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IFB NO. Y15-780-PH

INVITATION FOR BIDS

NORTHWEST WATER RECLAMATION FACILITY (NWRF) WATER MAIN EXTENSION AND PUMP STATION IMPROVEMENTS

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TECHNICAL SPECIFICATIONS

PART H

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TECHNICAL SPECIFICATIONS

ORANGE COUNTY

NWRF RECLAIMED WATER MAIN
EXTENSION AND PUMP STATION IMPROVEMENTS

Cap Number: 1435-06
Project Sequence Number: 76665
CPH Project No. O28425

May, 2015

DIVISION 0 - BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT PROVIDED BY ORANGE COUNTY PURCHASING

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2

SECTION 00015

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SECTION 01001

GENERAL WORK REQUIREMENTS

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 01110 "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 <u>$51.00 per hour</u> 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 01750 "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 – NOT REQUIRED

B. TRAFFIC MAINTENANCE
1. Maintain one way minimum traffic within the property at all times. Notify RPR 2 days in advance of any impacts to operational traffic within County property.

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 01027

APPLICATION FOR PAYMENT

PART 1 GENERAL

1.01 REQUIREMENT

A. This Section specifies administrative and procedural requirements governing the Contractor's Application for Payment.

B. Prior to submitting a monthly payment application, the Contractor's progressive As-Built Drawings and As-Built Asset Attribute Date, Gravity Main and Pipe Deflection Tables shall be accepted by the County.

C. Progressive As-Built Drawings shall indicate the horizontal and vertical locations of all current constructed improvements with sufficient information and notes to easily determine if the improvements were constructed in conformance with the Contract Documents. The progressive As-Built Asset Attribute Data, Gravity Main, and Pipe Deflection Tables shall include a Surveyor's certified statement regarding the constructed improvements being within the specified accuracies or if not, indicating the variances as described in specification Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey Accuracies.

1.02 FORMAT

Format and Content: Use the accepted Schedule of Values.

A. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

1. Generic Name
2. Related Specification Section
3. Name of Subcontractor
4. Name of manufacturer or fabricator
5. Name of supplier
6. Dollar Value.

B. 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 and payments as certified and paid for by the County.

1. The initial Application for Payment: The Application for Payment at time of Substantial Completion and the final Application for Payment involve additional requirements.

B. Payment Application Times: As stated in the General Conditions, payment applications are to be submitted monthly on a day of the month to be established by the County at the Pre-Construction conference.

C. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.

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 an extension or continuation sheet, listing Change Order number and dollar amount as for an 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 mechanical liens, and consent of surety with each application, as further explained below.

D. Submit a stored material log with each application for payment which identifies the type, quantity and value of all stored material, and that tracks when the stored materials are installed and deducts them from stored quantity at that time. Include original invoices for all stored materials that payment is requested.

E. Waivers of Claims and Mechanics Lien: With each Application for Payment submit waivers of claims and mechanics liens from Subcontractors or Subcontractors and suppliers for the construction period covered by the previous application.

1. 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, submit final or full waivers.

3. The County reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by 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.

5. Waiver Forms: Submit waivers of claims and lien on forms and executed in a manner acceptable to the County.

F. Transmittal: Submit four (4) executed copies of each Application for Payment to the County by means ensuring receipt within 24 hours. One (1) copy shall be complete, including waivers of lien and similar attachments when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner 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 by prior applications for payment, and 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: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of Subcontractors

2. List of principal supplier 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: Administrative actions and submittals that must precede or coincide with submittal of Monthly Partial Payments include the following:

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 Example (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) paper copies

11. Summary of Values

12. Pay Request

13. On-Site Storage.

I. Substantial Completion Application for Payment: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This

application shall reflect any Certificates of Partial Substantial Completion issued previously for County occupancy of designated portions of the Work.

Administrative actions and submittals that shall precede or coincide with this application include:

1. Occupancy permits and similar approvals

2. Warranties (guarantees) and maintenance agreements

3. Test/adjust/balance records

4. Maintenance instructions

5. Meter readings

6. Start-up performance reports

7. Change-over information related to the County's occupancy, use, operation and maintenance

8. Final Cleaning

9. Application for reduction of retainage and consent of surety

10. Advice on shifting insurance coverage

11. List of incomplete Work, recognized as exceptions to County's Certificate of Substantial Completion.

J. Final Completion Application for Payment: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment includes 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. Completion of project close-out requirements

3. Completion of items specified for completion after Substantial Completion

4. Assurance that unsettled claims are settled

5. Assurance that work not complete and accepted is now completed

6. Transmittal of required project construction records to the County

7. Proof those taxes, fees and similar obligations have been paid

8. Removal of temporary facilities and services has been completed

9. Removal of surplus materials, rubbish and similar elements

10. Change of door locks to County's access

11. Execute certification by signature of authorized officer

12. Prepare Application for Final Payment as required in General Conditions.

K. Submittal Procedures

A. Submit four (4) copies of each Application for Payment at time stipulated in Agreement.

B. Submit under transmittal letter.

L. Substantiating Data

A. When the County requires substantiating information, submit data justifying line item amounts in question.

B. Provide one (1) copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

Summary of work, other contracts, work sequence, working hours, operation of existing facilities, use of premises, OWNER furnished products, coordination, cutting and patching.

1.02 SUMMARY OF WORK

A. The project consists of the furnishing and installation of five vertical turbine pumps, electrical controls, approximately 3,800 lineal feet of 24-inch DIP reclaimed water main, and other miscellaneous work shown in the plans.

All work activities shall be required to be in accordance with the permits issued by the respective agencies. All work performed will be required to be done while maintaining the functional operation of the existing reclaimed pump station operation.

B. All materials, equipment, skills, tools, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work and in compliance with the requirements stated or implied by these Specifications or Drawings shall be furnished and installed by the CONTRACTOR without additional compensation, whether specifically indicated in the Contract Documents or not.

C. The Orange County Utilities Standards and Construction Specifications Manual (dated February 11, 2011) is incorporated by reference into these specifications. Contractor shall be aware that adherence to Standards in the County Manual and as described herein shall be required. Should any conflicting information exist between these two documents, then the Orange County Utilities Standards and Construction Specifications Manual shall be minimal specifications. Provided products used shall be from the approved manufactures listed in the Standards. Orange County Standards are available for download at: http://www.orangecountyfl.net/YourLocalGovernment/CountyDepartments/Utilities/StandardsConstructionSpecificationsManual.aspx

D. Repair, replace, or otherwise settle with the OWNER or OWNER'S Representative, if damage to property or existing facilities occurs, including damage to pavements, utilities, lawns, structures, etc.

E. Construct the Project under a Lump Sum Contract.

F. 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 disruptions caused during this construction.

G. The materials used to complete the Work shall be listed in the latest edition of "Orange County Utilities Standards and Construction Specifications Manual, Appendix D – List of Approved Products".

H. Any damage that occurs through the fault of the CONTRACTOR, shall be completely restored at the expense of the CONTRACTOR, based upon current County standards.

1.03 WORK UNDER OTHER CONTRACTS – N/A

1.04 WORK SEQUENCE

The CONTRACTOR's sequence of work may be of his choosing in order to complete the work in the allowed time frame provided that consideration is made to maintain at least two operational pumps at all times. The pump station shall remain in service at all times. The CONTRACTOR shall submit a schedule and work sequence to the OWNER at least ten (10) days following the Notice to Proceed. If work sequence of operations will require a shut down of any existing county utility systems, the CONTRACTOR shall provide in writing a detailed shut down plan that will be reviewed by the County prior to the commencement of that work.

1.05 OPERATION OF EXISTING FACILITIES

The proposed work for this project involves the connection to an existing reclaimed water main. Work also requires open cutting an existing roadway with heavy truck traffic. The CONTRACTOR shall perform their work taking all proper precautions and safety measures to insure a safe work area. The work shall be so conducted to maintain existing utility systems in operation. All utilities that occupy or are adjacent to the subject construction site are to remain in operation. The CONTRACTOR shall coordinate all construction activities with the Orange County Resident Inspectors.

1.06 CONTRACTOR USE OF PREMISES

Confine operations at the site to areas permitted by applicable laws, ordinances, permits, and by the Contract Documents. Do not unreasonably encumber the site with materials or equipment. The CONTRACTOR shall assume full responsibility for protection and safekeeping of products stored on the job site.

1.07 COORDINATION

A. The CONTRACTOR shall be fully responsible for the coordination of his work and the work of his employees, subcontractors, and suppliers and to assure compliance with schedules.

B. The coordination requirements of this Section are in addition to the requirements of this Specification Document.

C. It is the CONTRACTOR's responsibility to coordinate with all the utilities regarding locates, protection of existing facilities, testing, or relocations.

1.08 CUTTING AND PATCHING

A. Cutting and patching for inspection and testing and the payment therefore shall be as specified in the General Conditions and Supplementary Conditions.

B. The CONTRACTOR shall, at no additional expense to the OWNER, perform cutting and patching necessary for the completion of the Project. Perform cutting and patching in a manner to prevent damage to the facilities or previously completed work.

C. Refinish surfaces as necessary to provide an even finish.

1.09 DRAWINGS AND PROJECT MANUAL

A. The Utility Work shall be performed in accordance with the Drawings and Specifications prepared by CPH, Inc., 1117 E. Robinson Street, Orlando, Florida 32801.

B. The CONTRACTOR shall verify all dimensions, quantities and details shown on the Utility Drawings and Roadway Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the ENGINEER, and shall notify the same, in writing, of all errors, omissions, conflicts and discrepancies found therein with adequate notice. 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 ENGINEER 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 in either the Drawings or in the Specifications, but involved in carrying out their implied 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 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.

1.10 WEATHER

During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. The orders and decisions of the ENGINEER as to suspensions shall be final and binding. During suspension of the Work from any cause, the

Work shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise; and, if the ENGINEER will so direct, the rubbish and surplus materials shall be removed.

1.11 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 equal to or better than that existing before the damage was done, or he shall make good the damage in other manner acceptable to the ENGINEER.

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. Support trees to prevent root disturbances during nearby excavation.

C. Tree and Limb Removal

1. Tree limbs that interfere with equipment operation and are approved for pruning shall be neatly trimmed and the tree cut coated with tree paint. Trimming and removal of tree limbs shall be considered incidental. Portions of the project are in a wooded area and will require the removal of trees in order to install the new water main. The CONTRACTOR shall be responsible for the removal and proper disposal of all trees within the reclaimed water main easement area.

2. The CONTRACTOR shall obtain any permits required for removal of trees. 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. Sodded Areas – All 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. No seeding will be allowed.

F. The CONTRACTOR shall be responsible for locating and protecting (supporting as needed) and/or relocating all utilities lines, including irrigation lines, in the areas of the construction activities. If any existing lines are broken or damaged as a result of construction activities, the CONTRACTOR shall be responsible for repairing the lines at no additional cost to the OWNER.

1.12 DELIVERY AND STORAGE

A. General

1. The CONTRACTOR shall be responsible for all material, equipment and supplies sold and delivered to the OWNER under this Contract until final inspection of the Work and acceptance thereof by the OWNER.

2. All materials and equipment to be incorporated in the Work shall be handled and stored by the CONTRACTOR before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

3. Any materials that, in the opinion of the ENGINEER, become damaged to a point where they are unfit for their intended or specified use shall be promptly removed from the site of the Work, and the CONTRACTOR shall receive no compensation for the damaged material or its removal.

4. In the event any such material, equipment or supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the CONTRACTOR shall replace the same without additional cost to the OWNER.

B. Delivery – The CONTRACTOR shall:

1. Deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.

2. Coordinate deliveries in order to avoid delay in or impediment of, the progress of the Work of any related CONTRACTOR.

3. Schedule deliveries to the site not more than one month prior to scheduled installation without written authorization from the ENGINEER.

4. Arrange deliveries of products in accordance with construction schedules coordinated to avoid conflict with work and conditions at the site.

5. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

6. Immediately upon delivery, inspect shipments with the OWNER'S field representative to ensure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

7. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to products or packaging.

8. Submit operation and maintenance data to the ENGINEER for review prior to shipment of equipment.

C. Storage

1. The CONTRACTOR shall be responsible for securing a location for on-site storage of all material and equipment necessary for completion of this project.

2. All material delivered to the job site shall be protected from dirt, dust, dampness, water and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the OWNER.

3. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

4. When required or recommended by the manufacturer, the CONTRACTOR shall furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project.

5. The CONTRACTOR shall arrange the storage area in a manner to provide easy access for inspection. Periodic inspections of stored products shall be done to assure that products are maintained under specified conditions and free from damage or deterioration.

6. The CONTRACTOR shall carefully review and comply with the manufacturer's storage instructions. These instructions shall be carefully followed and a written record of this kept by the CONTRACTOR.

7. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding".

8. Mechanical equipment to be used in the Work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and start-up, at no extra cost to the OWNER.

D. Specific Material Storage Requirements

1. Loose Granular Materials: Store in a well-drained area on solid surfaces to prevent mixing with foreign matter.

2. Cement, Sand and Lime: Stored under a roof and off the ground and kept completely dry at all times.

3. Brick, Block and Similar Masonry Products: Handle and store in a manner to reduce breakage, chipping, cracking and spilling to a minimum.

4. All structural and miscellaneous steel and reinforcing steel: Store off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.

Should the CONTRACTOR fail to take proper action on storage and handling of equipment supplied under this Contract, within seven days after written notice to do

so has been given to correct the deficiencies, the OWNER retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the CONTRACTOR's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, and Engineering and any other costs associated with making the necessary corrections. In any event, equipment and materials not properly stored will not be included in a payment estimate. Any materials not suitable for use will be removed from the site and replaced with new materials.

1.13 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

A. Comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including two copies for the ENGINEER's use. Maintain one set of complete instructions at the job site during installation and until completion. Copies of all instructions shall also be included in the Operation and Maintenance Manuals, which are provided to the OWNER at the close of the contract.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with the manufacturer's instructions, consult with the ENGINEER for further instructions. Do not proceed with Work without clear instructions.

C. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

D. The CONTRACTOR shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the installation of the Work and to handle all emergencies normally encountered in Work of this character.

E. Equipment shall be installed in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise in writing by the ENGINEER during installation.

F. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

G. The CONTRACTOR shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the ENGINEER and made of ample size and strength for the purposes intended. The manufacturer shall furnish substantial templates and working drawings for installation.

1.14 CONSTRUCTION FIELD ENGINEERING

A. Registered Land Surveyor: The CONTRACTOR shall retain the services of a registered land surveyor licensed in the State of Florida for the following specific services as applicable to the Work:

1. Identify existing rights-of-ways and property lines along or adjacent to the Work;

2. Locate all existing utilities and structures as may be affected by the Work;

3. Locate control points prior to starting the Work;

4. Replace control points or reference points which may be lost or destroyed.

5. CONTRACTOR is to provide a preliminary set of Record Drawings that reflect any changes to the alignment or connections to existing facilities for the purpose of Certification of Construction Completion to FDEP for clearance of the lines. This As-built information is to be provided to the County prior to the pressure testing of the new line.

6. Prepare a certified survey of the actually constructed facilities based on information concurrent with the construction progress. This site survey shall be in accordance with Section 01720.

B. CONTRACTOR shall protect control points prior to starting the Work and shall preserve all permanent reference points during construction. Report to the OWNER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

The CONTRACTOR shall bear the cost of re-establishing project control points if disturbed, and bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes, and marks.

C. Submittals

1. Certificate signed by a Registered Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

2. Certified, signed and sealed drawings, including pdf files of the signed drawings, showing locations of all structures, piping conduits and other improvements. These drawings are referenced as the Project Record Drawings and shall be included with the Project Record Documents.

3. Completed Record Drawing Tables.

4. Documentation to verify accuracy of field engineering work when requested by the ENGINEER.

5. Electronic version of record drawing survey in the latest version of AutoCAD.

1.15 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 to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at their 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 no more than 300 feet. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the OWNER 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, concrete base or soil cement base shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material.

      All pipe and fittings shall be stored in a location inside the easement area, 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.

   b. 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.

B. Existing Utilities

1. The locations of all existing underground piping, structures and utilities have been taken from 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 to be encountered.

2. The CONTRACTOR shall, at all times in performance of the Work, employ approved methods and exercise reasonable care and skill so as to avoid

unnecessary delay, injury, damage or destruction of existing public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services; and shall cooperate fully with the Owners thereof to that end.

3. Pipelines shall be located substantially as indicated on the Drawings, but the OWNER reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. When the location of piping is dimensioned on the Drawings, it shall be installed in that location; when the location of piping is shown on a scaled drawing, without dimensions, the piping shall be installed in the scaled location unless the OWNER 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 him from laying and jointing different or additional items where required. The ENGINEER may require detailed pipe laying drawings and schedules for project control.

4. The CONTRACTOR shall exercise care in any excavation to locate all existing piping and utilities. All utilities, which do not interfere with the completed 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 OWNER. Any existing facilities that require operation to facilitate repairs shall be performed only by the OWNER of the respective utility.

5. It is the responsibility of the CONTRACTOR to ensure that all utility or other 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 by the CONTRACTOR.

C. Lines and Grades

1. All Work under this Contract shall be constructed in accordance with the line and grades shown on the Drawings, or as given by the ENGINEER. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

2. 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 OWNER, and shall be solely responsible for the accuracy thereof.

3. Water main and force main shall have a minimum of 36-inches of cover over the top of the pipe. Cover shall vary 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 approved by the OWNER.

To insure a uniform gradient for pressure pipe, all lines shall be installed using control stakes set at 50 ft intervals using surveyors' level instrument.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01120

COORDINATION WITH COUNTY'S OPERATIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Coordination

1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.

2. All contacts, requests, changes, communications, and coordination with the County shall be initiated through the County's Resident Project Representative (RPR). Any other communication or request that is not initiated through the RPR will be null and void. The RPR will decide if a Construction Assistance Request (CAR) is needed. All training, spare parts distribution, and other activities described elsewhere shall always require a CAR with seven (7) days' notice.

PART 2 – SITE CONSTRUCTION

2.01 SITE ADMINISTRATION

. CONTRACTOR shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. CONTRACTOR shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to OWNER or others. CONTRACTOR shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except OWNER's employees) to observe the same regulations as CONTRACTOR requires of its employees.

Access to the Site during construction will be limited to Contractor's or Subcontractor's employees, agents, and vendors (hereinafter "Representatives") for the sole purpose of performing the Work. Contractor/Subcontractor Representative's identity and business purpose will be subject to verification by Owner's security representative. Access to the Site will be limited to the main gate unless specific alternate arrangements are made with the Owner. CONTRACTOR will supply list, and periodically update it, which will contain the names of all personnel with driver license numbers and license plate numbers of all vehicles that will be on-site during construction.

OWNER reserves the right to direct CONTRACTOR to permanently remove any subcontractor or subcontracted employee from the site for breach of security, policy,

unsafe working practice, unprofessional behavior, or failure to comply with access restrictions.

2.02 COMMUNICATION WITH OWNER

All communication with Owner personnel for any purpose shall be administered solely through the County's RPR. Any other communication with the Owner personnel that is not initiated through the County RPR will be null and void.

2.03 SECURITY

CONTRACTOR shall be responsible for protection of the Site, and all Work, materials equipment, and existing facilities thereon, against vandals and other unauthorized persons. CONTRACTOR shall comply with Orange County's security requirements to protect the Northwest Water Reclamation Facility (NWRF) site.

The OWNER is implementing special security measures to protect the public wastewater system and the CONTRACTOR shall provide the same level of security. The CONTRACTOR shall provide the following security measures:

1. CONTRACTOR will supply list of all personnel that will be on NWRF site each morning to OWNER's RPR.

2. All personnel, employees and/or Subcontractors and suppliers that pass through the security perimeter shall wear Contractor issued photo identification badges.

3. CONTRACTOR will supply list with names, driver license and license plate numbers of all personnel.

4. CONTRACTOR shall perform background checks to identify any historical crimes dealing with terrorism, sabotage, or other government related illegal activities for all personnel passing through the security perimeter.

5. All project deliveries shall be inspected prior to entering the security perimeter of the Facility in order to verify contents. All delivery personnel and delivery vehicles shall be under supervision while within the security perimeter of the Facility in lieu of issuance of photo identification badges. The CONTRACTOR shall maintain staff to accept all deliveries to the site, the Owner will not be responsible for receipt of any deliveries.

6. If access other than the main gate off Alafaya Trail is utilized, a full time guard shall be provided at the construction gate during contractor working hours. All arrangements for alternatives access shall be pre-arranged with the Owner. All alternative access must be secured and locked when not in use.

No Claim shall be made against OWNER by reason of any act of an employee or trespasser, and CONTRACTOR shall make good all damage to OWNER's property resulting from CONTRACTOR's failure to provide security measures as specified.

2.04 CONSTRUCTION ADMINISTRATION REQUEST (CAR) FORM

The CONTRACTOR is responsible to submit a CAR to the Owner's Representative for any interaction requiring the involvement of the Owner's Operational Staff for the NWRF, including but not limited to the following examples: existing valve actuation, process interruptions, equipment operation interruption, power interruption, flow diversions, training. The CONTRACTOR will not have contact with the Operations Staff without Owner's Representatives' knowledge. The Owner's Representative reserves the right to direct the Contractor to provide a CAR at his discretion. Unless otherwise noted by the Owner's Representative, a CAR shall be submitted a minimum of seven (7) calendar days in advance of the intended operation noted within the CAR. Unless otherwise noted within the Contract Documents, for all activities affecting treatment process operation, a CAR shall be submitted a minimum of thirty (30) days in advance of the scheduled activity. Unless otherwise noted in the Contract Documents, the schedule for performing work which will require shutting down a unit process must be coordinated with the Owner by CAR submittal a minimum of sixty (60) days in advance of the scheduled activity. Reference a blank copy of the form within this section.

2.05 TOBACCO FREE CAMPUS

In order to protect the public health, safety and welfare of citizens and employees, smoking tobacco, or any other substance, is prohibited in County-owned or operated facilities and vehicles. Contractor's personnel will not be permitted to smoke tobacco products on County property, including County parking lots, break areas, and worksites. Smoking means the lighting of any cigarettes, cigar or pipe, or the possession of any lighted cigarette, cigar or pipe, regardless of its composition. This requirement shall be enforced from the beginning of construction and violators will be removed from the property.

2.06 OPERATOR TRAINING

A minimum of 2 days of training shall be provided for each piece of equipment supplied, including all electrical installation, instruments and testing equipment. The CONTRACTOR shall video and audio record each training session. The CONTRACTOR shall provide the County with a DVD compiling of all of the training sessions on the project. The DVD shall be able to be indexed per respective piece of equipment. The DVD shall be accompanied by an electronic compilation (.PDF format) of all the handout materials provided to Operators during those training sessions. At a minimum of 7 days in anticipation of scheduling a training session, the CONTRACTOR is responsible to submit a

CAR Form to the County RPR. The purpose of the submittal of the CAR Form is to request if the Contractor may conduct a training session with the Operations Staff on an anticipated date. The CAR is to be accompanied by the training agenda and all handouts to be provided. The County reserves the right to reject the date submitted in instances where Operations staff is unable to accommodate that date because of a scheduling conflict. From the training materials submitted, the County reserves the right to request additional materials to enhance the training. At a minimum, the training and those materials provided shall be based upon the Manufacturer's recommendations and the Manufacturer's Operations and Maintenance manuals.

CONTRACTOR'S ASSISTANCE REQUEST
FOR ACCESS TO COUNTY FACILITIES

PROJECT: _____

DATE: _____ **NUMBER:** _____

LOCATION/STRUCTURE: _____

_____

PURPOSE: _____

_____

_____

ADDITIONAL ASSISTANCE REQUESTED: _____

_____

_____

_____

DATE ACCESS NEEDED: _____

DURATION OF WORK: _____

_____ _____

Contractor **O.C.U. Construction**

COMMENTS/RESTRICTIONS: _____

_____

_____

_____

_____

_____

_____

Plant Supervisor

END OF SECTION

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SECTION 01270

MEASUREMENT AND PAYMENT - LUMP SUM CONTRACTS

PART 1 GENERAL

1.01 Section Includes

Measurement and payment provisions, schedule of values.

1.02 General Measurement and Payment Provisions

A. Payment for all work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made as a lump sum which will be complete payment for all work called for or reasonably inferable from the Contract Documents and other work will be considered incidental to the Contract and no additional compensation will be allowed.

B. The Owner reserves the right to alter the Drawings, modify incidental work as may be necessary, and increase or decrease the work to be performed to accord with such changes, including deductions or additions to the scope of work outlined in the Contract Documents. Changes in the work shall not be considered as a waiver of any conditions of the Contract nor invalidate any provisions thereof. Changes resulting in changes in the scope or quantities of Work or time or other conditions of work will be basis for consideration of a Change Order which is to be negotiated and executed before proceeding with the work. A supplemental agreement between the Contractor and the Owner will be required when such changes meet the conditions described in the Supplementary Conditions. Work which has not been authorized by a written Change Order will not be subsequently considered for additional payment.

C. The Contractor shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the Engineer shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.

D. If the Contractor makes a claim for an extra or additional cost and requests a Change Order be issued prior to performing the work and the Engineer and/or Owner renders a decision denying such request, the Contractor must notify the Engineer in writing within three (3) days of the time that the Contractor is informed of the Engineer's decision. Otherwise the Owner will not consider any such difference as a claim for a Change Order or additional payment or time. Any such written notice received by the Engineer from the Contractor within the 3-day period shall be just reason for the Engineer to re-evaluate his previous decision.

E. Failure on the part of the Contractor to construct any item to plan or authorized dimensions within the specification tolerances shall result in: reconstruction to acceptable tolerances at no additional cost to the Owner; acceptance at no pay; or, acceptance at reduced price, all at the discretion of the Engineer.

F. Work shall not be considered complete until all testing has been satisfactorily completed and the item of work has demonstrated compliance with plans and specifications.

G. A preliminary monthly application for payment shall be submitted to the Owner/Engineer for review five (5) days prior to the submittal for approval of the Contractor's monthly payment request.

1.03 Schedule of Values

A. CONTRACTOR shall submit Schedule of Values on forms provided by the County or, if none provided, on 8-1/2 inch by 14 inch white paper. Identify the schedule with:

1. Contract Title and Project Name, if applicable.

2. Name and Address of CONTRACTOR.

3. Date of submission.

B. The Schedule of Values shall list items of work and incorporated in the Contract, with additional spaces for entry of actual quantity completed and price of Work completed.

C. The Schedule of Values shall list the installed value of the component parts of Lump Sum Work in sufficient detail to serve as a basis for computing values for Progress Payments during construction:

1. The division of lump sum items into component parts shall be chosen to accommodate measuring actual progress in the field, such that progress measurement can be objective and verifiable. Appropriate units shall be used for each line item. For example, use units such as: backfill - per cubic yard; sidewalk installed - per square foot; cable pulled - per linear foot; foundation pilings - each; etc.

2. Identify each component part with the number and title of the respective major section of the Specifications. For each major component part list sub-component values of major products, operations or work areas under the item.

3. For each of the various component parts of the Work, include a directly proportional amount of CONTRACTOR's overhead and profit. No separate line items shall be allowed for CONTRACTOR's field or home office overhead or profit.

D. ENGINEER will review for approval and return Schedule of Values submittals in accordance with the General Conditions. If requested by ENGINEER, CONTRACTOR shall support amounts indicated on the Schedule of Values with data such as executed Sub-agreements, which will substantiate the correctness of the values, or revise values ENGINEER deems inappropriate.

E. CONTRACTOR shall revise and resubmit, and ENGINEER shall review for approval, the Schedule of Values to incorporate Change Orders executed by the County.

PART 2 – PRODUCTS – Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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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 01312

PROJECT MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

Work Specified Herein and Elsewhere

A. Work under this Section includes:

1. Preconstruction meeting.
2. Coordination meetings.

B. Related work specified elsewhere:

Submittals - Section 01340.

1.02 REQUIREMENTS INCLUDED

A. The ENGINEER shall schedule and administer a preconstruction meeting, the ENGINEER shall schedule all other meetings such as periodic progress meetings, and specially called meetings throughout the progress of the work.

1. Prepare agenda for meetings.
2. Preside at meetings.
3. Prepare Meeting Minutes.

B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The CONTRACTOR shall attend meeting to ascertain that work is expedited consistent with Contract Documents and construction schedules. CONTRACTOR shall provide updated construction schedule and two-week work look-ahead schedules at work progress meetings.

1.03 PRECONSTRUCTION MEETING

A. The ENGINEER will schedule a preconstruction meeting prior to beginning the work. This meeting shall be attended by the ENGINEER, the CONTRACTOR, and the OWNER and other affected entities. The purpose of the meeting shall be to review shop drawing procedures, construction methods, and to establish a construction schedule.

B. Location: Meetings shall be at NWRF Operations Building.

C. Attendance:

1. OWNER'S Representative
2. ENGINEER and his professional consultants

3. Resident Project Representative
4. CONTRACTOR'S Superintendent
5. Major Subcontractors
6. Major Suppliers
7. Utilities
8. Others as appropriate

D. Suggested Agenda:

1. Introduction of Attendees

2. Explanation of Project and Parts to be played by Various Parties

3. Contract Data

   a) Date of Notice to Proceed _____

   b) Date of Substantial Completion _____

   c) Date of Final Inspection _____

   d) Construction Schedule

   e) Progress Meetings

   f) Emergency Contact List

4. Affected Utilities

5. MBE/WBE Requirements

6. DEP Requirements

7. FDOT Requirements

8. Discussion of Construction Site

   a) Mobilization

   b) Site access-storage and lay-down areas

   c) Clean up

9. Permits

10. Hours of Work: Generally 7:00 A.M. to 4:00 P.M. Monday thru Friday, except Saturday, Sunday and County holidays.

11. Correspondence

    All correspondence through Orange County Utilities addressed to:

    Orange County Utilities Engineering
    9150 Curry Ford Road
    Orlando FL 32825
    Phone # 407-254-9900

12. Contractor Submissions

    (a) Shop Drawings

    (b) No work to be started until Contractor has an approved shop drawings in hand

    (c) Emergency Contact List

    (d) Maintenance of Traffic Plan

13. Progress Payments

14. R.F.I. Procedures

15. Change Order Procedures

16. Substantial Completion and Final Inspection

17. Record Documents

18. Safety

19. Copies of Drawings and Specifications

1.04 PROGRESS MEETINGS

A. Schedule regular periodic meetings. The progress meetings will be held every 30 days or less with the first meeting 30 days after the preconstruction meeting or 30 days or less after the date of Notice to Proceed.

B. Hold called meetings as required by progress of the work.

C. Location of the meetings: NWRF Operations Building

D. Attendance:

1. ENGINEER, and his professional consultants as needed
2. Subcontractors as appropriate to agenda
3. Suppliers as appropriate to the agenda
4. Others as appropriate

E. Suggested Agenda:

1. Review, approval of minutes of previous meeting
2. Review of work progress since previous meeting
3. Field observations, problems, conflicts
4. Problems which impede construction schedule
5. Review of off-site fabrication, delivery schedules
6. Corrective measures and procedures to regain projected schedule
7. Revisions to construction schedule
8. Progress, schedule during succeeding work period
9. Coordination of schedules
10. Review submittal schedules; expedite as required
11. Maintenance of quality standards
12. Pending changes and substitutions
13. Review proposed changes for:
    a. Effect on construction schedule and on completion date
    b. Effect on other contracts of the Project
14. Other business
15. Construction schedule with updates
16. Critical/long lead times

F. The CONTRACTOR is to attend progress meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the work, etc.

G. The CONTRACTOR is to provide a current submittal log and updated work schedule at each progress meeting in accordance with Section 01340.

END OF SECTION

SECTION 01315

PRECONSTRUCTION VIDEO

PART 1 GENERAL

1.01 DESCRIPTION

Provide continuous color digital audio-video recording along the entire length of all proposed, including inside and outside of the existing pump station and control room, work prior to construction to serve as a record of pre-construction conditions. For those properties for which service will be relocated from rear to front, provide full recording of each property. Provide two copies of the audio-video recordings on DVD. Supplement video recording with digital color photographs for areas that require details not ascertainable on the video recordings.

1.02 RELATED REQUIREMENTS

Section 01340 – Submittals

Submit one copy each to Engineer and Owner for review. If accepted submit two additional copies. If rejected resubmit the same as the initial review.

1.03 QUALIFICATIONS

The preconstruction audio-video recording shall be of professional quality that will clearly log an accurate visual description of existing conditions. Any portion of the recording not acceptable for the determination of the existing conditions shall be re-recorded at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of picture imperfection. The audio portion of the recording shall produce the commentary of the camera operator with proper volume, clarity, and be free from distortion. The recording system shall utilize EIA standard video and NTSC compatible color.

2.02 CAMCORDER

The recording shall be made with a high definition video camcorder. The camcorder shall record the color signal with a minimum resolution of 2100 pixels.

2.03 DVD

The DVD furnished to the County shall be high definition DVD discs. The DVDs shall be new and thus shall not have been used for any previous recording.

PART 3 EXECUTION

3.01 GENERAL

A. Provide owner a minimum of 48 hours notice in advance of recording such that Owners representative can be present during recording. The recordings shall contain coverage of all surface features located within the construction's zone of influence. The construction's zone of influence shall be defined (1) as the area within the permanent and temporary easements or right-of-way, and areas adjacent to these areas which may be affected by routine construction operations, and (2) by the direction of the Owner. The surface features within the construction's zone of influence shall include, but not be limited to, all roadways, pavements, curbs, driveways, ponds, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, and fences. Of particular concern shall be the existence or non-existence of any faults, fractures, or defects. Taped coverage shall be limited to one side of the street at any one time and shall include all surface conditions located within the zone of influence of construction supported by appropriate audio description.

B. The video recording shall be a simultaneous recorded audio recording. This audio recording, exclusively containing the commentary of the camcorder operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the feature being shown in the video portion of the recording. The audio recording also shall be free from any conversations between the camcorder operator and any other production technicians.

C. Each DVD shall be labeled and complete with a log of that videotape's contents. The log shall describe the various segments of coverage contained on that DVD in terms of the names of streets or easements, coverage beginning and end, directions of coverage, and video unit counter numbers.

