	Blue 30" Tall	171730 H40-P	Pantone 30"	171730 H40-G	Green 30" Tall
		Hot Box Vent Guard Fiberglass Enclosure	AVG2036 Encl	Blue 36" Tall	AVG2036 Encl	Pantone 36" Tall	AVG2036 Encl	Green 36" Tall
			GP3232 Base		GP3232 Base		GP3232 Base	
			AVG2041 Encl	Blue 41" Tall	AVG2041 Encl	Pantone 41" Tall	AVG2041 Encl	Green 41" Tall
		GP3232 Base		GP3232 Base		GP3232 Base		
	Safety-Guard/Hydro Guard	15100 Encl	Blue 34" Tall	15100 Encl	Pantone 34" Tall	15100 Encl	Green 34" Tall	
	Air Release Valves	<b>Air Release Valves shall be Combination Type, 316 SS</b>						
		ARI	D-040SS	Combination	D-040SS	Combination	D-020 (SS)	Combination
H-TEC		NA	NA	NA	NA	986 (316SS)	Combination	
Vent-O-Mat		Series RBX DN50	2"	Series RBX DN50	2"	RGX series		
ARV Vault	<b>Air Release Valve Frame and Cover</b>							
	US Foundry	NA	NA	NA	NA	USF 7665-HH-HJ		
Blow Off	Auto Blow Off	<b>Automatic Blow Off Valve</b>						
		Hydro Guard	HG-1 Standard Unit	Automatic	NA	NA	NA	NA
	Blow Off Valve	<b>Blow Off Valve - Fits standard 5-1/4 inch Valve Box</b>						
		Kupferle Foundry Co	Truflo Series TF #550		Truflo Series TF #550		NA	NA
	Water Plus Corp	The Hydrant Plus Series VB 2000B		The Hydrant Plus Series VB 2000B		NA	NA	
Casing Seals / Spacers	Casing End Seals	<b>Casing End Seals. Annular space between pipe and steel casing shall be brick and mortar with end seals to secure ends.</b>						
		Advance Products	Model AC and AW		Model AC and AW		Model AC and AW	
		BWM Company	Model WR and PO		Model WR and PO		Model WR and PO	
		Cascade Water Works	Model CCES		Model CCES		Model CCES	
		CCI Pipeline	Model ESW and ESC		Model ESW and ESC		Model ESW and ESC	
		Pipeline Seal & Insulator, Inc (PSI)	Model C and W		Model C and W		Model C and W	
		Power Seal	Model 4810ES		Model 4810ES		Model 4810ES	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Casing Seals / Spacers	Casing spacer	<b>Casing spacers shall be a min. 8-inches wide for pipe 12" Dia or less or min. 12-inches wide for pipe 16 or greater , shall have a minimum 14 gauge 304 stainless steel shell/band, minimum 10 gauge 304 reinforced risers; minimum thickness of 0.090 EPDM or PVC interior liners, glass reinforces polymer or ultra high molecular weight polyethylene and 304 stainless bolts, nuts and washers.</b>						
		Advance Products	SSI8 / SSI12		SSI8 / SSI12		SSI8 / SSI12	
		BWM Company	BWM-SS-8 / SS-12		BWM-SS-8 / SS-12		BWM-SS-8 / SS-12	
		Cascade Water Works	Series CCS 8" / 12"		Series CCS 8" / 12"		Series CCS 8" / 12"	
		CCI Pipeline	Model CCS8 / CSS12		Model CCS8 / CSS12		Model CCS8 / CSS12	
		Pipeline Seal & Insulator, Inc (PSI)	Series S8G-2 / S12G-2		Series S8G-2 / S12G-2		Series S8G-2 / S12G-2	
Coatings	Exterior Coatings for Exposed Metal Assets	<b>Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 1 Zinc / Urethane / Fluoropolymer application and color code per Section 3119 Coatings &amp; Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.</b>						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
			EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils
	Hydroflon Series 700		2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	
	Exterior Coatings for Exposed Metal Assets	<b>Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 2 Zinc / Epoxy / Urethane application and color code per Section 3119 Coatings &amp; Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.</b>						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
Hi-Build Epoxoline II			4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	
Series N69			Series N69		Series N69			
PPG / Ameron	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils		
	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils		
	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils		
	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils		

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Fittings	Fittings	<b>Ductile Iron Fittings C153 SSB / C110 FLG: (Water &amp; Reclaimed Water fittings shall cement lined or holiday free fusion bonded epoxy lined) (Wastewater fittings interior shall be Protecto 401 and holiday free)</b>						
		American	30" & up	FBE / Cement	30" & up	FBE / Cement	30" & up	Protecto 401
		Sigma		FBE / Cement		FBE / Cement		Protecto 401
		Star		FBE / Cement		FBE / Cement		Protecto 401
		Tyler Union & Clow		FBE / Cement		FBE / Cement		Protecto 401
Flow Meter	Flow Meter	<b>Flow Meters With Replaceable Sensors</b>						
		EMCO	NA	NA	NA	NA	Unimag 4411E	
Hydrants	Hydrants	<b>Hydrants Shall open left, 1-1/2 Pentagon operating nut, NST hose &amp; pumper thread, rotate 360 degrees, closed drains, epoxy on shoe in &amp; out and 304 SS nuts &amp; bolts below ground.</b>						
		American Flow Control	B-84-B (6 inch)		NA	NA	NA	NA
		Clow	Medallion 2545		NA	NA	NA	NA
		Mueller	Super Centurion 250		NA	NA	NA	NA
Joint Restraints	Ductile iron pipe MJ Restraints	<b>Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain ductile iron pipe to mechanical joint fittings, pipe and appurtenances.</b>						
		EBAA Iron Inc	Megalug Series 1100		Megalug Series 1100		Megalug Series 1100	
		Ford / Uni-Flange	UFR-1400		UFR-1400		UFR-1400	
		Sigma	OneLok Series SLD/SLDE		OneLok Series SLD/SLDE		OneLok Series SLD/SLDE	
		Smith Blair	Cam Lok Series 111		Cam Lok Series 111		Cam Lok Series 111	
		Star	Star Grip Series 3000		Star Grip Series 3000		Star Grip Series 3000	
		Tyler Union	TufGrip Series TLD		TufGrip Series TLD		TufGrip Series TLD	
	DIP Bell Joint Restraints (4" - 12") (New & Existing)	<b>Bell Joint Restraints for Ductile Iron Pipe (4"-12") (New &amp; Existing) - All restraints split serrated on bell and spigot ends. Pipe 16" and greater shall have restraint gaskets or locking bells. (Wastewater only for restraint of existing DIP FM)</b>						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
		Ford / Uni-Flange	Uni-Flange Series 1390C		Uni-Flange Series 1390C		Uni-Flange Series 1390C	
		Sigma	PV-Lok Series PWP-C		PV-Lok Series PWP-C		PV-Lok Series PWP-C	
		Smith Blair	Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165	
		Star	StarGrip Series 3100S		StarGrip Series 3100S		StarGrip Series 3100S	
DIP Bell Joint Restraints (16" & Greater)	<b>Ductile Iron Pipe Bell Joint Restraints for Ductile Iron Pipe (16" &amp; Greater) - All restraints shall have a split back-up ring for the bell and a serrated or wedge action gland for the spigot end. New installation for water &amp; reclaimed water piping 16" and greater shall have restraint gaskets or locking bells.</b>							
	EBAA Iron Inc	Series 1100HD	Existing Only	Series 1100HD	Existing Only	Series 1100HD	Existing Only	
	Sigma	Series SSLDH	Existing Only	Series SSLDH	Existing Only	Series SSLDH	Existing Only	
	Star	Series 3100S	Existing Only	Series 3100S	Existing Only	Series 3100S	Existing Only	

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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	Ductile iron pipe Bell Joint Restraint Gaskets and Locking Bell (4" & Above)	<b>Bell Joint Restraint Gaskets and Locking Bell (4" &amp; Above) Stainless Steel locking wedges built into the gasket-rubber. ANSI/AWWA C111/A21.11 Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe. Ductile Iron Bell Joint Restraint for Push-On Pipe- Locking bell joint system that prevents joint separation and allows for joint deflection. Bells shall be painted red to verify restrained gasket.</b>						
		American	Fast Grip Gasket	Gasket	Fast Grip Gasket	Gasket	NA	NA
			Flex-Ring Joint	Bell Lock	Flex-Ring Joint	Bell Lock	NA	NA
			Lok-Ring Joint	Bell Lock	Lok-Ring Joint	Bell Lock	NA	NA
		Griffin	Talon RJ Gasket	Gasket	Talon RJ Gasket	Gasket	NA	NA
			Snap-Lok	Bell Lock	Snap-Lok	Bell Lock	NA	NA
			Sure Stop 350 Gasket	Gasket	Sure Stop 350 Gasket	Gasket	NA	NA
		McWane Inc. DI Pipe Group	Thrust-Lock	Bell Lock	Thrust-Lock	Bell Lock	NA	NA
			TR-Flex	Bell Lock	TR-Flex	Bell Lock	NA	NA
			Super-Lock	Bell Lock	Super-Lock	Bell Lock	NA	NA
			Field Lok 350 Gasket	Gasket	Field Lok 350 Gasket	Gasket	NA	NA
		US Pipe	Field Lok Gasket	Gasket	Field Lok Gasket	Gasket	NA	NA
			TR-Flex	Bell Lock	TR-Flex	Bell Lock	NA	NA
			HP Lok Restraint Joint	Bell Lock	HP Lok Restraint Joint	Bell Lock	NA	NA
	<b>SS to DIP Transition Restraint -Flanged stainless steel pipe from Wetwell to Valve box restrained joint transition (epoxy coated, SS hardware) Flg x PE RJ.</b>							
	SS to DIP Transition Restraint	EBAA Iron Inc	NA	NA	NA	NA	Megaflange 2100	
		Sigma	NA	NA	NA	NA	SigmaFlange with One Lock SLDE	
		Smith Blair	NA	NA	NA	NA	911 Flange - Lock Restrained FCA	
	PVC Pipe MJ Restraints	<b>Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain PVC pipe to mechanical joint fittings, and appurtenances.</b>						
		EBAA Iron Inc	Mega-lug Series 2000PV		Mega-lug Series 2000PV		Mega-lug Series 2000PV	
			NA	NA	NA	NA	Megalug Series 2200 (42"-48")	
		Ford / Uni-Flange	UFR 1500 Series		UFR 1500 Series		UFR 1500 Series	
		Sigma	One Lok Series SLC/SLCE		One Lok Series SLC/SLCE		One Lok Series SLC/SLCE	
		Smith Blair	Cam Lok Series 120		Cam Lok Series 120		Cam Lok Series 120	
		Star	Star Grip Series 4000		Star Grip Series 4000		Star Grip Series 4000	
		Tyler Union	TufGrip Series TLP		TufGrip Series TLP		TufGrip Series TLP	
	PVC Bell Joint Restraints (4" - 12") (New & Existing)	<b>PVC Bell Joint Restraints: PVC pipe Split Serrated on Bell End and Spigot End. (4" - 12") (New &amp; Existing)</b>						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
		Ford / Uni-Flange	Uni-Flange Series 1390		Uni-Flange Series 1390		Uni-Flange Series 1390	
		Sigma	PV-Lok Series PWP		PV-Lok Series PWP		PV-Lok Series PWP	
		Smith Blair	Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165	
		Star	Series 1100C		Series 1100C		Series 1100C	
		Tyler Union	TufGrip 300C		TufGrip 300C		TufGrip 300C	



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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	PVC Bell Joint Restraints (16" & Greater)	<b>PVC Bell Joint Restraints: (16" &amp; Greater) PVC pipe Split Serrated on Bell End and Spigot End. Water &amp; Reclaimed Water Existing pipe only. Wastewater shall be new and existing pipe.</b>						
		Ford / Uni-Flange	Series 1390	Existing Only	Series 1390	Existing Only	Series 1390	
		JCM	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	
		Sigma	PV-Lok PWP	Existing Only	PV-Lok PWP	Existing Only	PV-Lok PWP	
		Smith Blair	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	
		Star	Series 1100C	Existing Only	Series 1100C	Existing Only	Series 1100C	
Pipe	PVC C900 DR 18 Bell & Spigot (4" - 12")	<b>C900 Bell &amp; Spigot PVC Pipe: 4 to 12-inch - AWWA C-900, Minimum DR18 for Water, Reclaimed and Wastewater. DR14 for Fire Lines. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>						
		Certainteed 4" to 12"	Certa-Lok C900/RJ	Blue	Certa-Lok C900/RJ	Pantone Purple	Certa-Lok C900/RJ	Green
		Diamond Plastics Corp	C-900	Blue	C-900	Pantone Purple	Diamond C900	Green
		Ipex Inc	C-900 Blue Brute	Blue	C-900	Pantone Purple	C900 Blue Brute	Green
		JM Eagle	C-900	Blue	C-900	Pantone Purple	C-900	Green
		National Pipe & Plastics Inc	C-900 Dura- Blue	Blue	C-900	Pantone Purple	C-900 Pipe	Green
		North American Pipe Corp (NAPCO)	C-900	Blue	C-900	Pantone Purple	C-900	Green
		Sanderson Pipe Corp	C-900	Blue	C-900	Pantone Purple	C-900	Green
	PVC C905 DR 18 Bell & Spigot 16" and Larger	<b>C905 Bell &amp; Spigot PVC Pipe 16" and Larger: AWWA C-905, Minimum DR18 for all Force Mains up to 24". Minimum DR21/DR25 for 30" and greater. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>						
		Certainteed 16"	NA	NA	NA	NA	Certa-Lok C905/RJ	NA
		Diamond Plastics Corp	NA	NA	NA	NA	Trans-21 DR18	Green
		Ipex Inc	NA	NA	NA	NA	IPEX Centurion	Green
		JM Eagle	NA	NA	NA	NA	C905 Big Blue	Green
National Pipe & Plastics Inc		NA	NA	NA	NA	C905	Green	
HDPE C906 DR11	<b>HDPE Pipe DR11 AWWA C906 shall be Ductile Iron Pipe Size, PE 3408/3608/4710 DIPS manufactured in accordance with ASTM F-714 and listed with NSF. Pipe shall be marked in accordance with either AWWA C901,AWWA C906. Compression type connections are not acceptable in new installations. Pipe joints shall be butt fusion or electro-fusion with flange or adapter. All HDPE shall be color coded to the Utility. Color identifications are in accordance with the APWA/ULCC Uniform Color Code. Manufacturers shall be members in good standing with PPI to maintain approval status.</b>							
	JM Eagle	HDPE	DR11 Blue	HDPE	DR11 Pantone	HDPE	DR11Green	
	Performance Pipe(Chevron)	Driscoplex 4000	DR11 Blue	Driscoplex 4000	DR11 Pantone	Driscoplex 4300	DR11 Green	
	PolyPipe, Inc.	EHMW Poly Pipe	DR11 Blue	EHMW	DR11 Pantone	EHMW	DR11Green	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pipe	Ductile Iron Pipe	<b>Ductile iron/Cast iron: (4" to 12" = Class 350, 16" to 24" - Class 250, 30" to 64" = Class 200). Water and Reclaimed water shall be cement lined. Wastewater Piping shall be Protecto 401 and Holiday Free. Exterior coatings as specified. Wastewater DIP piping shall be for pump station piping only. Manufacturers shall be members in good standing with DIPRA to maintain approval status.</b>						
		American	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		Griffin	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		McWane Inc. DI Pipe Group	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		US Pipe	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
Sample	Sample Station	<b>Sample Stations - Bacteriological Sample Station with built in flush system, all internal piping to be 2", brass and includes lockable green enclosures.</b>						
		Safety-Guard	SG-BSS-05 pedestal #77	green enclosure	NA	NA	NA	NA
		Water Plus Corp	Model 5000	green	NA	NA	NA	NA
Services	Brass Service Saddles	<b>Brass Service Saddles for 1" &amp; 2" water &amp; reclaimed water services on 4" through 12" Mains - Service saddles can be hinge or bolt controlled OD saddles to be used on C-900 and existing IPS OD PVC pipe.</b>						
		Ford	Series S-70, S-90	4"-12"	Series S-70, S-90	4"-12"	NA	NA
		AY McDonald	Model 3891 / 3895,3801 / 3805	4"-12"	Model 3891 / 3895,3801 / 3805	4"-12"	NA	NA
		Mueller	Series S-13000/H-13000	4"-12"	Series S-13000/H-13000	4"-12"	NA	NA
	Services	Service Saddles	<b>Service Saddles for 1" (CC) &amp; 2" (Iron pipe threads) Water &amp; Reclaimed Water services on mains greater than 12". Service saddles for 2" taps (iron pipe threads) on 4" mains and greater for Waste Water. : Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on C-900 / C905 or DI for all 1-in and -2in taps on pipes over 12in.</b>					
Ford			Series FC202	16" & greater	Series FC202	16" & greater	Series FC202	4" & greater
JCM			Series 406	16" & greater	Series 406	16" & greater	Series 406	4" & greater
Mueller			DR2S	16" & greater	DR2S	16" & greater	DR2S	4" & greater
Romac			Series 202NS	16" & greater	Series 202NS	16" & greater	Series 202NS	4" & greater
Smith Blair			Series 317	16" & greater	Series 317	16" & greater	Series 317	4" & greater
Services	Service Saddles for HDPE	<b>Service Saddles for 1" (CC) &amp; 2" (Iron Pipe threads) Water and Reclaimed Water Services: Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on HDPE for all 1-in and -2in taps. Taps to HDPE pipe shall be approved on a case by case basis.</b>						
		Ford	Series FCP202		Series FCP202		Series FCP202	
		Romac	Series 202N-H		Series 202N-H		Series 202N-H	
		Smith Blair	Series 317-1 for HDPE		Series 317-1 for HDPE		Series 317-1 for HDPE	
Corporation	Stops Ball Type	<b>Corporation Stops Ball Type (1-inch with AWWA taper C threads only/pack joint outlet for CTS) 2" Corporation Stop Ball Type shall be 2" MIP X FIP threads.</b>						
		Ford	FB1000, FB1700-7		FB1000, FB1700-7		FB1700-7	2" ARV
		AY McDonald	4701B-22, 3149B2		4701B-22, 3149B2		3149B2	2" ARV
		Mueller	P25008, B-20046		P25008, B-20046		B-20046	2" ARV