3.02 RECORDING SCHEDULE

A. The recording shall be performed, submitted and accepted by ENGINEER prior to the placement of any construction materials or equipment on the proposed construction site.

B. The CONTRACTOR shall coordinate the video recording with the construction schedule so that those portions of the construction that will be completed first will be recorded first. The recording company shall deliver the DVD recordings to the Owner upon their completion. Upon delivery of the DVDs, transfer of ownership of those DVDs shall be made to the Owner.

3.03 VISIBILITY

All recordings shall be performed during times of good visibility. No recording shall be done during periods of significant precipitation, mist, or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subject, and to produce bright, sharp video recordings of those subjects. No taping shall be performed when more than 10% of the area to be taped contains debris or obstructions unless otherwise authorized by the Engineer.

3.04 CONTINUITY OF COVERAGE

A. In order to increase the continuity of the coverage, the coverage shall consist of a single, continuous, unedited recording, which begins at one end of a particular construction area. However, where coverage is required in areas not accessible by conventional wheeled vehicles and smooth transport of the recording system is not possible, such coverage shall consist of an organized, interrelated sequence of recordings at various positions along that proposed construction area (e.g., wooded easement area).

B. The average rate of travel during a particular segment of coverage (e.g., coverage of one side of the street) shall be directly proportional to the number, size, and value of the surface features within that construction area's zone of influence.

3.05 CAMERA HEIGHT AND STABILITY

When conventional wheeled vehicles are used as conveyances for the recording system, the distance between the camera lens and the ground shall not be more than 10 feet. The camera shall be firmly mounted, such that transport of the camera during the recording process will not cause any unsteady picture.

3.06 CAMERA CONTROL

Camera pan, tilt, zoom-in, and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during videotape playback. In addition, all other camera and recording system controls, such as lens, focus, and aperture, video level, pedestal, chroma, white balance, and electrical focus, shall be properly controlled or adjusted to maximize recorded picture quality.

3.07 VIEWER ORIENTATION TECHNIQUES

The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views and visual displays of all visible house and building addresses shall be utilized. In easements where the proposed construction location will not be readily apparent in the videotape viewer, highly visible yellow flags shall be placed in such a fashion as to clearly indicate the proposed centerline of construction.

3.08 AREAS TO BE VIDEOTAPED

A. The CONTRACTOR shall be able to televise and tape areas with paved roads, along easements, through parks, lawns, and open fields and inside buildings. When video taping on private property, the CONTRACTOR shall give the Owner sufficient prior notice of such entry so that property owners may be advised of, and their permission obtained for, the work.

B. At no time shall the CONTRACTOR be allowed to use any electrical circuits within private property building structure. All videotaping shall be done during regular business hours, unless otherwise specified by the private property owner or the Engineer. The CONTRACTOR shall enter and leave private property in a professional and orderly, workmanlike manner.

END OF SECTION

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SECTION 01320

PROJECT COMPLETION SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

Project completion scheduling

1.02 SUBMITTALS

A. Within 14 days after the Effective Date of the Contract, Contractor shall submit for review a preliminary Progress Schedule including a schedule of submittals. The preliminary Progress Schedule shall include all major activities needed to complete project. Include major material and equipment order and delivery times.

B. The preliminary Progress Schedule may be a Bar-Chart Schedule or a Critical Path Method (CPM) Schedule and shall indicate the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents, and indicate in detail the planned activities for the first 60 days of the Contract Time.

C. Prior to submission of first Application for Payment, the complete Progress Schedule shall be submitted and approved by Owner. The complete Progress Schedule shall utilize CPM formatted by establishing a precedence diagram which is time scaled. Include on schedule activity start dates, stop dates, and duration; critical path; float; delivery schedules; and a 30-day look ahead for Work to be completed. Include submittal dates and durations for components with extended lead times in schedule.

D. Each schedule submittal shall bear a Contractor approval stamp. The approval stamp will constitute certification to the County that the Contractor has independently verified all data on that schedule. Also, it will constitute certification that the Contractor and Subcontractors and Suppliers have reviewed and coordinated the Activities and logic of the Progress Schedule with the requirements of the Work.

E. Project substantial and final completion dates shown on schedule shall be the same as or earlier than the contractual dates.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PROGRESS SCHEDULE

A. At least 14 days before submission of the first Application for Payment, a conference attended by Contractor, Orange County Utilities (OCU) Project Representative, Engineer and others as appropriate will be held to review the preliminary schedule for acceptability to OCU Project Representative. Contractor shall have an additional 14 days to make corrections and adjustments and to complete and resubmit the complete

initial (Revision 0) Progress Schedule. No progress payment shall be made to Contractor until acceptable schedules are submitted to OCU Project Representative.

B. The Progress Schedule shall be a CPM Schedule and will detail how the Contractor's priorities and sequencing for the Work conform to the Contract Times and the sequences of Work indicated in or required by the Contract Documents. It also will 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. The Progress Schedule will detail how the Contractor's Means and Methods translate into Activities and logic. 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. To the extent that sequences of Work are indicated in or required by the Contract Documents, the Progress Schedule will have Activities and logic portraying the Contractor's approach to meeting the sequences. Updated or progressed Progress Schedules shall indicate the actual timing and sequencing of completed Work.

C. The schedule of submittals is a part of the Progress Schedule that may be prepared as a separate tabular listing. It shall provide a workable arrangement for reviewing and processing the required submittals. Contractor shall coordinate the schedule of submittals with the other parts of the Progress Schedule, allowing for submittal review times specified in the Contract Documents and for re-submittals and re-reviews of complex items. Long lead delivery lead times shall be shown on the schedule of submittals or elsewhere in the Progress Schedule and be based on the scheduled date for acceptance of the submittals for those items.

D. The OCU Project Representative will review Progress Schedules for conformance with the Contract Times and any sequences of Work indicated in or required by the Contract Documents. Any review may comment on any requirement that may have a significant bearing on the use of the Progress Schedule to resolve issues affecting Contract Amount or Contract Time. Review comments may also result in the selection of Milestones and recording of Milestone Times. Reviews will not impose on the OCU Project Representative any responsibility for verifying whether Work is omitted, Activity durations are reasonable or Work sequences or Activity timing are practicable. Reviews will not impose on the OCU Project Representative any responsibility for confirming the adequacy of the level of labor and construction equipment or the reasonableness of Means and Methods. The correctness of the planning and scheduling of the Work will remain the responsibility of the Contractor.

3.02 PROGRESS SCHEDULE UPDATES

A. Contractor shall submit a progressed version of the Progress Schedule with each Application for Payment, showing actual progress up to the date of the application. A 30-day look ahead for Work to be completed shall be submitted with each Application for Payment.

B. Progress data shall include:

1. Activities started

2. Activities completed

3. Predicted activity starts

4. Predicted activity completions

5. Changes in original duration for specific activities

6. Changes in activity sequences

7. Percent complete on activities

C. If the update calculations results in early dates for completion of the Work, or a part thereof, beyond the Contract Time or Milestone, Contractor shall revise the schedule to show how the Work can be completed within the remaining time, or requests an extension of Contract Time if Contractor believes he is entitled to additional time under the Specifications. A narrative report shall be submitted with any revised or extended Progress Schedule explaining revisions made and actions taken or planned to recover the schedule or obtain a Change Order for an extension of Contract Time.

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SECTION 01340

SUBMITTALS

PART 1 GENERAL REQUIREMENTS

1.01 DESCRIPTION

Work Specified Herein and Elsewhere

This Section includes but is not limited to requirements for the following:

A. Construction Schedules

B. Shop Drawings, Product Data, and Samples

C. Test Results

D. Operation and Maintenance Manuals

E. Record Documents

PART 2 SCHEDULES AND REPORTS

2.01 SCHEDULE OF OPERATIONS

Submit a schedule of operations to the ENGINEER and OWNER for approval prior to any construction operations. The construction operations shall be sequenced to provide a minimum of interruption to operation of the existing facilities. Inform the OWNER and ENGINEER of any changes in the schedule and allow ample time for the OWNER to alter operations as required by the construction of the various components of the work. Approval of traffic control and schedules shall be obtained from the governmental entity having jurisdiction over the area of work.

PART 3 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.01 SHOP DRAWINGS

A. Shop Drawings are original drawings, prepared by the CONTRACTOR, a subcontractor, or distributor, which illustrate some portion of the work; showing fabrication, layout setting, or erection details.

B. Shop drawings shall be prepared by a qualified detailer and shall be identified by reference to sheet and detail numbers on the Contract Documents. Reproductions for submittal shall be full size opaque diazo prints or other print acceptable to the ENGINEER. Reduced size prints will not be reviewed or approved.

3.02 PRODUCT DATA

A. Product data are manufacturer's standard schematic drawings and manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data.

B. Standard drawings shall be modified to delete information which is not applicable to the project and supplemented to provide additional information applicable to the project.

C. Catalog sheets, brochures, etc., shall be clearly marked to identify pertinent materials, products, or models.

3.03 SAMPLES

Samples are physical examples to illustrate materials, equipment, or workmanship and to establish standards by which work is to be evaluated.

3.04 CONTRACTOR’S RESPONSIBILITIES

A. Prior to submission, the CONTRACTOR shall thoroughly check shop drawings, product data, and samples for completeness and for compliance with the Contract Documents and shall verify all dimensions and field conditions and shall coordinate the shop drawings with the requirements for other related work.

B. The CONTRACTOR'S responsibility for errors and omissions in submittals is not relieved by the ENGINEER'S review of submittals.

C. The CONTRACTOR shall notify the ENGINEER, in writing, at the time of submission, of deviations in submittals from the requirements of the Contract Documents and is not relieved by the ENGINEER'S review of submittals, unless the ENGINEER gives written acceptance of specific deviations.

D. Begin no work which requires submittals until return of submittals with ENGINEER stamp and initials or signature indicating the submittal has been reviewed.

3.05 SUBMISSION REQUIREMENTS AND ENGINEER REVIEW

A. Submit six (6) prints of each shop drawing. Submit at least six (6) copies of product data. Submit the number of samples indicated in the individual Specifications Section.

B. Shop drawings, product data, samples and certifications shall be submitted by the CONTRACTOR to the ENGINEER. Submittals should be properly identified with the name of the project, dated, and each lot submitted shall be accompanied by a letter of transmittal referring to the name of the project and to the specification page number and/or Drawing number for identification of each item. Submittals for each type of work shall be numbered consecutively, and the numbering system shall be retained throughout all revisions.

C. Submittals shall bear the CONTRACTOR'S stamp of approval certifying that they have been checked. Submittals without the CONTRACTOR'S initialed or signed certification stamp and submittals which, in the ENGINEER'S opinion, are incomplete, contain numerous errors or have not been properly checked, will be returned unchecked by the ENGINEER for resubmission. The CONTRACTOR shall mark his corrections in Green ink and the ENGINEER'S comments shall be noted in Red.

D. The ENGINEER will review submittals with reasonable promptness. The ENGINEER'S review of submittals shall not be construed as a complete check and shall not relieve the CONTRACTOR from responsibility for complete compliance with the Contract requirements. No corrections, changes or deviations indicated on submittals reviewed by the ENGINEER shall be considered as a change order.

E. If submittal is acceptable, the ENGINEER will retain three (3) sets of prints and return the remaining prints to the CONTRACTOR. If the submittal is not satisfactory, one set of prints will be retained by the ENGINEER and the remaining prints returned to the CONTRACTOR for appropriate action.

F. In the event a third submittal of shop drawings is required, due to previous submittals of incomplete or incorrect shop drawings not in accordance with the Drawings and Specifications, the CONTRACTOR will be charged one-half the cost incurred by the ENGINEER for the review of the third submittal. The CONTRACTOR shall bear the total cost incurred by the ENGINEER for all subsequent reviews. The ENGINEER costs charged to the CONTRACTOR will be at the cost plus rate generally charged by the ENGINEER and will be deducted by the OWNER from payments due the CONTRACTOR.

G. Distribution of copies of acceptable submittals will be as mutually determined by the CONTRACTOR, OWNER and ENGINEER on an individual item basis during or following the preconstruction conference.

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SECTION 01410

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

Regulatory requirements, project permits

1.02 RELATED SECTIONS

General Conditions
Supplementary Conditions

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. All piping installed within the right-of-way of any city, county, state, or federal highway or railroad shall be in accordance with a permit to construct issued by the controlling agency and obtained by the OWNER. In no case shall an open trench be constructed within a railroad right-of-way unless otherwise indicated.

B. Whenever the Drawings and Specifications conflict with the requirements of the permit, then the requirements of the permit shall govern and the cost of abiding by the provisions of the permit shall be considered incidental to the Contract.

C. All electrical apparatus and wiring pertaining to a piece of equipment or an appliance furnished and installed under this Contract shall comply with the National Electrical Code and shall be listed by Underwriters Laboratories or bear the approval of a recognized Testing Laboratory approved by the ENGINEER.

1.04 PROJECT PERMITS

A. The following permits are being obtained from the permitting agencies for the construction of the project, and will be provided to the selected CONTRACTOR prior to award of the contract:

1. Orange County Building Permit
2. FWC Gopher Tortoise Permit

B. The CONTRACTOR shall review and become familiar with all permits for the Project, complete with all conditions, attachments, exhibits and permit modifications. A copy of all permits for the Project shall be maintained by the CONTRACTOR at the project site, and shall be available for review upon request.

C. Any permits not referenced here but that are required for the project will be obtained by the Contractor. The CONTRACTOR shall be fully responsible to abide by all provisions of the permits. The CONTRACTOR is responsible for the selection, implementation and operation of all measures required by the permits, including the maintenance of said measures as necessary during construction. No additional

compensation will be allowed for any work associated with permit requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01415

STORMWATER POLLUTION PREVENTION / NPDES REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

Stormwater Pollution Prevention Plan requirements and recommendations under the NPDES program for construction projects located in Florida shall be submitted by the contractor.

1.02 PURPOSE

The purpose of this section is to outline minimum requirements for stormwater pollution prevention as required under the NPDES program.

1.03 RELATED SECTIONS

A. Section 01410 – Regulatory Requirements

B. Section 02370 – Erosion and Sediment Control

1.04 ABBREVIATIONS

A. NPDES - National Pollution Discharge Elimination System

B. SWPPP - Stormwater Pollution Prevention Plan

C. NOI - Notice of Intent

D. NOT - Notice of Termination

1.05 DEFINITIONS

The term "NPDES Generic Permit" means the State of Florida Department of Environmental Protection (FDEP) Generic Permit For Stormwater Discharge from Large and Small Construction Activities.

1.06 CONSTRUCTION PROJECTS REQUIRING COMPLIANCE WITH NPDES GENERIC PERMIT

A. All projects 1 or more acres in size that discharge to offsite areas.

B. Smaller projects that are in the same construction corridor as larger construction projects where the larger project is 1 or more acre in size and is required to comply with the NPDES Generic Permit. In this case, even if the smaller project is less than 1 acre in size, the smaller project must comply with the NPDES Generic Permit.

1.07 GENERAL REQUIREMENTS

A. Construction of this project is required to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Generic Permit for Stormwater Discharge from Small and Large Construction Activities and provide all silt fencing, inlet protections, turbidity barriers, etc. as needed for compliance with the approved NPDES. No separate payment for the permit, preparation of the permit, permit fees, materials, installations, maintenance, and removals.

B. In order to meet NPDES requirements, the Contractor is responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP), implementing, inspecting, maintaining, and reporting on all elements of the SWPPP, completing and submitting the required Notice of Intent (NOI) and Notice of Termination (NOT) forms as the Operator, and paying all associated fees. Copies of the NPDES Generic Permit, NOI, and NOT forms, and permit application fee information are available for download at dep.state.fl.us/water/stormwater/npdes/

C. The Contractor must include in the SWPPP the names and addresses of all subcontractors working on this project who will be involved with the major construction activities that disturb site soil or who implement a pollutant control measure. These subcontractors, in addition to the Contractor, shall comply with the requirements of the NPDES Generic Permit and any local governing agency having jurisdiction concerning erosion and sedimentation control, and shall sign a copy of the certification statement in the SWPPP.

D. The SWPPP shall describe and ensure the implementation of best management practices which will be used to reduce the pollutants in stormwater discharge associated with construction activity and to assure compliance with the terms and conditions of the NPDES Generic Permit. The erosion and sediment control measures shown on these Drawings are the minimum required and are to be installed prior to construction. The Contractor is responsible for complying with all applicable rules, regulations and water quality standards and may need to install additional controls to meet these requirements.

1.08 SWPPP IMPLEMENTATION AND SUBMITTAL REQUIREMENTS

A. The SWPPP shall be completed prior to submittal of the NOI and shall include the elements necessary to comply with the NPDES Generic Permit for construction activities administered by the FDEP and shall also include all local governing agency and Owner requirements. There may be more stringent local government or Owner requirements for Erosion and Sediment Control, which would be located in the Specifications or on the Drawings. The more stringent requirement governs.

B. The Contractor must file the NOI with FDEP and the Owner at least two (2) business days prior to the start of construction. The Contractor shall also submit a copy of the NOI to the MS4 operator for all projects that discharge stormwater associated with construction activity to a municipal separate stormwater system (MS4). A copy of the NOI and a description of the project must be posted in a prominent place for public viewing at the construction site.

C. The SWPPP must be implemented at the start of construction. A complete copy of the SWPPP, including copies of all inspection reports, plan revisions, etc., must be retained at the project site at all times during working hours and kept in the permanent project records for at least three years following submission of the NOT.

D. Final Stabilization means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover (evenly distributed, without large bare areas) with a density of at least 70% for all unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as geotextiles) have been employed. Once construction is completed and final stabilization has been achieved, the Contractor must file the NOT to FDEP, the Owner, and the MS4 operator within 14 days.

1.09 INSPECTIONS

A. It is the responsibility of the Contractor to assure the adequacy of site pollutant discharge controls. Between the time the SWPPP is implemented and final site stabilization is achieved, all disturbed areas and pollutant controls must be inspected at least once every seven calendar days and within 24 hours following a rainfall of 0.5 inches or greater. The inspections are to be conducted by the Contractor's qualified designated representative.

B. All inspections shall be documented in an inspection report that summarizes the scope of the inspection, the names and qualifications of personnel making the inspection; the date of the inspection; rainfall data; major observations relating to the implementation of the SWPPP, and actions taken in order to ensure compliance with NPDES requirements and the SWPPP. Such reports shall identify any incidents of non-compliance and actions taken to bring the project into compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the NPDES requirements and the SWPPP. Each inspection report shall be signed and certified by each inspector.

1.10 UPDATING AND MODIFYING THE SWPPP

A. Based on inspection results, any modifications necessary to increase effectiveness of the SWPPP to an acceptable level must be made within seven calendar days of the inspection.

B. The SWPPP must be updated each time there are significant modifications to the pollutant prevention system or a change of contractors working on the project that disturbs site soil. For construction activities where the operator changes, the new operator shall file an NOI for coverage under this permit at least two (2) days before assuming control of the project and the previous operator shall file an NOT to terminate permit coverage in accordance with the NPDES Generic Permit. Amendments to the plan shall be prepared, signed, dated, and kept as attachments to the original SWPPP.

1.11 MINIMUM SWPPP PROVISIONS

A. Each SWPPP shall provide a description of pollutant sources and other information including a description of the nature of the construction activity; the intended

sequence of major activities which disturb soils for major portions of the site; estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other construction activities; existing data describing the soil or the quality of any discharge from the site and an estimate of the size of the drainage area for each discharge point; a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, an outline of areas which may not be disturbed, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters, wetlands, and locations where stormwater is discharged to a surface water or MS4; and the latitude and longitude of each discharge point and the name of the receiving water(s) for each discharge point.

1.12 MINIMUM EROSION AND SEDIMENT CONTROL CONSTRUCTION REQUIREMENTS

A. Stabilize all construction site exits with coarse aggregate or other approved materials, in accordance with details on the Drawings. Other minimum construction requirements that need to be implemented in order to comply with the NPDES Generic permit include installation of sediment barriers down slope from construction activities that disturb site soil; constructing rock surface temporary parking areas; installation of sediment barriers down slope prior to clearing and grubbing; installation of sediment barriers on the down slope side of utility construction and soil stockpiles; and the installation of sediment barriers on the down slope side of grading activities.

B. Stabilization measures shall be initiated as soon as practicable, but in no case more than 7 days, in portions of the site where construction activities have temporarily or permanently ceased.

C. The Owner has the authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, trenching, borrow and embankment operations. The Owner also has authority to direct Contractor to provide immediate permanent or temporary erosion and sediment control measures.

D. The Contractor shall respond to erosion and sediment control maintenance requirements or implement additional measures to control erosion ordered by Owner or governing authorities within 48 hours or sooner if required at no additional cost to the Owner.

E. The Contractor shall incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls.

F. For drainage basins with 10 or more disturbed acres at one time, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. The 3,600 cubic feet of storage area per acre drained does not apply to flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. For drainage basins with 10 or more disturbed acres at one time and where a temporary sediment basin providing

3,600 cubic feet of storage per acre drained, or equivalent controls is not attainable, a combination of smaller sediment basins and/or sediment traps and other BMPs should be used. At a minimum, silt fences, or equivalent sediment controls are required for all sideslope and downslope boundaries of the construction area.

G. Water trucks shall be used as needed during construction to reduce dust generated on the site. Dust control must be provided by the Contractor and shall be in compliance with applicable local and state dust control regulations.

1.13 MAINTENANCE REQUIREMENTS

A. Maintain all erosion and sediment control measures throughout construction. Repair or replace all damaged sediment barriers. Remove accumulated sediment along all silt fences where the height of the sediment exceeds one-third of the height of the silt fence. Inspect all temporary and permanent grassing areas and re-grass where there are bare spots, washouts, or unhealthy growth.

B. At the completion of construction, once final stabilization has been achieved, clean all accumulated sediment from all storm structures, pipelines, and stormwater ponds. Remove all temporary sediment controls upon receipt of authorization to remove has been received from the Owner or Engineer. Note that this may not occur for some time after construction activities have been completed, in order to ensure their removal has not occurred until final stabilization has been achieved to the satisfaction of the Owner and Engineer.

1.14 STORMWATER DISCHARGE PROVISIONS

A. Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the governing local agency. Water used for construction that does not originate from an approved public supply must not discharge from the site. Allowable non-stormwater discharges include discharges from fire fighting activities; Fire hydrant flushing; Water used to wash vehicles or control dust; Water flowing from potable sources and water line flushing; Irrigation drainage; and runoff from pavement wash down where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents have not been used.

B. Solid materials, including building materials, are not allowed to be discharged from the site with stormwater. All solid waste, including disposable materials incidental to the major construction activities, must be collected and placed in containers. The containers shall be emptied periodically by a contract trash disposal service and hauled away from the site.

C. Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil in accordance with local and state regulations.

D. All personnel involved with construction activities must comply with state and local sanitary or septic system regulations. Temporary sanitary facilities shall be provided at the site throughout the construction phase. They must be utilized by all construction personnel and shall be serviced by a commercial operator.

E. Discharges resulting from groundwater dewatering activities at construction sites are permitted provided the groundwater is free of sediments, is not contaminated, and dewatering occurs in accordance with state and local governing agency regulations.

F. Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated, and disposed at an approved solid waste or chemical disposal facility.

G. The discharge of hazardous substances or oil in the stormwater discharge(s) from a facility or activity shall be prevented. This does not relieve the operator of the reporting requirements of 40 CFR part 117 and 40 CFR part 302. The operator shall submit within 14 calendar days of knowledge of the release a written description of: the release (including the type and estimate of the amount of material released), the date that such release occurred, the circumstances leading to the release, and remedial steps to be taken. The SWPPP must be modified within 14 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

CONTRACTOR AND SUBCONTRACTOR CERTIFICATION

The Contractor and subcontractor(s) that will implement the pollutant control measures described in the SWPPP must be identified below. Each must sign a statement certifying that they understand the NPDES Generic permit authorizing stormwater discharges during construction. These statements must be maintained in the SWPPP file on site.

Contractor implementing the SWPPP:

_____

Business Name

_____

Business Address

_____

_____

_____

Business Telephone Number

CERTIFICATION: (Note signature requirements in Part VI.G. of the NPDES Generic Permit.)

"I certify under penalty of law that I understand, and shall comply with, the terms and conditions of the Generic Permit for Stormwater Discharge from Large and Small Construction Activities and this Stormwater Pollution Prevention Plan prepared thereunder."

_____

Signature Date

_____

Printed Name

CONTRACTOR
CERTIFICATION

The SWPPP has been prepared by:

Business Name

Business Address

Business Telephone Number

The Contractor who has prepared the SWPPP shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature Date

Printed Name

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01420

REFERENCES

PART 1 GENERAL

1.01 SECTION INCLUDES

Referenced standards and abbreviations

1.02 REFERENCED STANDARDS

A. Any reference to published specifications or standards of any organization or association shall comply with the requirements of the specification or standard which is current on the date of Advertisement for Bids. In case of a conflict between the referenced specifications or standards, the one having the more stringent requirements shall govern.

B. In case of conflict between the referenced specifications or standards and the Contract Documents, the Contract Documents shall govern.

1.03 ABBREVIATIONS

The following are definitions of abbreviations used within the Project Manual:

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FS	Florida Statutes
NEC	National Electrical Code
NECA	National Electrical Contractors' Association
NEMA	National Electrical Manufacturers Association
NSF	National Sanitation Foundation
OOCEA	Orlando-Orange County Expressway Authority
OSHA	Occupational Safety and Health Administration
PS	United States Products Standards
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
FDOT Specification	FDOT Standard Specification for Road and Bridge Construction, latest edition
FDOT Index	FDOT Roadway and Traffic Design Standards, latest edition

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01450

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

Quality control, quality assurance

1.02 QUALITY CONTROL

A. It is the CONTRACTOR'S responsibility to perform all work to a degree and in a manner that satisfies and complies with the Project requirements. In order to fulfill this responsibility, the CONTRACTOR is required to have an approved Quality Control Program, including testing, as part of his Contract work in accordance with the Contract Documents and to submit details of his Program to the ENGINEER for review and approval prior to commencing any construction operations. The submittal shall include detailed information on locations and number of all tests, etc., that will be necessary for the CONTRACTOR to make his own determination that the work is being performed in compliance with the Project requirements.

B. As part of the CONTRACTOR'S Quality Control Program included as part of his work, the CONTRACTOR shall employ and pay for an independent, approved soils testing laboratory to perform testing services outlined in these Contract Documents.

C. The CONTRACTOR'S Quality Control Program shall include, but not be limited to, the following in addition to the type and frequency of tests as required by the technical specifications:

1. Piping and structural excavation, bedding and backfill materials and density quality control testing.

2. Determination of compaction effort needed for compliance with the density requirements.

3. Asphalt paving quality control testing including design mix review, materials, and field strength samples and testing

D. In addition to Quality Control Testing, the CONTRACTOR shall be responsible for required testing or approvals for any work (or any part thereof) if laws or regulations of any public body having jurisdiction specifically require testing, inspections or approval. The CONTRACTOR shall pay all costs in connection therewith and shall furnish the ENGINEER the required certificates of inspection, testing or approval. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER or ENGINEER acceptance of a supplier of materials or equipment proposed to be incorporated into the work.

E. Any design or testing laboratory utilized by the CONTRACTOR shall be an independent laboratory acceptable to the OWNER and the ENGINEER, approved in writing, and complying with the latest edition of the "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of

Independent Laboratories.

F. Testing laboratories, whether provided by the OWNER or the CONTRACTOR, shall promptly notify the ENGINEER and the CONTRACTOR of irregularities or deficiencies of work which are observed during performance of services. Laboratories shall submit two (2) copies of all reports directly to the ENGINEER and two (2) copies to the CONTRACTOR.

1.03 QUALITY ASSURANCE

A. In addition to the services provided by the laboratory paid for by the CONTRACTOR as a part of his work, the OWNER, at his sole discretion, may employ an additional independent soils laboratory as part of OWNER'S Quality Assurance Program to verify that the work meets the requirements of the Contract Documents. The OWNER furnished Quality Assurance testing may include the type and frequency of tests as required by the technical specifications. The OWNER reserves the right to have additional tests made beyond those specified in the Contract Documents. The Contractor shall cooperate with the OWNER and make the work and samples available for OWNER testing at no additional cost in case the OWNER chooses to have additional OWNER furnished testing performed. It is the sole responsibility of the Contractor to see that his work meets all provisions of the Contract Documents.

B. The CONTRACTOR shall cooperate with the soils laboratory personnel and provide access to the work to be tested. The CONTRACTOR shall notify the ENGINEER and OWNER'S testing laboratory sufficiently in advance of operations to allow scheduling of tests. The CONTRACTOR shall furnish casual labor and facilities to obtain and handle samples at the site and to store and cure test samples as required.

1.04 TESTING OF MATERIALS

A. Unless otherwise specified, all materials shall be sampled and tested in accordance with the latest published standard methods of ASTM in effect at the time bids are received. If no ASTM Standards apply, applicable standard methods of the Federal Government or of other recognized agencies shall be used.

B. Test of materials shall be made by a representative of the CONTRACTOR, unless otherwise provided. Testing of equipment shall be the responsibility of the CONTRACTOR or an authorized manufacturer's representative. All test results shall be furnished to the ENGINEER in writing. The CONTRACTOR shall provide facilities required to collect and forward samples. The CONTRACTOR shall furnish the required samples without charge.

C. The CONTRACTOR shall not make use of or incorporate in the work, the materials represented by the sample until tests have been made and the material found to be in accordance with the requirements of the Specifications.

D. Materials to be tested and the applicable test procedure shall be as outlined in the individual sections of these Specifications.

1.05 SOURCE AND QUALITY OF MATERIALS AND EQUIPMENT

A. The source of materials to be used shall be in accordance with the Contract Documents and as approved by the ENGINEER before delivery. The approval of the source of any material shall continue as long as the material conforms to the Specifications.

B. All material not conforming to the requirements of the Specifications shall be considered as defective and shall be removed from the work. If in place, faulty materials shall be removed by the CONTRACTOR at his expense and replaced with acceptable material unless permitted otherwise by the OWNER. No defective materials which have been subsequently corrected shall be reused until approval has been given.

C. Upon failure of the CONTRACTOR to comply immediately with any order of the ENGINEER to remove and replace defective material, the OWNER shall have authority to remove and replace defective materials, and to deduct the cost of removal and replacement from any monies due or to become due to the CONTRACTOR. Failure to reject any defective materials or work at the time of installation shall in no way prevent later rejection when such defects are discovered, nor obligate the OWNER to final acceptance.

1.06 CONSTRUCTION PROGRESS PHOTOGRAPHS

Contractor shall be responsible for taking construction progress photographs throughout the progress of the work. This may include but not be limited to photos for water line crossings of other utilities, valve installations, service connections fittings, etc. Copies of the photos shall be in digital format and be provided to the County RPR on a weekly basis.

1.07 ADDITIONAL TESTING

In addition to soils laboratory and materials testing, the CONTRACTOR shall perform other testing called for in the Contract Documents including but not limited to piping, pressure, leakage, infiltration and exfiltration, as appropriate.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01520

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

Construction facilities, controls, temporary utilities, project identification signs, field office and storage sheds, storage of materials and equipment.

1.02 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Responsibility

No facilities will be provided by the COUNTY. All construction facilities and temporary controls shall be provided by the CONTRACTOR and remain the property of the CONTRACTOR establishing them and shall be maintained in a safe and useful condition until removed from the construction site.

B. Temporary Electric Service (if required)

1. The CONTRACTOR shall furnish and maintain temporary lighting and power required to perform the Work as necessary. Include in the Bid all costs for providing temporary electrical service.

2. Temporary service shall include protective enclosures, branch wiring, outlets, lamps, and grounding as required by NEC and Local Electrical Codes.

C. Temporary Heating (if required)

The CONTRACTOR shall furnish fuel or power and provide and operate all temporary heating units. Heat shall be provided as necessary to perform the Work. Temporary heating units shall be adequately vented and approved devices which will not damage finished areas. The CONTRACTOR shall also furnish all tarpaulins and temporary enclosures necessary to provide this protection.

D. Temporary Ventilation (if required)

The CONTRACTOR shall provide, operate, and furnish power for temporary ventilation required for the proper installation and curing of materials and safety of workmen to prevent hazardous accumulations of dust, fumes, or vapors.

E. Telephone Service

The CONTRACTOR shall provide and maintain telephone service at the job site in the event of an emergency situation. The CONTRACTOR shall pay for all local calls; toll calls shall be paid for by persons making such calls.

F. Temporary Water

1. Provide a temporary water distribution system for all construction purposes. OCUD does not charge for responsible water usage needed for construction.

2. Furnish potable drinking water in suitable dispensers and with cups for use of all employees at the job.

3. Provide all temporary piping, hoses, etc., required to transport water to the point of usage by all trades.

G. Temporary Sanitary Facilities

Provide temporary toilet facilities as required. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Enough chemical toilets shall be provided to conveniently serve the needs of all personnel. Chemical toilets and their maintenance shall meet the requirements of State and local health regulations and ordinances.

H. Temporary Pumping and Site Drainage

The CONTRACTOR shall keep the site free from water at all times to permit continuous access and to prevent damage to the work.

I. Material Hoists and Cranes

1. Provide material hoists required for normal use by all trades and employ skilled hoist operators. Provide all necessary guards, signals, safety devices, etc., required for safe hoist operation. The construction and operation of material hoists shall be in accordance with the applicable ANSI Standards, the "Manual Code of Accident Prevention in Construction" of the Associated General Contractors of America, OSHA, and of other Federal, State, and municipal codes or ordinances. The CONTRACTOR shall prohibit the use of hoists for transporting personnel. Hoists shall be located to avoid risk of damage to completed work.

2. Special rigging and hoisting facilities shall be provided by each trade requiring their use.

J. Temporary Runways, Scaffolding, and Ladders (if required)

1. Provide temporary ladders, ramps, and runways as required for performance and inspection of the work. The above facilities shall be constructed and maintained in accordance with the applicable Federal, State, and Municipal regulations and codes.

2. Furnish, erect, and maintain all scaffolding required for this work. Scaffolding shall be constructed and maintained in accordance with

applicable State and Federal laws and local ordinances. Scaffolding shall be promptly removed after serving its purpose.

3. The structural strength and safety of scaffolding, runways, covers, railings, ladders, stairs, etc., and compliance with law shall be the sole responsibility of the CONTRACTOR.

K. Temporary Chutes (if required)

No materials shall be dropped from structures except through enclosed wooden or metal chutes which shall be provided and maintained as required for the performance of the work by the various trades.

L. Security

Full time watchmen will not be specifically required as a part of the Contract, but the CONTRACTOR shall provide inspection of work area daily and shall take whatever measures are necessary to protect the safety of the public, workmen, and materials, and provide for the security of the site, both day and night.

M. Access Roads and Parking Areas

1. Construct temporary roadways and parking areas within the site as required to provide proper access to the site for delivery of material and equipment of all trades.

2. At completion of the Work or when directed by the ENGINEER, surfacing and sub-base material used for the temporary road and parking areas shall be removed, unless otherwise approved by the ENGINEER.

N. Dust and Mud Control

Take all necessary precautions to control dust and mud associated with the work of this Contract, subject to the approval of the ENGINEER. In dry weather, spray dusty areas daily with water in order to control dust. Take necessary steps to prevent the tracking of mud onto adjacent streets and highways.

O. Traffic Regulation

1. The CONTRACTOR shall be responsible for any necessary protection and maintenance of traffic for the construction by the proper use of barricades, warning lights, flares, and necessary traffic control and safety devices, and shall conform to Federal, State, and Local regulations regarding their use.

2. All forms of traffic control on public roadways required by the construction operations shall be in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways, the Florida Department of Transportation Work Zone requirements and Guidelines, Traffic Control for Highway Construction, and Maintenance Operations.

P. CONTRACTOR'S Field Office and Storage Sheds

The CONTRACTOR shall provide field office and storage sheds as required for the performance of the Work and protection of materials and equipment. Field offices are only required for contracts with Contract Times greater than 6 months.

1. The CONTRACTOR shall provide space in the field office for the for the OWNER'S or ENGINEER'S use during the construction contract. This trailer will serve as a field office and shall contain a separate phone line, fax and copy machine, desk, chair and water for OWNER or ENGINEER to use during construction.

2. The CONTRACTOR shall not only provide and pay for the trailer, but shall also provide and pay for the telephone lines and their monthly bills, lavatory supplies, monthly electric bill, weekly service of the sanitary facilities, water hook up, connection fees, once per week cleaning of the trailers, plus all associated bills and fees for the trailer and its contents. The mobile office trailer and exterior stairs shall meet all Federal, State, and local laws and shall comply with Health Department regulations.

1.03 MATERIALS AND EQUIPMENT

A. Transportation and Handling

1. Manufactured materials and products shall be delivered to the project site as needed for installation, undamaged, in original packages, containers, or bundles, as packaged by the manufacturer with manufacturer's name, brand, seals, and labels intact.

2. Materials other than those designated within the Specifications or approved by the ENGINEER shall not be delivered to the project site.

B. Storage and Protection

The CONTRACTOR shall be responsible for protection and preservation of all materials until final acceptance of the Project. Any damage to work prior to acceptance shall be remedied by the CONTRACTOR at no additional cost to the OWNER.

C. Protection of Completed Work

Provide temporary weather-tight enclosures to protect work from damage by the elements, and protect finished surfaces to prevent any damage resulting from the work of any trade.

1.04 SUBMITTALS

A. Prior to installation of construction facilities and temporary controls, submit the

following items for review and approval:

1. Maintenance of Traffic Plan - show all proposed barricades, signs, markings, and temporary construction, identify sequencing.

2. Project identification sign - provide proposed text, layout, and sizing of all required signs.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

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 reseeding 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 01650

START-UP/CHECK-OUT

PART 1 - SCOPE OF WORK

1.01 GENERAL

A. The work specified in this Section consists of start-up and final check-out of Mechanical, Electrical, Communications, Pneumatic, Hydraulic, Conveyance or Special Construction or any other discipline as called for by the technical specifications of the Contract Documents. These systems (may include heating, ventilating, air conditioning, fire protection systems, HVAC and control systems, communications and alarm systems, lighting, power distribution, controls, and other electrical systems) and other operating equipment as required; will be demonstrated, to Owner, to operate in the manner prescribed by the Contract Documents to ensure a complete operating system, ready for the Owner's use.

B. The intent of the start-up testing is for the Contractor to demonstrate to the Owner and Engineer the Work will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance. The demonstration shall be conducted upon completion of all systems. Acceptability of the system will be based on the equipment performing as specified under actual and simulated operating conditions and with no deficiencies. All material used shall be listed on the "List of Approved Products – Appendix D of the Manual of Standards and Specifications for Wastewater and Water Main Construction", Orange County.

1.02 TESTING

A. The Contractor shall furnish all labor, fuel, energy, lubrication, water, and all other materials, equipment, tools and instruments necessary for system start-up testing. The Contractor shall conduct preliminary testing of equipment prior to start-up testing and make all changes, adjustments and replacements required. Acceptability of the system will be based on the equipment performing as specified, under these actual and simulated operating conditions and with no deficiencies. All material used shall be listed on the latest edition of the List of Materials and Approved Manufacturers - Appendix D of the Manual of Standards and Specifications for Wastewater and Water Main Construction. The testing shall demonstrate that all items of the manual have been met by the equipment as installed and shall include, but not be limited to the following tests:

1. All equipment has been properly installed and meets the design performance requirements. Contractor is to provide manufacturer's Certification on installation and materials prior to startup.

2. All functions of the pumps and electrical equipment shall be tested and inspected for operation and workmanship. There are no mechanical or electrical defects.

3. The pumps demonstrate they meet the design specifications and the pump

controls perform satisfactorily. The pumps shall be tested to verify their performance meets the pump curve specified by the manufacturer.

B. The Contractor shall notify the Owner at least 72 hours prior to performing all testing.

C. A factory representative knowledgeable in the mechanical and electrical equipment furnished shall inspect and supervise a start-up of their respective equipment. A minimum of one (1) working day shall be provided to allow for the proper and successful start-up and testing by each equipment supplier. Additional time may be necessary due to faulty or incomplete work. Upon satisfactory completion of the testing, the factory representatives shall issue the required manufacturer's warranty certificates. The Contractor shall be responsible for the coordination of the equipment representatives to be on site so that time is not overlapping between representatives.

D. The units shall operate without overheating or overloading any parts and without objectionable vibration as determined by the Owner.

1.03 RETESTING

If the start-up testing does not meet the requirements of this Specification, the deficiencies shall be corrected and the testing procedure will begin again.

PART 2 – PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY REQUIREMENTS

A. Start-up Certification

Prior to start-up of a system, successfully complete all the testing required of the individual components of the system.

B. Demonstrate to Owner and Engineer that all of the components of the system are operating under their own controls as designated.

C. Coordinate start-up activities with the County's treatment plant personnel, the Manufacturer's Representative and the Engineer prior to commencing start-up of a system.

3.02 START-UP

A. Confirm that all equipment in a system is properly energized, prior to start-up.

B. Initiate start-up of each system in accordance with the Operation and Maintenance Manual.

C. Observe the system operation and make adjustments as necessary to optimize the

system performance.

D. Coordinate with the Owner and the Engineer for any adjustments desired or operational problems requiring debugging.

E. Make adjustments as necessary.

F. Acceptability of each system's performance will be based on the system performing as specified, under actual operating conditions. The intent of the start-up is to demonstrate to Owner that each system will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance.

G. Demonstrate the essential features of the systems as delineated elsewhere in the Contract Documents. Each system shall be successfully demonstrated only once, after completion of all required testing. The disciplines involved may include, but are not limited to:

1. Mechanical

2. Conveyance

3. Electrical

4. Communication

5. Instrumentation & Controls

6. Pneumatic

7. Hydraulic

8. Specialized Construction.

END OF SECTION

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SECTION 01720

PROJECT RECORD DOCUMENTS AND SURVEY

PART 1- GENERAL

1.01 PURPOSE AND DESCRIPTION OF WORK

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, to enable future location, identification and modification of the Work without lengthy and expensive site measurement, investigation or examination.

B. 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.

C. The location of the constructed improvements as depicted in the contract drawings is required. To verify the As-Built Drawing accuracies and to insure the Work was constructed in conformance with the contract drawings, the following survey documents are required to be certified by the Surveyor.

1. As-Built Asset Attribute Data Table,
2. Pipe Deflection Table, and
3. Boundary Survey and Survey Map Report for any easements that have constructed pipes within and monuments that were replaced.
4. As-built drawings shall be the same as the design plans with plan and profile information provided.

1.02 DEFINITIONS

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

A. **As-Built Drawings:** Drawings prepared by the Contractor's Surveyor shall depict the actual location of installed utilities for the completed WORK in a full size hard copy and an electronic AutoCAD 2015 file (dwg) format.

B. **Record Drawings:** Drawings, prepared and certified by the County's Consultant Engineer, shall be a compiled representation of the constructed project, a listing of the sources and the basis of information used in the preparation of the "record drawings", the constructed project meets the Engineer's design intent and note the material deviations from the design documents, and the accuracy of the location information is based upon the Contractor's surveyor data supplied in the tables (As-Built Asset Attribute Data, Gravity Main, and Pipe Deflection).

C. **Boundary Survey:** Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 61G17-6 'Minimum Technical Standards', FAC.

D. **Surveyor:** Contractor's Surveyor that is licensed by the State of Florida as a professional surveyor and mapper pursuant to Chapter 472, F.S.

E. **Survey Map Report:** As a minimum the Survey Map Report shall identify any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained.

1.03 QUALIFICATIONS OF THE SURVEYOR

A. The Surveyor, who is proposed by the Contractor to provide services for the Project, is subject to the approval of the County. Prior to any services being performed, the Contractor shall submit the name and address of any proposed Surveyor and a 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. These submittals shall be provided to the County prior to Notice to Proceed. It is recommended that the Surveyor attend the Preconstruction meeting. Any Surveyor, who has not previously performed work for the County in the past, shall attend the Preconstruction meeting.

1.04 RELATED REQUIREMENTS

A. All General Conditions, Supplements to the General Conditions, and any Addenda issued by the County are a part of this Section in the same manner as if fully written herein, and shall govern the Work of this Section, except where more stringent articles or requirements are stipulated, then they shall govern this Section.

B. The Contract Documents are complementary and what is required by anyone shall be as binding as if required by all.

C. Other requirements affecting Record Documents may appear in pertinent other sections of these specifications.

D. All as-builts shall be submitted in accordance as specified herein and in accordance with Section Orange County Utilities Standards and Construction Specifications Manual.

1.05 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.

D. Survey documents shall comply with the minimum technical standards of Chapter 61G17-6 of the Florida Administrative Code (FAC) and Table 01720-1 Minimum Survey Accuracies specified in, whichever are more stringent. Asset attribute data shall be signed, sealed and dated by the Surveyor. All coordinates shall be geographically registered in the Florida State Plan Coordinate System using the contract drawings control points for horizontal and vertical controls.

Table 01720-1

Minimum Survey Accuracies

Asset/Location	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: horizontal center and vertical top, unless otherwise specified
Bench Marks	N/A	0.01	Point
Baseline Control Locational Accuracy	.01	N.A	Point
Tract and Easements Corners	*	N/A	Survey Monuments
Mains at 100’ max. intervals; includes electrical conduits	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeve, Tapping Saddle, and end of the pipe if Plugged or Capped.	0.1	0.1	Fitting
Restrained Pipe	0.1	N/A	Restrained Joint Limits
Connections	0.1	0.1	Pipe
Bore and Jack Casing	0.1	0.1	Top pf Casing at the Casing Limits
Directional Drill	0.1	0.1	10ft intervals during the directional drill operation
Hydrants	0.1	N/A	Operating Nut
Valves	0.1	0.1	Operating Nut and Valve Body
Air Release Valves, Blow-off, and Backflow Valves	0.1	N/A	Valve Enclosure
Master Meters, Deduct Meters, and Wastewater Meters	0.1	N/A	Register
Meter Box	0.1	N/A	Top of Meter Box
Clean-out	0.1	N/A	Top of Clean-out
Manhole Rim; includes electrical	0.1	0.1	Manhole
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station	0. 1	0.01	Wet Well and Pipe Inverts
Demolished Pipe	.1	.1	Limits of Abandoned or removed pipe
Existing Utilities water, wastewater, reclaimed water, and appurtenant structures. **	.1	.1	Pipe or structure or electrical conduits, manholes, HH, etc.

* Shall conform to the requirements of the “Chapter 5J-17, “Minimum Technical Standards’, FAC”, certified by a Surveyor.

** Within the limits of construction and shall also include storm water pipes if the Water Main crosses the storm sewer.

1.06 SUBMITTALS

A. Comply with pertinent provisions for the timely submittal requirements under this article and specification section.

B. Prior to submitting a monthly payment application, the Contractor's progressive As-Built Drawings and tables (As-Built Asset Attribute Data, Reclaimed Water Main, and Pipe Deflection) shall be acceptable to the County.

C. Progressive As-Built Drawings which will indicate the horizontal and vertical locations of all current constructed improvements with sufficient information and notes to easily determine if the improvements were constructed in conformance with the Contract Documents. The progressive As-Built Drawings shall include a Surveyor's certified statement regarding the constructed improvements being within the specified accuracies or if not indicating the variances, as described in Table 01720-1 Minimum Survey Accuracies. The Contractor shall also submit the following updated monthly tables certified by the Surveyor:

D. 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.

E. Prior to the County submitting for FDEP clearance or partial clearance to place a main in service, the complete as-builts for those specific segments need to be submitted and approved by the Engineer prior to submission to the FDEP. Contractor shall allow for ten days for review of as-builts.

1.07 RECORD DOCUMENTS AT SITE

A. Maintain at the site and always available for County's use one 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. Progressive As-Built Drawings
7. Current Surveyor's tables for the As-Built Assets Attribute Data, pipe deflection data, and gravity main data.

B. Maintain the documents in an organized, clean, dry, legible condition and completely protected from deterioration and from loss and damage until completion of the Work, transfer of all record data to the final Record Documents and for submittal to the County.

PART 2- PRODUCTS

2.01 AS-BUILT 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.

D. In the event of overlapping changes, use different colors for entries of the overlapping changes.

E. 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.

F. Make entries in the pertinent other documents while coordinating with the Engineer and the County for validity.

G. 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 the installed pipe line in relation to State Plane Coordinates and elevations.
2. Plan view and profile drawings: State Plane coordinates and elevations or depths for all assets shown in the Asset Attribute Data Table on each drawing if the fittings, valves, appurtenances, etc. are shown on that drawing sheet.
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 fittings, valves, pipes 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 changes including relocation of road crossing, valves, fittings or pipe.

2.02 RECORD DOCUMENTS

A. A full size, two (2) hard copy set of the final Record Documents and shall include all of the documents described below under this subsection 2.02.

B. The following documents shall be signed and sealed by the Surveyor:

1. As-Built Asset Attribute Data Table (see Table 1720-2 for an example or refer to Section 3111 of the Orange County Standards and Construction Specifications Manual). The required asset table is available for download at http://www.orangecountyfl.net/YourLocalGovernment/CountyDepartments/Utilities/StandardsConstructionSpecificationsManual.aspx.

2. Survey and Survey Map Report for the location of constructed pipes within any easements and right-of-way. As a minimum, the Survey Map Report shall identify or describe the locations where the pipe centerline was constructed within three feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary, any corners that had to be reset, measurements and computations made, pump station boundary issues, and accuracies obtained. Survey map report shall be dated after the Work within the right-of-ways or easements have been completed.

3. Reclaimed Water Main Table

4. Pipe Deflection Table (see Table 1720-3 for an example). *A copy of the required table is available for download at:* http://www.orangecountyfl.net/YourLocalGovernment/CountyDepartments/Utilities/StandardsConstructionSpecificationsManual.aspx.

C. Digital Set of the final Record Documents including but not limited to:

1. Scanned digital copies of the final As-Built Drawings.

2. Electronic Survey documents electronically sealed by the Surveyor.

3. Final Record Documents information.

4. Digital As-Built Drawing in the Engineer's current version of AutoCAD file (dwg) format for the Contract Drawings, updated to match the final Record Drawing information.

D. New Boundary Survey to re-establish easement corners, right-of-way monuments, or pump station site corners with monuments if destroyed by the Work.

E. Scanned Documents: Scan the Survey Documents and other Record Documents reflecting changes from the Bid Documents.

F. The scanned As-Built drawing sets shall be 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 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. Review all Record Documents to ensure a complete record of the project.

G. Provide an encompassing digital AutoCAD file that includes all the information of the As-Built Drawings 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 and Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).

TABLE 1720-2

Asset Attribute Data Form Examples

General Information Worksheet

	A	B	C
1	**Date of submittal**	3/3/2009	
2			
3	**Collection Date**	3/3/2009	
4			
5	**Project Number**	123456	
6			
7	**Project Name**	ABC	
8			
9	**Contractor Name**	Joe Contractor	
10			
11	**Company**	Your Company	
12			

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements

Hydrants Worksheet

	A	B	C	D	E	F	H	I
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Service Type**		
2	1	H001	535896.7840	1491359.5830	99.78	Water		
3	2	H002	536062.0800	1491360.9250	99.20	Water		
4	3	H002	509643.9000	1481344.6000	99.20	Water		

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements

Valves Worksheet

	B	C	D	E	F	G
1	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Valve Type**	**Service Type**
2	V001	535887.9950	1491394.7730	96.74	Gate	Water
3	V002	535884.7480	1491396.1010	91.27	Gate	Water
4	V003	535883.6870	1491393.4900	92.18	Gate	Water

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements

Manhole Worksheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Invert Elv N**	**Invert Elv NE**	**Invert Elv E**	**Invert Elv SE**	**Invert Elv S**	**Invert Elv SW**	**Invert Elv W**	**Invert Elv NW**	**Service Type**
2	15	15	535898.3040	1491144.0450	96.31	91.56	88.81			88.71		88.61		Water Reclamation
3	277	277	505962.0207	1474906.7832	92.76		86.83				86.85			Water Reclamation
4	278	278	506130.5461	1475093.6556	91.00				85.95		86.17		87.2	Water Reclamation
5	279	279	505993.3960	1475243.3448	92.36				88.8					Water Reclamation

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements | Lookup | Relation

Meter Worksheet

	A	B	C	D	E	F	G
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Meter Type**	**Service Type**
2	7	7	535887.9950	1491394.7730	96.74	Flow	Water

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements

Fitting Worksheet

	A	B	C	D	E	F	G
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Fitting Type**	**Service Type**
2	20008	F0001	538549.20	1475457.69	78.94	Tee	Water Reclamation
3	20010	F0002	538544.73	1475457.74	78.94	Tee	Water Reclamation
4	20013	F0003	538544.36	1475467.92	79.02	Tee	Water Reclamation

General Info | Hydrants | Valve | Manhole | Meter | Fitting | Cleanout | Pipes | Structures | Easements

Cleanout Worksheet

	A	B	C	D	E	F	H
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Service Type**	
2	15	15	535898.3040	1491144.0450	96.31	Water Reclamation	
3	277	277	505962.0207	1474906.7832	92.76	Water Reclamation	

General Info / Hydrants / Valve / Manhole / Meter / Fitting / **Cleanout** / Pipes / Structures / Easements /

Pipes Worksheet

	A	B	C	D	E	F	G	H	I
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**W Pipe Type**	**WW Pipe Type**	**RW Pipe Type**	**Service Type**
2	20001	P00001	1475448.92	538024.96	81.5	Distribution	Pressurized		Water Reclamation
3	20002	P00002	1475487.58	538055.74	79.74	Distribution	Pressurized		Water Reclamation
4	20004	P00003	1475470.75	538166.01	79.46	Distribution	Pressurized		Water Reclamation

General Info / Hydrants / Valve / Manhole / Meter / Fitting / Cleanout / **Pipes** / Structures / Easements /

Structures Worksheet

	A	B	C	D	E	F	G
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**	**Structure Type**	**Service Type**
2	20	3980	535886.9150	1491144.3200	96.17	PumpStation	Water Reclamation

General Info / Hydrants / Valve / Manhole / Meter / Fitting / Cleanout / Pipes / **Structures** / Easements /

Easements Worksheet

	A	B	C	D	E	F	G
1	**ID Number**	**Utilities Asset Number**	**Easting**	**Northing**	**Elevation**		
2	1721	1721	468066.6800	1515018.8300			
3	1722	1722	468066.9400	1514983.8300			
4	1723	1723	468041.9400	1514983.6500			
5	1724	1724	468041.9400	1515018.6400			

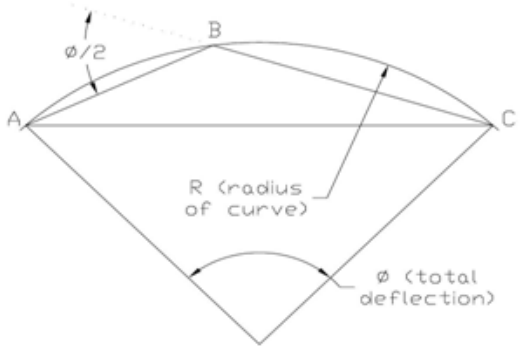
Hydrants / Valve / Manhole / Meter / Fitting / Cleanout / Pipes / Structures / **Easements** /

Note: Do not fill out Utilities Asset Number (grey) column.

TABLE 01720-3

PIPE DEFLECTION TABLE EXAMPLE

Project:			
Contractor:			
Progress Mtg Date:			
Contract #			
Dwg Sheet #			
Utility Type		FM	
Pipe Manufacturer		National Pipe	
Pipe size & material		16" PVC C905	
PVC Manufacturer Deflection		*6*	**inches**
County Allowable Deflection	*75%*	*4.5*	**inches**
Allowable Angle of Offset		*1.5*	**degrees**
Allowable Radius of Curvature		*764*	**feet**
Laying Length of Pipe		*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'	Radius of Curve**	Average Offset Angle***	Average Offset****
					Length AB	Length BC	Length AC	XYZ (w/ elevation)	XYZ (w/ elevation)	per laying length	per laying length
					ft	ft	ft	degrees	ft	degrees	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 be inputted

Values in yelloware over spec

*Uses lawof cosines to determine angle ABC and Ø.
angle ABC = arccos((AB²+BC²-AC²)/(2*AB*BC))
180-Ø/2 = angle ABC
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 lawof sines, using the chord length AC and radius R.
Since sin((Ø/2)*(PI/180))=(Chord/2)/R and length AC=Chord
R=AC/(2*sin(Ø*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.

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 Work. If the Surveyor performing the Work discovers any discrepancies that will affect the Project, the Contractor must immediately report these findings to the County and Engineer. All survey work shall meet the requirements as defined in Florida Administrative Code 61G17-6. Reference and preserve all survey points during construction. If survey points are disturbed, it is the responsibility of the Contractor's Surveyor to reset the points at the Contractor's expense. Copies of the Surveyor's field notes and/or electronic files for point replacement shall be provided to the County.

1. 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's Engineer will provide electronic files of the Drawings to be used by the Surveyor in complying with these specifications.

2. 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 by the County.

B. Use survey control points to layout such work tasks as the following:

1. Clearing, grubbing, work limits, right-of-way lines and easements

2. Locations for pipelines and all associated structures and appurtenances

C. 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. Establish replacement points based on the original survey control. Copies of all reference field notes and/or electronic files for point replacement shall be submitted to the County.

3.02 CONSTRUCTION PROGRESS MEETINGS

A. Contractor shall provide progressive and a final version of the Record Documents both as paper copies and electronic format described below.

1. Construction Contract, As-Built Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.

2. 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.

3. Change orders, verbal orders, and other modifications to Contract.

4. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).

5. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.

6. Field test records, inspection certificates, manufacturer certificates and construction photographs.

B. Progressive record documents shall include the following updated monthly tables certified by the Surveyor:

1. As-Built Asset Attribute Data Table: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements. The monthly submittal shall include the Surveyor's statement regarding the constructed improvements being within the specified accuracies as described in Table 01720-1 Minimum Survey Accuracies or if not, indicating the variances.

2. 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. *County will provide an electronic version of a blank table that shall be used to input the data.*

3.03 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 Engineer and County.

3.04 STORAGE AND PRESERVATION

A. Store Record Documents and samples at a protected location in the project field office apart from documents used for construction.

1. Provide files and racks for storage of documents

2. Provide locked cabinet or secure space for storage of samples.

B. File documents and samples in accordance with CSI format with section numbers matching those in the Contract Documents.

C. In the event of loss of recorded data, use means necessary to again secure the data to the County's approval.

1. Such means shall include, if necessary in the opinion of the County, removal and replacement of concealing materials.

2. In such cases, provide replacements of the concealing materials to the standards originally required by the Contract Documents.

END OF SECTION

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SECTION 01750

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

Substantial completion requirements, clean-up, final completion requirements, closeout submittals

1.02 CLEAN-UP OPERATIONS

A. The entire project site shall be thoroughly cleaned at the completion of the work.

B. The CONTRACTOR shall be responsible for the removal of excess dust and mud created by the construction project from all sidewalks, streets, and highways as directed by the OWNER. Equipment to clean these surfaces shall be subject to approval by the OWNER.

1.03 SUBSTANTIAL COMPLETION REQUIREMENTS

A. Complete the following before requesting the inspection for certification of substantial completion.

1. Submit as-built drawings.

2. Deliver tools, spare parts, extra stocks of material and similar physical items to the OWNER.

3. Complete required cleaning and testing of systems, and instruction of the OWNER'S operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.

4. Complete final cleaning up requirements, including touch-up painting of marred surfaces.

5. Touch-up and otherwise repair and restore marred exposed finishes.

B. Work is not substantially complete until regulatory agency letters of clearance for placing systems into service are received by the OWNER.

1.04 CLOSEOUT SUBMITTALS

A. Upon completion of the project, or portions thereof, the CONTRACTOR shall transfer to the OWNER all applicable items accumulated throughout construction. These include but are not limited to the following items:

1. Service manuals, installation instructions, special tools, and specialties.

2. Spare parts ordered as part of this Contract.

3. Submittal of the Material and Workmanship Bond.

4. Submittal of manufacturers' guarantees, bonds, and letters of coverage extending beyond the time limitations of the CONTRACTOR'S guarantee.

5. Delivery of any salvaged or borrowed materials or equipment to the OWNER.

6. CONTRACTOR provide to OWNER Record documents of completed facilities, including certified copy of the survey.

7. CONTRACTOR to provide to OWNER all keys to all doors, gates, and equipment.

8. Checklist indicating satisfactory completion of all unfinished items from the final inspection.

9. Waivers of lien.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 02050

DEMOLITION OF EXISTING STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work
   1. This Section specifies the labor, materials, equipment, and incidentals required for the demolition, relocation, and/or disposal of all structures, building materials, equipment, and accessories to be removed as shown on the Drawings and as specified herein.
   2. There may be existing and active stormwater, wastewater, water, and other facilities on site as indicated on the Drawings. It is essential that these facilities, when encountered, remain intact and in service during the proposed demolition. Consequently, the Contractor shall be responsible for the protection of these facilities and shall diligently direct all his activities toward maintaining continuous operation of the existing facilities and minimizing operational inconvenience.
   3. Demolition generally includes:
      a. Complete demolition and removal of manholes, valve vaults, wetwells, piping, and mechanical and electrical equipment related to the Work as shown on the Drawings and specified herein.
      b. Complete demolition and removal of all above and below ground structures, concrete slabs and foundations, vaults, and underground utilities (water, wastewater, electrical, etc.) as shown on the Drawings and specified herein.
      c. All material, equipment, rubble, debris, and other products of the demolition shall become the property of the Contractor for his disposal off-site in accordance with all applicable laws and ordinances at the Contractor's expense. The sale of salvageable materials by the Contractor shall only be conducted off-site. The sale of removed items on the site is prohibited by the County.
   4. The Contractor shall examine the various Drawings, visit the site, determine the extent of the Work, the extent of work affected therein, and all conditions under which he is required to perform the various operations.
   5. The Contractor shall fill and compact all voids left by the removal of pipe, structures, etc. with materials described herein to a grade that will provide for positive drainage of the disturbed area to drain run-off in direction consistent with the surrounding area. The Contractor shall provide all fill materials to the site as needed. Compaction of fill shall match the compaction of adjacent undisturbed material.

1.02 QUALITY ASSURANCE

A. Permits and Licenses: Contractor shall obtain 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.

B. Notices: Contractor shall issue written notices of planned demolition 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. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone, or sewer service to remove any equipment in the structures to be demolished and to remove, disconnect, cap, or plug their services to facilitate demolition.

D. Contractor shall notify the Orange County Risk Management Department in writing prior to beginning any demolition work.

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. Submit to the County for their approval, 2 copies of proposed methods and operations of demolition or relocation of the structures specified below prior to the start of Work. Include in the schedule the coordination of shut-off, capping, and continuation of utility service as required.

C. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the County's operations.

D. Before commencing demolition work, all structure relocation, bypassing, capping, or modifications necessary will be completed. Actual work will not begin until the County has inspected and approved the prerequisite work and authorized commencement of the demolition work.

E. The above procedure must be followed for each individual demolition operation.

1.04 SITE CONDITIONS

A. Prior to demolition, the Contractor shall obtain written verification from the utility owner(s) that the existing utilities, including stormwater, wastewater, and/or water facilities, are not operational and are ready for demolition.

B. The County assumes no responsibility for the actual condition of the structures to be demolished or relocated.

C. Conditions existing at the time of inspection for bidding purposes will be maintained by the County insofar as practicable. However, variations within each site may occur prior to the start of demolition work.

D. No additional payment will be made for pumping or other difficulties encountered due to water.

E. Certain information regarding the reputed presence, size, character and location of existing underground structures, pipes and conduit has been shown on the Drawings. There is no certainty of the accuracy of this information, and the location of underground structures shown may be inaccurate and other obstructions than those shown may be encountered. The Contractor hereby distinctly agrees that the County is not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information regarding obstructions either revealed or not revealed by the Drawings; and that he shall have no claim for relief from any obligation or responsibility under this Contract in case the location, size, or character of any pipe or other underground structure is not as indicated on the Drawings, or in case any pipe or other underground structure is encountered that is not shown on the Drawings.

1.05 RESTRICTIONS

A. No building, tank or structure, or any part thereof, shall be demolished until an application has been filed by the Contractor with the Building Department Inspector and a permit issued if a permit is required. The fee for this permit shall be the Contractor's responsibility. Demolition shall be in accordance with applicable provisions of the Building Code of the State of Florida.

B. No explosives shall be used at any time during the demolition. No burning of combustible material will be allowed.

C. Contractor shall notify the Orange County Risk Management Department prior to beginning any demolition work.

1.06 DISPOSAL OF MATERIAL

A. All salvageable or useable material or equipment to be retained by the County shall be shown on Drawings, and shall be moved to a designated area by Contractor for pick up by County. The Contractor shall promptly remove all other materials from the site as indicated or shown on the Drawings.

B. All materials not retained by the County shall become the Contractor's property and shall be removed off-site.

C. The on-site storage of removed items is prohibited by the County. Off-site sale of salvageable material by the Contractor is acceptable.

1.07 TRAFFIC AND ACCESS

A. Conduct work to ensure minimum interference with on-site and off-site roads, streets, sidewalks, and occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the existing facilities remaining in operation by plant personnel and plant associated vehicles, including trucks and delivery vehicles.

C. Do not close or obstruct streets, sidewalks, or other occupied or used facilities without permission from the County. Provide alternate routes around closed or obstructed traffic in access ways.

1.08 PROTECTION

A. Conduct operations to minimize damage by falling debris or other causes to adjacent buildings, structures, roadways, other facilities, and persons. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.09 DAMAGE

A. Promptly repair damage caused to adjacent facilities by demolition operations as directed by the County at no cost to the County.

1.10 UTILITIES

A. Maintain existing utilities as directed by the County to remain in service and protect against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied or operational facilities, except when authorized by County. Provide temporary services during interruptions to existing utilities as acceptable to the County.

C. The Contractor shall cooperate with the County to shut off utilities serving structures of the existing facilities as required by demolition operations.

D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the interruption of all public and private utilities or services.

E. All utilities being abandoned shall be terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.11 EXTERMINATION

A. If required, before starting demolition, the Contractor shall employ a certified rodent and vermin exterminator and treat the facilities in accordance with governing health laws and regulations. Any rodents, insects, or other vermin appearing before or during the demolition shall be killed or otherwise prevented from leaving the immediate vicinity of the demolition work.

1.12 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. The Contractor shall comply with the governing regulations.

B. Clean adjacent structures and improvements of all dust and debris caused by demolition operations as directed by the County. Return areas to conditions existing prior to the start of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and relocation of existing facilities shall be in accordance with the approved critical path schedule as specified in paragraph 1.03 above.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING, AND APPURTENANCES

A. Equipment to be retained by the County will be designated for retention by the County prior to bidding as specified in Paragraph 1.06 above. Subject to the constraints of maintaining existing facilities in operation as shown on the Drawings, all other process equipment, non-buried valving and piping, and appurtenances shall be removed from the site.

3.03 DEMOLITION PROCEDURES

The Contractor shall adhere to the following demolition procedures as referenced on the Drawings:

A. TO BE DEMOLISHED: Demolition shall be the breaking up, cutting, filling of any holes resulting, final grading of the area, performing any other operations required, and the removal from the site of all structures and equipment (structures, substructures, floor slabs, equipment, tanks, pipes, fittings, electrical systems, light poles, wiring, underground conduits and wiring, isolated slabs, and sidewalks) as indicated on the Drawings. All pieces of concrete, metal, and any other demolished material shall be removed to a depth of at least 5-feet below existing grade. Broken pieces of concrete may be size reduced by an on-site crusher, but in any event must be removed from the project site.

Before commencing structural demolition, remove all mechanical, electrical, piping, and miscellaneous appurtenances. Completely remove the structure by thoroughly breaking up concrete into pieces no more than 2-feet across the largest dimension.

B. TO BE REMOVED: Where indicated on the Drawings, the structures and equipment shall be completely removed from the site with all associated connecting piping or electrical service. The item shall be taken whole or in parts to be salvaged or disposed of by the Contractor.