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Services	Curb Stops	<b>Curb Stops - Straight Valves: Ball type compression 2" cts O.D. tubing by 2" FIP</b>						
		Ford	B41-777W		B41-777W		NA	NA
		AY McDonald	6102W-22		6102W-22		NA	NA
		Mueller	P25172		P25172		NA	NA
	Curb Stops	<b>Curb Stops - Straight Valves: ball type compression x compression</b>						
		Ford	B44-444W		B44-444W		NA	NA
		AY McDonald	6100W-22		6100W-22		NA	NA
		Mueller	P25146		P25146		NA	NA
	PE tubing	<b>Polyethylene tubing: AWWA C901. UV protection (SDR-9) 1-inch and 2-inch only. PE 3408 / PE 4710</b>						
		Charter Plastics	Blue Ice		Lav Ice		NA	NA
		Endot	Endopure Blue		Endocore Lavender		NA	NA
		JM Eagle	Pure-Core		NA	NA	NA	NA
Line Stops	<b>Line Stops</b>							
	JCM							
	Romac							
	Smith Blair							
Tapping Sleeves and Valves	Tapping Sleeves	<b>Tapping Sleeves: (Mechanical joint for taps on cast iron, ductile iron, PVC &amp; AC pipe, including size on size) with stainless steel nuts and bolts.</b>						
		American Flow Control	Series 2800		Series 2800		Series 2800	
			Series 1004		Series 1004		Series 1004	
		Clow	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC
			Series F-5207	A/C Pipe	Series F-5207	A/C Pipe	Series F-5207	A/C Pipe
		JCM	Series 414	FBE	Series 414	FBE	Series 414	FBE
		Mueller	Series H-615	DIP/PVC	Series H-615	DIP/PVC	Series H-615	DIP/PVC
			Series H-619	A/C Pipe	Series H-619	A/C Pipe	Series H-619	A/C Pipe
Smith Blair	Style 623	FBE	Style 623	FBE	Style 623	FBE		
Tapping Valves: 12" and smaller	<b>Tapping Valves: 12" and smaller - Tapping Valves shall be furnished with an alignment lip and installed in the vertical position for Water and Reclaim Water. Wastewater shall be installed horizontally and abandoned in the open position. Tapping valves shall be resilient seated only and meet the requirements of AWWA C509 or C515</b>							
	American Flow Control	Series 2500	Alignment Lip	Series 2500	Alignment Lip	Series 2500	Alignment Lip	
	Clow	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip	
	Mueller	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	<b>Tapping Valves: 16" and Larger - Tapping valves shall be furnished with an alignment lip and be installed in the vertical position for Water and Reclaimed Water. No tapping valve shall be installed horizontally for Water and Reclaim Water unless approved by the engineer. Tapping Valves 16" and larger AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a spur gear actuator unless noted by the engineer. All tapping valves above 24" shall be furnished with NPT pipe plugs for flushing the tracks when valves are installed horizontally. Tapping valves for Wastewater shall be installed horizontally and abandoned in open position.</b>						
		American Flow Control	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port
		Clow	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port
		Mueller	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port
Valves	Butterfly Valve 42" and Above	<b>Butterfly Valves 42"and above. AWWA C504. Actuators input torques based on 150 psi valve pressure and 16 fps velocity with a maximum input of 80 ft-lb on 2" nuts and shall withstand 250 ft-lbs. Valve seats shall be leak-tight in both directions at 150 psi.</b>						
		Clow	Style #1450		Style #1450		NA	NA
		Dezurik	BAW		BAW		NA	NA
		Mueller / Pratt	LINSEAL III / Groundhog		LINSEAL III / Groundhog		NA	NA
	Check Valves	<b>Valves (Check) 4-inch and Larger (8 mil epoxy lined)</b>						
		American Flow Control	NA		NA		Series 600 or 50 line	
		Clow / M&H / Kennedy	NA		NA		106	
	Gate Valves 4" - 12"	<b>Gate Valves 12" and smaller - resilient seated only AWWA C509 or C515. Valve seat shall be leak-tight in both directions at 150 psi.</b>						
		American Flow Control	Series 2500		Series 2500		NA	NA
		Clow	Series F-6100		Series F-6100		NA	NA
Mueller		Series A-2360		Series A-2360		NA	NA	
Gate Valves (Vertical) 16" and Up	<b>Gate Valves 16" and larger (Vertical Installation) AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a gear actuator unless noted by the engineer. Valve seat shall be leak-tight in both directions at 150 psi.</b>							
	American Flow Control	Series 2500		Series 2500		NA	NA	
	Clow	Series F-6100		Series F-6100				
	Mueller	Series A-2361		Series A-2361		NA	NA	

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FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater			
			Model #	Comments	Model #	Comments	Model #	Comments		
Valves	Plug Valves	<b>Plug Valves - Bi-directional, MJ &amp; Flanged (min. 8mil fusion bonded epoxy with stainless steel bolts), gear operator to be sized for rated pressure of the valve. Valves 4"-20" shall be 80% Full Port and valves 24" and greater shall be minimum of 70% full port. Valve shall be factory tested to minimum 100 PSI in both directions.</b>								
		Clow	NA	NA	NA	NA	F-5412 FLG	4" & up		
			NA	NA	NA	NA	F-5413 MJ	4" & up		
		Dezurik	NA	NA	NA	NA	Series PEF or PEC	4" & up		
		Millikan / Pratt	NA	NA	NA	NA	Eccentric / Ballcentric	4" & up		
			NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up		
Val-Matic	NA	NA	NA	NA	5700 or 5900 (MJ)	4" & up				
Valve Boxes	Valve Boxes with Locking Lids (Cast Iron)	<b>Two piece standard screw type Heavy Duty Valve Boxes with Locking Lids (Cast Iron) and type of service cast in heavy duty traffic lid (H2O loading) ASTM A48</b>								
		Bingham/Taylor	Series 4905	Box	NA	NA	Series 4905	Box		
			4905-X	Extension	NA	NA	4905-X	Extension		
			4904-L	Blue Water Locking Lid	NA	NA	4904-L	Green Sewer locking Lid		
		Sigma	Series VB 261X-267X	Box	VB-25031LK-VB-2612	Box	Series VB 261X-267X	Box		
			VB 6302	Extension	VB-6302	Extension	VB 6302	Extension		
			VB 4650W	Blue Water Locking Lid	VB2503LK	Purple Square Locking Lid	VB 4650S	Green Sewer locking Lid		
		Star	Series VB-0002	Box	NA	NA	Series VB-0002	Box		
			VBEX 12-24S	Extension	NA	NA	VBEX 12-24S	Extension		
			VBLIDLOCK	Blue Water Locking Lid	NA	NA	VBLIDLOCK	Green Sewer locking Lid		
		Tyler Union	Series 6850	Box	NA	NA	Series 6850	Box		
			58, 59, 60	Extension	NA	NA	58, 59, 60	Extension		
			Locking Lid	Blue Water Locking Lid	NA	NA	Locking Lid	Green Sewer locking Lid		
		Valve Box	Valve Box	<b>For mains equal to, or greater than, 16" diameter or equal to greater than 6' feet deep</b>						
				American Flow Control	# 2A - 9A Retrofit Valve Box Insert	Fit inside std valve boxes	NA		2A - 9A Retrofit Valve Box Insert	Green Sewer locking Lid
				Mueller Company	MVB050C thru MVB130C with Extension Stem	Blue Water Locking Lid	MVB050CR thru MVB130CR with Extension Stem	Purple Square Locking Reclaim Lid	MVB050C thru MVB130C with Extension Stem	Green Sewer locking Lid
			MVB875 Guide Plate		MVB875 Guide Plate		MVB875 Guide Plate			

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LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Coatings	Anti-Graffiti Paint	<b>Block Walls-Anti-Graffiti Paint per Section 3119 Coatings &amp; Linings</b>							
		American Building Restoration Products	NA	NA	NA	NA	Polyshield Graffiti Preventer for Unpainted Masonry Type B	Super Bio Strip or Strip it all	
		Tnemec / Chemprobe	NA	NA	NA	NA	626 DUR A PEL	680 Mark A Way	
		Professional Products of Kansas, Inc	NA	NA	NA	NA	Professional Water Seal & Anti-Graffiti (PWS-15 Super Strength)	Professional Phase II Cleaner	
	Coatings for Existing Manholes	<b>Rehabilitation corrosion protection system per Section 3119 Coatings &amp; Linings. Interior coating for force main connections to existing concrete manholes only. New precast structures and existing pump stations shall be lined.</b>							
		CCI Spectrum, Inc	NA	NA	NA	NA	Spectrashield	min of 500 mils	
		Kerneos Aluminate Technologies	NA	NA	NA	NA	Sewpercoat	1" (1000mil)	
		Raven Lining System	NA	NA	NA	NA	Raven 155 Primer Raven 405	min 8 mils min 125 mils	
		Sauereisen	NA	NA	NA	NA	210 Series Topcoat Glaze 210G	min 125 mils min 20 mils	
		Tnemec	NA	NA	NA	NA	Series 434 Topcoat Glaze 435	min 125 mils 15-20 mils	
PVC Pipe and fittings	Pipe SDR 35 Gravity Mains	<b>PVC Pipe for Gravity SDR26/SDR 35 (Green in color) ASTM-D034. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>							
		Certainteed	NA	NA	NA	NA	Gravity Sewer Pipe		
		Diamond Plastics Corp	NA	NA	NA	NA	Sani-21 SDR-35		
		JM Eagle	NA	NA	NA	NA	Gravity Sewer		
		National Pipe & Plastics, Inc.	NA	NA	NA	NA	Ever-Green Sewer Pipe		
		North American Pipe Corp (NAPCO)	NA	NA	NA	NA	Gravity Sewer		
		Sanderson Pipe Corp	NA	NA	NA	NA	Gravity Sewer		
	Locate Balls	<b>Locating Marker Systems - Wastewater Locator balls placed at all sanitary sewer cleanouts</b>							
		3M	NA	NA	NA	NA	3M™ EMS 4" Extended Range 5' Ball Marker 1404-XR		
	Fittings SDR 35	<b>Fittings, Adapters and Plugs - Gravity PVC ASTM-D3034, Min SDR26/ SDR 35</b>							
		GPK Products, Inc.	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
		Harrington Corporation (HARCO)	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
		Multi Fittings Corp.	NA	NA	NA	NA	SDR26/SDR 35 Trench Tough Sewer Fittings		
JM Eagle		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			
Plastic Trends Inc		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			
TIGRE USA, Inc.		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
PVC Pipe a	Flexible Pipe Connectors	<b>Flexible Pipe Connectors and Transitions</b>						
		Fernco	NA	NA	NA	NA	1002, 1051, 1056 Series	
		Indiana Seal	NA	NA	NA	NA	102, 151, 156 Series	
		Mission Rubber	NA	NA	NA	NA	MR02, MR51, MR 56 Series	
Precast Concrete Structures	MH Lids	<b>Frame and Cover</b>						
		USF Fabrication Inc.	NA	NA	NA	NA	USF 225-AS	
	Adj Ring	<b>Top Adjusting Rings - HDPE with heavy duty loading (H-20)</b>						
		Ladtech, Inc	NA	NA	NA	NA	24R, 24S with Rope Sealant CS2455	
	Hatches	<b>Wet Well and Valve Vault Access Frames and Covers (Include the term "Confined Space" etched or cast into the cover with recessed lock &amp; hasp. Frames and covers per manufacturers specifications.</b>						
		Halliday Products	NA	NA	NA	NA	S1R or S2R Series	
		USF Fabrication Inc.	NA	NA	NA	NA	APS or APD Series	
	Precast Concrete Structures	<b>Precast Manhole and Wetwell Structures ASTM C478. Precast concrete shall be batched with concrete dyed crystalline waterproofing admixture with corrosion protection. Concrete without admixture or without color tint /tracer shall be rejected.</b>						
		Allied Precast	NA	NA	NA	NA	Dyed Admix	
		Atlantic Concrete Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Delzotto Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Dura Stress Underground Inc.	NA	NA	NA	NA	Dyed Admix	
		Hanson Pipe & Product	NA	NA	NA	NA	Dyed Admix	
		Mack Concrete	NA	NA	NA	NA	Dyed Admix	
		Oldcastle Precast	NA	NA	NA	NA	Dyed Admix	
Standard Precast Inc.	NA	NA	NA	NA	Dyed Admix			
Concrete Admix	<b>Crystalline Waterproofing Concrete Admix with color dye shall be added to all concrete structures (precast and cast-in-place) to provide waterproofing and corrosion resistance. Concrete without admixture or without color tint / tracer shall be rejected. % concentration of admix with colored dye added to the mix shall be based on weight of cement.</b>							
	Kryton International	NA	NA	NA	NA	KIM K-301R (with red dye)	2%	
	Xypex Chemical Corp	NA	NA	NA	NA	Xypex Admix C-1000Red (with red dye)	3.0 - 3.5%	
Liners	<b>Interior Liner for New or existing Precast Manhole and Precast Wetwell Structures per Section 3119 Coatings &amp; Linings</b>							
	AFE	NA	NA	NA	NA	Fiberglass Liner		
	AGRU Liner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	Containment Solutions Inc. (Flowtite)	NA	NA	NA	NA	Fiberglass Liner		
	GSE Studliner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	GU Liner	NA	NA	NA	NA	Reinforced Plastic Liner		
		L & F Manufacturing	NA	NA	NA	NA	Fiberglass Liner	