C. TO BE ABANDONED: Where indicated on the Drawings, the structures and equipment shall be left in place, drained, and the contents properly disposed. The upper 4-feet of the structure shall be cut and removed, including the cover slab and access port, frame, and cover. All structures to be abandoned with bottom slabs shall be drilled (2 holes minimum, 2.0-inch diameter each) or hole punched to prevent flotation and filled with common fill.

D. PIPING TO BE REMOVED: Where indicated on the Drawings, pipe (and conduit) shall be drained and the contents properly disposed. The pipe (or conduit) shall then be completely removed from the site, including fittings, valves, and other in-line devices. Connections to existing piping to remain shall be plugged by mechanical means (M.J. plugs, tie-rods, or thrust blocks). Piping shall be removed in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."

E. PIPING TO BE ABANDONED: Where indicated on the Drawings, piping (or conduit) shall be left in place. All such piping shall be drained and the contents properly disposed. The pipe (or conduit) shall then be filled with grout (flowable fill) and each end of the pipe (or conduit) shall be plugged using a concrete plug in a manner acceptable to the County. Piping shall be abandoned in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."

F. TO BE PROTECTED: Where indicated on the Drawings, the utility service, fence, structure, tree, or device so designated shall be temporarily protected during the prosecution of the demolition work as specified in Division 1.

G. TO REMAIN: Where indicated on the Drawings, the designated facilities shall remain intact and in service during the prosecution of the demolition work.

3.04 DEWATERING OF EXISTING PROCESS UNITS AND DISPOSAL OF RESIDUE

The Contractor shall notify the County prior to beginning the dewatering work on any existing process units which contain wastewater, grit, or sludge. The Contractor, at his own expense, shall remove the entire contents of each structure and dispose off site. The proper transport and disposal of all residues shall remain the responsibility of the Contractor.

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 ±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 too:
   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 02230

SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Layout of work and protection of bench marks.

B. Protection of structures, trees, or vegetation to remain.

C. Clearing and grubbing.

D. Stripping and storing topsoil.

1.02 RELATED SECTIONS

A. Section 02320 - Trenching, Bedding and Backfilling

B. Section 02370 - Erosion and Sedimentation Control

1.03 COORDINATION

A. Notify the following utility owners which may have utilities in the project area.

B. Contact Sunshine State, One-Call at 1-800-432-4770, to determine if there are other utilities in the area, and their location.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 BENCH MARKS AND MONUMENTS

Maintain all existing benchmarks, monuments and other reference points; if destroyed, replacement costs will be deducted from payments due the CONTRACTOR.

3.02 LAYING OUT WORK

A. Base lines, property lines, and easement lines, are shown on the Drawings. Benchmarks utilized are also shown on the drawings. If the bench marks are disturbed as a result of construction activities, reestablish such items by utilizing a Florida licensed surveyor.

B. Stake out the construction, establish lines and levels, temporary bench marks, batter boards, centerlines and reference points for the work, and verify all dimensions relating to interconnection with existing features.

C. Report any inconsistencies in the proposed grades, lines and levels, dimensions and locations to the ENGINEER before commencing work.

D. Unless otherwise directed by the OWNER or ENGINEER, the CONTRACTOR is expected contain all construction activities within the right-of-way, easements, and property secured by the OWNER, as shown on the drawings. At no time shall the CONTRACTOR disturb surrounding properties or travel on surrounding properties without written consent from the property OWNER. Any repair or reconstruction of damaged areas in surrounding properties shall be repaired by the CONTRACTOR on an immediate basis. All costs for repairs shall be the responsibility of the CONTRACTOR and no extra compensation shall be provided.

E. The CONTRACTOR shall be responsible for locating and protecting and/or relocating all utilities lines, including irrigation lines, in the areas of the construction activities. If any existing lines are broken or damaged as a result of construction activities, the CONTRACTOR shall be responsible for repairing the lines at no additional cost to the OWNER.

3.03 BURNING

Burning is not allowed.

3.04 PROTECTION OF TREES AND SHRUBS

A. Existing trees and shrubs within the treatment plant site shall remain unless specifically required to be removed as indicated on the Drawings.

B. Within the right-of-way, easements, and OWNER secured property, the intent is to allow trees and shrubs to remain in accordance with the following schedule: Utility pipeline construction - trees and shrubs to remain outside a 15 foot wide path, centered on the pipeline.

C. Protect branches, trunks, and roots of trees and shrubs that are to remain. Trees to remain in the construction area shall be boxed, fenced or otherwise protected before any work is started; remove boxing when directed by the ENGINEER. Do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars with tree paint.

D. The CONTRACTOR shall assume full responsibility for the protection of all trees and shrubs. It will be the CONTRACTOR'S responsibility to follow any ordinance pertaining to Orange County's regulations.

3.05 RELOCATION OF UTILITIES (IF REQUIRED)

A. Active utilities which do not interfere with the work shall be supported and protected from damage. After obtaining the ENGINEER's and COUNTY's approval, relocate or remove active utilities which will interfere with work as indicated. Pay for all damage to active utilities and for relocation or removal of all interfering utilities which are ascertainable from Drawings, surveys, site inspection or encountered during construction.

B. Inactive or abandoned utilities and appurtenant structures encountered shall be removed to avoid interference as directed by the ENGINEER. Exposed ends of

abandoned lines shall be plugged or capped in a water-tight manner. Any inactive or abandoned utilities shall be shown on the project record drawings.

3.06 CLEARING AND GRUBBING

A. Areas to receive clearing and grubbing shall include all areas to be occupied by the proposed improvements, areas for fill and site grading. Remove trees outside of these areas only as indicated on the Drawings or as approved in writing by the ENGINEER or OWNER.

B. Clearing shall consist of removing trees and brush and disposal of other materials that encroach upon or otherwise obstruct the work.

C. Exercise extreme care during the clearing and grubbing operations to not damage existing structures, pipes or utilities.

D. Grubbing shall consist of removing and disposing of stumps, roots larger than 2" in diameter, and matted roots. Remove to a depth of not less than 18" below the original surface level of the ground.

E. All combustible debris and refuse from site preparation operations shall be removed to legal off-site disposal areas. No burning is allowed on site.

3.07 TOPSOIL REMOVAL

A. All areas to be occupied by proposed improvements shall be stripped of all brush, weeds, grass, roots and other material.

B. Remove all loamy, organic topsoil suitable for seeding and planting to whatever depth encountered and store separately from other excavated material. Stockpile in designated areas and provide for proper drainage. Cover storage piles as required to prevent windblown dust.

C. In the event that inadequate space within the site or work area is available for stock-piling topsoil without interfering with other construction operations, contact OWNER for determination of another storage location.

D. Dispose of unsuitable topsoil as specified under disposal of debris. Excess topsoil shall be removed from site unless specifically noted on Contract Drawings.

3.08 DISPOSAL OF DEBRIS

A. All combustible debris and refuse from site preparation operations shall be removed by CONTRACTOR to legal off-site disposal areas.

B. All non-combustible debris (not including acceptable fill material, fences, or other structures), resulting from site preparation operations shall become the property of the Contractor and shall be removed to legal off-site disposal areas.

END OF SECTION

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SECTION 02320

TRENCHING, BEDDING, AND BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Trenching for piping.

B. Sheeting, shoring and bracing

C. Bedding, backfilling, and compaction.

1.02 RELATED SECTIONS

A. Section 02230 - Site Preparation

B. Section 02240 – Dewatering

C. Section 02310 - Finish Grading

D. Section 02370 - Erosion and Sedimentation Control

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:

1. AASHTO M145 - Classification of Soils and Soil Aggregate Mixtures
2. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in Drop

B. American Society for Testing and Materials (ASTM) latest edition:

1. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort
2. ASTM D2487 - Classification of Soils for Engineering Purposes

C. Occupational Safety and Health Administration (OSHA) Regulations, including:

Part 1926 Subpart P – Excavations

1.04 DEFINITIONS

A. Bedding - Area from bottom of trench to centerline of pipe

B. Backfill - Material above the top of pipe to the topsoil, paving sub-grade, or foundation level.

C. Influence Area - The area within lines sloped downward at 45^{o} from the outer edges of paving, foundations, and utility lines. As a minimum, the influence area shall extend 5 feet beyond the edge of pavement (where there is no curb) or 5 feet beyond the back of curb.

1.05 QUALITY ASSURANCE

Field density testing frequencies:

A. Two tests for each 300 linear feet of pipeline or fraction thereof per lift of general backfilling in the pipeline trench.

B. One test per lift per each change in type of fill.

1.06 PRECONSTRUCTION REQUIREMENTS

Precondition surveys and vibration monitoring are required for those areas where residential structures are within 100 feet of the proposed construction.

PART 2 PRODUCTS

2.01 GENERAL

It is intended that previously excavated materials conforming to the following requirements be utilized wherever possible.

2.02 MATERIALS

A. Acceptable materials (suitable material): AASHTO M145 classification A-1, A-3, A-2-4, A-2-6; ASTM D2487 classification GW, GP, GM, SM, SW, SP; unless otherwise disapproved within the Soil and Subsurface investigation reports. No more than 12 percent of acceptable materials shall pass the number 200 sieve.

B. Unacceptable materials (unsuitable material): AASHTO M145 classification A-2-5, A-2-7, A-4, A-5, A-6, A-7, A-8; ASTM D2487 classification GC, SC, ML, MH, CL, CH, OL, OH, PT; unless otherwise approved within the Soil and Subsurface investigation reports.

C. Controlled low strength material ("excavatable flowable fill") shall meet the requirements of FDOT specification section 121, with a 28-day compressive strength of 80-100 psi.

2.03 SHEETING, SHORING, AND BRACING

A. The structural strength and safety of all sheeting, shoring and bracing shall be the sole responsibility of the Contractor. Repair any damage resulting from failure to provide adequate supports.

B. Provide timber-work, shoring, bracing, sheeting, and sheet piling where necessary to retain banks of excavations, prevent cave-in of adjacent ground, prevent displacement of utilities and structures, and to protect public safety.

C. Contractor is solely responsible for the design, installation, and operation of dewatering systems and their safety and conformity with local codes and regulations.

PART 3 EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS

A. Provide suitable temporary drainage channels for any water that may flow along or across the work as specified hereafter.

B. Provide barriers, warning lights and other protective devices at all excavations.

C. Sidewalks, roads, streets, and pavements shall not be blocked or obstructed by excavated materials, except as authorized by the Engineer, in which case adequate temporary provisions must be made for satisfactory temporary passage of pedestrians, and vehicles. Minimize inconvenience to public travel or to tenants occupying adjoining property.

D. Where necessary to place excavated material adjacent to buildings, erect barriers to keep earth at least 4' from such buildings. Earth deposited on lawns shall be promptly and carefully removed to preserve the turf. All trees, shrubs, and landscaping shall be protected. Boring and jacking shall be used, if necessary, except where written permission is granted to remove trees and shrubs.

E. If open excavations cross existing rigid surfacing, the surfacing shall be removed for a width one foot beyond the anticipated edge of the excavation. The pavement break shall be sawed to insure a straight joint. Surface replacement shall match existing surfacing except as otherwise indicated on the Drawings. Where open excavation is allowed along or across public roadways, excavation, backfill, and surface replacement shall conform to the requirements of all permits applicable thereto. In no case shall surface replacement edges bear on less than 12 inches of undisturbed soil.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Locate and identify existing utilities that are to remain and protect from damage.

C. Notify utility companies to remove or relocate utilities that are in conflict with proposed improvements.

D. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.03 SHEETING, SHORING, AND BRACING

A. Furnish, install, and maintain, without additional compensation, sheeting, bracing, and shoring support required to keep excavations within the easement provided, to support the sides of the excavation, and to prevent any movement which may damage adjacent pavements or structures, damage or delay the work, or endanger life and health. Voids outside the supports shall be immediately filled and compacted.

B. Sheeting, where required, shall be driven below the bottom of excavation so the lowest set of wales and struts are above the bottom of the excavation to allow necessary working room.

C. The Engineer may direct in writing that supports in trenches be cut off at any specified elevation, in which case Contractor shall be paid for the supports left in place.

D. Contractor may leave in place, to be embedded in the backfill of the excavation, any or all supports for the purpose of preventing injury to persons or property, whether public or private. However, no supports which are within 4 feet of the ground or pavement surface may be left in place without written permission of the Engineer. No extra payment will be made for supports left in place at the Contractor's option.

E. All supports not left in place shall be removed in such manner as to avoid endangering the piping, structures, utilities or property, whether public or private. All voids left by the withdrawal of sheeting shall be immediately filled and compacted.

F. The right of the Engineer to order supports left in place shall not be construed as creating an obligation on his part to issue such orders. Failure by the Engineer to exercise this right shall not relieve the Contractor from total liability for damages to persons or property resulting from the failure of the Contractor to leave in place sufficient supports to prevent any caving or moving of the ground adjacent to the excavation.

3.04 TRENCHING

A. All excavations shall be made by open cut unless otherwise indicated. Sides of trenches shall be kept as nearly vertical as possible from the trench bottom to a level of one foot above the top of the pipe. Slope sides of trenches in accordance with OSHA requirements and the recommendations contained within the project geotechnical report.

B. Excavation of trenches shall not advance more than 50 feet ahead of completed pipe installation except as approved by the Engineer.

C. Excavate trenches to depth indicated or required for indicated flow lines and invert elevations. Over excavate trenches a minimum of 2 feet where excavations occur within unsuitable soils, and replace over excavated material with suitable soils.

D. Where rock is encountered, carry excavation 6 inches below scheduled elevation and backfill with a 6 inch layer of crushed stone or gravel prior to installation of pipe.

E. For pipes or conduit 5 inches or less, excavate to indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

F. For pipes or conduit 6 inches or larger, and other work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6 inches below bottom of work to be supported.

G. Except as otherwise indicated, excavate for pressure piping so top of piping is minimum 3 feet below finished grade.

H. Unsuitable excavated materials shall be removed from the site and disposed, unless otherwise indicated on the Drawings.

I. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

J. Trench bottoms shall be kept dry, compacted, and stable to a depth two feet below the bottom of the trench.

K. Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 9 -12 inch clearance on each side of pipe or conduit.

L. If more than one pipe is to be installed in a trench, the pipes shall be spaced a minimum of one foot apart for pipes 4 inches and larger.

M. If portions of the bottom of trenches consist of material unstable to such a degree that, in the opinion of the Engineer, it cannot adequately support the pipe or structure, the bottom shall be over excavated and stabilized with approved coarse granular stabilization material. Depth of stabilization shall be as directed by the Engineer. The initial 50 tons of stabilization shall be incidental to the Contract. Compensation will be allowed only for such additional quantities as the Engineer shall direct in writing to be placed.

N. Do not backfill trenches until tests and inspections have been made.

3.05 TRENCH BACKFILLING

A. Following placement of pipe and inspection of joints, install tamped bedding material. Place bedding fill materials in layers of 6 inch loose depth.

B. All bedding and backfill material shall be suitable soils or flowable fill. Backfill material within 1 foot of pipe and appurtenances shall not contain rock or stone

larger than 2 inch diameter. If a sufficient quantity of suitable material is not available from the trench or other excavations within the site, provide additional suitable material or flowable fill.

C. After completion of bedding and preliminary approval of piping and testing, the pipe shall be covered to a point one foot above the top of the pipe for the full trench width, placed in layers of 8 inch loose depth.

D. Place backfill over pipe. Where trench is within the influence area of roadways, structures, foundations, or slabs, place backfill in layers of 8 inch loose depth. In all other areas, place backfill in layers of 12 inch loose depth.

E. Take necessary precautions not to cause settlement or damage to adjacent slabs, walls, structures, or foundations. Place backfill and fill materials evenly adjacent to structures, without wedging against structures or displacement of piping or conduit.

3.06 COMPACTION

A. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the site, subject to the approval of the Engineer.

B. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the Engineer. Vibratory compaction is not allowed within 100 feet of existing structures. In these areas, compaction shall be accomplished by static means only. If compaction difficulties arise, the Engineer shall be consulted to review and possibly modify compaction procedures.

C. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated.

D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

3.07 TESTING AND CLEANUP

A. Provide for testing and cleanup as soon as practicable, so these operations do not lag far behind pipe installation. Perform preliminary cleanup and grading operations immediately after backfilling.

B. All surplus excavated material shall be disposed of by the Contractor.

3.08 FIELD QUALITY CONTROL

Minimum Density Requirement (ASTM D1557 or AASHTO T180)

A. Fill under and within the influence area of roadways, structures, slabs, foundations = 98 percent
B. All other areas = 95 percent

END OF SECTION

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SECTION 02510

RECLAIMED WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping and fittings for reclaimed water distribution systems

B. Valves

C. Installations

1.02 RELATED SECTIONS

Section 02320 - Trenching, Bedding and Backfilling

1.03 REFERENCES

A. American Water Works Association (AWWA) and American National Standards Institute (ANSI) latest edition:

1. ANSI/AWWA C104/A21.4 - Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
2. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile Iron Pipe Systems
3. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings, 3 Inch Through 48 Inch, for Water
4. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
5. ANSI/AWWA C115/A21.15 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Fittings
6. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe
7. ANSI/AWWA C151/A21.51 - Ductile Iron Pipe, Centrifugally Cast, for Water
8. ANSI/AWWA C153/A21.53 - Compact Ductile Iron Fittings for Water Service
9. AWWA C504 - Rubber Seated Butterfly Valves
10. AWWA C509 - Resilient Seated Gate Valves for Water Supply Service
11. AWWA C515 - Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
12. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
13. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances
14. AWWA C800 - Underground Service Line Valves and Fittings

B. American Society for Testing and Materials (ASTM) latest edition:

1. ASTM A307 - Carbon Steel Bolts and Studs

2. ASTM A536 - Ductile Iron Castings

1.04 DEFINITIONS

Definitions are as included in References, above.
Reclaimed Water = Unrestricted public access reuse water as defined by FAC 17-610

1.05 SUBMITTALS

A. Detailed layout drawings for all pipelines 6 inches and larger

B. Details of joints for all piping 6 inches and larger

C. Product data for gaskets for all piping

D. Product data for all pipe over 6 inches in diameter

E. Valves, blow-off valves and other piping specialties and installation details

F. Product data and installation procedures for joint and pipe restraint

G. Certification of pipe and fittings coatings

H. Product data and installation procedures for polyethylene encasement.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.

PART 2 - PRODUCTS

All products referenced in this document shall comply with the latest edition of Appendix D of the Orange County Manual of Standards and Specifications for Wastewater and Water Main Construction, which is included at the end of this manual.

2.01 DUCTILE IRON PIPE

A. Buried pipe shall conform with ANSI/AWWA C150/A21.50 and C151/ A21.51, and shall have a minimum working pressure of 150 psi. Buried pipe shall comply with the following pressure class (PC) designations unless otherwise indicated on the Drawings:

1. 12 inch diameter and smaller = PC 350
2. 14 inch through 24 inch diameter = PC 250
3. 30 inch through 64 inch diameter = PC 200

B. All flanges shall be minimum class 125, and shall be fully machine faced. Bolts and

nut shall conform to ASTM A307, Grade B.

C. Pipe shall be color coded pantone purple 522-C with tape. The tape (min 2") shall be permanently affixed to the top and each side of the pipe (three 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.

2.02 FITTINGS FOR DUCTILE IRON

A. Fittings shall be manufactured of ductile iron, conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.

B. All full body (C110/A21.10) fittings shall be pressure rated to 250 psi, minimum. All compact fittings (C153/A21.53) shall be pressure rated to 350 psi, minimum.

C. Fitting joints shall be compatible with the type of pipe in use or specified, e.g., flange fittings for flange pipe and mechanical joint for mechanical joint pipe and push-on joint pipe.

2.03 LININGS AND COATINGS FOR DUCTILE IRON FITTINGS

A. Interior lining shall be standard thickness ANSI A21.4 cement mortar lining and an NSF approved seal coat.

B. Exterior coating for buried pipe and fittings shall have an ANSI A21.51 or A21.10 bituminous coating.

C. Exterior coating of exposed pipe and fittings shall be factory applied rust inhibiting epoxy primer, minimum 3 mils dry film thickness. After installation, exterior surfaces shall be painted with two coats Tnemec Series 2 Tneme-Gloss, Glidden Life Master Pro High Performance Acrylic No. 6900 Series, or equal, at minimum 4 mils dry film thickness per coat. Paint color to be in accordance with local utility requirements.

2.04 JOINTS FOR DUCTILE IRON PIPE AND FITTINGS

A. Mechanical and push-on joints shall be rubber gasketed, conforming to ANSI/AWWA C111/A21.11. Mechanical joint bolts and nuts shall conform to ASTM A307, Grade B. Ductile iron glands shall be provided with ductile iron pipe.

B. Lubricants other than that furnished by the pipe manufacturer with the pipe shall not be used.

2.05 RESTRAINED JOINTS FOR DUCTILE IRON PIPE AND FITTINGS

A. All pipe shall be restrained.

B. A 1" red stripe shall be painted on the bell of all restrained joints.

2.06 POLYETHYLENE ENCASEMENT

A. Provide virgin polyethylene encasement Type I, Grade E-1, 0.4 maximum flow rate, 1200 psi minimum tensile strength, 300% minimum elongation, 800 volt/mil thickness minimum dielectric strength for ductile iron pipe, for all buried ductile iron pipe.

B. Polyethylene material shall have a minimum nominal thickness of .008" (8 mils). The minus tolerance on thickness shall not exceed 10% of the nominal thickness. Material shall be colored purple.

2.07 GENERAL VALVE REQUIREMENTS

A. Unless otherwise indicated or specified, all valves smaller than 2 inches shall be all brass or bronze; valves two inches and larger shall be iron body, fully bronze or bronze mounted.

B. Where required for satisfactory operation of valves, provide valve operators, extension stems, stem guides, cast iron valve boxes, floor boxes, handwheels, operator stands, position indicators, and other valve appurtenances. Extension stems shall be complete with guide bearings, wrench nut, and tee handle wrench. All machinery stuffing boxes shall be packed with material selected for the service intended. Maintain all packing until final acceptance by the Owner.

C. Manufacturer's name, service, and pressure marking shall be cast into the body.

D. Valve operators shall be sized for operation at the pressure and flow conditions required for proper operation.

E. Manual operators for exterior buried valves shall conform to AWWA C504.

F. Valve shafts shall be one piece extended completely through the disc or stub shafts extending 1½ times the shaft diameter into the disc. Valve shaft diameter shall be as required by AWWA C504. Valve shafts shall be 304 or 316 stainless steel. Disc to stem connections or turned down portions of shafts shall be designed to transmit shaft torque equivalent to 75% of the required shaft diameter. Bushings shall be of reinforced Teflon, luberized bronze, or stainless steel. Seals may be preloaded by packing gland mechanism.

G. Manual valve operators shall be designed to hold the valve disc in any intermediate position between fully opened and fully closed without creeping or fluttering. The operator shall be capable of transmitting sufficient torque to open or close each valve under the most adverse operating conditions. An indicating arrow shall be provided to give full closed, full open or intermediate disc position indicators.

H. Extension stems shall be provided for all valves in buried locations and in other locations where indicated on the Drawings.

I. Extension stems shall be fabricated from solid steel shafting not smaller in diameter than the stem of the valve or from galvanized steel pipe having an internal diameter

not smaller than the diameter of the valve stem. Stem couplings shall be both threaded and keyed to the coupled stems and shall be of standard design and construction. Pipe couplings will not be acceptable.

J. Stems for buried valves shall extend to within 6 inches of the surface of the ground. Each extension stem shall be connected to the valve operator with a suitable universal joint type coupling. All connections shall be pinned. Each extension stem shall be provided with spacers which will center the stem in a valve box having an inside diameter of approximately 5 inches, and shall be equipped with a standard AWWA wrench nut as described in AWWA C500, except where handwheels are indicated.

2.08 LININGS AND COATINGS FOR VALVES

A. Valves 4 inches and larger shall be lined and coated.

B. Interior of valves shall be coated with a rust-inhibiting epoxy primer, followed by an NSF approved lining material, total minimum dry film thickness of 16 mils, applied at the factory.

C. Exterior coating on buried valves shall be rust inhibiting epoxy primer, followed by a coal tar epoxy, total minimum dry film thickness of 16 mils, applied at the factory.

D. Exterior coating of exposed valves shall be factory applied rust inhibiting epoxy primer, minimum 3 mils dry film thickness. After installation, exterior surfaces shall be painted with two coats Tnemec Series 2 Tneme-Gloss, Glidden Life Master Pro High Performance Acrylic No. 6900 Series, or equal, at 4 mils minimum dry film thickness per coat. Paint color to be in accordance with local utility requirements.

2.09 GATE VALVES

A. Standard gate valves (pressure up to 75 psi) smaller than 2 inches shall be all brass or bronze.

B. Gate valves 2 inches and larger shall be resilient wedge gate valves, conforming to AWWA C509. The valves shall be iron body, cast iron fully encapsulated molded rubber wedge complying with ASTM D2000, non-rising stem with O-ring seals. Valves shall open counterclockwise.

C. Tapping valves and sleeves shall be approved AWWA type of the size required. Valves shall conform to the requirements of AWWA C509.

2.10 BUTTERFLY VALVES

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

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

shall be of corrosion resistant material. Valves shall have the manufacturer's name and valve rating cast in body

C. Valve seats shall be EPDM. Valve seats shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material. Valve seats shall be designed to be leak-tight in both directions at differential pressures up to, and including, the rated pressure of the valve class.

D. Valve disc shall be designed to withstand full differential pressures across the closed valve disc without exceeding a stress level equivalent to one fifth of the tensile strength of the material.

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

F. The valve shaft shall be turned, ground and polished constructed of 18-8 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one-piece unit extending full size through the value disc and valve bearing or it may be of a stub shaft design.

2.11 CHECK VALVES

A. Swing Check Valves Smaller Than Three Inches

Swing check valves smaller than 3" shall be bronze body valve with a regrinding type bronze disc. Internal parts shall be serviceable through a removable bronze top. Valves shall be flanged, threaded or solder end and for horizontal or vertical use as required for the installation.

B. Swing Check Valves Three Inches and Larger

Swing check valves 3" and larger shall be a cast iron body valve with bronze seat ring and bronze clapper or cast iron clapper with a bronze disc ring. All bronze clapper or internal parts shall be capable of being removed from the valve by removing the cover. Valves shall incorporate an external lever and weight with damper where indicated on the Drawings. Check valves shall be provided with anti-slamming mechanisms provided by valve manufacturer.

2.12 VALVE BOXES

A. All buried valves shall be provided with adjustable valve boxes approximately 5 inches in diameter with a minimum thickness of 3/16 inch and constructed so that the removable cover will not be thrown out by travel over it. Valve boxes shall be of sound, close grained cast iron, free from flaws and defects, built strong and rugged enough to withstand the shock of street traffic.

B. Valve boxes shall be of sufficient length to operate all valves buried in the ground. Valve boxes shall consist of base, center section, and top section with cover.

C. Valve boxes located in unpaved areas shall be Screw Type design with locking lids.

D. Valve boxes shall have valve box covers with the inscription "WATER" or “RECLAIMED WATER” cast thereon.

E. All valve box covers shall be painted in an approved manner with primer paint and the finish paint shall be two coats of enamel to color as required by Orange County.

2.13 PRESSURE REDUCING VALVE

A. The valve shall be a Singer Valve model 106-PR-SC / 206-PR-SC, size 6-inch, ANSI Class 150 pressure rating, flange standard, globe- style valve. The Pressure Reducing Pilot (Normally Open Pilot) spring range shall be 20 to 200 psi, with set-point preset at Singer Valve to 70 psi bar.

B. The pressure reducing valve shall provide smooth frictionless motion and maximum low flow stability with actuation being achieved by the use of a single rolling diaphragm and no low flow by-pass shall be acceptable for low flow conditions. The seat shall have an AISI 316 Stainless Steel seat with integral bottom guide, bolted in place, utilizing SpiralockTM thread tapping technology. The AISI 316 Stainless Steel seat ring shall be easily replaceable without special tools.The valve shall seal by means of a corrosion-resistant seat, and resilient, rectangular seat disc. These and other parts shall be replaceable in the field without removing the valve from the line. The stem shall be AISI 316 stainless steel and provided with wrench flats. Alignment of the body, bonnet and diaphragm assembly shall be by precision dowel pins. The main valve and its control system shall contain no packing glands or stuffing boxes. The diaphragm shall not be used as a seating surface, nor shall pistons be used as an operating means. The pressure reducing valve shall be operationally and hydrostatically tested prior to shipment.

C. The main valve body shall be constructed of ASTM A536-65 / 45 / 12 ductile iron. The flanges shall be designed to ANSI Class 150 standards. main valve body shall have a NSF 61 Approved protective fusion bonded epoxy coating internally and externally. The protective fusion bonded epoxy coating shall conform to the ANSI / AWWA C116 / A21.16 current version specification. No machining of any external parts after final coating will be acceptable to ensure a continuous coating surface throughout the entire valve.The main valve seat ring shall be bronze per ASTM B61.Elastomers (diaphragms, resilient seats, and O-rings) shall be EPDM-N. All external fasteners shall be AISI 18-8 Stainless Steel with AISI 18-8 Stainless Steel washers. Mild steel studs or bolts will not be acceptable.Control pilots shall be ASTM B61 bronze with stainless steel internals. The speed control(s), isolation ball valves, and fittings shall be brass, and control line tubing shall be copper. Filter shall be of all-316 stainless steel with a stainless steel braided hose

D. The pressure reducing valve shall be covered by a minimum three year (3) warranty against defects in materials and workmanship. The stainless steel seat shall be covered by a lifetime replacement warranty.

E. The control valve shall be installed with a 1” (25mm) Single Point Insertion Magnetic Flow Meter in one of the inlet body tapings. The flow meter shall consist

of two components: an electromagnetic sensor and a converter. The flow meter shall determine the volumetric flow rate by means of the Continuity Equation where flow rate "Q" equals mean velocity "V" times cross sectional area "A" (Q = V x A). The velocity measurement must be taken at a known location, then, through empirically established equations, the sensed velocity will be converted to a mean velocity. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide a galvanically isolated Dual 4-20mA output. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display.

2.14 AIR RELEASE VALVES

A. The air release valves for use in water mains shall be single body combination air release valves designed to release large quantities of air at start up, admit air on shut down and release air in operation. Air release valves shall be made of either high strength plastic with corrosion resistant polymer materials or have a cast iron body, cover and baffle, stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim. Air release valves must be installed in an enclosure as shown on the detail. Fittings from the main to the air release valve in the enclosure shall be threaded and made of brass. Vent piping shall be provided to grade level.

2.15 PIPELINE IDENTIFICATION TAPE

A. Identification tape shall be an inert plastic film specifically formulated for prolonged underground use. Minimum thickness 4 mils, width 6 inches, letter size 1 inch. Lettering shall be continuous.

B. Tape shall be the standard product of a manufacturer regularly engaged in the supply of this tape. Provide tape with adhesive backing for attachment to pipe.

C. Identification tape color and lettering shall be:

1. Reclaimed Water Mains - "RECLAIMED WATER MAIN", black printing on purple background

2.16 PIPELINE WARNING TAPE

A. Warning tape shall be 6 inch wide vinyl continuous tape, for identification and warning purposes. It shall be color coded and worded as follows:

1. Reclaimed Water Main - Purple with black lettering, "CAUTION: RECLAIMED WATER MAIN BURIED BELOW"

2.17 LOCATING WIRE

Locating wire shall be color-coded 10 gage continuous insulated wire. Color coding shall be similar to warning tape colors. Wire shall be properly attached to the pipe by an approved

method. Locating wire shall be tested for continuity.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and shall be worked into place without springing or forcing.

B. Cut all pipe and drill all holes that may be necessary. Cut sections of pipe shall be reamed or filed to remove all burrs. The pipe interior and joints shall be thoroughly cleaned before being installed and kept clean during construction.

C. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe, except copper and polyethylene, is prohibited. Joint deflection shall not exceed 75 percent of the manufacturer's recommended maximum deflection.

D. Any transition from one pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically indicated on the Drawings or approved by the Engineer.

E. Make adequate provision for expansion and contraction of piping.

F. Trenching, bedding and backfilling shall be in accordance with Section 02320.

G. Valves shall be installed on all pipes ahead of appliances and equipment not furnished with stops, and elsewhere as required for proper control and isolation of sections of systems for maintenance purposes.

H. Minimum cover over pipes shall be 36 inches.

3.02 CONCRETE CRADLES AND ENCASEMENT

Concrete cradles and encasement shall be as indicated on the drawings, or as directed by the Engineer. All concrete cradles and anchors shall be of Class B concrete. Any use of concrete cradles or encasement shall be required to be approved by Orange County in writing prior to installation.

3.03 SEPARATION OF NON-POTABLE AND POTABLE WATER LINES

A. The horizontal separation between water mains and sanitary sewer, storm sewer, wastewater force mains, stormwater force mains, reclaimed water mains and onsite sewage treatment and disposal systems shall be in accordance with the following:

1. The outside of water mains shall be a minimum of three feet from the outside of any existing or proposed storm sewer, stormwater force main, vacuum type sanitary sewer and reclaimed water main.

2. The outside of water mains shall be a minimum of six feet from the outside of any existing or proposed gravity sanitary sewer and wastewater force

main. The minimum horizontal separation distance between the outside of water mains and the outside of gravity sanitary sewers can be reduced to three feet where the bottom of the water main is at least six inches above the top of the sewer.

3. The outside of water mains shall be a minimum of ten feet from all parts of any existing or proposed onsite sewage treatment and disposal system such as septic tanks, drainfields, and grease traps. Onsite sewage treatment and disposal systems do not include package sewage treatment facilities and public wastewater treatment facilities.

B. The vertical separation between water mains and sanitary and storm sewer, wastewater or stormwater force mains, and reclaimed water mains shall be in accordance with the following:

1. Wherever possible, water mains shall cross over existing or proposed gravity sanitary sewer, vacuum type sanitary sewer, and storm sewer, so the outside of the water main is at least six inches above the outside of the sewer. Where it is not possible for the water main to cross over existing or proposed gravity sanitary sewer, vacuum type sanitary sewer, and storm sewer, then the water main can cross under these types of pipeline systems provided the outside of the water main is at least 12 inches below the outside of the pipeline. At the crossing, the proposed pipe joints shall be arranged so that all water main joints are at least three feet from vacuum type sanitary sewer or storm sewer joints, and at least six feet from gravity sanitary sewer joints.