APPENDIX D

LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Precast Concrete Structures	Heat Shrink Seal	<b>Heat Shrink Seal - Precast structures shall be primed with manufacturer approved primer prior to application of heat shrunk encapsulation.</b>							
		Canusa-CPS	NA	NA	NA	NA	Wrapid Seal with WrapidSeal Primer (Canusa G Primer )		
		Pipeline Seal & Insulator, Inc (PSI)	NA	NA	NA	NA	Riser Wrap with Polyken 1027 or 1039 primer		
	Joining Material	<b>Joining Material Min. 2" width for all products to ensure squeeze out with manufacturer approved primer.</b>							
		Henry Company	NA	NA	NA	NA	Ram-Nek	with Primer	
		Martin Asphalt Company	NA	NA	NA	NA	Evergrip 990	with Primer	
		Trelleborg Pipe Seals	NA	NA	NA	NA	NPC – Bidco C-56	with Primer	
	Pipe Seals Gravity	<b>Resilient Connector Pipe Seals, Manhole - Gravity less than 12-inch and less than 15-ft deep</b>							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok (cast-in-place)		
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal (cast-in-place)		
		IPS	NA	NA	NA	NA	Wedge Style		
		NPC	NA	NA	NA	NA	Kor-N-Seal Model WS		
		Press seal gasket	NA	NA	NA	NA	PSX Direct Drive		
	Pipe Seals Gravity	<b>Cast in Place Pipe Seals, Manhole - Gravity Greater Than or Equal to 12-inch and all pipe sizes greater than 15-ft deep</b>							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok	cast in place	
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal	cast in place	
	FM Pipe Seals	<b>Modular Pipe Seals for Wet Well and Valve Box penetrations and all forcemain connections to existing and new precast concrete structures. EPDM Rubber with 316 SS Hardware</b>							
		CCI Pipeline Systems	NA	NA	NA	NA	Wrap-It Link WL-SS Series		
		Pipeline Seal & Insulator, Inc / Link Seal	NA	NA	NA	NA	Link-Seal S-316 Modular Seal		
		Proco Products, Inc	NA	NA	NA	NA	PenSeal ES-PS Series		



APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Generator	Gen	<b>Generator Systems, Fixed Shall be UL 2200 Certified.</b>						
		Caterpillar	NA	NA	NA	NA	CAT Diesel Generator Set	
		Cummins Power Generation	NA	NA	NA	NA	Diesel Generator Set	
	Fuel Tanks	<b>Generator Fuel Tanks. Shall be UL2085 certified.</b>						
		Convault	NA	NA	NA	NA	CVT-3SF or CVT-3FF	
		Phoenix	NA	NA	NA	NA	Envirovault	
	GR	<b>Generator Receptacle (GR)</b>						
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042 (230V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042-S22 (460V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Pyle National	NA	NA	NA	NA	JRE-4100 (230V, 100A, 3P, 4W)	
ATS	<b>Generator Transfer Switch</b>							
	Russelectric	NA	NA	NA	NA	RMTD Series with model 2000 controller	NEMA 12/3R 316SS Enclosure	
Odor Control Units	Biotrickling Filters	<b>Biotrickling filters</b>						
		BioAir	NA	NA	NA	NA		
		Bioem	NA	NA	NA	NA	Biosorbens BTF	
		Envirogen	NA	NA	NA	NA	BTF	
		Siemens	NA	NA	NA	NA	Zabocs BTF	
	Carbon Adsorption Units	<b>Carbon Adsorption Units</b>						
		Calgon	NA	NA	NA	NA		
		Pure Air Filtration	NA	NA	NA	NA		
		Siemens	NA	NA	NA	NA		
	Pressure Gauges	<b>Pressure Gauges shall have Diaphragm Seals. Oil filled.</b>						
Ashcroft		NA	NA	NA	NA	10 1008SL 02L 60#	Gauge Diaphragm Seal	
		25 200SS 02T XYTSE						
Terice		NA	NA	NA	NA	D83LFSS4002LA100 - Gauge M51001SSSS - Diaphragm Seal D99100 Fill and Mount Charge		
	Winter Gauges	NA	NA	NA	NA	PFQ770 0-60 PSI D70950 top D70954 Bottom		
Pumps	<b>Submersible Pumps</b>							
	ABS	NA	NA	NA	NA			
	Flygt	NA	NA	NA	NA			

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pumps	Floats	<b>Float Regulator (FR) - Duplex and Triplex Pump Stations</b>						
		Atlantic Scientific	NA	NA	NA	NA	Roto-Float	
Pumps	Radar	<b>Radar - Pulse Burst Radar Transmitter. Input 24 VDC and Output 4-20 mA</b>						
		Magnetrol	NA	NA	NA	NA	R82-520A-011	
Pump Station Main Ser	Main Srvc Disconnect	<b>Main Service Disconnect Breaker</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
	Surge Protector Device	<b>Surge Protector - UL 1449, 3rd Edition listed and labeled, minimum 10 year warranty, NEMA LS-1 and IEEE C62, 41/45 tested with NEMA 4X enclosure, internal fusing, voltage and phase to match service. Rated 80,000 amps per mode for Duplex &amp; Triplex stations and 150,000 Amperes per mode for Master Stations. All devices shall be provided with a NEMA 4X Plastic enclosure which is approved in lieu of stainless steel.</b>						
		Current Technology (Power & Systems)	NA	NA	NA	NA	XN-80, TG-150 or CurrentGuard 150 Plus Series	
		Joslyn AKA (Total Protection Solutions)	NA	NA	NA	NA	TSS-ST 160 Series, ST 300 Series or JSP-300 Series	
		Surge Suppressors, Inc	NA	NA	NA	NA	LSE Series or SHL Series	
Sub Panel	Sub Panel	<b>Sub-Panel Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop</b>						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
Pump Station Control Panel	Control Panel	<b>Control Panel Supplier</b>						
		ECS	NA	NA	NA	NA		
		Sta-Con Inc	NA	NA	NA	NA		
	Enclosure	<b>Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop</b>						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
	Mnts	<b>Mounting Channel for Enclosures</b>						
		Unistrut Stainless Steel	NA	NA	NA	NA	1" 5/8 x 1" 5/8 316 SS	
	Seal-off	<b>Explosion-Proof Sealoff</b>						
	Cooper Crouse-Hinds	NA	NA	NA	NA	EYSR - 2 Inch Min.		
FL	Flasher (FL)							
		MPE	NA	NA	NA	NA	025-120-105	
		SSAC	NA	NA	NA	NA	FS-126	

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Panel		<b>Alarm Light / With Base and Globe (AL)</b>						
	AL	American Electric	NA	NA	NA	NA	F32552	
		Red Dot Globe	NA	NA	NA	NA	VGLR-01	
		Red Dot Base					VA-01	
		<b>Alarm Horn (AH)</b>						
	AH	Wheelock	NA	NA	NA	NA	3IT-115-R	
		<b>Fuses (F)</b>						
	Fuse	Bussmann	NA	NA	NA	NA	FNQ-R or KTK-R	
		<b>Hand-Auto-Off Selector (HOA)</b>						
	HOA	Square D	NA	NA	NA	NA	9001-SKS43B	
		<b>Horn Silence Button (HSS)</b>						
	HSS	Square D	NA	NA	NA	NA	9001-SKR1RH5	
		<b>Mechanical Interlock</b>						
	Inter-lock	Square D	NA	NA	NA	NA	S29354	
		<b>Control Panel Main Circuit Breaker (MCB) With S29450 Circuit Breaker Auxiliary Switch</b>						
	Breakers	Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Emergency Circuit Breaker (ECB) With S29450 Circuit Breaker Auxiliary Switch</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Motor Circuit Breaker (MB)</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Control Circuit Breaker/ GFCI Receptacle Breaker/ SCADA Breaker</b>						
	Square D	NA	NA	NA	NA	QOU120		
	<b>Motor Starter (MS)</b>							
MS	Square D	NA	NA	NA	NA	Type S Class 8536		
	<b>Overload Heater(OL)</b>							
OL	Square D	NA	NA	NA	NA	Part number will vary with size needed		
	<b>Overload Reset</b>							
OR	Square D	NA	NA	NA	NA	9066-RA1		
	<b>Control Circuit Transformer (XMFR)</b>							
Transformer	Square D	NA	NA	NA	NA	9070TF75D23	120/24 Volt .075 KVA	
	<b>Main Circuit Transformer (MCT)</b>							
	Square D	NA	NA	NA	NA	9070T2000D1	480/120 2KVA	
	<b>Supplemental Protector Breaker - 3 pole, 1-amp for Phase Monitor</b>							
SPB	Square D	NA	NA	NA	NA	MG24532		