2. Wherever possible, water mains shall cross over existing or proposed reclaimed water mains, wastewater force mains and stormwater force mains. Whether the water main crosses over or under these types of pipeline systems, the outside of the water main shall be at least 12 inches from the outside of the existing or proposed reclaimed water main, wastewater force main and stormwater force main. At the crossing, the proposed pipe joints shall be arranged so that all water main joints are at least three feet from reclaimed water main joints and stormwater force main joints, and at least six feet from the joints of wastewater force mains.

C. No water main shall pass through or come in contact with any part of a sanitary sewer manhole.

D. Any construction variances must be approved by Orange County and FDEP prior to use.

3.04 PLUGS

A. Installed piping systems shall be temporarily plugged at the end of each day's work, or other interruption to progress on a given line. Plugging shall be adequate to prevent entry of small animals or persons into the pipe or the entrance or insertion of deleterious materials.

B. Standard plugs shall be inserted into all dead-end pipes, tees, or crosses; spigot ends shall be capped; flanged and mechanical joint ends shall have blind flanges of metal.

C. Plugs installed for pressure testing shall be blind flanges fully secured and blocked to withstand the test pressure.

D. Where plugging is required because of contract division or phasing for later connection, the ends of such lines shall be equipped with a permanent type plug or blind flange. Installation or removal of such plugging shall be considered incidental to the work.

3.05 DUCTILE IRON PIPE

A. Mechanical joints: install according to the manufacturer's specifications. Socket and gasket shall be clean and gasket shall be properly centered before joint is made.

B. Push-On Type Joints: Remove any foreign matter in the gasket seat, wipe gasket clean, flex and place in socket. Apply thin film of lubricant to inside surface of gasket. Complete joint assembly by forcing the plain end of the entering pipe past the gasket until it makes contact with the bottom of the socket.

C. Flanged Joints: Bolt flanged joints with care so there is no restraint on the opposite end of the piece, which would prevent pressure from being evenly and uniformly applied upon the gasket. The pipe or fitting must be free to move in any direction while bolting. Gradually tighten bolts, each in turn, at a uniform rate of gasket compression around the entire flange.

3.06 BURIED AND EXPOSED VALVES

A. Buried valves 6 inch diameter and larger shall be set on a foundation of solid concrete or stone not less than 8 inches thick nor less than one cubic foot in volume. Foundations shall be set on firmly compacted ground.

B. The height of the valve and its supporting foundation shall conform to the height of the connecting pipe. Valves shall be set in a vertical position unless otherwise indicated on the Drawings.

C. Exposed valves shall be installed in a vertical position wherever possible. Unless otherwise indicated or directed by the Engineer, valve stems shall never be below a horizontal position.

D. Open and close each valve observing full operation prior to installing successive lengths of pipe.

3.07 VALVE BOXES AND CURB BOXES

A. Boxes shall rest on the valve and shall be adjusted so that the cover may be set flush with paving; in areas without paving, set the cover as directed by the Engineer. Boxes shall be set to allow equal movement above and below finish grade.

B. The base of the box shall be centered over the valve, and the top of the base section shall be approximately on line with the nut on top of the valve stem. The entire assembly shall be plumb.

3.08 INSTALLATION OF IDENTIFICATION AND WARNING TAPE

A. Install identification tape on all pipelines. Place tape as follows:

1. 2 inch through 8 inch diameter pipe - center along top half of pipe

2. 10 inch through 18 inch diameter pipe - place along both sides of the top half of pipe

3. 20 inch diameter and larger pipe - place on both sides of top half of pipe with a third strip centered along top half of pipe

B. Place tape from joint to joint on every section of pipe.

C. Install warning tape along all pipelines. Install 2 feet above pipe, minimum of 1 foot below grade.

3.09 LOCATOR WIRE

Install locator wire along all pressurized pipelines 2 inch diameter and larger. Loop wire into all valve boxes. Test all wire for electrical continuity. Repair or replace locate wire at failed test locations.

3.10 TESTING GENERAL REQUIREMENTS

A. Test procedures and method of disposal of water shall be approved by the Engineer. All tests shall be made in the presence of the Engineer and utility. Preliminary tests made by the Contractor without being observed by the Engineer will not be accepted. Notify the Engineer and the utility companies at least 48 hours before any work is to be inspected or tested.

B. All defects in piping systems shall be repaired and/or replaced and retested until acceptable. Repairs shall be made to the standard of quality specified for the entire system.

C. Sections of the system may be tested separately, but any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested. Pressure tests shall be made between valves to demonstrate ability of valves to sustain pressure.

D. Provide all necessary test equipment. Increments on gages used for pressure pipe testing shall be of scaled to the nearest 1 psi. Gages, pumps, and hoses shall be in good working order with no noticeable leaks.

E. Tests for any exposed piping shall be made before covering and insulation is placed.

F. The pressure and leakage test for buried piping shall be made after all jointing operations are completed and restraints have been in place at least seven days. Lines tested before backfill is in place shall be retested after compacted backfill is placed.

G. All service connections to water and reclaimed water mains shall be completed prior to testing.

H. Sections of piping between valves and other short sections of line may be isolated for testing. If shorter sections are tested, test plugs or bulkheads required at the ends of the test section shall be furnished and installed by Contractor, together with all anchors, braces, and other devices required to withstand the hydrostatic pressure without imposing any thrust on the pipe line. Contractor shall be solely responsible for any damage that results from the failure of test plugs or supports.

I. All items including valves and controls shall be given a thorough test. The entire system shall be operated for two days to prove compatibility of equipment and to achieve proper adjustment for operation. Valves, pipes, tanks, and other items that are non-operating or occasional-operating shall be tested for ability to meet design criteria.

3.11 PRESSURE AND LEAKAGE TESTING (DI MAINS)

Note: All testing and inspection for acceptance of reclaimed water systems shall meet requirements listed in Orange County Utilities Standards in Construction Manual Section 4510.

A. Preliminary flushing may be accomplished through full diameter flush or swabbing.

1. Preliminary flush shall have a minimum of 2.5 feet per second full diameter in accordance with AWWA C651 Standard, “Disinfecting Water Mains”. Flushing shall be allowed for pipes less than or equal to 12-inch.

2. Swabbing

a. In lieu of flushing, new reclaimed water mains may be hydraulically or pneumatically cleaned with a polypropylene swabbing device to remove dirt, sand, and debris from main.

B. Piping shall be slowly filled with water and all air expelled. Care shall be taken that all air valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air valves.

C. Apply hydrostatic test pressure of 150 psi (water mains), for 10 minutes and for such additional period necessary for the Engineer to complete the inspection of the line under test. Do not exceed pipe manufacturer's suggested time duration at the test pressure. If defects are noted, repairs shall be made and the test repeated until all parts of the line withstand the test pressure.

D. Apply leakage test pressure of 150 psi (water mains). Maintain pressure at a maximum variation of 5 percent during the entire leakage test. The duration of the leakage test shall be two hours minimum, and for such additional time necessary for the Engineer to complete inspection of the section of line under test. Leakage measurements shall not be started until a constant test pressure has been established. The line leakage shall be measured by means of a water meter installed on the supply side of the pressure pump.

E. No leakage is allowed in exposed piping, buried piping with flanged, threaded, or welded joints or buried non-potable piping in conflict with potable water lines.

F. Tested sections of buried piping with slip type or mechanical joints will not be accepted if it has a leakage rate in excess of that rate determined by the formula:

AWWA C-600 $$L = \frac{SD\sqrt{P}}{148{,}000}$$

L = Maximum permissible leakage rate, in gallons per hour, throughout the entire length of line being tested.

S = Length of line tested (in feet).

D = Nominal internal diameter (in inches) of the pipe.

$\sqrt{P}$ = The square root of the actual pressure in psig on all joints in the tested portion of the line. This actual pressure shall be determined by finding the difference between the average elevation of all tested pipe joints and the elevation of the pressure gauge and adding the difference in elevation head to the authorized test pressure.

G. All apparent leaks discovered within one year from the date of final acceptance of the work by the Owner shall be located and repaired by Contractor, regardless of the total line leakage rate.

END OF SECTION

SECTION 02810

SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

Provide all materials, water, equipment, transportation, tools, and labor, to establish grass plus all items called for or that can be reasonably inferred from the drawings, including sodding, grading, fertilizing, watering, mowing, replacing and maintaining the area for a complete job. Sod all areas disturbed. Seed and mulch not allowed.

1.02 APPLICABLE PUBLICATIONS

Portions of the publications listed below form a part of this specification only to the extent referenced.

A. Florida Department of Transportation, "Standard Specification for Road and Bridges Construction" (Fla. DOT SPEC).

B. Turfgrass Producers Association of Florida, "Standards of Sod Quality."

1.03 RECORDS

Submit written weekly records to the County of all grassed areas for use in determining the beginning and ending of the maintenance period for each area. The records shall indicate the date of grassing, fertilizing and mowing, the type (sod), quantity (sf. ft., sq. yds., or acres) and location of grassing.

1.04 SUBMITTALS

A. Submit Shop Drawings in accordance with the General Conditions, Section 01300 and the following. Submit certificates stating that the materials conform to the requirements of this specification as follows.

1. Certificate from sod producer stating that sod meets the requirements for "Florida Standard Grade" as defined by the Turfgrass Producers Association of Florida, and set forth in paragraph "SOD" of this specification.

2. Fertilizer manufacturer's certificate of analysis including Nitrogen, Phosphorus Potash and complete micro-nutrients in accordance with paragraph "Fertilizer" of this specification.

PART 2 - PRODUCTS

2.01 SOD

A. Argentine Bahia with well matted roots. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 24-inch or larger, except where 6-inch strip sodding is called for.

B. The sod shall have no visible broadleaf weeds when viewed from a standing position and the turf shall be visibly consistent with no obvious patches of foreign grasses. In no case may the total amount of foreign grasses or weeds exceed 2% of the total canopy. Florida Standard Grade sod shall be neatly mowed and mature enough that when grasped at one end it can be picked up and handles without damage. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured, at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling.

2.02 FERTILIZER

Commercial grade, controlled release, granular fertilizer consisting of blend of coating prilled urea with iron included in a slowly soluble form, free flowing and uniform in composition conforming to Florida DOT Specification 982-1, and bearing the manufacturer's guaranteed statement of analysis by weight of 12 parts nitrogen, 8 parts phosphoric acid and 8 parts potash, plus complete micronutrient including magnesium, sulfur, zinc, manganese, copper and boron.

2.03 SOURCE REQUIREMENTS FOR SOD AND MULCH

Comply with all current restrictions for transporting sod and mulch material from or through quarantine areas for the white fringed beetle, witchweed, and West Indian sugar cane borer weevil, as issued by the Division of Plant Industry, Florida Department of Agriculture and the Animal and Plant Health Inspection Service, U.S. Department of Agriculture.

2.04 WATER FOR GRASSING

Water shall be free of acid, alkali, or organic materials and shall have a pH of 7.0 to 8.5. Provide all water needed for grassing. Provide permanent or temporary piping and valves,

and temporary trucks to convey water from the source to the point of use. Provide any meters required and pay for water used if the water is taken from a public water system. Water shall be free of petroleum products, pesticides and any other deleterious constituents. Plant reclaimed water is available for watering. Contractor is responsible for pumping of reclaimed water source. Coordinate with Owner's representative for pumping access.

PART 3 - EXECUTION

3.01 COORDINATION OF WORK

Coordinate all work activities to provide for establishment of grass cover at the earliest possible time in the construction schedule to minimize erosion of topsoil.

3.02 CONSTRUCTION METHODS – GENERAL

A. Provide and establish grass in all areas designated on the drawings or that are disturbed during construction (except areas to be paved, landscaped or covered with structures).

B. Do not fertilize when wind velocities exceed 15 miles per hour. Sod only when the soil is in proper condition to induce growth.

C. When a length of roadway slopes or adjacent areas have been graded and made ready, commence grassing in accordance with these specifications. Incorporate grass covering into the project at the earliest practical time in the life of the contract to reduce potential erosion.

D. Store fertilizer in dry locations away from contaminants. Sprinkle sod with water and protect from exposure to wind and direct sunlight until planted. Provide covering that will allow air to circulate so that heating will not develop.

3.03 CONSTRUCTION METHODS FOR GRASSING

A. The location of grassing will be as called for in the drawings. If the type is not designated, match the type of grass in adjacent areas.

B. Sequence of Operations: The several operations involved in the work shall proceed in the following sequence:

1. Preparation of the ground.

2. Sodding.

3. Watering and maintaining.

3.04 PREPARATION OF AREA TO BE GRASSED

A. Prepare the areas to be grassed by disc-harrowing and thoroughly pulverizing them to a depth of at least 6 inches.

B. Bring all areas to be grassed to finished grades, remove weeds, surplus dirt and rock debris over 1 inch in diameter, and rough grade the area.

C. Test the soil for pH. If the soil is below a pH level of 5.5, spread lime to raise the pH level to at least 5.5

D. Uniformly apply fertilizer at the rate of 400 to 500 pounds per acre. Immediately after the fertilizer and/or lime are spread over the area, mix them into the soil to a depth of approximately 4 inches.

E. Float the area to a smooth uniform grade. Slope all areas to drain. Establish flow lines as shown on the drawings. Finish areas to be grassed approximately 1 inch below top of adjoining curb or pathway.

3.05 SODDING

A. Incorporate sodding into the project at the earliest practical time in the life of the contract. Do not use sod which has been cut for more than 3 days. Stack any sod which is not planted within 24 hours after cutting and maintain properly moistened.

B. Place the sod on a prepared surface, with abutting joints. Fill any gaps or cracks between sod blocks with sod. Roll with a minimum one-ton roller to obtain an even surface. Bring the sod edge in a neat, clean manner to the edge of all paving and shrub areas and project limits.

C. Where sodding is used in drainage ditches, stagger the setting of the pieces to avoid a continuous seam along the line of flow.

D. On areas where the sod may slide due to height and slope, peg the sod with pegs driven through the sod blocks into firm earth at suitable intervals. Replace any pieces of sod which, after placing, show an appearance of extreme dryness.

3.06 MOWING

A. Mow first when the grass reaches a height of 3 to 4 inches. Mow a second time when the grass reaches a height of 6 inches and before a seedhead occurs. Subsequent mowings should establish a uniform grass surface of 2 ½ inches and be made before seedhead occurs. All mowings should be made with a cut height as low as possible to stop shading of the Bahia grass.

B. Mow sod to establish a uniform grass surface of 2 ½ inches.

C. Provide equipment for mowing that does not rut the soil surface. Fill any ruts that are in excess of two (2) inches deep with native soil free from twigs and rocks larger than 1 inch in diameter. Temporarily suspend mowing operations when the soil is too wet to provide adequate support and traction for equipment.

3.07 WATERING

A. Maintain a balanced watering program until the acceptance of work.

B. Apply water in sufficient quantities and as often as seasonal conditions require keeping the grassed areas moist.

C. Provide supplemental water and irrigate seed areas when the rainfall is not CONTRATOR's responsibility to determine the quantities of water required and when to irrigate. This obligation shall remain in full force and effect until final acceptance of the work by the County and shall be provided at no additional cost to County.

D. County, at his discretion, may relieve Contractor of this obligation at such time as County is able to provide irrigation. This action, however, does not relieve Contractor of the provisions and guarantees set forth in the Contract Documents.

3.08 MAINTENANCE

A. Maintain all grassed areas for a period of 90 days after the date of substantial completion and guarantee against all defects and faults of material and workmanship.

B. Maintain grass areas by watering, fertilizing, and mowing to establish an even and uniform grass surface of 2 ½ inches, as specified above.

C. In the event that the grass exhibits iron chlorosis symptoms during the establishment period, apply liquid iron at manufacturer's recommended rates.

3.09 GUARANTEE

A. Guarantee all grasses areas to be alive and in satisfactory growth at the end of the maintenance period (90 days).

B. Replace any grass that is dead or not in satisfactory growth, as determined by the County or County's representative. Guarantee new sod or seed for an additional 90 days.

C. The term "Satisfactory Growth" as used in this section is defined as even plant growth in healthy conditions without bare spots larger than one square foot in seeded areas and without bare spots in sodded areas resodded. All grassed and sodded areas shall be maintained until satisfactory growth has been demonstrated. In the event that the subsequent stand of grass is found to be contaminated with weeds or other obnoxious or undesirable growth, effectively eliminate such undesirable growth, at the CONTRACTOR's expense.

D. Replace sod with the same variety as initially specified.

3.10 INSPECTION

A. Request inspection from the County and his representative at least 72 hours in advance of the time inspection is required.

B. Provide an authorized representative to be on-site during inspection.

END OF SECTION

SECTION 02820

FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Fence Requirements

B. Fence Gates

C. Lift Station Site Fencing

D. Barbed wire fencing and timber posts

1.02 REFERENCES

A. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction and Roadway and Traffic Design Standards, latest implemented editions:

1. Index No. 802 - Fence Type B
2. Specification Section 550 - Fencing

1.03 SCOPE OF WORK

A. Furnish all materials, equipment, transportation, tools and labor, unless otherwise specified, to construct fencing and other appurtenances, and all items called for or that could reasonably be inferred from the drawings, including fabric, posts, frame, bracing, gates and all accessories for a complete job ready to operate. If any items for a complete job are omitted or not shown, the Contractor shall furnish and install the same without cost to the Owner.

B. For projects that require fence to be removed and replaced, the intent is to reinstall removed fence. Where fence has been damaged or cannot be reused, replace with new fence meeting these specifications and matching the height, color of fabric, and accessories (such as barbed wire attachments) as the existing fence.

1.04 SUBMITTALS

A. Provide product data and shop drawings for all posts, rails, chain link fence fabric, tension wire, gates.

B. Provide drawings indicating the location of all pull posts and gate locations.

PART 2 PRODUCTS

2.01 GENERAL

All fence and gate material shall be FDOT Fence Type B, per FDOT Roadway and Traffic Design Standards and Standard Specifications for Road and Bridge Construction. Per these standards, there are a number of options for the fence materials. Listed below are the material options selected by the Owner to be used for this project.

2.02 LINE POSTS

A. Zinc galvanized steel pipe (galvanized at 1.8 oz per square foot), Schedule 40, vinyl coated black, class A bonded.

B. Required Size:

1. General Fencing (ponds, right-of-way): 1½ inch nominal diameter
2. Lift Station Site Fencing: 2 inch nominal diameter

2.03 CORNER, END, AND PULL POSTS

A. Zinc galvanized steel pipe (galvanized at 1.8 oz per square foot), Schedule 40, vinyl coated black, class A bonded.

B. Required Size:

1. General Fencing (ponds, right-of-way): 2 inch nominal diameter
2. Lift Station Site Fencing: 3 inch nominal diameter

2.04 RAIL

A. Zinc galvanized steel pipe (galvanized at 1.8 oz per square foot), Schedule 40, vinyl coated black, class A bonded.

B. Required Size:

1. General Fencing (ponds, right-of-way): 1¼ inch nominal diameter
2. Lift Station Site Fencing: 1½ inch nominal diameter

2.05 CHAIN LINK FABRIC

A. No. 9 gage steel wire zinc coated (coated at 1.8 oz per square foot). The gage requirement refers to the wire plus zinc coated diameter, and does not include any other coatings.

B. Wire to be vinyl coated black, class A bonded.

C. Top to be twisted and barbed, bottom to be knuckles.

D. Required Mesh Size:

1. General Fencing (ponds, right-of-way): 2 inch
2. Lift Station Site Fencing: 1 inch

E. Required Height (measured from bottom of fabric to top of fabric):

1. General Fencing (ponds, right-of-way): 6 feet
2. Lift Station Site Fencing: 7 feet

2.06 TENSION WIRE

A. No. 7 gage steel wire zinc galvanized (galvanized at 1.8 oz per square foot). The gage requirement refers to the wire plus zinc coated diameter, and does not include any other coatings.

B. Wire to be vinyl coated black, class A bonded.

2.07 TIE WIRE

A. No. 9 gage steel wire zinc galvanized (galvanized at 1.8 oz per square foot). The gage requirement refers to the wire plus zinc coated diameter, and does not include any other coatings.

B. Wire to be vinyl coated black, class A bonded.

2.08 GATES

A. Provide double swing gate, 16 feet opening, hinged to swing total of 180 degrees so gate can swing in or out. Also provide latches, locking device, and gate stop keeper (cane bolt and cane bolt anchor base embedded in concrete).

B. All materials to match fencing materials identified above.

C. Height of gate to match height of fence.

2.09 BARBED WIRE ATTACHMENT

Provide barbed wire attachment per FDOT Index No. 802 along all lift station site fencing plus other areas designated on the drawings.

2.10 BARBED WIRE FENCING AND POSTS

Barbed wire shall be two strands of light gauge galvanized steel, twisted with barbs. All posts shall be pressure treated timber, 4 inch diameter line posts, 10 inch diameter corner posts.

2.11 MISCELLANEOUS HARDWARE

Zinc coated commercial grade steel. Paint black or as directed by Owner.

PART 3 EXECUTION

3.01 POSTS

Embed all posts in 3000 psi concrete bases. All posts to extend 3 feet minimum into concrete base. All concrete base diameters to be 12 inches, top of base to crowned 1 inch above grade, bottom of base to be 6 inches below bottom of post.

3.02 FENCE FABRIC, WIRE, RAILS, AND ACCESSORIES

A. Install per FDOT requirements.

B. Barbed wire attachments are to be installed facing outward.

3.03 GATES

Provide gate stop keeper embedded in concrete.

3.04 BARBED WIRE FENCE

Embed barbed wire fence posts 33 inches (line), 39 inches (corner). Embed corner posts in concrete. Provide bracing and ties as necessary at the fence corners to ensure a stable fence.

END OF SECTION

SECTION 03300

CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

General requirements for formwork, reinforcement, accessories and cast-in-place concrete.

1.02 REFERENCES

A. American Concrete Institute (ACI) latest edition:

1. ACI 301 - Structural Concrete for Buildings
2. ACI 305 - Hot Weather Concreting
3. ACI 306 - Cold Weather Concreting
4. ACI 315 - Detailing Manual
5. ACI 318 - Building Code Requirements for Structural Concrete
6. ACI 347 - Formwork for Concrete

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition:

AASHTO T152 - Air Content of Freshly Mixed Concrete by the Pressure Method

C. American Society for Testing and Materials (ASTM) latest edition:

1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Reinforced Concrete
2. ASTM A615 - Deformed and Plain Billet Steel Bars
3. ASTM C31 - Making and Curing Concrete Test Specimens in the Field
4. ASTM C33 - Concrete Aggregates
5. ASTM C39 - Test Method for Compressive Strength
6. ASTM C94 - Ready-Mixed Concrete
7. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content
8. ASTM C143 - Test Method for Slump of Hydraulic Cement Concrete
9. ASTM C150 - Portland Cement
10. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete (Volumetric Method)
11. ASTM C231 - Test Method for Air Content of Freshly Mixed Concrete (Pressure Method)
12. ASTM C260 - Air-Entraining Admixtures for Concrete
13. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
14. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

1.03 SUBMITTALS

A. Submit reinforcement steel shop drawings in accordance with Division 1, the General Conditions and prepared in accordance with ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures. Drawings shall indicate bending diagrams, shapes, dimensions, clearances, splicing and laps, accessories, and installation notes.

B. Submit manufacturer's literature for all admixtures proposed for the work.

C. Submit delivery tickets in accordance with ASTM C94 for each batch of ready-mixed concrete. Information on the ticket shall include class of concrete, water content, time of loading, truck number, admixtures, and quantity.

D. At least 35 days prior to placing of concrete, the CONTRACTOR shall submit proposed mix proportions and samples of proposed materials.

1.04 QUALITY CONTROL

A. Materials and methods of mixing and placing concrete shall conform to ACI 318, Building Code Requirements for Reinforced Concrete.

B. Tests for slump shall be made when directed by the ENGINEER in accordance with ASTM C143.

C. Air content tests shall be made, when directed by the ENGINEER, in accordance with ASTM C138, C173, C231, or AASHTO T-152.

PART 2 PRODUCTS

2.01 FORMWORK

Formwork lumber shall be straight and clean. All nails shall be withdrawn and surfaces in contact with concrete shall be thoroughly cleaned before reuse.

2.02 REINFORCEMENT

A. Reinforcement bars shall be ASTM A615, Grade 60 deformed bars, except as otherwise indicated.

B. Smooth dowels shall be ASTM A615, Grade 60 plain bars.

C. Threaded dowels shall be ASTM A36.

D. Welded wire fabric shall conform to ASTM A185. Where welded wire fabric is shown but not sized on Drawings, use 6" x 6" x W2.9 x W2.9 WWF.

E. Accessories for proper installation of reinforcement shall conform to CRSI "Manual of Standard Practice for Reinforced Concrete Construction". Bar supports at exposed surfaces shall be Class C-Plastic Protected.

F. Reinforcement fabrication shall conform to ACI 315 and ACI 318, and approved shop drawings.

2.03 JOINT FILLERS

A. Joint fillers shall be products of the following manufacturers, or equal:

1. W. R. Meadows, Inc., Elgin, Illinois.

2. W. R. Grace and Co., Cambridge, Massachusetts.

B. Preformed bituminous fiber joint filler shall be non-extruding type conforming to ASTM D1751.

C. Control joint strips shall have a minimum depth of 25 percent of slab thickness and a minimum thickness of 1/8 inch.

2.04 CONCRETE MATERIALS

A. Water shall be clean and potable.

B. Portland cement shall be ASTM C150 Type I, II or III.

C. Aggregate

1. Fine and coarse aggregate shall be clean, hard, natural, or manufactured material conforming to ASTM C33.

2. The nominal maximum size of the aggregate shall not be larger than three-fourths of the minimum clear spacing between individual reinforcing bars. Coordinate with maximum aggregate sizes specified hereafter for classes of concrete.

D. Admixtures

Admixtures shall conform to ASTM C260 (air entrainment) or C494 (water reduction) and shall be products of one of the following manufacturers, or equal.

1. Dewey and Almy Chemical Div., W. R. Grace and Co.

2. Euclid Chemical Co.

3. Master Builders Co.

4. Sika Chemical Corp.

2.05 MISCELLANEOUS MATERIALS

A. Vapor barrier shall be polyethylene film 0.006 inches thick and shall conform to Product Standard PS-17.

B. Liquid Membrane Curing Compound

1. Membrane curing compound shall conform to ASTM C309, Type 1 or Type 2. Type 2 compound shall be used for Portland cement concrete pavement only. All permanently exposed exterior slabs shall receive clear acrylic curing and sealing compound. Moisture loss shall not be more than 0.055 gr./sq. cm when applied to 200 sq. ft./gal.

2. Products shall conform to the above and shall be products of one of the following manufacturers, or equal:

   a. W.R. Meadows "Curettard"
   b. Sonneborn-Contech "Sonsil"
   c. Burke Co. "Res-Xnu"
   d. Lambert Corp. "Gardseal"

C. Chemical Hardener

1. Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, conforming to Federal Specifications TT-C-800A and Corps of Engineers Specification CE 204.

2. Products shall conform to the above and shall be products of one of the following manufacturers, or equal:

   a. Euclid Chemical Co. "Surfhard"
   b. Sonneborn-Contech "Lapidolith"
   c. Master Builders "Saniseal"
   d. Lambert Corp. "Solidus"

2.06 CONCRETE MIXTURES

A. Concrete not indicated otherwise shall be Class A concrete.

B. The proportions of cement, aggregate, and water shall be selected by the CONTRACTOR in accordance with ACI 318 to provide a plastic and workable mix. Coarse aggregate shall be limited to prevent harshness and honeycombing. Coarse aggregate size shall not be greater than the maxima listed for the various classes of concrete and as previously specified under aggregate.

C. Class A Concrete: Class A structural concrete shall have a 28-day strength of 4000 psi, shall contain not less than 540 pounds (5-3/4 bags) of cement per cubic yard of concrete, shall have a water-cement ratio of not more than 0.47 (5-1/4 gallons per bag of cement), and shall contain 4 percent to 6 percent entrained air, by volume,

except interior slabs subject to abrasion shall not contain more than 3 percent entrained air. In addition, Class A concrete shall contain a water-reducing, densifying admixture and have a maximum slump of 4 inches. The maximum aggregate size for slabs shall be 1 inch.

D. Class B Concrete: Class B lean concrete shall have a 28-day strength of 2500 psi, it shall contain not less than 420 pounds (4-1/2 bags) of cement per cubic yard of concrete, shall have a water-cement ratio of not more than 0.71 (8 gallons per bag of cement), and shall have a 5-inch maximum slump. The maximum aggregate size shall be 2 inches.

E. Admixtures

1. Water-reducing densifying admixture added to Class A concrete shall reduce the water-cement ratio while maintaining slump and compressive strength. Use as manufacturer recommends.

2. Other admixtures may be proposed by the CONTRACTOR or requested by the ENGINEER and shall be provided at no additional cost to the OWNER. Subject to approval, admixtures may be used for the following:

a. To increase slump up to 50% while maintaining compressive strength and water-cement ratio.

b. To retard set during hot weather.

3. Calcium chloride, admixtures containing calcium chloride, or admixtures not approved, in writing by the ENGINEER, are prohibited.

PART 3 EXECUTION

3.01 GENERAL

A. Comply with ACI 305 or 306 for hot or cold weather concreting.

B. Do not mix salt, chemicals, or other foreign materials with the concrete to prevent freezing without approval of the ENGINEER. Maintain the temperature of concrete above 50 degrees F for 5 days after placement. When high early strength Portland cement concrete is used, the temperature shall not be less than 70 degrees F for 2 days or 50 degrees F for 3 days.

C. In no case shall the temperature of concrete exceed 90 degrees F at the time of placement.

3.02 PREPARATIONS

A. Coordinate with other trades and properly place and locate in position all necessary dowels, bolts, anchors, anchor slots, inserts, sleeves, openings, hangers, metal ties and other fastening devices required for attachment and support of adjacent work. Securely anchor all embedded items.

B. The subgrade and/or bedding shall be compacted and free of frost. If placement is allowed at temperatures below freezing, provide temporary heat and protection as required to remove all frost. Saturate the subgrade approximately 8 hours before placement and sprinkle ahead of the placement of concrete in areas where vapor barrier is not used. Remove all standing water, ice, mud, and foreign matter before concrete is deposited.

C. On porous subgrade or beddings, or where indicated on the Drawings, provide vapor barrier. Lay vapor barrier sheets with 6-inch edge laps and tape or seal with mastic. Stretch and weight edges and laps to maintain their positions until concrete is placed. Coordinate with placement of reinforcement.

3.03 FORMWORK REQUIREMENTS

A. Formwork shall comply with ACI 347 and to shape, lines and dimensions as indicated on the Drawings. Forms shall be properly braced or tied to maintain position and shape under all dead and live loads and to prevent leakage. Forms shall be assembled so their removal will not damage the concrete. Tolerances for formed surfaces shall be in compliance with ACI 301.

B. Lumber formwork may be used for surfaces which will not be exposed to view. Use plywood or metal forms for exposed surfaces.

C. The inside surface of lumber forms shall be soaked with clean water prior to placing concrete. All other forms shall be treated with an approved form oil or lacquer. If oil is used, all excess oil shall be wiped off.

3.04 REINFORCEMENT

A. The placement of reinforcing steel shall conform to "Placing Reinforcing Bars", as published by the Concrete Reinforcing Steel Institute except as noted.

B. Reinforcement shall be inspected and approved by the ENGINEER before enclosing forms are erected and shall be rechecked immediately prior to depositing concrete.

C. Splices, Laps, and Dowels

1. Provide continuous reinforcement or dowels through construction joints. One half of reinforcement shall be discontinued across control joints unless otherwise indicated. All reinforcement shall be discontinued across expansion joints.

2. Splice laps shall be as indicated on the Drawings. Dowels shall be of the same size as the largest bar to which they lap, unless otherwise indicated.

3. Splices for horizontal wall reinforcement of circular tanks shall be staggered so that no more than each fifth bar in each face is spliced within any two feet of wall perimeter. Slab reinforcement splices for circular tanks shall be staggered as indicated on the Drawings. The minimum length of staggered

lap splices in circular structures shall be as indicated on the Drawings.

D. Fabric Reinforcement for Slabs

1. Fabric reinforcement for slabs shall be overlapped at splices not less than the spacing of the cross wires plus 2 inches. Fabric shall extend to within 4 inches of concrete edges.

2. Unless otherwise shown, place reinforcement 2 to 3 inches below the top of the finished slab. Mesh shall either be sandwiched between two layers of fresh concrete or supported on mesh supports. Supports that may puncture the vapor barrier, if any, shall not be used.

E. Reinforcement for Formed Concrete

Secure steel reinforcement to maintain proper position during concrete placement. Concrete protection for reinforcement shall conform to ACI 318, except as otherwise indicated on the Drawings. The distance from the center of reinforcing bars to the opposite face of all structural slabs, walls, columns, or beams shall conform to ACI 318. The distance may be increased provided the required cover is maintained.

3.05 JOINTS

A. Provide construction joints with shear transfer keyways as indicated.

B. Tops of edge forms and screeds shall be set to the finished elevations and to provide uniform pitch to drains as indicated on Drawings.

C. For drives, pavements, parking areas, walks and slabs on grade, provide preformed non-extruding asphalt strip or bituminous fiber joint filler set 1/8-inch below finished surface unless otherwise indicated. Tool concrete edges on each side of joint. No sealant is required.

3.06 BATCHING

A. Materials for concrete shall be proportioned and batched according to the approved design mix.

B. Water shall be measured to within 1 pint of the total amount required per batch. Admixtures shall be measured by weight or volume to an accuracy of 3 percent.

3.07 MIXING AND TRANSPORTING CONCRETE

A. Concrete shall be ready-mixed or job-mixed at the CONTRACTOR's option. Ready-mixed concrete shall be mixed and delivered to the project in accordance with ASTM C94. Job-mixed concrete shall be in accordance with the requirements of ACI 318.

B. Concrete shall be in its final position within one hour after the water and aggregate have been added to the cement, except in cool weather (50`F or less).