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Pump Station Control Panel	PM	<b>Phase Monitor (PM)</b>							
		MPE 240 V.	NA	NA	NA	NA	001-230-118-OVG5		
		MPE 480 V.	NA	NA	NA	NA	002-480-123-OVG5		
	Pump Alternator	<b>Pump Automatic Alternator (PAA)</b>							
		Diversified Duplex	NA	NA	NA	NA	ARA-120-ACA		
		Diversified Triplex	NA	NA	NA	NA	ARA-120-AME		
		MPE Duplex	NA	NA	NA	NA	008-120-13SP		
		MPE Triplex	NA	NA	NA	NA	009-120-23P		
	MPE Triplex Socket	NA	NA	NA	NA	SD-12-PC			
	Alt. Test Switch	<b>Alt. Test Switch</b>							
		Carling Technologies	NA	NA	NA	NA	6GG5E-78		
		Honeywell	NA	NA	NA	NA	2TL1-50		
	Relay	<b>Relay</b>							
		Potter Brumfield 24 Volt	NA	NA	NA	NA	KRPA-11AN-24		
		Potter Brumfield 120 Volt	NA	NA	NA	NA	KRPA-11AN-120		
		Square D 24 Volt	NA	NA	NA	NA	8501KP12P14V14		
	Square D 120Volt	NA	NA	NA	NA	8501KP12P14V20			
	Relay Base	<b>Relay Base</b>							
		IEDC 8 Pin Relay Base 600 Volt	NA	NA	NA	NA	SR2P-06		
	Duplex Receptacle / GFCI	<b>Duplex Receptacle/GFCI (DR) Upgraded to 20 Amp</b>							
		Hubbell	NA	NA	NA	NA	GFTR20BK		
		Pass & Seymour	NA	NA	NA	NA	2095TRBK		
	ETM	<b>Elapse Time Meter (ETM)</b>							
		Reddington	NA	NA	NA	NA	711-0160		
	Grounding	<b>Grounding System</b>							
		Marathon	NA	NA	NA	NA	Neutral Isolation Block 1421570		
		Panduit	NA	NA	NA	NA	Ground Lug LAM2A 1/0 - 014 -6Y		
	Square D	NA	NA	NA	NA	Ground Buss PK7GTA			
TS	<b>Terminal Strip (TS)</b>								
	Marathon	NA	NA	NA	NA	Series 200			
	Square D	NA	NA	NA	NA	9080GR6			
TS	<b>Terminal Strip End Blocks and End Clamps</b>								
	Square D	NA	NA	NA	NA	9080GM6B & 9080GH10			

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Pane	PL	<b>Pilot Light (PL) 24 Volt with 1819 Bulb</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelight 930507X	
	RL	<b>Run Indicator Light (RL) 120 Volt</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X With 120MB Bulb	
	MT	<b>Moisture and Temperature Failure Light (MT) 120 Volt with 120MB Bulb</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X	
Sluice Gate	<b>Sluice Gate for Wet Well with Motorized Operator</b>							
	BNW	NA	NA	NA	NA	Model 77 - 316 SS		
	Fontaine	NA	NA	NA	NA	Model 20 - 316 SS		
VFD	<b>Variable Frequency Drives</b>							
	Square D	NA	NA	NA	NA			

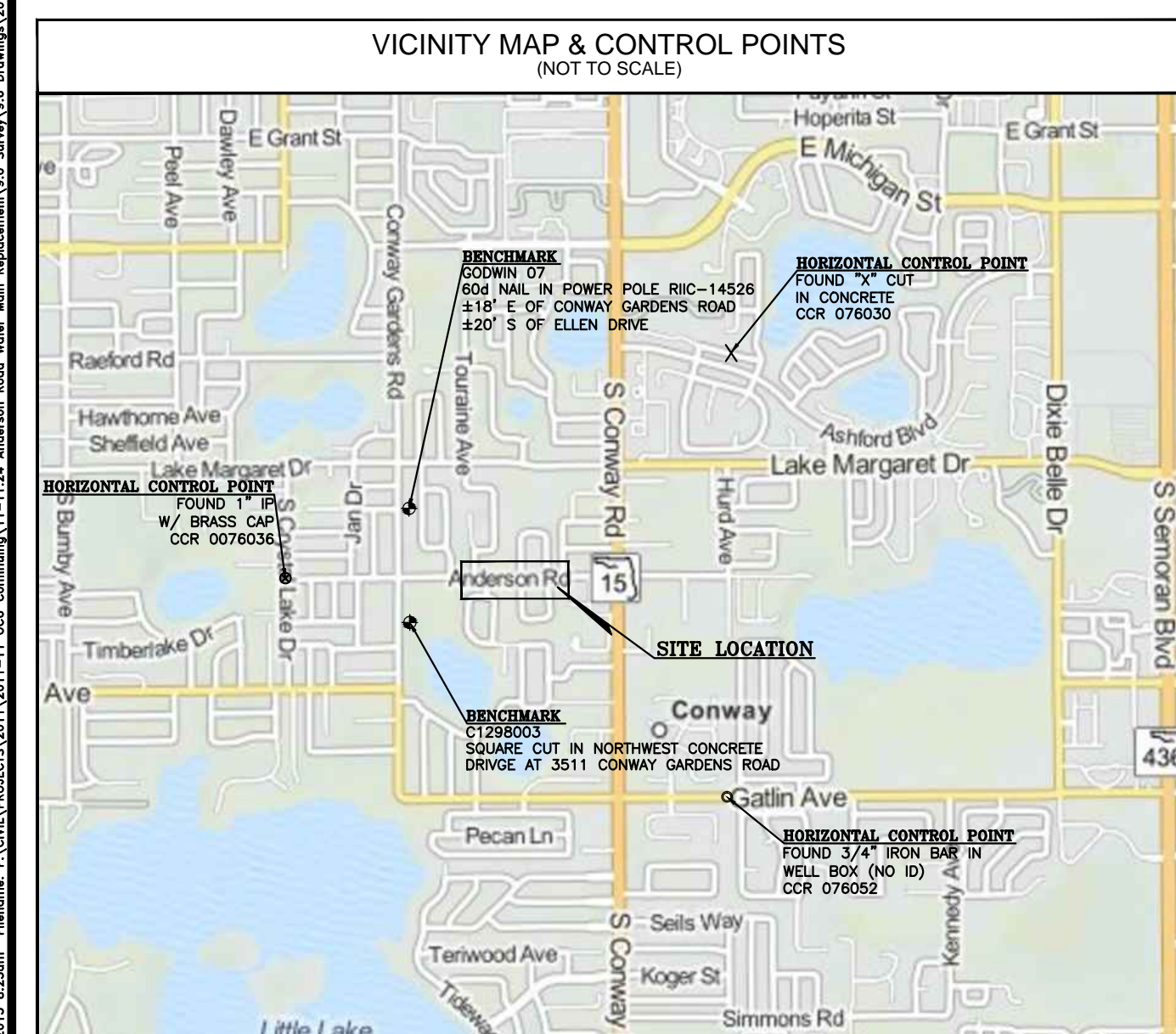
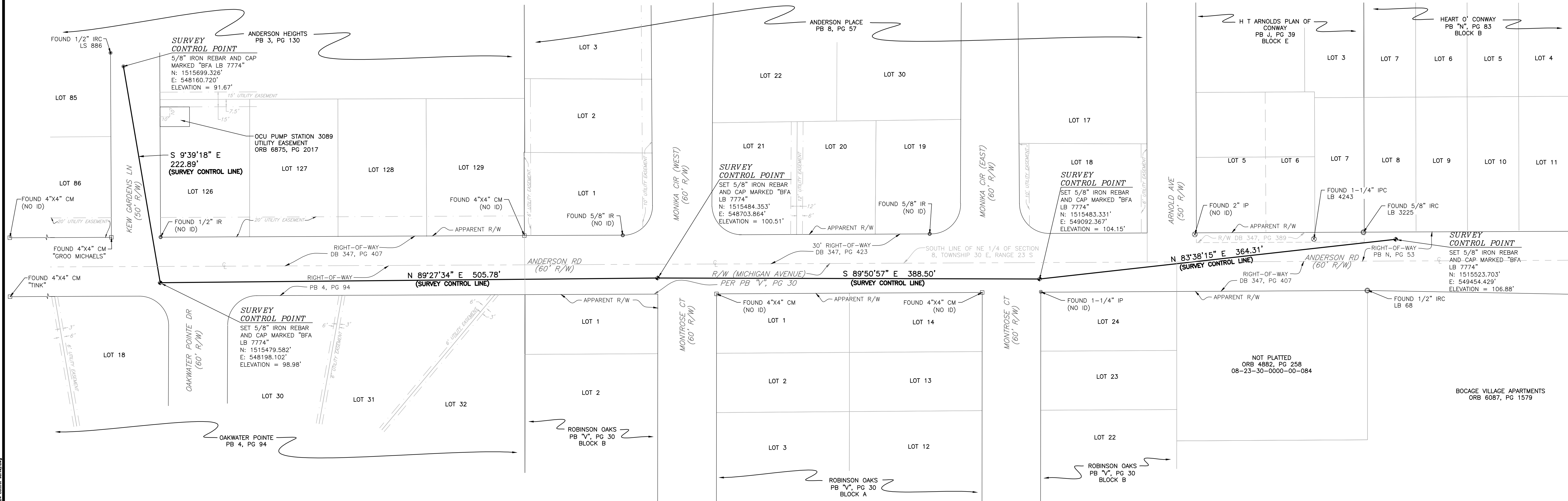
# **APPENDIX E**

## **ORANGE COUNTY UTILITIES**

### **BOUNDARY SURVEY(S)**

# CONTROL SURVEY

## ANDERSON ROAD WATER MAIN AND FORCE MAIN REPLACEMENT SECTION 8, TOWNSHIP 30 EAST, RANGE 23 SOUTH ORANGE COUNTY, FLORIDA.



### SURVEYOR'S NOTES:

- THIS CONTROL SURVEY IS ACCOMPANIED BY A SIGNED AND SEALED SURVEYOR'S REPORT AND NEITHER IS COMPLETE WITHOUT THE OTHER.
- GRAPHIC SYMBOLS, SHOWN HEREON, ARE NOT SHOWN TO SCALE.
- LAST DAY IN THE FIELD: JANUARY 30, 2015

### DATUM REFERENCE:

**HORIZONTAL DATUM:**  
COORDINATE VALUES AND BEARINGS FOR THIS PROJECT ARE IN THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983/1990 ADJUSTMENT, EXPRESSED IN U.S. SURVEY FEET.

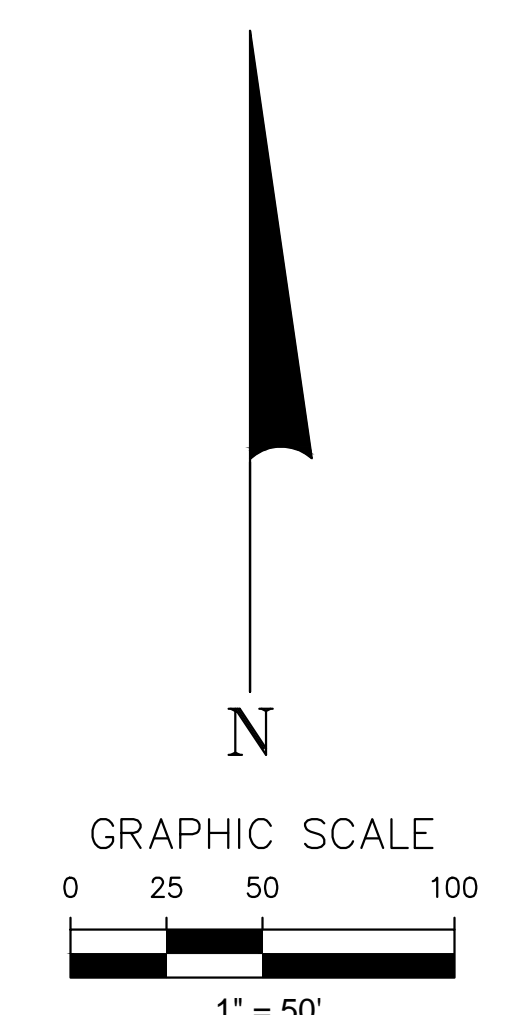
**VERTICAL DATUM:**  
ALL VERTICAL CONTROL IS BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), EXPRESSED IN U.S. SURVEY FEET.

### PUBLISHED CONTROL POINTS:

- HORIZONTAL CONTROL POINTS:**
- CCR 076030 - "X" CUT IN CONCRETE  
NORTHING: 1518159.60'  
EASTING: 551216.42'
  - CCR 076052 - 3/4" IRON BAR IN WELL BOX  
NORTHING: 1512856.245  
EASTING: 551226.598
  - CCR 076036 - 1" IRON PIPE WITH BRASS CAP  
NORTHING: 1515485.95'  
EASTING: 545921.80'
- VERTICAL CONTROL POINTS:**
- GODWIN 07 - 60# NAIL ON WEST FACE OF POWER POLE  
ELEVATION = 98.00'
  - C1298003 - SQUARE CUT ON NORTHWEST CORNER OF DRIVEWAY  
ELEVATION = 93.07'

### LEGEND:

- N NORTH / NORTHING
- E EAST / EASTING
- S SOUTH
- W WEST
- CCR CERTIFIED CORNER RECORD
- PB PLAY BOOK
- DB DEED BOOK
- PG PAGE NUMBER
- R/W RIGHT-OF-WAY
- IR IRON REBAR
- IPC IRON PIPE AND CAP
- IP IRON PIPE
- CM CONCRETE MARKER
- SC SURVEY CONTROL POINT
- 4X4 FOUND 4X4 CONCRETE MARKER
- 5/8 FOUND 5/8" REBAR
- 5/8 FOUND 5/8" REBAR AND CAP
- IP FOUND IRON PIPE
- X FOUND "X" CUT IN CONCRETE
- LINE NOT TO SCALE



No.	REVISIONS	BY	DATE

LINE IS 2 INCHES  
AT FULL SIZE  
(IF NOT SCALE ACCORDINGLY)

**ORANGE COUNTY**  
ORANGE COUNTY UTILITIES  
9150 CURRY FORD ROAD  
ORLANDO, FLORIDA 32825

**BFA Environmental Consultants**  
Barnes, Ferland and Associates, Inc.  
1230 E. Hillcrest Street, Orlando, FL 32803  
PH: (407) 896-8808 FAX: (407) 896-1822  
CERTIFICATE OF AUTHORIZATION NUMBER: LB 7774

ANDERSON ROAD WATER MAIN AND FORCE MAIN REPLACEMENT  
**CONTROL SURVEY**

\* NOT VALID WITHOUT SIGNATURE AND EMBOSSED SEAL OF A FLORIDA LICENSED SURVEYOR.

DRAWING INFORMATION	DATE
PROJECT No.: 2011-11.24	12/31/2014
DRAWN BY: CRS	12/31/2014
CHECKED BY: WM	
FIELD BOOK:	
DRAWING FILE: SEE MARGIN	SCALE: 1" = 50'

SHEET NUMBER  
**1 OF 1**

# **APPENDIX G**

## **ORANGE COUNTY UTILITIES**

### **DEWATERING DISCHARGE OFF-SITE**

- **Orange County Environmental Protection Division Work Instruction**
- **Generic Permit for the Discharge of Produced Ground Water From any Non-Contaminated Site Activity**
- **FDEP Notice of New Method for Mercury Testing**
- **Memo – EPA - Analytical Methods for Mercury in NPDES Permits**



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# Department of Environmental Protection

## Notice of New Method for Mercury Testing

### New Method for Mercury Testing Has Been Approved

In accordance with Rule 62-620.610, Florida Administrative Code (F.A.C.), all sampling and monitoring data, required to be reported to the Department, shall be collected and analyzed in accordance with Rule 62-4.246, Chapters 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate. Effective August 25, 2003, Chapter 62-620, F.A.C., was revised to adopt, and incorporate by reference, various sections of Title 40 of the Code of Federal Regulations revised as of July 1, 2003, including the revised 40 CFR 136. The revised 40 CFR 136 includes a new method for low-level mercury analysis, EPA Method 1631(Revision E), Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry (Method 1631E).

### Who is Required to Use Method 1631E?

Applicants for a wastewater facility permit and wastewater facility permittees are now required to use the low-level mercury Method 1631E when reporting results associated with water quality standards (WQSs) below 0.2 micrograms per liter (ug/L). The following facilities are now required to use Method 1631E for all **effluent samples**:

- Facilities discharging to Class I and Class II surface waters, including wetlands.
- Facilities discharging to Class III Marine or Fresh surface waters, including wetlands.
- Facilities with Water Quality Based Effluent Limits (WQBELs), or any other limit for mercury specified in a permit, below 0.2 ug/L.

This includes effluent samples collected for any of the following requirements:

- Monitoring specified in Section I, *Reclaimed Water and Effluent Limitations and Monitoring*, section of permits.
- Monitoring performed under Section 3.A. of *Wastewater Permit Application Form 2A For Domestic Wastewater Facilities*; Part VII.C. of *Application to Discharge Process Wastewater from New or Existing Industrial Wastewater Facilities to Surface Water - Form 2CS*; or Part V.C. of *Application to Discharge Process Wastewater from New or Existing Industrial Wastewater Facilities to Ground Water - Form 2CG*.
- Priority pollutant scans performed in accordance with pretreatment program annual report requirements.
- Monitoring performed for the development or re-evaluation of local discharge limitations.
- Monitoring required in Table 4 of the Generic Permit for Discharges from Petroleum Contaminated Sites and Table 1 of the Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity.

The low-level mercury method provides, for the first time, the ability to assess compliance with mercury water quality standards (WQSs) below 0.2 ug/L. Your permit requires that surface water discharges shall be analyzed using a sufficiently sensitive method in accordance with 40 CFR 136. *Wastewater Permit Application Forms 2A, 2CS, and 2CG* require effluent testing be conducted using methods that are able to detect pollutants at levels adequate to meet WQSs and to provide reasonable assurance that the WQSs will not be violated in the future.

Additionally, in order to develop technically and legally defensible local discharge limitations for domestic wastewater facilities that have pretreatment programs, Method 1631E must be used to provide data that clearly establishes the basis for any calculated mercury limitations. Note, regarding local discharge limitations, the requirement to use Method 1631E may be expanded to other locations in the collection and treatment system on a case-by-case basis depending on the initial results from effluent analysis using Method 1631E.

### Mercury Laboratory Analysis

Method 1631E has a minimum level of quantitation of 0.0005 ug/L, or 0.5 nanograms per liter (ng/L), which is 400-times more sensitive than Method 245.1 ("Manual Cold Vapor Technique"). Due to the sensitivity of Method 1631E, the results are typically measured in parts per trillion (ng/L) rather than in parts per billion (µg/L). The Department is currently evaluating Method 1631E to determine target method detection limits (MDLs) and target practical quantification limits (PQLs). Until target MDLs and PQLs are incorporated into Rule 62-4.246(4), the laboratory analysis is expected to achieve MDLs close to, or below, 1 ng/L. All laboratory analysis must be done by a NELAP accredited laboratory with current certification by Florida Department of Health for Method 1631E.

### Mercury Clean Sampling Techniques

Clean sample handling techniques should be used when collecting samples for low-level mercury analysis to preclude false positives arising from sample collection, handling, or analysis. Sample collection methods should be consistent with *DEP-SOP-001/01: FS 8200 Clean Sampling For Ultratrace Metals in Surface Waters* and *EPA Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (EPA-821-R-96-011). Because FS 8200 and Method 1669 are performance-based procedures, sample collection personnel may modify these procedures or eliminate steps if the modification does not lead to unacceptable contamination of samples or blanks. Any modifications should be thoroughly evaluated and demonstrated to be effective before field samples are collected. This may be accomplished through documentation of uncontaminated samples, equipment blanks and/or other quality control samples.