C. Concrete shall be transported from the mixer to place of final deposit in such manner to prevent separation or loss of ingredients.

3.08 GENERAL CONCRETE PLACEMENT SCHEDULE

All structural concrete.....	Class A Concrete
Sidewalks	Class B Concrete

3.09 DEPOSITING CONCRETE

A. Concrete shall be placed in accordance with the requirements of ACI 318 and within 10 feet of its final position. Place concrete only during normal working hours unless the ENGINEER is notified at least 24 hours in advance. Concrete shall not be placed until the ENGINEER has approved the formwork, reinforcement, and embedded items and debris has been removed.

B. Whenever new concrete is to be placed against existing surfaces, roughen and clean the surface to improve bond.

C. Depositing Slabs and Flatwork

1. Provide runways and chutes to discharge concrete close to final position to minimize spreading and segregation.

2. Place slabs-on-grade using formed construction joints. Maximum size of pour shall be 40 feet each way for slabs with wire mesh reinforcement and 75 feet each way for slabs with bar reinforcement. Allow 24 hours between pours of adjacent slabs. Provide joints as specified or shown. Set continuous joint strips between slabs and abutting vertical surfaces as indicated on the Drawings.

3.10 FINISHING SLABS AND FLATWORK

A. Unless otherwise indicated, provide the following slab finishes:

Description	**Concrete Finish**
Class B concrete surfaces	Float
Submerged slabs	1 troweling
Exposed slabs	3 trowelings
Ramps and walks	Float & broom finish

B. Concrete Tolerances

1. Concrete shall be within ¼-inch of a 10-foot straightedge in all directions except where slabs are dished for drains. Deviations from the elevation indicated shall not exceed ¼-inch.

2. Slabs sloped for drainage shall not have depressions which retain water.

C. Screeding

1. Immediately after placement, screed concrete with straightedges or power strikeoffs. Do not use roller screeds or vibrating screeds.

2. Stakes for wet screeds shall be driven down flush with subgrade or pulled out as work progresses to avoid disturbing screeded concrete.

3. For drains in level slabs, form a 5-foot diameter depression approximately ½-inch below the adjacent slab surface.

4. Unless otherwise indicated on the Drawings, slabs sloped for drainage shall be uniformly pitched toward the drains at 1/8-inch per foot. Form a dished depression at drains unless otherwise indicated.

D. Immediately after screeding, darby surface with wood or magnesium darby to eliminate ridges and to fill in voids left by screeding.

E. Float Finish

1. Float concrete using magnesium or aluminum hand floats or power floats after the concrete has stiffened to a point where only a ¼-inch indentation can be imparted by normal foot pressure.

2. Float finish shall result in a uniform, smooth, granular texture. After floating, check slab tolerances with 10-foot straightedge. Fill low spots with fresh concrete; do not sprinkle with dry cement.

F. Trowel Finish

1. Where scheduled, or indicated, trowel with steel trowels after floating.

2. Initial troweling shall be done either by power or by hand with the trowel blade kept as flat as possible against concrete surface to prevent washboard or chatter effect.

3. Second troweling may be done by power if three trowelings are scheduled. If two trowelings are specified, second troweling shall be done by hand.

4. Third troweling shall be done by hand and shall continue until the concrete is consolidated to a uniform, smooth, dense surface free of trowel marks and irregularities.

5. Allow sufficient time between successive trowelings to allow the concrete to become harder. Each successive troweling shall be done with trowels that are progressively smaller and are tipped more to increase compaction of the concrete surface.

G. Broom at right angles to direction of traffic to give a non-skid finish. Use a fine, soft-bristled broom for pedestrian ramps and walks, and a coarse, hard-bristled broom for vehicular pavement.

3.11 CONTROL JOINTS

A. Control joints for non-structural slabs shall consist of partial depth plastic strips set flush with finished surface or 1/8-inch wide joints cut with a diamond saw. Control joints shall be one-quarter to one-third the depth of the slab unless otherwise indicated.

B. Saw joints as soon as concrete has hardened sufficiently so aggregate will not be dislodged but before shrinkage stresses develop cracks. Sawn joints shall be filled with joint sealant in accordance with Section 07900.

C. Unless otherwise indicated on the Drawings, spacing of control joints shall not exceed 25 feet in each direction.

3.12 PROTECTION AND CURING

A. Comply with ACI 305 and 306 for protecting and curing concrete in hot and cold weather. Fresh concrete shall be protected from rain, premature drying and excessively hot or cold temperatures, and shall be maintained with minimal moisture loss for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Cure all concrete for a minimum period of 7 days (3 days for high early strength concrete) after placing.

B. Flatwork

1. Immediately after finishing, begin curing by covering with constantly saturated moisture retaining fabrics, impervious sheeting, or membrane curing compounds. Surfaces shall be thoroughly wetted with a fine spray before they are covered with sheeting.

2. Sheeting shall provide complete surface coverage with all joints lapped at least 4 inches and shall be placed and secured in a manner that will not mar or damage the concrete surface.

C. Membrane Curing Compounds

1. Apply compound hereinbefore specified in accordance with manufacturer's recommendations. Apply by spraying in a two-coat continuous operation. Apply the coats at right angles to each other with coverage of 200 square feet per gallon per coat. Begin application not later than 4 hours after finishing of the surface. The application shall result in an uninterrupted adherent film free of defects.

2. On surfaces scheduled to receive sealants, paint, seamless flooring, or other adhesive bonded finishes, either the membrane curing compound shall be compatible with the bonding agent or the curing compound shall be removed

with sandblasting, acid etching or grinding, to the satisfaction of the installer of the finish surfacing. Bonded surfaces that fail to adhere to the concrete shall be removed and replaced at no additional cost to the OWNER.

D. Concrete Floor Hardener

1. Apply hardener to floors of mechanical and electrical rooms and in other areas as required. Application shall be in strict accordance with the manufacturer's recommendations and as follows:

a. Hardener shall be applied at original container consistency without dilution to dry, clean surfaces no sooner than 30 days following completion of curing. NOTE: Hardener shall not be applied over surfaces covered with membrane curing agent.

b. Application shall generally be a three-coat process adjusted to accommodate extreme concrete densities only if prior review has been obtained from the Architect. Application coverage shall be made at the approximate rate of one gallon to 100 square feet.

c. Apply first and second coats generously to surface, mop or squeegee standing water to leave a uniformly wet surface, allow to dry. Apply third coat in a manner similar to first two, except that surplus must be scrubbed with stiff bristled broom and flushed from floor surface with clear water. Scrubbing and flushing shall remove all traces of effervescence. Remove excess water and allow to dry.

3.13 DEFECTIVE CONCRETE

A. All concrete not formed as indicated on the Drawings within tolerances specified in ACI 347 shall be removed and replaced.

B. Temperature and shrinkage cracks which develop prior to final acceptance of the work shall be repaired.

3.14 MISCELLANEOUS CONCRETE WORK

Provide concrete equipment pads and supports as indicated and conforming to approved shop drawings. Fastening devices and accessories shall be located by templates or setting diagrams furnished by the manufacturer.

3.15 CLEAN-UP

A. All concrete floor construction shall have the surfaces thoroughly scrubbed and cleaned with clear water. After cleaning, the floors shall be protected until they are accepted.

B. Clean all surfaces affected by the Concrete Work. No extraneous concrete or discoloration shall be left on any construction.

3.16 CONCRETE TESTING

A. Compressive Strength Tests: Conform to ASTM C31 and ASTM C39. One set of four cylinders for each 50 cu. yds., or fraction thereof, of each strength concrete placed in any one day. Test one specimens at seven days; test two specimens at 28 days. One specimen shall be retained for 56 days and tested only at the direction of the ENGINEER.

B. Slump Tests: Conform to ASTM C143. Perform one test for each load point of discharge and one for each set of compressive strength test specimens.

C. A minimum of 24 hours' notification is required for all concrete placement. Contractor to complete the Concrete Placement Form for all placement.

END OF SECTION

SECTION 09901
COATINGS AND LININGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This specification pertains to the coating of above ground assets including but not limited to: steel, ductile iron pipe, ductile iron fittings, valves, hydrants, hardware and all appurtenances. Brass, bronze and 316 Stainless Steel shall not be coated.

1.02 QUALITY ASSURANCE

A. All work shall be proved to be in first class condition and constructed in accordance with the Drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor at no expense 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."

1.04 COVERAGE

A. The protective lining/coating corrosion protection shall cover all concrete surfaces within the wetwell or manhole including the adjustment ring area.

B. Coatings and lining surfaces shall be holiday free and all defects shall be repaired in accordance with the manufacturer’s recommendations prior to the next coat being applied.

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 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, HYDRANTS, FITTINGS AND APPURTENANCES)

Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. All cleaning, surface

preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of AWWA, ANSI, NACE, SSPC, NSF, and ASTM. Color-coding shall be Safety Blue, Safety Green and Pantone Purple 522-C for water, wastewater and reclaimed water respectfully. Surfaces shall be holiday detected in accordance with ASTM G 62. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions. The County shall be notified of time of testing so that he might be present to witness testing.

A. Procedures for Coating Exterior of DIP, Hydrants, Fittings and Appurtenances

1. Surface Preparation: Do not abrasive blast or prepare more surface area than can be coated in the same day; prepare surfaces and apply prime coatings within an 8-hour period.
    a. Steel: Shall require NACE-1/SSPC-SP5 White Metal Blast Cleaning minimum angular anchor profile of 1.5-mils. White metal blast cleaning removes all of the coating, mill scale, rust, oxides, staining, corrosion products, and other foreign matter from the surface.
    b. DIP: DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances), Shall require NACE-3/SSPC-SP6 Commercial Blast Cleaning minimum angular anchor profile of 1.5-mils. Commercial blast cleaning removes all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter from all surfaces and allows stains to remain on 33% (percent) of each unit area of surface.
    c. Note: Primer Option - Hydrants, FBE (Valves and appurtenances), existing factory coatings: Where specifically called out in the Coating System Table below, NACE-4/SSPC-SP7 may be substituted for the commercial blast for hydrants and factory applied FBE (Valves and appurtenances) where the coating manufacturer has specifically provided compatible coatings with existing coatings including urethane, epoxy, alkyd and water-based coatings. Under no circumstances shall DIP with asphaltic seal coat be over-coated. NACE-4/SSPC-SP7 Brush-Off Blast Cleaning shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be removed by lifting with a dull putty knife after abrasive blast cleaning has been performed.
2. Contaminants: Remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating in accordance with SSPC-SP1 for the substrate and between each coating layer.
3. Temperature: Surface temperature of substrate shall be a minimum of 5°F above the dew point and rising and generally between 40°F to 100°F. Temperatures shall not exceed manufacturer’s recommendations.
4. Stripping: Edges, corners, crevices, welds, and bolts shall be given a brush coat/stripe coat for each material/layer. The stripe coat shall be applied by a brush and worked in both directions.
5. Coatings Systems: Two (2) options for coating systems are provided. Each coat shall be a distinctive color or shade to verify each coating in the system.
6. Prime coat: DIP, DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances) prime coat shall be zinc-rich. Zinc-rich shall only be used on

bare metal. Factory applied FBE/Asphaltic/Mastic coatings on valves and appurtenances shall be completely removed per NACE 3 / SSPC-SP6.

7. Note: Where specifically called out in the Coating System Table for factory applied FBE (Valves and appurtenances) surface preparation may be NACE-4/SSPC-SP7 and the prime coat shall be an Inorganic water based epoxy. Asphaltic seal coats and mastics shall not be overcoated with Inorganic water based epoxy.
8. Intermediate coat: Varies per coating system.
9. Final Coat: Varies per coating system.
10. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturers recommendations. All low voltage holiday testing shall be performed using a Tinker & Rasor model M-1 Holiday Detector or equal.
11. Coating Systems: Either System 1 or System 2 shall be used for above ground, non-immersion ferrous metal surfaces (Inclusive of Steel, DIP, Hydrants, Fittings and Appurtenances).

Color Codes

Generic Name	Application	Tnemec	Carboline	PPG / Ameron
Safety Blue	Water Master Meters	True Blue / Safety 11SF	9122	BL Safety Blue
Safety Green	Pump Station Piping	Hunter Green 08SF	V358	GN Safety Green
Pantone Purple 522C	Reclaimed Master Meters	Purple Rain / Safety 14 SF	7528	PL Safety Purple
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF	V358	GN Safety Green
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF	1420	OR 2Safety Orange
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF	7573	RD 2 Safety Red
Safety Silver	Hydrant Barrel	Aluminum 57GR	J766	SL Safety Silver

System 1 - Zinc / Urethane / Fluoropolymer

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0
Prime Coat - option for FBE or Hydrants only. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA
Intermediate Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carbothane 133 HB	3.0 - 5.0
Final Coat.	Advanced Thermoset Fluoropolymer Polyurethane	Hydroflon Series 700	2.0 - 3.0	Carboxane 950	2.0-3.0

System 2 - Zinc / Epoxy / Urethane

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils	PPG / Ameron	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Aromatic Urethane, Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0	Amercoat 68HS	3
Prime Coat option for FBE, Hydrants. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA	NA	NA
Intermediate Coat.	Polyamidoamine Epoxy	Color Hi-Build Epoxoline II Series N69	4.0 - 10.0	Carboguard 60	4.0 - 6.0	Amerlock 2/400	4.0 - 6.0
Final Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carboxane 950	2.0 - 3.0	Amercoat 450H	2.0 - 3.0

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. All materials shall be delivered to the job in original sealed and labeled containers of the coating manufacturer, and shall be subject to inspection by the County. Labels shall show name of manufacturer, type of coating, formulation, date, color and manufacturers recommendations. Coatings manufacturer date shall not exceed the manufacturer's recommendations for storage and useful life and Coatings manufactured in excess of 1-year prior to application shall be rejected.

B. Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other surface preparation method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.

C. All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation.

D. All ferrous metal surfaces shall be free of all defects and have all sharp edges, welds, slag, defects and weld splatter ground smooth in accordance with NACE Standard RPO178.

E. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) for each coating. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating.

F. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up

prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before the next coat is applied in accordance with the coating manufacturer's recommendations for drying time between coats. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color.

G. Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to holidays, sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

H. Surfaces not required to be coated: Brass, Bronze, Stainless steel (Not including SS bolts and nuts)

3.02 INSPECTION FOR ACCEPTANCE

A. The quality of materials, the process of manufacture and the finished sections shall be subject to inspection and approval by the County. Such inspection may be made at the place of manufacture, at the site after delivery or at both places and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Sections that have been damaged after delivery will be rejected and if already installed removed and replaced, entirely at the Contractor’s expense.

B. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer’s drawings. Sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. A 3-year Warranty is required for fading, deterioration, etc.

D. Spare Paints: One (1) unopened gallon of paint for each type and color used shall be provided.

END OF SECTION

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SECTION 11061

VERTICAL TURBINE PUMPS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Vertical turbine pumps and drivers.

b. Testing.

B. The work to be performed under this Section of the Specifications shall include, but not be limited to, the furnishing and installation of the necessary equipment and appurtenances to provide the complete pumping system as indicated on the Drawings and/or as specified herein.

C. Pump manufacturer must certify in writing that pumps and motors can be installed in the existing cans without issue.

1.02 SCOPE

A. The Reclaimed Water Pump Station equipment and appurtenances shall be furnished and installed in the position shown on the Drawings in accordance with recommendations of the Hydraulic Institute and the manufacturer's guarantee requirements for NPSH, lubrication, and other detailed operating requirements. All necessary piping, conduit, valves, wall sleeves, concrete foundation, foundation bolts, fabricated pump head, grouting, pumps, drivers, shafting, power supply, pipe connections, etc., shall be provided to insure a complete and satisfactory installation of pumping equipment.

B. Five (5) vertical turbine pumps shall be furnished and installed in accordance with the manufacturer's recommendations as shown on the Drawings and specified herein. The pumps shall be utilized for pumping reclaimed water from the Ground Storage Tank to customers in the City of Apopka and City of Ocoee.

C. The Contractor shall furnish and install five (5) new pumps with 125 HP motors.

D. Five existing high-tensile steel pump suction barrels are installed at the Reclaimed Water Pump Station as shown on the Drawings and detailed in this Specification Section. All pumps and assemblies must fit within existing cans and operate within the HI recommended limitations for this type of installation. Contractor or Pump Manufacturer shall be responsible to field measure elevations of the cans, pedestals, and existing above ground pipe so that the pumps fit the existing cans and pedestals to meet the elevations of the existing piping. Any changes in pedestals or piping shall be the responsibility of the contractor at no additional cost to the Owner.

E. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment furnished. They are, however, intended to cover the furnishings, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances for the complete pumping system herein specified, whether specifically mentioned in these Specifications or not.

F. Please refer to the Electrical and Control Specifications for the requirements necessary to integrate the new pumps into the County's system.

1.03 QUALITY ASSURANCE

A. Pumps shall conform to the applicable requirements of ANSI/AWWA E101 and Hydraulics Institute Standards, except as modified in this Section. Pumps shall be designed, fabricated, installed, and tested in accordance with the requirements of the Hydraulic Institute Standards and the specified standards.

B. The reclaimed water pumps and equipment shall be new and unused and shall be the standard products of manufacturers having a successful record of operation, manufacturing, and servicing the equipment specified herein for a minimum of five (5) years.

D. Submit certified factory tests in accordance with the standards of the Hydraulic Institute for all pumps. Certified pump performance curves shall be submitted including head/capacity, brake horsepower and pump efficiency for each pump supplied. Test results shall be submitted to and approved by the Engineer prior to shipment of any components. Tests will be conducted at a minimum of five points along the pump performance curve on the actual pumping units to be furnished. All equipment shall be tested as a complete unit by the pump manufacturer who shall certify to its compliance with the project requirements.

1.04 ACCEPTABLE MANUFACTURERS

A. The vertical turbine pumps shall be manufactured in accordance with these specifications by a manufacturer whose high quality has been demonstrated with five years of service in similar installations. All the pumps to be provided under this section shall be supplied by the same manufacturer. Pumps shall be manufactured by Peerless Pump, Deming, Fairbanks Morse, or Aurora/Layne, meeting the performance requirements of this section.

B. Subject to compliance with requirements of this Specification Section, manufacturers offering products that may be incorporated into the work shall be as listed in Appendix D of the Orange County Manual of Standards and Specifications for Wastewater and Water Main Construction.

1.05 SUBMITTALS

A. Certifications

Factory primers and/or finished painting shall be in accordance with Section 09900 of these Specifications. Submit a letter certifying the manufacturer, product designation and specification data of all shop paints and primers to be used for equipment under this section.

B. Shop Drawings

Submit shop drawings of all pumps, drivers, and pump heads for approval in accordance with these Specifications and those of the overall plant construction project. Shop drawings shall include the following features:

1. Manufacturer's specification data and descriptive literature.

2. Performance curves showing capacity in gpm, NPSH, head and pump horsepower from 0 gpm to 130% of design capacity. Characteristics of pumps furnished shall have a maximum tolerance of 1% in head or capacity above or below requirements specified herein.

3. Motor efficiencies and power factors at all design operating points.

4. The following data shall be submitted for each motor:

    a. Manufacturers designation

    b. Horsepower output

    c. Time rating

    d. Temperature rise

    e. RPM at full load

    f. Frequency

    g. Number of phases

    h. Voltage

    i. Full load amperes

    j. Code

    k. Design letter

    l. Service factor

5. Drawings showing general dimensions, openings, connections, construction details of the equipment, wiring diagrams, piping drawings, and weights of major components. Provide a letter that the submitted shop drawings have been derived of field verified elevations and measurements and state the

submitted equipment has been fitted for the installation in this project.

6. Procedures for proper installation.

7. Manufacturer's guarantee.

8. Information about the nature and location of parts, service crews and repair facilities.

9. Factory certification that the bowl assembly meets the specified requirements.

10. Bearing loads and stresses.

11. Certified factory performance testing in accordance with the Hydraulic Institute Standards shall be performed on each new pump to be furnished after fabrication and assembly, but prior to shipment to the project site.

12. Complete master wiring diagrams, elementary and control schematics, including coordination with other electrical control devices, suitable outline drawings shall be furnished for approval before proceeding with manufacture. It is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard pre-printed sheets or drawings simply marked to indicate applicability to this contract will not be acceptable. Refer to the Electrical Drawings for typical control wiring diagrams.

C. Operation and Maintenance Manuals.

1. After approval of shop drawings, submit two (2) complete bound sets and one CD with PDF's of the following:

   a. Operation and maintenance instruction bulletins for each pump and driver.

   b. Complete parts list.

   c. Wire lists and wiring diagrams for all panels.

2. Manuals shall include all cut sheets, drawings, equipment lists, descriptions, etc. that are required to instruct Operation and Maintenance personnel unfamiliar with such equipment.

3. Following startup Contractor shall submit six (6) final copies of the operations and maintenance manuals and two (2) CD's containing PDF versions of the final manual.

1.06 PUMPING CAPACITY DOCUMENTATION

The pump manufacturer shall prepare and submit performance curves for each size of pump

and motor combination furnished. This data shall be based on previous factory tests of similar pumping units that were performed in accordance with the standards of the Hydraulic Institute. Data submitted shall include the following:

A. Head - Capacity Curve

B. Pump Efficiency

C. Brake Horsepower from 0 GPM to 130% of the specified pump design capacity

D. RPM

E. Impeller Diameter

F. NPSH Required

1.07 Pump Painting

A. All wetted metal surfaces not stainless steel or bronze shall receive final finish coatings consisting NSF, Part 61, approved, high solids epoxy applied at the manufacturer's factory, applied a minimum of 10-12 mils, DFT anywhere on the cured, coated surface. These surfaces shall include the exterior of the bowl assembly; interior and exterior of the pump column pipe assembly, and the interior and exterior of the pump discharge head. Provide color options to owners during submittal process.

B. All exposed ferrous metal, except machined bearing surfaces, shall be shop primed in accordance with the project Specifications. A two-coat finish, approved by the Owner, shall be applied to the pump head and motor after installation is completed if coating is damaged during installation.

C. All unexposed surfaces of the pumping equipment shall be finished with a protective finish coating in accordance with the project Specifications.

D. Anchor bolts, pump shafting, and accessories, including pump data plates, shall be masked off to prevent over-coating after installation.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver pumping equipment to the job site at the appropriate time for installation. Equipment items shall be crated or affixed to pallets with protective wrappings. Exercise care to prevent damage from handling.

B. Store mechanical and electrical components off the ground in weather-tight enclosures. Keep equipment dry at all times.

C. Motors not immediately installed on the pump units and wired into control circuits must be stored in an area protected from weather and shall have their space heaters wired to temporary power to prevent moisture damage in the motors.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. 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.

G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.09 MANUFACTURER'S SERVICES

A. The manufacturer of the vertical turbine pumps shall provide the services of a factory-trained service representative to check and adjust the equipment and system when ready to be placed into operation. The manufacturer shall notify the Engineer when the service representative will be at the project site. The serviceman shall train the Owner's operator in the operation and maintenance of the equipment, inspect thoroughly for damage and missing items, check integral equipment supplied by other manufacturers, and make any necessary adjustments. The Owner may take an audio or an audio-video recording of the training session as part of this Contract

B. Prior to start-up, the service representative shall furnish a letter to the Engineer confirming that the installation is in accordance with the manufacturer's recommendations, necessary alignments, and adjustments have been made, and the equipment is ready for operation.

C. All pumps shall be given complete factory performance tests on the pump bowl assemblies of all pumps to demonstrate conformance with the Engineer's requirements as specified herein. Factory performance tests shall be non-witnessed, with performance tests made at full speed and frequency. A minimum of 10 performance points shall be recorded and plotted for each pump, and the curve shall bear the serial number of the tested pump.

D. A written report covering the technician's findings and installation approval shall be submitted to the Engineer prior to system start-up. The installation and testing inspection report shall cover inspections performed, outline in detail any deficiencies noted, and outline in detail corrective measures taken. The technician shall remain on the job site until all deficiencies are corrected, or shall make as many additional trips as required to ensure that the installation is proper and acceptable to the Owner and Engineer.

E. The service representative shall make inspection trips as indicated under Performance Requirements (Item 3.04 of this Section). Notify the Engineer and the Owner at least one week prior to any inspection and furnish a report of the inspection.

1.10 FIELD TEST

A. Prior to acceptance, conduct a field operational test in accordance with Section 01650 of these Specifications to demonstrate each pump's performance, under the observation of the Engineer, to determine if the installed equipment meets the purpose and intent of the Specifications.

B. Tests shall demonstrate that the equipment and work is not defective electrically, mechanically, or otherwise, and that it operates as intended based upon the control system, and is in a safe and satisfactory operating condition.

C. Prior to applying electrical power to any motor driven equipment, the drive train shall be rotated by hand to demonstrate free operation of all mechanical parts.

D. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, and motor power input in kilowatts.

E. The Manufacturer's representative and the Contractor shall conduct a field pumping test of each pump to confirm functionality and satisfactory operation of equipment. The pumps shall each be field tested to establish the field pumping rate, head, and overall efficiency. The field testing shall include measurement of voltage and amperage. Three copies of a report documenting the field testing performance shall be prepared and submitted by the Manufacturer's representative.

F. A written report covering the system start-up shall be submitted to the Engineer not more than two weeks after start-up procedures, outlining in detail any discrepancies, deficiencies, or failures occurring during start-up, and outlining in detail corrective measure taken or to be taken. The technician shall remain on the job site until the pumping system equipment is operating properly, or shall make as many additional trips as required until the system is operating properly.

1.11 GUARANTEE

A. The pump manufacturer shall guarantee all equipment to be free from defects in design, materials and workmanship for three years from the date of final acceptance by the Owner. During the guarantee period, furnish and install replacement parts for any defective component at no additional cost, except for those items which are normally consumed in service such as oil, grease, packing, etc. Failure and replacement of any component within the three (3) year guarantee period shall serve to restart the three (3) year guarantee period for that component.

B. The manufacturer's warranty period shall be guaranteed replacement for three (3) years and a three (3) year warranty on all parts and labor.

C. For additional guarantee requirements, see the General Conditions.

PART 2 PRODUCTS

2.01 VERTICAL TURBINE PUMPS AND DRIVERS

A. General

1. The pumping units required under this Section shall be complete including pumps with proper alignment and balancing of the individual units. Ample room for inspection, repairs and adjustment shall be provided.

2. The discharge head and suction barrel for each pump shall be rigidly and accurately anchored into position. All necessary anchor bolts, nuts and washers shall be Type 304 Stainless Steel and furnished by the Contractor.

3. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, and all other pertinent data shall be suitably secured to each pump and motor.

4. Ample means of lubrication shall be provided for all bearings and parts where required. Alenite or Zerk industrial type fittings, or approved equal, shall be used for grease lubrication.

5. Pumps and motors shall perform the work intended without undue wear and undue heating. The motors shall comply with the requirements of the Electrical Section (Division 16) of these Specifications.

6. Pumps will be exposed to high levels of chlorine residuals. Pumps and seals shall not be adversely affected by a 10 mg/l chlorine residual.

B. Vertical Turbine Pumps

1. Five (5) reclaimed water distribution pumps shall be provided.

2. Furnish and install water lubricated, closed coupled vertical turbine, surface discharge pumps as shown on the Drawings and specified herein. Pumps shall be equipped with split seal with zero leakage. Pumps shall be designated as the Reclaimed Water Distribution Pumps, and shall meet the requirements outlined in Article 2.01(B)(3).

3. Pumps shall be designed to operate at any point on the curve defined by the following operating points:

	Reclaimed Water Pumps
Number of pumps required	5
Maximum Motor Size (HP)	125
Phase & Voltage	3/480
Maximum Pump Design Speed (rpm)	1800
Minimum Pump Column Size (inches)	10
Minimum Pump Discharge Size (inches)	10
Drive Type	Variable Speed
SHUT-OFF DESIGN POINT	
Flow (GPM)	0
TDH (Feet) Minimum	370
PRIMARY DESIGN POINT	
Flow (GPM)	1,250
TDH (Feet)	278
Minimum Hydraulic Efficiency	80%
SECONDARY DESIGN POINT	
Flow (GPM)	1,000
TDH (Feet)	325
Minimum Hydraulic Efficiency	77%
RUNOUT CONDITIONS	
Min. Flow (GPM)	1,600
TDH (Feet)	200
Minimum Hydraulic Efficiency	70%
Maximum $NPSH_{RE}$ (Feet)	30

NOTES:

1. Pumps must be suitable to operate continuously at the specified primary, secondary, and run-out points without cavitation, excessive noise or harmful vibration, and without exceeding the motor nameplate rating without the use of the service factor.

4. The pumping unit shall consist of clip-on type basket strainer, bell type suction, bowl assembly, discharge column, line shaft, discharge head assembly, and driver.

2.02 SUCTION STRAINER

A basket pattern suction strainer constructed of 316 stainless steel of approved design shall be attached to the bottom bowl assembly to prevent any material from entering the pump

bowls that will damage the pump. The suction strainer shall have a net area at least four (4) times the suction pipe area. The maximum opening shall be not more than 75% of the minimum opening of the water passage through the bowl or impellers. Suction strainers shall be designed as vortex suppressors.

2.03 BOWL ASSEMBLY

A. The pump bowls shall be of the best quality, close grained, enameled cast iron equivalent to ASTM A48 Class 30, having a minimum tensile strength of 30,000 psi, free of casting faults, accurately machined and fitted to close dimensions, and with bolt flanges of sufficient cross-section to prevent deflection. Bowls shall be flanged and bolted with stainless steel hardware. Reinforce flanges with at least four ribs which are one-half the flange metal thickness or greater. Use a casting with a diffuser of maximum cross-section to ensure long life. The interior of the bowls are to be lined with porcelain enamel to ensure consistency of output and optimum performance. Suction bowl to have flared opening for minimum vortex.

B. The inside of the casting and all facing shall be accurately machined so as to make a close running fit of impellers, to reduce head loss, and make water-tight joints. Pump bowls shall be vitreous enamel coated.

C. The exposed, wetted surfaces of the pump shall be white blast cleaned, primed, and finish coated with high build epoxy in compliance with NSF, Part 61, to a minimum of 10 mils DFT, anywhere on the coated surface. All machined surfaces are to be left bright and finished.

D. The pump bowls shall be sized for the design flow. Provide sufficient stages to deliver the rated capacity of the pump under the operating conditions.

E. The bowl shaft is to be of minimum 416 stainless steel sized to transmit the full power of the electrical motor driver with stainless steel locking colletts.

F. The pump shaft is to be of minimum 416 stainless steel sized to transmit the full power of the electric motor driver.

G. Each bowl assembly is to be provided with dual bearings of hi-lead bronze, or 316 stainless steel sleeve bearings.

H. The impellers shall be made of the best grade zincless, aluminum, nickel bronze, 316 stainless steel or approved equal material. They shall be of the enclosed type, correctly designed and accurately machined and polished to fit the castings. Impellers shall be firmly affixed to the shaft by stainless steel lock connects and dynamically balanced to provide perfect rotative parts on the shaft.

I. The impeller shaft shall be of stainless steel of not less than 12% chrome content and shall be supported on both sides of each impeller. The bowls shall be capable of withstanding a hydrostatic pressure equal to twice the pressure at rated capacity of 1-1/2 times shut-off head, whichever is greater.

2.04 DISCHARGE COLUMN PIPE

A. The pipe size shall match bowl size so friction loss will not exceed 4 ft. per 100 ft, based on the rated capacity of the pump. The pipe shall be cut to the proper setting length and be interchangeable for like sized pumps and or standard weight and conforming to AWWA Specifications for Deep Well Vertical Turbine Pumps. The ends of the column pipe shall be faced parallel and the threads machined to such a degree that the ends will butt to ensure proper alignment when assembled.

2.05 LINE SHAFT

A. The shaft shall be 416 stainless steel and furnished in suitable length for the close coupled setting and be interchangeable for like size pumps. To ensure accurate alignment of the shafts, they shall be straight within 0.005 inches total indicator reading for a 5-ft section; the butting faces shall be machined square to the axis of the shaft; the maximum permissible error in the axial alignment of the thread axis with the axis of the shaft shall be 0.002" in 6". The line shaft shall be coupled with stainless steel couplings of a dissimilar alloy to prevent galling, which shall be designed with a safety factor of 1-1/2 times the shaft safety factory, and shall be threaded to tighten during pump operation. Line shaft bearings to be made of EPDM.

B. The line shaft diameter shall be sized to conform with ANSI/AWWA Specifications for the motor horsepower.

2.06 DISCHARGE HEAD ASSEMBLY

A. A discharge head of fabricated steel, with 150 lb. flat face flanges in accordance with ASTM A516 Grade 70 Plate, A105 Flange, and A53 Grade B pipe and shall be of the above-ground type shall be provided for mounting a vertical electric motor and supporting the pump column, bowls, and suction pipe. Pump heads shall be fabricated with dimensions as required to match existing piping and pump can elevations.

B. The pump head shall be fabricated steel with integral mounting plate and shall have a machined face to receive a vertical hollow shaft motor with an adjusting nut. The outlet flange shall be fitted to receive 125 lb. ANSI Standard flange fittings. Size shall be 10-inch for the reclaimed water distribution pumps. Provide stainless steel expanded metal hand-hold guards. Each discharge flange shall also be equipped with a ¼" NPT connection for a pressure gauge.

C. The stuffing box shall be cast iron with a minimum of five (5) rings of graphited packing, one (1) teflon/bronze seal cage, and split bronze packing gland or approved equal.

D. Provisions shall be made, by means of a coupling above the packing box area, to allow for removal of the motor without removing the pumps or piping.

E. A temporary plate or blind flange shall be bolted to the discharge until permanent piping is installed.

2.07 PUMP SUCTION BARRELS (EXISTING)

A. Pump submittals must show that pumps fit in existing cans.

2.08 DRIVERS

Five (5) new 125 HP motors will be provided. The following Specifications cover the new motors.

A. Electric motors shall be selected in accordance with the pump performance characteristics. Motor horsepower rating shall be selected based on the pumps possible peak horsepower requirements. In sizing the motor, maximum brake horsepower required at any point on the published performance curve shall not exceed the motors nominal nameplate rating with use of the service factor. The no load current of the motor shall not exceed nameplate current at any system speed with voltage variations of plus or minus 10%.