Note, discrete and composite samplers have been found to contaminate samples with mercury at the ng/L level. Therefore, grab samples are permissible when using Method 1631E. However, grab samples must be representative of the wastewater discharge and a field blank should be collected along with the sample.

In order for a permittee to justify a claim that any reported mercury is due to outside contamination, a blank must have been collected. For this reason, permittees should consider collecting at least one blank at each site for each day a sample is collected. If more than one sample is collected in a day, at least one blank for each 10 samples collected on that day should also be collected. The blank may either be an equipment blank or a field blank. Once a permittee demonstrates the ability to collect samples from a given site using an established procedure that prevents contamination, the permittee may choose to decrease the number of blanks being taken. Specific definitions and procedures for collecting blanks are found in DEP SOP FQ 1000.

Field blanks should be collected only if no equipment other than the sample container is used to collect samples. If the sampling procedure involves the use of additional equipment, such as a peristaltic pump and pump tubing, equipment blanks should be collected. All blanks are subject to the same preservation, digestion, and analysis protocols as regular samples and should have a concentration at least five times lower than the sample concentration. The permittee may not subtract field blank concentrations when reporting sample results.

Sample-collection, preservation, and shipping requirements should be discussed with contract laboratories to ensure the requirements of Method 1631E are met.

### Additional Assistance and Information

For additional information on Method 1631:  
[www.epa.gov/waterscience/methods/1631.html](http://www.epa.gov/waterscience/methods/1631.html)

Please refer questions concerning sample collection to:  
Silky Labic: 850-245-8066  
[Silky.Labic@dep.state.fl.us](mailto:Silky.Labic@dep.state.fl.us)

Additional information concerning NELAP certified laboratories can be obtained from:  
Department of Health Bureau of Laboratories  
P.O. Box 210 Jacksonville, FL 32231  
(904) 791-1599 (voice)(904) 791-1591 (fax)  
[ftp.dep.state.fl.us/pub/labs/assessment/doh/accredited.pdf](ftp://ftp.dep.state.fl.us/pub/labs/assessment/doh/accredited.pdf)

**STATE OF FLORIDA**

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**GENERIC PERMIT**

**FOR THE**

**DISCHARGE OF PRODUCED GROUND WATER**

**FROM ANY NON-CONTAMINATED SITE ACTIVITY**

**Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity**

(1) The facility is authorized to discharge produced ground water from any non-contaminated site activity which discharges by a point source to surface waters of the State, as defined in Chapter 62-620, F.A.C., only if the reported values for the parameters listed in Table 1 do not exceed any of the listed screening values. Before discharge of produced ground water can occur from such sites, analytical tests on samples of the proposed untreated discharge water shall be performed to determine if contamination exists.

(2) Minimum reporting requirements for all produced ground water dischargers. The effluent shall be sampled before the commencement of discharge, again within thirty (30) days after commencement of discharge, and then once every six (6) months for the life of the project to maintain continued coverage under this generic permit. Samples taken in compliance with the provisions of this permit shall be taken prior to actual discharge or mixing with the receiving waters. The effluent shall be sampled for the parameters listed in Table 1.

Table 1

Parameter	Screening Values for Discharges into:	
	Fresh Waters	Coastal Waters
Total Organic Carbon (TOC)	10.0 mg/l	10.0 mg/l
pH, standard units	6.0-8.5	6.5-8.5
Total Recoverable Mercury	0.012 µg/l	0.025 µg/l
Total Recoverable Cadmium	9.3 µg/l	9.3 µg/l
Total Recoverable Copper	2.9 µg/l	2.9 µg/l
Total Recoverable Lead	0.03 mg/l	5.6 µg/l
Total Recoverable Zinc	86.0 µg/l	86.0 µg/l
Total Recoverable Chromium (Hex.)	11.0 µg/l	50.0 µg/l
Benzene	1.0 µg/l	1.0 µg/l
Naphthalene	100.0 µg/l	100.0 µg/l

(3) If any of the analytical test results exceed the screening values listed in Table 1, except TOC, the discharge is not authorized by this permit.

(a) For initial TOC values that exceed the screening values listed in Table 1, which may be caused by naturally-occurring, high molecular weight organic compounds, the permittee may request to be exempted from the TOC requirement. To request this exemption, the permittee shall submit additional information with a Notice of Intent (NOI),

described below, which describes the method used to determine that these compounds are naturally occurring. The Department shall grant the exemption if the permittee affirmatively demonstrates that the TOC values are caused by naturally-occurring, high molecular weight organic compounds.

(b) The NOI shall be submitted to the appropriate Department district office thirty (30) days prior to discharge, and contain the following information:

1. the name and address of the person that the permit coverage will be issued to;
2. the name and address of the facility, including county location;
3. any applicable individual wastewater permit number(s);
4. a map showing the facility and discharge location (including latitude and longitude);
5. the name of the receiving water; and
6. the additional information required by paragraph (3)(a) of this permit.

(c) Discharge shall not commence until notification of coverage is received from the Department.

(4) For fresh waters and coastal waters, the pH of the effluent shall not be lowered to less than 6.0 units for fresh waters, or less than 6.5 units for coastal waters, or raised above 8.5 units, unless the permittee submits natural background data confirming a natural background pH outside of this range. If natural background of the receiving water is determined to be less than 6.0 units for fresh waters, or less than 6.5 units in coastal waters, the pH shall not vary below natural background or vary more than one (1) unit above natural background for fresh and coastal waters. If natural background of the receiving water is determined to be higher than 8.5 units, the pH shall not vary above natural background or vary more than one (1) unit below natural background of fresh and coastal waters. The permittee shall include the natural background pH of the receiving waters with the results of the analyses required under paragraph (2) of this permit. For purposes of this section only, fresh waters are those having a chloride concentration of less than 1500 mg/l, and coastal waters are those having a chloride concentration equal to or greater than 1500 mg/l.

(5) In accordance with Rule 62-302.500(1)(a-c), F.A.C., the discharge shall at all times be free from floating solids, visible foam, turbidity, or visible oil in such amounts as to form nuisances on surface waters.

(6) If contamination exists, as indicated by the results of the analytical tests required by paragraph (2), the discharge cannot be covered by this generic permit. The facility shall apply for an individual wastewater permit at least ninety (90) days prior to the date discharge to surface waters of the State is expected, or, if applicable, the facility may seek coverage under any other applicable Department generic permit. No discharge is permissible without an effective permit.

(7) If the analytical tests required by paragraph (2) reveal that no contamination exists from any source, the facility can begin discharge immediately and is covered by this permit without having to submit an NOI request for coverage to the Department. A short summary of the proposed activity and copy of the analytical tests shall be sent to the applicable Department district office within one (1) week after discharge begins. These analytical tests shall be kept on site during discharge and made available to the Department if requested. Additionally, no Discharge Monitoring Report forms are required to be submitted to the Department.

(8) All of the general conditions listed in Rule 62-621.250, F.A.C., are applicable to this generic permit.

(9) There are no annual fees associated with the use of this generic permit.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
WATER

signed: August 23, 2007

**MEMORANDUM**

**SUBJECT:** Analytical Methods for Mercury in National Pollutant Discharge Elimination System (NPDES) Permits

**FROM:** James A. Hanlon, Director  
Office of Wastewater Management

**TO:** Water Division Directors, Regions 1 - 10

The purpose of this memorandum is to inform you of EPA's March 12, 2007, approval of Method 245.7 for measurement of mercury and modified versions of approved analytical methods for mercury as well as the impact of their approval on the NPDES permitting process. While several different methods are currently approved under 40 CFR Part 136 for the analysis of mercury, some of these methods have much greater sensitivities and lower quantitation levels than others. This memorandum clarifies and explains that, in light of existing regulatory requirements for NPDES permitting,<sup>1</sup> only the most sensitive methods such as Methods 1631E and 245.7 are appropriate in most instances for use in deciding whether to set a permit limitation for mercury and for sampling and analysis of mercury pursuant to the monitoring requirements within a permit.

**BACKGROUND**

Section 301 of the Clean Water Act (CWA) requires NPDES permits to include effluent limitations that are as stringent as necessary to meet water quality standards. Thus, under the Act and EPA regulations, each permit must include, as necessary, requirements in addition to or more stringent than technology-based effluent limitations established under section 301 of the CWA in order to achieve water quality standards. 40 C.F.R. § 122.44(d)(1). The regulations require limitations to control all pollutants that the NPDES program director determines are or may be discharged at a level that "will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard," including both narrative and

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<sup>1</sup> This memorandum is based on existing legal requirements and authorities. It does not impose any new, legally binding requirements on EPA, states, or the regulated community.



numeric criteria, 40 C.F.R. § 122.44(d)(1)(i). If the program director determines that a discharge has the reasonable potential to cause or contribute to such an excursion, the permit must contain water quality-based effluent limitations for the pollutant, 40 C.F.R. § 122.44(d)(1)(iii). Thus, a prospective permittee may need to measure various pollutants in its effluent at two stages: first, at the permit application stage so that the program director can determine whether “reasonable potential” exists and establish appropriate permit limits; and second, where a permit limit has been established, to meet the monitoring requirements within the permit. The following discussion explains which analytical methods permit applicants and permittees should use to make these measurements when mercury is the pollutant at issue.

### Approved Analytical Methods

Measurements included on NPDES permit applications and on reports required to be submitted under the permit must generally be made using analytical methods approved by EPA under 40 CFR Part 136. See 40 CFR 136.1, 136.4, 136.5, 122.21(g)(7), and 122.41(j). For mercury, there are three methods commonly used in the NPDES program that EPA has approved under Part 136: Method 245.1, Method 245.2, and Method 1631E. Methods 245.1 and 245.2 were approved by EPA in 1974 and can achieve measurement of mercury down to 200 parts per trillion (ppt). Additionally, EPA approved Method 1631 Revision E in 2002. Method 1631E has a quantitation level of 0.5 ppt, making it 400 times more sensitive than Methods 245.1 and 245.2. In fact, the sensitivity of Methods 245.1 and 245.2 are well above the water quality criteria now adopted in most states (as well as the criteria included by EPA in the Final Water Quality Guidance for the Great Lakes System) for the protection of aquatic life and human health, which generally fall in the range of 1 to 50 ppt.<sup>2</sup> In contrast, Method 1631E, with a quantitation level of 0.5 ppt, does support the measurement of mercury at these low levels.