B. Motors shall have a minimum service factor of 1.15. They shall be sized to operate the specified loads continuously without operating in the service factor overload range. The temperature rise under such conditions shall not exceed 70 degrees C above a 40 degree C ambient for totally-enclosed motors measured by thermometer. Insulation shall be Class B.

C. The motors shall be invertor rated, premium efficiency WP-1 or TEFC, vertical hallow shaft (VHS), premium efficient, NRR, motors designed for "Outdoor Installation." Each pump shall be non-overloading along the entire curve.

D. Couplings shall be as recommended by the pump manufacturer, unless otherwise specified, and as approved by the motor manufacturer and the Engineer.

E. The motors shall comply with requirements of the Electrical Specifications (Division 16). Provide space heaters and winding thermostats.

F. All pump motors shall be provided with a minimum of two (2) lifting eye bolt.

G. A thrust bearing of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust shall be incorporated into the driver as an integral part of it. The bearing shall be of such size that the average life rating is no less than five years under continuous operation.

H. A top drive coupling shall be equipped with a non-reverse back-stop.

2.09 Pressure Gauges

A. Contractor shall provide a pressure gauge on both the inlet and outlet side of each pump. Gauges shall be compound, direct reading instruments.

B. A ground key stop cock, pulsation damper and wye strainer shall be installed between the gauge and point of connection.

C. The range of all gauges shall be approximately two times the normal system pressure so that when the system is operating the pressure gauge will read near center scale.

D. Gauges shall be 6" diameter dials. Cases shall be cast aluminum, flange mounted, back or bottom connected with "snap-on" ring or bezel. Bourdon tubes shall be of bronze.

E. Each gauge shall be equipped with a surge suppression snubber, level handle gauge cock and union.

F. Connection of the gauges to the pressure taps in the pump suction barrel and discharge shall be with hard drawn copper tubing and solder fittings or with screwed brass pipe neatly installed with straight runs and right angle bends.

G. Accuracy: Shall meet the requirements of ANSI B40.1, Grade A; 1% between 25 and 75% of range span, 2% over balance.

2.10 MISCELLANEOUS

A. Provide data plates of stainless steel, suitably attached to the pump. Data plates shall contain the manufacturer's name, pump size and type, serial number, speed, impeller diameter, capacity, head rating, and other pertinent data.

B. All machine bolts, nuts, and cap screws shall be of the hex head type. Hardware requiring special tools or wrenches shall not be used.

PART 3 EXECUTION

3.01 EXAMINATION

Examine pumps to be sure all passages are clean and clear of obstructions and that impellers rotate freely. Examine pump mounting surface and also make certain that bolts are properly located. Correct any irregularities prior to installation.

3.02 INSTALLATION

A. The pumping equipment and all appurtenances shall be furnished and installed in the positions shown on the Drawings in accordance with the manufacturer's guarantee requirements for clearance, NPSH, lubrication and other detailed operating requirements. All necessary piping, conduit, valves, meters and gauges, concrete foundation, foundations bolts, grouting, pumps, drivers, shafting, power supply, pipe connections, equipment supports, vibration isolation, etc., shall be provided to insure a complete and satisfactory installation of pumping equipment.

B. The supplier of the pumping equipment shall also supply the driver and shall assume responsibility of the proper functioning of the pump and driver and all elements of the power train.

C. Check alignment, and where necessary, realign shafts of motors and pumps within

recommended tolerances by manufacturer, and in presence of manufacturer's service representative. Prior to powering, shaft will be dial indicated for total indicated runout (T.I.R.) above stuffing box in accordance with the Hydraulics Institute Standards. This information will be included in the field report.

D. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

E. Have manufacturer's representative on-site to inspect installation and provide the Engineer with a written report as to any installation or start-up problems. Should any problems be noted, the manufacturer's representative will describe procedures to resolve them.

F. Ensure that pump units are wired properly, with rotation in correct direction, and that pump and motor grounding have been provided.

G. Install pumps where indicated, in accordance with the manufacturer's installation instructions and with recommended clearances provided for service and maintenance.

H. Securely anchor units. Insure that stress is not applied to discharge connection by piping. Make sure all connections are tight.

I. The pump setting shall be at a depth to where the basket strainer is 5-inches off the sump floor, or as recommended by the manufacturer.

J. The Contractor shall do all work required to give a complete and satisfactory installation, including setting of the turbine pump, and settling into operation the pump after installation.

3.03 TESTING

A. All equipment shall be tested by the Contractor under the observance of the Engineer to determine if all equipment and work furnished meet the purpose and intent of the specifications; that none of the work is defective electrically, mechanically, or otherwise; and that the complete assemblies are in a safe and satisfactory operating condition.

B. After installation, test each pump in accordance with the procedures listed in the Hydraulics Institute Standards.

C. There shall be no significant change in vibration and noise level over the entire listed range of flow for the pumping system.

3.04 MANUFACTURER'S REPRESENTATIVE

A. Provide services of qualified manufacturer's service representative to inspect equipment and installation, to perform required field tests and to instruct Owner's personnel in operation and maintenance.

B. A minimum of three days of a manufacturer's service representative's time and two

separate trips to the job site shall be included in the project.

C. In addition, after six and twelve months of operation make one day inspection trips to inspect and adjust the system.

3.05 CLEANING

Clean grease, oil, or any other debris from the exterior surfaces of the equipment and adjacent surfaces.

3.06 TOOLS AND SPARE PARTS

A. One set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. The Manufacturer shall furnish the following:

1. Five (5) complete sets of gaskets and packing for each pump size supplied.

2. Two (2) complete sets of keys and accessories for each pump size supplied.

3. Two (2) complete sets of line shaft bearings.

4. Two (2) complete set of approved seals.

C. All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with inedible marking as to the contents.

D. Parts Numbering

Parts shall be completely identified with a numerical system (no alphabet letters) to facilitate parts inventory control. Each part shall be properly identified by a separate number, and those parts which are identical shall have the same number to effect minimum spare parts inventory.

E. Signage

All pumps shall be labeled with identification number(s) painted as per Section 09901.

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SECTION 13300

PROCESS INSTRUMENTATION AND CONTROL SYSTEM

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. Work includes engineering, furnishing, installing, testing, documenting and placing in operation field instruments and control system modifications at Orange County, Florida's North West Regional Facility (NWRF) Reclaimed Water Main Extension.

B. The Work to be furnished hereunder includes the following major elements:

1. Field instruments for new equipment. These instruments are further defined in Part 2 hereof.

2. Provision of a PLC based control panel at the Apopka flow meter assembly at the north side of plant boundary location and integration thereof into the existing plant control system. As closely as possible, the new control panel shall be constructed to match that at the existing Ocoee metering site.

3. Integration of the new Apopka variable frequency drives (VFDs) I/O requirements shown in the Contract Drawings.

4. Integration of power monitors for Distribution Panels 'DPA' and 'DPB' into the existing plant PLC Ethernet network

5. Modification of the existing control system's Human Machine Interface (HMI) application programs for monitoring and controlling the process improvements.

C. It is the ultimate responsibility of the CONTRACTOR to furnish a complete and fully operable equipment that reliably performs the specified functions. However, it is the intent of these Contract Documents that a single entity (henceforth referred to as the SYSTEM SUPPLIER) be retained by the CONTRACTOR to have overall responsibility for designing, furnishing, interfacing, adjusting, testing, documenting, and starting-up the equipment described in the Contract Documents.

D. As furnishers of the existing Process Control System (PCS), the work defined in this Specification Section shall be performed by one of the following listed below and henceforth referred to as the SYSTEM SUPPLIER.

1. Curry Controls, Lakeland, Florida

2. DCR Engineering, Tampa, Florida

3. Siemens Water Technology Control Systems

E. The CONTRACTOR shall be responsible for:

1. Equipment storage and protection until installed following the storage and handling instructions recommended by the SYSTEM SUPPLIER. Anti-static and winterization requirements shall be per the SYSTEM SUPPLIER's instructions and the SYSTEM SUPPLIER shall periodically verify that these instructions are followed.

2. Including within the electrical subcontractor's scope the provision, installation and termination of field and power wiring to the equipment. Termination shall be made in accordance with final accepted interconnection diagrams developed by the SYSTEM SUPPLIER. The electrical subcontractor shall mark on the interconnect diagram the field wire numbers used for each termination point. The SYSTEM SUPPLIER shall finalize the interconnect diagrams by including these field wire numbers in the final as built version.

3. Physical installation of the equipment. The CONTRACTOR shall require the SYSTEM SUPPLIER to observe and advise on the installation of the equipment to the extent required to certify, with the operational check-out tests, that the equipment will perform as required.

F. All engineering development required by the SYSTEM SUPPLIER will be in accordance with the Conditions of this Contract.

G. Equipment found to be defective prior to system acceptance shall be replaced and installed at no additional cost to the OWNER.

H. In the bid price, the SYSTEM SUPPLIER shall provide for obtaining the services of authorized field personnel from the manufacturers of components or systems provided under this section but not manufactured by the SYSTEM SUPPLIER. Should these personnel be required during installation, start-up and checkout of the equipment, such services shall be provided at no additional cost to the OWNER.

1.02. RELATED WORK

A. All conduits, power and field wiring and cables are provided and installed under Division 16.

1.03. SUBMITTALS

A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.

B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities.

C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the ENGINEER as not approved.

D. Submit the following Field Instrumentation Shop Drawings in a single package:

1. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments, including all miscellaneous electrical and mechanical devices furnished under this section.

2. Complete part numbers for all instruments, including any options, shall be identified. Provide manufacturer's data that correlates to the complete part number.

3. Individual data sheets for all components of the field instruments to supplement the above information by citing all specific features for each specific component (e.g. scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.

4. Installation details for all field mounted devices to show conformance with the Contract Documents.

5. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.

E. Provide a single control system shop drawing submittal containing the following:

1. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, the location of any booster relays or common dropping resistors, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into four areas for identification of element locations: PLC I/O point(s), panel face, back-of-panel, and field, respectively.

2. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme.

3. Bill of Materials: A list of all components, including all 3rd party software. Group components by type and include component model number and part number, component description, quantity supplied, and reference to component catalog information.

4. Descriptive Information: Catalog information, descriptive literature, performance specifications, internal wiring diagrams, power and grounding requirements, power consumption, and heat dissipation of all elements. Clearly mark all options and features proposed for this project.

5. Installation Details. Equipment installation drawings showing external dimensions, enclosure material and spacing, mounting connections, and installation requirements.

6. Application Programming. A written description of each control strategy. These descriptions shall lead the user through the major subsections of the programs. They shall generally describe the programming methods and techniques that will be used to implement the functional requirements of this Specification.

7. A list of, and descriptive literature for, spares, expendables, and test equipment.

F. Test Procedures: Submit the procedures proposed to be followed during all system testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.

G. Test Reports: Upon completion of each required test, document the test by submitting a copy of the signed off test procedures to the ENGINEER.

1.04. FINAL DOCUMENTATION

A. After the demonstration tests have been completed and as a part of the final acceptance requirements, submit the equipment record drawings. Record drawings shall include, corrected for any changes that may have been made up through Substantial Completion:

1. instrument loop wiring diagrams

2. panel wiring diagrams

3. panel elevations

4. interconnection diagrams showing terminal numbers at each wiring termination

B. Record drawings shall be developed or converted to AutoCAD Version 2015. Provide two copies of all AutoCAD files on separate Compact Disks.

C. Operating and Maintenance (O&M) Manuals: Provide the specified number of complete sets of three-ring bound O&M manuals in accordance with Division 1. Include descriptive material, drawings, and figures bound in appropriate places. Include:

1. Cross references to 3rd party O&M manuals previously supplied.

2. Additional operating and maintenance instructions in sufficient detail to facilitate the operation, removal, installation, adjustment, calibration and maintenance of each component provided with the equipment.

3. All the submittal data for each component from the approved shop drawing submittals with corrections made on approved as noted items.

4. A Compact Disk containing the shop drawing data in PDF format in the binder sleeve.

D. Provide the following additional final documentation:

1. licenses in the OWNER's name for all software supplied

2. final copies of all programming files on Compact Disk

1.05. QUALITY CONTROL

A. The SYSTEM SUPPLIER shall be subcontracted by and paid by the CONTRACTOR.

B. The SYSTEM SUPPLIER shall meet all of the requirements of these specifications, and, unless specifically stated otherwise, no prior acceptance of any subsystem, equipment, or materials has been made.

C. All equipment furnished by the SYSTEM SUPPLIER shall be of the latest and most recent design and shall have overall accuracy as guaranteed by the manufacturer.

D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.

E. Component equipment shall be as supplied by one of the manufacturers named or approved equal. The design of the equipment is based on the first-named manufacturer's equipment if there is a difference.

F. To facilitate the OWNER's operation and maintenance, products shall be of the same major MANUFACTURER, with panel mounted devices of the same type and model as far as possible.

G. In order to insure the interchangeability of parts and the maintenance of quality, strict compliance with the above requirements shall be maintained.

H. The SYSTEM SUPPLIER shall designate a single point of contact for interface with the ENGINEER on this project. The ENGINEER reserves the sole right to approve or reject this point of contact.

I. The SYSTEM SUPPLIER shall provide experienced personnel on-site to coordinate and/or perform installation, termination, and adjustment; on-site testing; OWNER training; and startup assistance for the equipment.

1.06. STANDARDS

A. The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.

B. Instrument Society of America (ISA) and National Electrical Manufacturers Association (NENIA) standards shall be used where applicable in the design of the equipment.

C. Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment famished has been manufactured in accordance with the National Electric Code and OSHA requirements.

D. Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.

1.07. WARRANTY AND GUARANTEES

A. In accordance with Division 1, the SYSTEM SUPPLIER shall furnish to the OWNER a written three-year guarantee commencing with substantial completion, that all equipment and parts thereof, material and/or workmanship are of top quality and free from defects.

B. The SYSTEM SUPPLIER shall guarantee all equipment whether or not of his own manufacture.

C. The SYSTEM SUPPLIER shall provide a 2-year Maintenance Agreement for all components supplied by the System Supplier. The Bid shall include a 24-hour on-call agreement.

PART 2 - PRODUCTS

2.01. GENERAL REQUIREMENTS

A. Equipment to be installed in a hazardous area shall meet Class, Group, and Division classification as shown on the Contract Electrical Drawings, or comply with the local or National Electrical Code, whichever is the most stringent requirement.

B. All instruments requiring plumbing shall utilize stainless steel components as follows:

1. Test Tap: Shall consist of Crawford Fitting Co. Swagelock quick connects Series QC4-DE, or equal.

2. Tubing, Stainless Steel: Shall be ASTM A 312, TP 316, seamless, soft annealed with 0.065 inch wall. Fittings shall be ASTM A 276, TP 316 compression or socket weld type.

3. Valve, Ball: Shall be stainless steel ball valves, Whitey Series 40, Hoke Flamite Series 7100, or equal.

C. All instrumentation supplied shall be of the MANUFACTURER's latest design and shall produce or be activated by signals which are established standards for the water and wastewater industries.

D. All electronic instrumentation shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mA DC (milliampere direct current); however, signals between instruments within the same panel or cabinet may be 1-5 volts DC (direct current). Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.

E. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks.

F. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent. Indicator readouts shall be linear in process units.

G. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

H. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

I. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion through the installation of plug-in circuit cards or additional cabinets.

J. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C at up to 95 percent Relative Humidity (non-condensing).

K. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 volts-amperes (VA), unless specifically noted otherwise.

L. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

2.02. LIGHTNING/SURGE PROTECTION

A. Surge suppressors and arrestors meeting the requirements of ANSI Standard C-62.41 (latest revision) shall be provided as further detailed below.

B. DC signals. Lightning and surge protection shall be provided on all 4-20 mA signal wires entering or leaving the panel. The protectors shall meet the following criteria:

1. 35 mm DIN rail mounted.

2. Response time of less than five nanoseconds.

3. Automatic reset.

4. Operating signal voltage: up to 30 Volts DC

5. Operating signal current: up to 150 mA

6. Capable of withstanding 1,200 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

7. Capable of withstanding 100 Amps at IEEE/ANSI C-62.41 10 x 1 milliseconds long wave.

8. Nominal series resistance of 5 ohms each leg

9. Manufacturer/model:

   a. EDCO DRS-036

   b. Transtector DRDC-24

   c. Approved equal.

C. Single phase AC Power (to 15Amps). Lightning and surge protectors for AC power supply lines up to 15 Amps service shall meet the following criteria:

1. Serial protection with replaceable fuse.

2. Failure indicator

3. Response time of less than five nanoseconds.

4. Capable of withstanding up to 10,000 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

5. Manufacturer/model:

   a. EDCO HSP121BT

   b. Approved equal.

D. Single phase AC Power (over 15Amps). Lightning and surge protectors for AC power supply lines over 15 Amps service shall meet the following criteria:

1. Parallel protection using MOVs and thermal fusing technology.

2. Failure indicator

3. Response time of less than five nanoseconds.

4. Capable of withstanding up to 6,500 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

5. Manufacturer/model:

   a. EDCO FAS-120AC

   b. Approved equal.

E. AC Powered Instruments. Lightning and surge protection shall be provided on both the AC power supply and signal lines. The protectors and the instrument/transmitter shall be mounted in a NEMA 3R Stainless Steel vented enclosure with three point latch. The protectors shall meet the following criteria:

1. NEMA 4X small case, conduit mounted enclosure.

2. Response time of less than five nanoseconds.

3. AC Power protection: IEEE/ANSI Std. C-62.41 rated C3 at 330 Volts clamping level.

4. Signal line protection: 10,000 Amp 8 x 20 microsecond surge, clamped at 36 Volts clamping level.

5. Test jacks for low level signal monitoring.

6. Manufacturer/model: EDCO SLAC series or approved equal.

F. Loop Powered Instruments. Lightning and surge protection shall be provided on the 4-20 mA DC signal line. The protectors shall meet the following criteria:

1. Encapsulated in Stainless Steel Pipe nipples for in-line conduit mounting.

2. Response time of less than one nanosecond.

3. Capable of withstanding up to 400 occurrences of 500 Amps at 10 x 1 millisecond.

4. Series resistance of 5 ohms per line.

5. Protection of both lines plus shield.

6. Manufacturer/model: EDCO SS65 or approved equal.

G. All discrete input and output signals that connect to instruments or equipment outside the electrical building housing the control system shall be equipped with interposing relays to electrically isolate them from the control system I/O. Discrete output interposing relays shall each be equipped with a snubber circuit across the coil.

2.03. FIELD INSTRUMENTS

A. Electro-magnetic Flow Metering System (LP-5160 and LP5180). The magnetic flow metering system shall comprise a flow through spool piece with sensing electrodes (Flow Element, FE) and an electronics unit (Flow Indicating Transmitter, FIT). The spool piece shall contain a coil energized by d.c. pulses from the electronics unit. The voltage induced in the process fluid shall be sensed by the electrodes and converted, by the electronics unit, into a derived flow signal.

1. System Performance:

   a. Systems shall be wet calibrated at the factory using NIST traceable equipment.

   b. Overall system accuracy shall be plus or minus 0.5 percent of rate between 1 and 30 feet per second.

   c. It shall be possible to verify system calibration in the field. Methods which require removal of the spool piece or a second flow measurement (i.e. another meter or known volume) will not be acceptable.

2. Materials:

   a. Tube – Carbon Steel

   b. Liner – Neoprene rubber for clean water applications. All other applications shall be Teflon.

   c. Flange –316 Stainless Steel ANSI 150#

   d. Electrodes – 316 Stainless Steel.

3. Ratings:

   a. Vault located spool piece – Rated for continual submergence to 10 feet. This shall include potting of the able between the spool piece and electronics unit.

   b. Other spool pieces –NEMA 4X.

   c. Electronics Unit – NEMA 4X

4. Electrical:

   a. Power Requirement - 120 VAC plus or minimum 10 percent, 60 Hertz.

   b. Maximum Power Consumption – 20 Watts.

5. Functional:

a. Programmable low flow cut-out

b. Empty pipe detection

c. Electronic unit display: minimum of 2 x 16 character, backlit LCD.

6. Options

a. Provide grounding rings and/or integral grounding electrodes as required to establish potential matching.

b. Provide ultrasonic cleaning where necessary for coating sensitive systems

c. Provide special tools and software necessary to effect field calibration

d. Provide certificate of factory calibration

7. Manufacturer, Model series:

a. Per Orange County Utilities – Appendix D- List of approved products.

B. Pressure Transducer (LP-5161 and LP-5164). The pressure transducer shall sense variations in pressure and produce a standard current output signal linear with gage pressure (Pressure Indicating Transmitter, PIT), differential pressure (Differential Pressure Indicating Transmitter, DPIT), flow via square root extraction of differential (Flow Indicating Transmitter, FIT) or, via inference, level (Level Indicating Transmitter, LIT). The transducer shall use a diaphragm activated cell method to monitor process pressure via impulse piping connected through a valve manifold and, where noted, diaphragm seals.

1. Performance:

a. Total accuracy of less than or equal to 0.2% of span for +/- 50 degree temperature changes from 1:1 to 10:1 range down.

b. Adjustable zero and span values anywhere within the nominal range.

c. Differential transducers shall provide direct reading or integral square-root extraction.

2. Materials:

a. Metallic Wetted parts – 316 Stainless Steel.

b. Wetted O-rings – Glass filled TFE.

c. Fill liquid - NSF approved for use in drinking water applications.

d. Electronics Housing – Low copper aluminum with polyurethane paint.

e. Mounting hardware – 316 Stainless Steel.

3. Ratings:

a. Enclosure – NEMA 4X

4. Electrical:

a. Transmitter excitation: 10.5 to 32 Volts DC at up to 18 mA.

5. Options:

a. Provide surge/lightning protection within the transmitter.

b. Provide 3-way SS valve manifold.

c. Provide integral LCD indicator with displayed value in process units.

d. Provide minimum half inch process connection.

6. Manufacturer, Model series:

a. Rosemount, 3051 series.

b. Endress & Hauser, Cerebar S series.

c. Siemens, Sitrans P series.

d. Approved equal.

C. Flow Switch (LP-5134 and LP-5135). The flow switches shall use thermal dispersion and be capable of monitoring low flow rates in viscous fluids. The sensor head employs two temperature sensors with a constant low power heating source attached to one. The other temperature sensor compensates for process temperature changes. The difference in temperature between the two sensors varies with flow.

1. Performance:

a) Operating Temperature – 0 to 65 degrees C

b) Operating pressure – Up to 500 psig

c) Response time – less than 5 seconds

d) Adjustable setpoint down to 0.01 feet/second in liquid and 0.1 feet/second in air.

2. Materials:

a) Sensor Head – 316L stainless steel.

3. Ratings:

a) Electrical Class – UL approved explosion proof

b) Electronic enclosure – NEMA 4X.

4. Electrical:

a) Power Requirement - 120 VAC plus or minimum 10 percent, 60 Hertz.

b) Maximum Power Consumption – 5 Watts

c) Output – DPDT relay contact rated 10 Amps resistive at 120 VAC.

5. Manufacturer, model:

a) Magnetrol, model TSF

b) Ameritrol, model FX

c) Approved equal

2.04. REMOTE CONTROL PANEL FLOW MONOTORING SYSTEM (RCP)

A. The RCP shall be a NEMA 4X stainless steel enclosure located at the flow metering location.

B. The RCP shall be constructed and contain identical components to those currently installed at the Ocoee remote flow metering site.

C. Should it prove impossible to fulfill the above requirement due to a particular component being no longer available, the SYSTEM SUPPLIER shall specifically identify and provide appropriate documentation for a proposed alternate.

D. The SYSTEM SUPPLIER shall also furnish a NEMA 4X stainless steel termination box. This box shall be located outside the RCP and provided initially jumpered field termination blocks for the future connection of a Remote Terminal Unit furnished, installed and wired by the City of Ocoee for their own monitoring purposes. The signals to be connected in this way are indicated on the Contract Drawings.

2.05. CONTROL SYSTEM MODIFICATIONS

A. Control strategies:

1. General. Provide control strategies that meet the following general conditions:

a. Wherever in the descriptions the control strategy refers to the operator, it is intended to mean via the operator graphic screens to be installed on the OWNER’s existing Plant Control System.

b. All control strategies shall run within the PLC. Data manipulation (calculated analog values, elapsed time functions, event determination) shall be performed by the PLC for the associated equipment it is monitoring. Any resulting values from these manipulations shall be reported as individual registers. The intent is to avoid utilizing the HMI software for this purpose.

c. The control functions described herein are not intended to be complete comprehensive programming logic descriptions. They describe only the general intended control operation required. Provide complete program logic to completely fulfill the functional requirements indicated.

d. Provide all programming necessary to support the functional requirements of the operator graphic screens.

e. Provide complete debugging services to address issues identified by the OWNER or ENGINEER during and after startup until final acceptance.

2. Overall Pumping Control Source Selection. Provide an operator controllable software Apopka/Both/Ocoee select switch used to determine the control source for the overall pumping control strategy. While the select switch is in Apopka or Ocoee, use the associated discharge pressure signal (PIT-6011 or PIT-5151 respectively) for control purposes. While the select switch is in Both, proceed as follows:

   a. Under normal circumstances, use the average of the two readings.

   b. If either transmitter fails, issue an alarm to the operator and switch to using the other transmitter.

   c. If the two transmitter values differ by more than an operator adjustable value, issue an advisory alarm to the operator and use the lowest reading as the control source.

3. Pumping Operational Parameters. Provide the following operator adjustable parameters associated with overall station operations:

   a. PSL. Lower operating limit for selected Distribution Pressure

   b. PS. Target operating value for selected pressure.

   c. PSH. Upper operating limit for selected Distribution Pressure

4. Overall Pumping Control Strategy. Establish an automatic sequence for the pumps. Allow the operator to override this and manually assign the pumps. Issue calls for pumps as follows:

   a. Automatically alternate the pump sequence every 24 hours at midnight.

b. When the system pressure drops to PSL, start the next pump in sequence and provide a PID control loop that adjusts pump speed to maintain PS.

c. Call for the next pump if the speed signal is at 100% and the distribution pressure falls to PSL.

d. Stop the longest running pump if the speed signal is at an operator adjustable low value and the distribution pressure rises to PSH. Restrict the operator adjustment to between 55% and 95% speed.

e. When a pump is called to start while another is running, temporarily suspend the PID loop and ramp the running pump's speed down until the starting pump's speed matches, at which time resume the PID control.

f. Prevent a pump starting within a preset time of it being turned off.

5. Individual Pump Control. Provide the operator with a software HAND/OFF/AUTO select switch and SPEED potentiometer for each pump. While the select switch is in HAND run the pump at the speed set by the software potentiometer. While the select switch is in OFF, stop the pump and prevent any further control command. While the select switch is in AUTO, control the pump based on the above overall pumping strategy.

6. Apopka Plant Discharge Pressure Monitoring (LP-6011 and 6015). Monitor for and record minimum and maximum daily value. Record the date and time of occurrence for each.

7. Apopka Remote Station Flow Monitoring (LP-6010). Provide the following functions:

a. Monitor for and record minimum and maximum daily 5-minute average values. Record the date and time of occurrence for each.

b. Accumulate a running daily total flow. At midnight, transfer the total to yesterday's total and restart from zero.

8. In-Plant Discharge Flow Monitoring (LP-5180). Provide the following functions:

a. Monitor for and record minimum and maximum daily 5-minute average values. Record the date and time of occurrence for each.

b. Accumulate a running daily total flow. At midnight, transfer the total to yesterday's total and restart from zero.

B. System HMI:

1. Provide a new graphic operator screen depicting the Apopka Pumping System. This shall be similar to the existing graphic screen covering the existing pumps.

2. Modify existing overview graphic screens, reports and trends to incorporate the new process equipment.

C. System I/O:

1. System I/O associated with the two new pumps are pre-assigned existing spare I/O within the Reclaimed Pump Station PCP.

2. The new analog signal (FT-5180) shall be connected to existing, pre-wired but unassigned analog input spares.

3. I/O for the power monitors shall be connected to the existing Ethernet switch in the Reclaimed Pump Station PCP.

4. Refer to marked up as-built PCP drawings for additional proposed modifications.

PART 3 - EXECUTION

3.01. GENERAL

A. Coordination Meetings: In order to ensure timely performance of the Contract and the system's conformance with these specifications, coordination meetings shall be held at Electrical Design Associates Orlando office. The first meeting will be held 30 days after award of the Contract to the CONTRACTOR. The CONTRACTOR and SYSTEM SUPPLIER shall provide for their attendance at this meeting in their quotation. A schedule and location for additional coordination meetings (approximately one each month) will be derived at this initial meeting for periodic update, coordination, and conflict resolution during the project duration.

B. Partial Payment for Work Completed: The breakdown in the Schedule of Values allows for the partial payment of work completed for the PCS. Before partial payment is considered for approval, each specific activity must be completed.

C. Partial Payment Limits: The partial payments provided for the Work shall satisfy the following limiting criteria (percents of the lump sum pay item for the Work):

Submittals (not including PICS O&M Manuals)..... 15%
Training..... 5%
O&M Manuals 5%
Demonstration Tests 10%

D. Prerequisite Activities and Lead Times: Do not start the following key project activities until the listed prerequisite activities have been completed and lead times have been satisfied:

1. Hardware Purchasing, Fabrication, and Assembly: Associated design related submittals completed (no exceptions, or approved as noted).

2. Shipment: Completion and approval of all design related submittals.

3. Startup: Operational Checkout Tests.

4. Demonstration Tests: Operational Check-out Tests, Startup, OWNER Training, and Demonstration Test Procedures must be complete. Give 4 weeks' notice prior to the planned test start date.

E. The equipment shall be assembled as far as possible at the SYSTEM SUPPLIER's shop. No work, other than correction of minor defects or minor transit damage, shall be done on the panels at the jobsite.

F. Substantial Completion: Substantial Completion for the project is as defined in the General Conditions. However, the following requirements must be fulfilled before consideration will be given for Substantial Completion of the equipment:

1. All equipment submittals have been completed.

2. The equipment has successfully completed the Demonstration Tests.

3. The required OWNER training has been completed.

4. All spares, expendables, and test equipment have been received by OWNER.

G. Final Acceptance: equipment final acceptance is defined as the date when the ENGINEER issues a written notice of final acceptance. For this Section, the following must have been completed before consideration will be given to the issuance of notice of final acceptance:

1. All punch-list items have been checked off.

2. Revisions to the equipment O&M Manuals have been made (that may have resulted from the Demonstration Tests).

3.02. PRODUCT HANDLING

A. Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.

B. Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.

C. Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.

D. Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.

E. Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.

F. ESD Protection: Provide for the proper handling, storage, and environmental conditions required for the equipment components deemed static sensitive by the equipment manufacturer. Utilize anti-stat wrist straps and matting during installation of these items to prevent component degradation.

G. Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments. Specific storage requirements shall be in accordance with the SYSTEM SUPPLIER's recommendations.

H. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.

I. The CONTRACTOR shall be responsible for any damage charges resulting from the handling of the materials.

3.03. INSTALLATION

A. Install the equipment in the location indicated on the Drawings and follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturers' instruction, and these Contract Documents, follow ENGINEER's decision, at no additional cost. Keep a copy of manufacturers' instructions on the jobsite available for review at all times

B. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance. Coordinate I&C work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.

C. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.

D. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes

matching as nearly as possible the type, color, consistency, and type of surface of the original finish. Clean and polish the exterior of all panels and enclosures upon the completion of the demonstration tests.

E. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.

F. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.

G. Fully isolate outputs for transmitted electronic signals between transmitters and receivers, equipment of different manufacturers and between control panels to conform to ISA Standard S 50. 1.

3.04. TRAINING

A. The cost of training programs to be conducted with OWNER's personnel shall be included in the Contract price.

B. The SYSTEM SUPPLIER shall provide two four-hour sessions of on-site training in the troubleshooting and maintenance of the radio link equipment.

3.05. TESTING - GENERAL

A. All elements of the equipment, both hardware and software, shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents

B. As a minimum, the testing shall include shop tests, operational check-out tests, and Demonstration Tests.

C. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.

D. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.

E. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulation techniques in the test procedures.

F. The SYSTEM SUPPLIER shall coordinate all of their testing with the CONTRACTOR, the ENGINEER, all affected suppliers, and the OWNER.

G. The ENGINEER reserves the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The ENGINEER's decision shall be final regarding the acceptability and completeness of all testing.

3.06. OPERATIONAL READINESS TEST (ORT)

A. Prior to startup and demonstration testing, certify that the equipment (inspected, tested and documented) is ready for operation. These inspections and tests shall include Loop/Component inspections and tests. The SYSTEM SUPPLIER shall fully debug problems in the system as a whole. Final approval of control software will not be based on written descriptions of software functions alone, but on actual performance in the field.

B. Check the entire equipment for proper installation, calibration and adjustment on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and the equipment Specifications.

C. The Loop/Component Inspections and Tests shall be implemented using approved forms and checklists. These shall be developed by the SYSTEM SUPPLIER and submitted for approval.

D. Loop Status Report: Each control loop shall have a Loop Status Report to organize and track its inspection, adjustment, and calibration. These reports shall include the following information and check-off items with spaces for sign-off by the SYSTEM SUPPLIER:

1. Project Name

2. Control Loop Number or description

3. Tag Number or description for each component of the control loop

4. Check-offs/sign-offs for each component for proper installation, termination, and calibration/adjustment

5. Check-offs/sign-offs for the control loop for proper panel interface terminations, 1/0 interface terminations, I/0 signal operation relative to the computer network, and total loop operation ready

6. Space for comments

E. Component Calibration Sheet: Each field instrument element and each PLC I/0 module shall have a Component Calibration Sheet. These sheets shall have the following information, spaces for data entry, and a space for signoff by the SYSTEM SUPPLIER:

1. Project Name

2. Component Identification or I/0 Module Number

3. Manufacturer, Model Number/Serial Number of field element

4. Summary of Functional Requirements (scale, range, computing equation, control action, etc.)

5. Calibrations of span, setpoints, and preset adjustable parameters

6. Space for comments

F. Maintain the Loop Status Reports and Component Calibration Sheets at the jobsite and make them available to the ENGINEER at any time.