In addition to Methods 245.1, 245.2, and 1631E listed above, EPA approved Method 245.7 as well as modified versions of other EPA-approved methods on March 12, 2007. See 72 FR 11200. Method 245.7 has a quantitation level of 5.0 ppt, making it 40 times more sensitive than Methods 245.1 and 245.2. Additionally, modified versions of EPA-approved methods may also be used for the measurement of mercury. Methods approved under Part 136, such as 245.1 and 245.2, may be modified to achieve lower quantitation levels than can be achieved by the method as written.<sup>3</sup> Modifications to an EPA-approved method for mercury that meet the method

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<sup>2</sup> Many states have adopted mercury water quality criteria of 12 ppt for protection of aquatic life and 50 ppt for the protection of human health, and for discharges to the Great Lakes Basin, the applicable water quality criteria for mercury are 1.3 ppt for the protection of wildlife and 1.8 ppt for the protection of human health. In 2001, EPA issued new recommended water quality criteria guidance for the protection of human health. This new guidance recommends adoption of a methylmercury water quality criterion of 0.3 milligrams of methylmercury per kilogram (mg/kg) in fish tissue. EPA is currently developing implementation guidance to assist states in implementing the criterion, and *Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion* (EPA-823-B-04-001) was released for public comment in August 2006.

<sup>3</sup> Examples of such modification may include changes in the sample preparation digestion procedures such as the use of reagents similar in properties to ones used in the approved method, changes in the equipment operating parameters such as the use of an alternate more sensitive wavelength, adjusting the sample volume to optimize method performance, and changes in the calibration ranges (provided that the modified range covers any relevant regulatory limit).

performance requirements of Part 136.6 are considered to be approved methods and require no further EPA approval. See 72 FR 11239-40 (March 12, 2007). For analytical method modifications that do not fall within the flexibility of Part 136.6, the modified methods may be approved under the alternate test procedure program as defined by Parts 136.4 and 136.5.

## **ACTIONS RESULTING FROM THE MARCH 12, 2007, RULEMAKING**

To implement the March 12, 2007, rule, the Office of Wastewater Management (OWM) provides the following guidance:

### Monitoring Data Submitted as Part of NPDES Permit Applications

As noted, most states have adopted water quality criteria for the protection of aquatic life and human health that fall in the range of 1 to 50 ppt, and Methods 245.1 and 245.2, as written, do not detect or quantify mercury in this range. A "did not detect" result using Method 245.1 or Method 245.2 would show only that mercury levels are below 200 ppt but would not establish that they are at or below the applicable water quality criterion. Therefore, when a permit writer receives a permit application reporting mercury data analyzed with Method 245.1 or Method 245.2 as "did not detect" results, the permit writer in reality may lack the information needed to make a "reasonable potential" determination. In contrast, Method 1631E is able to detect and quantify mercury concentrations at these low levels.

EPA therefore expects, in general, that all facilities with the potential to discharge mercury will provide with their NPDES permit applications monitoring data for mercury using Method 1631E or another sufficiently sensitive EPA-approved method. For purposes of permit applications, a method for mercury is "sufficiently sensitive" when (1) its method quantitation level is at or below the level of the applicable water quality criterion for mercury or (2) its method quantitation level is above the applicable water quality criterion, but the amount of mercury in a facility's discharge is high enough that the method detects and quantifies the level of mercury in the discharge.<sup>4</sup> Accordingly, EPA strongly recommends that the permitting authority determine that a permit application that lacks effluent data analyzed with a sufficiently sensitive EPA-approved method such as Method 1631E is incomplete unless and until the facility supplements the original application with data analyzed with such a method. See 40 CFR 122.21(e) (a permit application is determined to be complete at the discretion of the permitting authority) and 40 CFR 122.21(g)(13) (the applicant shall provide to the Director, upon request, such other information as the Director may reasonably require to assess the discharge). Such data would allow the permitting authority to characterize the effluent to determine whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion of state water quality standards for mercury and would consequently allow the permitting authority to determine whether a water quality-based effluent limit for mercury is necessary in the permit.

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<sup>4</sup> To illustrate the latter, if the water quality criterion for mercury in a particular state is 2.0 ppt, Method 245.7 (with a quantitation level of 5.0 ppt) would be sufficiently sensitive where it reveals that the level of mercury in a facility's discharge is 5.0 ppt or greater. In contrast, Method 245.7 would not be sufficiently sensitive if it resulted in a level of non-detect for that discharge because it could not be known whether mercury existed in the discharge at a level between 2.0 and 5.0 (less than the quantitation level but exceeding the water quality criterion).

### Monitoring Requirements in Permits

Where a permit authority establishes a permit limit for mercury, it also needs to consider specifying an analytical method that the permittee must use to monitor for mercury during the term of the permit. Methods 245.1 and 245.2, as written, are not likely to be sensitive enough to detect or quantify the concentration of mercury in the discharge at a level that matches the limitation for mercury in the permit. EPA therefore expects the permitting authority to require the use of a sufficiently sensitive EPA-approved method for monitoring under the permit in order to ensure that the sampling and measurements required are "representative of the monitored activity" (as required by 40 CFR 122.41(j)(1)). For purposes of monitoring under a permit, a method for mercury is "sufficiently sensitive" when (1) its method quantitation level is at or below the level of the mercury limit established in the permit or (2) its method quantitation level is above the mercury limit in the permit, but the amount of mercury in a facility's discharge is high enough that the method detects and quantifies the level of mercury in the discharge.<sup>5</sup>

### EPA Permit Review and Objection to State Issued Permits

For NPDES-authorized states, EPA regions are expected to review state permits and should strongly consider objecting to permits that are issued based on analytical data collected and analyzed using an EPA-approved method that is not sufficiently sensitive or that do not require use of a sufficiently sensitive EPA-approved method for monitoring when the permit includes a limit for mercury. OWM is expecting to undertake a permit quality review of a small representative number of permits with respect to mercury limitations and other conditions.

If you have questions concerning the content of this memorandum, please contact Linda Boornazian, Director of the Water Permits Division, at 202-564-0221 or have your staff contact Marcus Zobrist of the State and Regional Branch at 202-564-8311 or zobrist.marcus@epa.gov.

cc: NPDES Branch Chiefs Regions 1 - 10

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<sup>5</sup> See footnote 4.

**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION  
WORK INSTRUCTION**

**Title:** Dewatering Permitting and Approvals Work Instruction  
**Number:** EPD-WI-2000-04

Effective Date: 10/04/2011 Revision: 1  
Renewal Date: 10/04/2014 Revision Date: 10/04/2011  
Approved By: Elizabeth R. Johnson, Environmental Programs Administrator

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**Purpose:** The purpose of this work instruction is to provide guidance regarding the approvals required to initiate construction related dewatering in unincorporated Orange County

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**I. Procedure**

**County Offices:**

**Orange County Public Works**

For proposed dewatering discharges to the Orange County Municipal Separate Storm Sewer System (MS4), contact Orange County Development Engineering prior to commencement of dewatering. OC Public Works Contact: Miguel Tamayo, 407-836-7914.

**Orange County Utilities (OCU)**

If the groundwater discharge testing indicates groundwater quality parameter exceedences, the discharge may be allowed to enter into the Orange County sanitary system. Coordinate with OCU. If OCU can accept the discharge, a County Industrial Wastewater Discharge Permit (IWD) will be required. Per Florida Department of Environmental Protection (FDEP), no FDEP dewatering permitting is required if an IWD is received.

Contact: Susanna Littell, OCU/Water Reclamation, 407-254-7710 (Industrial Wastewater Discharge Permits)

Contact: Laura Woodbury, P.E., OCU/Development Engineering, 407-254-9928.

Rules/Permits:

- Chapter 37 Article XX. Addresses industrial waste pretreatment and permitting.
- Industrial Wastewater Discharge (IWD) Permit. Required prior to discharge to the wastewater system.
- OCU Development Engineering Connection Requirements. OCU Development Engineering reviews and approves plans for groundwater dewatering and remediation projects when discharge will be to the OCU sanitary sewer system.

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**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION  
WORK INSTRUCTION**

**State Agencies:**

**Florida Department of Environmental Protection (FDEP)**

For dewatering that is discharged offsite, sampling/analytical work is required prior to dewatering to determine if the proposed activity can be permitted under one of the generic dewatering permits.

FDEP Contacts: Ali Kazi, 407-897-4149; Randall Cunningham, 407-897-4152.

Rules/Permits:

- Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)).
- Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2)).
- Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660).

**Water Management Districts:**

**St. Johns River Water Management District**

Contact: Richard Kimmel, 407-659-4849.

Rules/Permits:

- No permit ("No Notice").
- Noticed General Permit for Short-term Construction Dewatering.
- Individual and Standard General Consumptive Use Permit.

**South Florida Water Management District**

Contact: Mario Cabana, 407-858-6100, ext. 3816.

Rules/Permits:

- "No-Notice" Short-Term Dewatering Permits.
- Dewatering General Water Use Permits.
- Long-term Dewatering Individual Permits.

For dewatering activities located in the City of Orlando contact Lisa Lotti at 407-246-2037.

**II. Scope**

This procedure applies to construction sites within unincorporated Orange County.

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**Definitions:**

**Off-site:** For the purposes of this Work Instruction, off-site means property not under control of the owner/applicant or (discharging to) the municipal separate storm sewer system or waters of the County.

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**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION  
WORK INSTRUCTION**

**Related Documents:**

Florida Department of Environmental Protection's Construction Generic Permit

**History of Revisions:**

Revision No.	Revision Date	Summary of Revisions
0	06/06/2011	Original
1	10/04/2011	Update contact information

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