G. Witnessing: These inspections and tests do not require witnessing. However, the ENGINEER will review the Loop Status Sheets and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Check-out Tests. Correct any deficiencies found.

3.07. FIELD ACCEPTANCE TEST (FAT)

A. Once the equipment has passed the ORT, the SYSTEM SUPPLIER shall perform a witnessed Field Acceptance Test (FAT) on the complete equipment. The FAT shall demonstrate that the equipment is operating and in compliance with the Contract requirements. Each specified function shall be demonstrated on a paragraph-by-paragraph, and site-by-site basis.

B. Prior to the FAT, the entire installed equipment shall be certified in writing by the CONTRACTOR that it is ready for operation.

C. The system shall operate for a continuous 100 hours without failure before this test will be considered successful.

D. The FAT shall cover the entire equipment, including control functions, alarms, and status monitoring. Test procedures used for shop tests may be adopted for these tests if modified as required.

3.08. 30-DAY SITE ACCEPTANCE TEST (SAT)

A. After completion of the Field Acceptance Test, the entire system shall operate for a period of 30 consecutive days, under conditions of full plant process operation, without a single non-field repairable malfunction.

B. Provide complete O&M Manuals for the equipment at the jobsite at least two weeks prior to the SAT.

C. During this test, plant operating and SYSTEM SUPPLIER personnel shall be present as required. The SYSTEM SUPPLIER is expected to provide personnel for this test who have an intimate knowledge of the hardware and software of the system.

D. While this test is proceeding, the OWNER shall have full use of the system. Only plant operating personnel shall be allowed to operate equipment associated with live plant processes.

E. Any malfunction during the tests shall be analyzed and corrections made by the SYSTEM SUPPLIER. The ENGINEER and/or OWNER will determine whether any such malfunctions are sufficiently serious to warrant a repeat of this test.

F. Any malfunction, during this 30 consecutive day test period, which cannot be corrected within 24 hours of occurrence by the SYSTEM SUPPLIER's personnel, or more than two similar failures of any duration, will be considered as a non-field-repairable malfunction.

G. Upon completion of repairs, by the SYSTEM SUPPLIER, the test shall be repeated as specified herein.

H. In the event of rejection of any part or function, the SYSTEM SUPPLIER shall perform repairs or replacement within 90 days.

I. All data base errors must be corrected prior to the start of each test period. The 30-day test will not be considered successful until all databases are correct.

J. The total availability of the system shall be greater than 99.5 percent during this test period.

1. Availability is given by "(Total Time-Down Time) □ / Total Time".

2. Down times due to power outages or other factors outside the normal protection devices or back-up power supplies provided, shall not contribute to the availability test times above.

K. Upon successful completion of the 30-day Site Acceptance Test and subsequent review and approval of complete system final documentation, the system shall be considered substantially complete and the warranty period shall commence.

L. Spare Parts

1. 5 spare fuses for all amps and sizes

2. 5 spare lamps for all types

3. 5 tuss – each type.

END OF SECTION

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 sections in addition to Division 1 - General Requirements.

1.02 GENERAL CONDITIONS FOR ALL WORK

A. All Work must closely be coordinated among the electric utility, the construction manager, and the Owner.

B. Contractor to visit the site during bidding prior to

1.03 SCOPE OF WORK

A. Permanent electrical power is existing at the Pump Station at the voltages indicated on the drawings.

B. Provide complete electrical system for the proposed pump station and remote site in accordance with the drawings.

C. Provide conduits to serve the electrical system as shown on the drawings:

D. Provide surge suppressors where indicated on the drawings.

E. Provide all testing and startup services.

F. Each bidder or his authorized representatives are strongly encouraged, before preparing a bid, visit all areas of the proposed site in which work will take place and be performed to inspect carefully the present conditions.

G. All necessary temporary power, control and instrumentation requirements are the responsibility of the Contractor and shall be furnished at no extra cost to the Owner. Power and controls shall be furnished to all existing equipment at all times.

H. Pay all fees required for permits, inspections, and connections.

I. Contractor shall provide signage at each pump disconnect stating “Equipment Starts Automatically”.

J. All panels, disconnects, enclosures, etc. to include warning signs indicating voltage, power source and power source location.

K. Contractor shall provide a sign at the pump station door stating “Warning Qualified Personnel Only”.

L. Contractor shall provide locator tape over all buried conduit and ductbank.

M. Contractor shall provide pump identification on each pump disconnect.

1.04 REFERENCES

A. ANSI/NFPA70-National Electrical Code.

1.05 SUBMITTALS

A. Include products specified in the following sections:

1. Section 16100 – Raceways, Boxes and Cabinets
2. Section 16120 – Wires and Cables
3. Section 16195 – Electrical Identification
4. Section 16370 – Variable Frequency Drives
5. Section 16450 – Grounding System
6. Section 16476 – Disconnects and Circuit Breakers
7. Section 16709 – Surge Protection

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

C. Mark dimensions and values in units to match those specified.

D. Indicate applicable specification section on each submitted document.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable Building Codes for project location.

B. Electrical: Conform to NFPA 70 - 2011 Edition.

C. Occupational Safety and Health Administration (O.S.H.A.).

D. Utility company rules and regulations.

E. Obtain permits and request inspections from authority having jurisdiction.

1.07 CONDUIT DRAWINGS

A. In addition to the manufacturer's equipment shop drawings, the CONTRACTOR shall submit for approval, electrical installation working drawings for the pump station building and the site electrical containing the following:

1. Concealed and buried conduit layouts shown on floor plans drawn at not less than 1/4-inch = 1-foot-0-inch scale. The layouts shall include locations of process equipment, motor control centers, transformers, panelboards, control panels and equipment, motors, switches, motor starters, large junction or pull

boxes, instruments, and any other electrical devices connected to concealed or buried conduits.

2. Plans shall be drawn on high quality reproducible, double sided mylar, size 36-inch x 24-inch, and shall be presented in a neat, professional manner.

3. Concrete floors and/or walls containing concealed conduits shall not be poured until conduit layouts are approved.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit complete operations and maintenance data for all equipment furnished under this Division in accordance with Section 01340 manuals shall be prepared specifically for this installation and shall include all required cuts, Drawings, equipment lists, descriptions, complete part lists, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.09 WARRANTY

A. Provide a warranty for all the electrical equipment in accordance with the requirements of other sections, but in no case less than three (3) years from date of substantial completion.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical systems shall be complete and operable for the intended purpose in accordance with applicable codes at the time of acceptance.

B. The Contractor shall coordinate all activities with the construction manager and the Owner.

END OF SECTION

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SECTION 16100

RACEWAYS, BOXES AND CABINETS

PART 1 - GENERAL

1.01 SUBMITTALS

A. Provide submittals for all electrical equipment enclosures.

B. Contractor shall submit all conduit runs, prior to any installation.

1.02 REFERENCES

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Comply with NECA "Standard of Installation."

1.03 LISTING AND LABELING

A. Provide products specified in this Section that are UL listed and labeled.

PART 2 - PRODUCTS

2.01 CONDUIT

A. Liquid Tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

B. PVC Conduit and Tubing Fittings: NEMA TC 3; Schedule 80, match to conduit or conduit/tubing type and material.

C. Aluminum Rigid Conduit

2.02 BOXES

A. Outlet and Device Boxes: Use 1 of the following:

1. Nonmetallic Boxes: NEMA OS2.

B. PWI and Junction Boxes: Use 1 of the following:

1. Small Boxes: NEMA OS 1, stainless steel.

2. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

C. Hinged Cover Enclosures: Stainless steel enclosure with continuous hinge cover and flush latch. The enclosure shall be provided with stainless panel insert for mounting

equipment. Outdoor enclosures shall be 316 NEMA 4X Stainless Steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Seal all outdoor raceways using duct seal.

B. Use the following wiring methods:

1. Exposed: Rigid Aluminum

2. Underground: PVC Schedule 80 – Concrete Encased as shown

3. Instrumentation (shielded cable): Aluminum or PVC (dependent on location)

4. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid tight flexible metal conduit.

5. Boxes and Enclosures:

a. 316 NEMA 4X stainless steel. All hardware shall be stainless steel.

C. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

D. Install raceways level and square and at proper elevations. Provide adequate headroom.

E. Complete raceway installation before starting conductor installation.

F. Use temporary closures to prevent foreign matter from entering raceway.

G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

H. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated keep the legs of a bend in the same plane and the straight legs of offsets parallel.

I. Raceways Embedded in Slabs: Install in middle third of the slab thickness where practical, and leave at least 1-inch (25 mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in the concrete.

3. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.

J. Install underground raceways:

1. At least 36" below grade.
2. All buried ductbanks to be concrete encased 3000 psi color red concrete.

K. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

3. 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

L. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

M. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

N. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

O. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb (90kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.

P. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling, threaded inside for plugs, and set flush with the finished floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.

Q. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

R. Install hinged cover enclosures and cabinets plumb. Support at each corner.

S. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

END OF SECTION

SECTION 16120

WIRES AND CABLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish, install and test all wire, cable, and appurtenances as shown on the Drawings and as hereinafter specified.

1.02 SUBMITTALS

A. Samples of proposed wire and cable shall be submitted for approval. Each sample shall have the size, type of insulation, UL listing and voltage stenciled on the jacket.

B. Approved samples will be sent to the project location for comparison by the Resident Engineer with the wire actually installed.

C. Installed, unapproved wire shall be removed and replaced at no additional cost to the Owner.

D. Contractor shall submit locations and types of any splices that would be performed for approval.

1.03 APPLICATIONS

A. Wire for lighting and receptacle circuits above grade shall be type THHN/THWN.

B. Wire for all power motor circuits and below grade lighting and receptacle circuits shall be type RHW or XHHW, stranded.

C. Single conductor wire for control, indication and metering shall be type MTW No. 14 AWG, 19 strand or type THHN/THWN No. 14 AWG stranded.

D. Multi-conductor control cable shall be No. 14 AWG, 19 strand.

E. Wire for process instrumentation or shielded control cable shall be No. 16 AWG, shielded and stranded.

1.04 MINIMUM SIZES

A. Except for control and signal leads, no conductor smaller than No. 12 AWG shall be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All wires and cables shall be of annealed, 98 percent conductivity, soft drawn stranded copper conductors.

2.02 600 VOLT WIRE AND CABLE

A. Type RHW and XHHW shall be cross-linked polyethylene (XLP); as manufactured by the Southwire Co., Collyer Insulated Wire Co., Rome Cable or approved equal.

B. Type THWN shall be as manufactured by the Southwire Co., Collyer Insulated Wire Co., Rome Cable or approved equal.

2.03 INSTRUMENTATION AND CONTROL CABLE

A. Process instrumentation wire shall be twisted pair, 600V, cross-linked polyethylene insulated, aluminum tape shielded, polyvinyl chloride jacketed, type "XLP" as manufactured by the American Insulated Wire Co., Eaton Corp. "Polyset," or approved equal. Multi-conductor cables shall be supplied with individually shielded twisted pairs.

B. Multi-conductor control cable shall be stranded, 600V, cross-linked polyethylene insulated with PVC jacket, type "XLP" as manufactured by the American Insulated Wire Co., Eaton Corp. "Polyset," or approved equal.

2.04 TERMINATIONS AND SPLICES

A. Power Conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling.

B. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors per termination. Termination on screw type terminals shall be made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors. Heat shrink boots shall be utilized for all outdoor splices.

C. Instrumentation Signal Conductors (including graphic panel, alarm, low and high level signals): Terminations permitted shall be typical of control conductors. Splices are allowed at instrumentation terminal boxes only.

D. Except where otherwise approved by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.

E. Splices <u>shall not</u> be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc.), conduit bodies, etc.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All conductors shall be carefully handled to avoid kinks or damage to insulation.

B. Lubrications shall be used to facilitate wire pulling. Lubricants shall be U.L. listed for use with the insulation specified.

C. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.

D. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only shielded instrumentation wire. Instrumentation cables shall be separated from control cables in manholes.

E. Shielding on instrumentation wire shall be grounded at one end only, as directed by supplier of the instrumentation equipment.

F. Wire and cable connections to terminals and taps shall be made with compression connectors. Connections of insulated conductors shall be insulated and covered. All connections shall be made using materials and installation methods in accordance with instructions and recommendations of the manufacturer of the particular item of wire and cable. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance of all completed connections of insulated conductors shall be not less than that of the uncut conductor.

G. All wire and cable shall be continuous and without splices between points of connection to equipment terminals, except a splice will be permitted by the Engineer if the length required between the points of connection exceeds the greatest standard shipping length available from the manufacturer specified or approved by the Engineer as the manufacturer of the particular item of wire and cable.

H. Steel fish tapes and/or steel pulling cables shall not be used in PVC conduit runs.

I. All control and instrumentation circuits and wiring shall be clearly and permanently numbered and labeled at each end so as to identify the location of the opposite end and the function of the circuit. Individual wires in a multi-wire circuit shall be identified with wire numbers. Labeling shall be in place prior to turnover of any equipment, system or sub-system to Owner.

3.02 TESTS

A. Motor feeders 600-volt wire insulation shall be tested with a meg-ohmmeter after installation. Tests shall be made at not less than 1,000 VDC.

B. All motor conductors shall be tested as in paragraph A above. These tests shall be witnessed by the Engineer. A written report shall be submitted to the engineer for review.

END OF SECTION

SECTION 16160

PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor materials, equipment and incidentals required and install all panelboards as hereinafter specified and as shown on the Drawings.

PART 2 - PRODUCTS

1.02 RATING

A. Panelboard ratings shall be as shown on the Drawings. All panelboards shall be rated for the intended voltage.

B. Panelboards installed indoors shall be NEMA 1 type enclosure unless otherwise noted.

C. Panelboards installed outdoors or in non-climate controlled areas shall be NEMA 4X 316 SS type enclosure unless otherwise noted.

1.03 STANDARDS

A. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

1.04 CONSTRUCTION (NEMA 1)

A. Interiors:

1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the antiturn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated.

2. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

4. A nameplate shall be provided listing panel type, number of circuit breakers and ratings.

B. Buses:

1. Bus bars for the mains shall be of copper. Full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

4. Buses for 120/208V light panels shall be rated 10,000 amperes RMS symmetrical.

C. Boxes:

1. Recessed boxes shall be made from galvanized code gauge steel without multiple knockouts. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides.

2. Surface mounted boxes shall have an internal and external finish as hereinafter specified in paragraph D4.

3. At least 4 interior mounting studs shall be provided.

4. All conduit entrances shall be field punched.

D. Trim:

1. Hinged doors covering all circuit breaker handles shall be included in all panel trims.

2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48-in in height shall have a vault handle and 3-point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.

3. The trims shall be fabricated from code gauge sheet steel.

4. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.

5. Trims for flush panels shall overlap the box by at least 3/4-inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Manufacturer:

1. 120/240V, single phase, 3-wire, and 120/208V 3-phase, 4-wire panelboards shall be as manufactured by Square D or equal.

2. 480V, 3-phase, 3-wire panelboards shall be as manufactured by Square D or equal.

1.05 CONSTRUCTION (NEMA 4X SS)

A. Interiors:

1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the antiturn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated.

2. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

4. A nameplate shall be provided listing panel type, number of circuit breakers and ratings.

B. Buses:

1. Bus bars for the mains shall be of copper. Full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a

neutral connection.

3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

4. Buses for 120/208V light panels shall be rated 10,000 amperes RMS symmetrical.

C. Boxes:

1. Recessed boxes shall be made from galvanized code gauge steel without multiple knockouts. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides.

2. Surface mounted boxes shall have an internal and external finish as hereinafter specified in paragraph D4.

3. At least 4 interior mounting studs shall be provided.

4. All conduit entrances shall be field punched.

D. Trim:

1. Hinged doors covering all circuit breaker handles shall be included in all panel trims.

2. Doors shall have semi flush type cylinder lock and catch, except that doors over 48-in in height shall have a vault handle and 3-point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.

3. The trims shall be fabricated from code gauge sheet steel.

4. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with ANSI Z55.1, No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.

5. Trims for flush panels shall overlap the box by at least 3/4-inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Manufacturer:

1. 120/240V, single phase, 3-wire, and 120/208V 3-phase, 4-wire panelboards shall be as manufactured by Square D or equal.

2. 480V, 3-phase, 3-wire panelboards shall be as manufactured by Square D or equal.

1.06 CONSTRUCTION (NEMA 1)

A. Interiors and Buses:

1. Interiors and buses shall be as herein before specified for NEMA 1 construction.

B. Boxes and Covers:

1. Boxes and covers shall be made from stainless-steel with natural finish.
2. Boxes and covers shall be bolted together and gasketed.
3. Conduit openings shall be tapped.

C. Manufacturer:

1. NEMA 1 panelboards shall be as required by voltage application; manufactured by the Square D Company or approved equal.

1.07 CONSTRUCTION (NEMA 4X SS)

A. Interiors and Buses:

1. Interiors and buses shall be as herein before specified for NEMA 4X SS construction.

B. Boxes and Covers:

1. Boxes and covers shall be made from stainless-steel with natural finish.
2. Boxes and covers shall be bolted together and gasketed.
3. Conduit openings shall be tapped.

C. Manufacturer:

1. NEMA 1 panelboards shall be as required by voltage application; manufactured by the Square D Company or approved equal.

1.08 CIRCUIT BREAKERS:

A. Panelboards shall be equipped with circuit breakers as shown on the Drawings.

B. Circuit breakers shall be molded case, bolt-in type.

C. Circuit breakers used in 120/240 and 120/208V panelboards shall have an interrupting capacity of not less than 10,000 - amperes, RMS symmetrical.

D. Circuit breakers used in 480V panelboards shall have an interrupting capacity of not less than 65,000 - amperes, RMS symmetrical.

E. GFCI (ground fault circuit interrupter) shall be provided for circuits where indicated on the Drawings. GFCI units shall be 1 pole, 120 volt, molded case, bolt-on breakers, incorporating a solid state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be U.L. listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time), and an interrupting capacity of 10,000 amperes RMS.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Boxes for surface mounted panelboards shall be mounted so there is at least 1/2-inch air space between the box and the wall.

B. Unless otherwise noted on the Drawings, top of cabinets shall be mounted 6-feet 0-inch above the floor, properly aligned and adequately supported independently of the connecting raceways.

C. All wiring in panelboards shall be neatly formed, grouped, laced, and identified to provide a neat and orderly appearance. A typewritten directory card identifying all circuits shall be placed in the cardholder inside the front cover.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Nameplates and tape labels.

B. Wire and cable markers.

C. Color coding.

1.02 SCOPE

A. Provide engraved nameplates for the following equipment as indicated on the drawings:

1. Label all compartments.
2. Label all outdoor junction boxes.
3. Label control system panels.

B. All wires shall be marked and color-coded.

C. All control wiring shall have wire numbers on each end.

D. All exposed conduits to be painted to match color of back wall.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B. Wire and Cable Markers: Pre-printed self-sticking type.

C. Color Coding Tape: Vinyl plastic insulating tape, colors as specified in part 3.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure

nameplate to inside face of recessed panelboard doors in finished locations.

3.02 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

B. Any color coding schemes used in existing work shall be maintained in new work.

C. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

240/120 Volts	120/208 Volts	Phase	480/277 Volts
Black	Black	A	Brown
Blue	Blue	B	Orange
Red	Red	C	Yellow
White	White	NeutralWhite	
Green	Green	Ground	Green

3.03 NAMEPLATE ENGRAVING

A. Provide nameplates to identify all electrical distribution and control equipment and loads served. Letter Height: 1/8 inch for individual switches and loads served for distribution and control equipment identification.

B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.

C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.

D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.

END OF SECTION

SECTION 16370

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install variable frequency drives as shown on the Drawings and as specified herein.

B. These specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment furnished. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances for the variable frequency drives herein specified.

1.02 DESCRIPTION OF SYSTEM

A. The variable frequency drives shall be furnished by the Contractor. The Contractor is responsible for complete system operation and necessary coordination.

B. The drives furnished herein under shall be totally compatible and adequately sized with both the existing Pumps and Motors.

C. VFDs shall be sized as shown on the electrical drawings.

D. VFDs shall be provided with Reduced Voltage Solid State (RVSS) bypass starters.

E. VFDs shall meet the requirements of IEEE-519.

1.03 QUALIFICATIONS

A. Variable speed drives shall be of sufficient size for the duty to be performed and shall not exceed their full-rated capacity when the driven equipment is operating as specified. To assure unity of responsibility, all equipment specified in this Section of the specifications shall be furnished and coordinated by the pumping system supplier.

B. The drives covered by these Specifications are intended to be equipment of proven ability as manufactured by reputable manufacturers having long experience in the production of identical units. The equipment furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.

C. The variable frequency control shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10% total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when other variable frequency drives are operated from the same bus.

D. Operation of all pump VFDs shall not add more than 3% total harmonic voltage distortion or 10% total current distortion to the normal bus (calculated at the load side of the utility transformer). Calculations shall be as described by IEEE-519 1992 edition. The load side of the utility transformer is the point of common coupling. Transformer short circuit capability shall be 30,000 amps symmetrical. Non-linear peak loading of the transformer shall be assumed to be 400 amps. The Contractor shall provide the necessary filtering components as required to meet these criteria. The Contractor shall submit a harmonic analysis detailing compliance with the VFD shop drawing submittal.

E. The variable frequency drive manufacturer shall maintain and staff engineering service and repair shops through the United States, including the State of Florida, trained to do start up service, emergency service calls, repair work, service contracts and training of customer personnel.

F. Approved Manufacturers:

1. The variable frequency drives shall be manufactured by:

a. Danfoss
b. Cutler Hammer
c. Square D

1.04 SUBMITTALS

A. Copies of all materials required to establish compliance with the specifications shall be submitted. Submittals shall include at least the following:

1. Certified shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.

2. Descriptive literature, bulletins and/or catalogs of the equipment.

3. Data on the characteristics and performance of the variable frequency drives. Data shall include certification that the variable frequency drives are warranted for use with the existing motors.

4. Complete drawings shall be furnished for approval before proceeding with manufacture and shall consists of master wiring diagrams, elementary or control schematics including coordination with other electrical control devices operating in conjunction with the variable frequency drive, and suitable outline drawings with sufficient details for locating conduit stub-ups and field wiring. Generic schematics not specific to this project shall not be acceptable.

5. A list of the manufacturer's recommended spare parts with the manufacturer's

current price for each item. Include gaskets, packing, etc. on the list. List bearings by the bearing manufacturer's numbers only.

1.05 OPERATING INSTRUCTIONS

A. Three copies of the operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

B. A factory representative who has complete knowledge of proper operation and maintenance shall be provided for one (1) day after completion of all training to instruct representatives of the Owner on proper operation and maintenance.

1.06 PRODUCT HANDLING

A. 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 and the units and equipment are ready for operation.

B. All equipment and spare parts must be properly protected against any damage during a prolonged period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.07 WARRANTY

A. All equipment supplied under this Section shall be warranted by the CONTRACTOR and the equipment manufacturers for a period of five (5) years, parts and labor from date of substantial completion.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no additional cost to the Owner.

C. The manufacturer's warranty period shall run concurrently with the CONTRACTOR's warranty period. No exception to this provision shall be allowed.

PART 2 - PRODUCTS

2.01 GENERAL

A. The SYSTEM SUPPLIER shall furnish and install complete variable frequency drives as described in this specification and as detailed on the applicable Drawings.

B. The SYSTEM SUPPLIER shall be responsible for the erection, installation, and start up off the equipment covered by this specification.

C. The variable frequency drive shall be furnished by an approved manufacturer, a vendor who has actively been manufacturing variable frequency drives for a period of at least five (5) years.

D. The variable frequency drive shall comply with the latest applicable standards of ANSI, NEMA, IEEE, and the National Electrical Code.

E. Variable frequency drive shall operate as specified on standby generators or normal power sources.

F. The VFD shall include an Ethernet Module in each for monitoring purposes.

G. Reduced Voltage Solid State Bypass Starter:

1. Reduced voltage starter shall be combination solid state motor controller with circuit breaker.

2. Starters shall be provided with isolation and full voltage bypass contactors with overloads. Selector switch shall be on WPCP inner door. AIC rating shall be 25,000 amps.

3. Motor starter shall have a 120-volt operating coil, overload relay in each phase and control power transformer.

4. Motor starter shall have 1-N.O. and 1-N.C. auxiliary contacts. Additional auxiliary contacts shall be furnished where shown on the Drawings or as required by the control scheme.

5. Overload relays shall be adjustable and manually reset by push button in compartment door. Replaceable individual overload relay heaters of the proper size shall be installed in each phase.

6. Control power transformer shall be sized for additional load where required. Transformer secondaries shall be equipped with time-delay fuses.

7. Motor circuit protector shall be molded case with adjustable magnetic trip

only. They shall be specifically designed for use with solid state reduced voltage starters. Motor circuit protectors shall have auxiliary disconnect contacts when used with starters having external control circuits.

8. The following options shall be required:
   - Soft start
   - Soft stop
   - Protective module - line side of each starter

H. OPERATIONAL DESCRIPTION

1. The description which follows generally describes the intended operation of the VFD as given in the elementary diagrams in the Contract Drawings.

2. While in VFD control, the pump is started and stopped by the position of the H/O/A switch as follows:

   a. When in HAND, the pump will run using the speed signal from the VFD control panel.

   b. When in OFF, the pump will not run.

   c. While in AUTO, the pump starts and stops based on the PLC control output while the VFD is forced by digital input to use the speed signal from the PLC.

2.02 CONSTRUCTION

A. Each variable frequency drive shall consist of a 460V, 3 phase rectifier, DC link and variable frequency inverter with features, functions and options as specified. The inverter shall be voltage source design using pulse width modulation (PWM) techniques. VFD design shall be “quiet type” utilizing IGBT transistors in the inverter section.

B. The variable frequency drives shall be rated for the HP, full load current and rpm of the motor. The variable frequency drives shall be designed to provide continuous speed adjustment of three-phase motors. The variable frequency output voltage shall provide constant volts-per-Hertz excitation to the motor terminals up to 60 Hertz.

C. Inverters shall be capable of converting incoming three phase, 460V (+10 to -10%) and 60 Hertz (+/-2) Hertz power to DC bus levels. The DC voltage shall be inverted to a variable frequency output.

D. Controllers shall be rated for an ambient temperature of 0 degrees C to 40 degrees C, an altitude of up to 3,300 feet above sea level and humidity of 0 to 95% non-condensing.

E. Controller enclosures shall be NEMA Type 1. The inverters shall have complete front accessibility with easily removable assemblies. All air openings shall be filtered.

F. The following standard basic control features shall be provided on the inverter:

1. Start, Stop, "Power On" indicating light and speed control potentiometer. Terminations for remote mounted operator control devices shall be furnished.

2. Unidirectional operation, coast to rest upon stop.

3. Variable linear independent timed acceleration.

4. Variable torque performance from 4 to 60 Hertz.

5. All variable frequency drives shall be furnished with AC power line reactors or integral DC link reactor.

6. Frequency stability of ½% for 24 hours with voltage regulation of +2% of maximum rated output voltage.

7. LED status indication for Power On, Run, Inverter Enable, Overcurrent, Overvoltage, Overtemperature, Low Supply, and Phase Loss.

8. 115V AC control power for operator devices.

9. Phase insensitive to input power.

10. Automatic restart upon return of power following a utility outage. Drive shall require manual reset after three (3) attempts in a 60 second period.

11. Ethernet module for each VFD to monitor parameters.

12. Embedded Web server, ability to configure, control, monitor and diagnose the Drives via Internet explorer.

G. The following protective features shall be provided on the drive:

1. Input AC circuit breaker with an interlocked, pad lockable handle mechanism and AC input line current limiting fuses for fault current protection of AC to DC converter section and circuit breaker. Minimum short circuit rating 42,000 AIC.

2. Electronic overcurrent trip for instantaneous overload protection.

3. Undervoltage and phase loss protection of output.

4. Over-frequency protection.

5. Over-temperature protection.

6. In addition to Surge protection in the AC drive, additional surge suppression from input AC line transients located external from the drive, shall be provided.

7. Electrical isolation between the power and logic circuits, as well as between the 115V AC control power and the static digital sequencing.

8. Drive to be capable of withstanding output terminal line short or open circuits without component failure.

9. Output dv/dt protection filter to minimize dv/dt to acceptable levels at motor terminals.

10. Common mode filter shall be provided in the drive on VFD output (2 minimum per drive) to reduce bearing current and Radio Frequency Interference (RFI).

11. VFD Display:

    a. VFD shall provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using a standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.

    b. VFD Keypad shall feature an INFO key that, when pressed, shall display the contents of the programming manual for the parameter that is currently viewed on the display. The description shall explain the feature and how the settings can be made by the operator.

    c. VFD shall display all faults in plain text; VFD's which can display only fault codes are not acceptable.

    d. The keypad shall feature a 6-line graphical display and be capable of digitally displaying up to five separate operational parameters or status values simultaneously (including process values with the appropriate engineering unit) in addition to Hand/Off/Auto, Local/Remote, and operating status.

    e. Keypad shall provide an integral H-O-A (Hand-Off-Auto) and Local-

Remote selection capability, and manual control of speed locally without the need for adding selector switches, potentiometers, or other devices.

f. All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.

g. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.

h. VFD Display shall have the ability to display 5 different parameters pertaining to the VFD or the load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different user-selectable parameters.

i. VFD display shall indicate which digital inputs are active and the status of each relay.

j. It shall be possible to toggle between three status read-out screens by pressing the key. Various operating variables, even with different formatting, can be shown in each status screen.

k. VFD display shall indicate the value of any voltage or current signal, including the engineering units of measurement, connected to the analog input terminals.

l. VFD display shall indicate the value of the current at the analog output terminals, including the engineering units of measurement.

m. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

12. Provide passive harmonic filtering to reduce harmonic distortion to required specified levels.

H. The following standard independent adjustments shall be provided on the inverter:

1. Minimum speed (0 HZ to Max HZ).

2. Maximum speed (Min to Max HZ).

3. Acceleration time 0.1 to 600 Sec. (minimum).

4. Deceleration time 0.1 to 600 Sec. (minimum).

5. Volts per Hertz.

6. Stability adjustment, if required.

I. The following shall be furnished with each controller:

1. Isolated process instrument speed input signal of 4-20 mA DC.

2. Isolated process instrument speed output signal 4-20 mA DC.

3. Relay output auxiliary contacts as shown on the drawings or as required herein, in Division 11 or Division 15.

4. Keypad functionality to include load ammeter, voltmeter, and speed output indicating meters.

5. Built-in self diagnostics shall include an I/O map and fault messages stored.

6. Relay output auxiliary contacts as shown on the drawings.

7. Local/Off/Remote, Start/Stop and speed potentiometer selector switches.

8. Additional line filtering as required for harmonic abatement.

9. Permanent wire markers on all wiring.

J. Additional control circuitry as required in Division 13 and as shown on the electrical drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings. Field wiring shall be in accordance with manufacturer’s recommendations. Anchor bolts shall be stainless steel and set in accordance with the manufacturer's recommendations. VFD motor leads shall be in rigid conduit. Each VFD shall have its own rigid conduit for its motor leads. Motor leads shall not be mixed with any other wiring. See VFD manufacturer’s instruction manuals for detailed directions on installation of the VFD’s and the installation of the motor leads.

3.02 SPARE PARTS

A. Contractor to include:
   a. One (1) Spare VFD – Complete
   b. One (1) Spare Key Pad

3.03 SHOP PAINTING

A. Prior to shop painting, all surfaces shall be thoroughly cleaned, dry, and free from all mill/scale, rust, grease, dirt, and other foreign matter.

B. Drives shall be shop painted.

3.04 TESTING

A. Tests and Check

1. The drive manufacturer shall test the drive controller with a motor load prior to shipment. The motor shall have equal or greater full load current than the specified motor.

2. A certified copy of all tests and checks performed in the field, complete with meter readings and recordings, where applicable, shall be submitted to the Owner.

B. After the drives have been completely installed, and working under the direction of the Manufacturer, conduct in the presence of the Owner, such tests as necessary to indicate that operation conforms to the Specifications.

3.05 TRAINING

A. The cost of training programs to be conducted with Owner's personnel shall be included in the Contract price. The training and instruction, insofar as practicable, shall be directly related to the System being supplied. Classes to be selected by the Owner. Training shall be conducted at the Owner's Plant Site and shall provide detailed hands-on instruction to Owner's personnel covering: system debugging, program modification, trouble-shooting, maintenance procedures, calibration procedures, and system operation. On-site training for general plant staff shall be conducted over two (2) 1-day sessions.

3.06 START UP SERVICES

A. The supplier shall provide start up services for the VFDs to the Contractor. A minimum of two days and two trips shall be provided.

END OF SECTION

SECTION 16450

GROUNDING SYSTEM

PART 1 - GENERAL

1.01 Scope of Work

A. Furnish and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as hereinafter specified and shown on the Drawings.

1.02 Related Work

A. Conduit shall be as specified under Section 16100.

B. Wire shall be as specified under Section 16120.

PART 2 - PRODUCTS

2.01 Materials

A. Ground rods: Ground rods shall be copperclad steel 3/4-inch x 30 foot. Ground rods shall be Copperweld or be an approved equal product.

PART 3 - EXECUTION

3.01 General

A. Tie into the existing grounding system.

B. Grounding electrodes shall be driven as required. Where rock is encountered, grounding plates may be used in lieu of grounding rods.

C. All equipment enclosures, motor and transformer frames, conduits systems, cable armor, exposed structural steel and similar items shall be grounded.

D. Exposed connections shall be made by means of approved grounding clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A or approved equal. All buried connections shall be made by welding process equal to Cadweld.

E. All underground conductors shall be laid slack and where exposed to mechanical injury shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard.

F. The Contractor shall exercise care to insure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.02 Tests

A. The Contractor shall test the ground resistance of the system. The Engineer shall be notified forty-eight (48) hours before tests are made to enable the Owner to have designated personnel present. All test equipment shall be provided by the Contractor and approved by the Engineer. Dry season resistance of the system shall not exceed 5 ohms. If such resistance cannot be obtained with the system as shown, the Contractor shall provide additional grounding as directed by the Engineer, without additional payment. The Contractor shall submit all grounding system test results to the Engineer for review.

END OF SECTION

SECTION 16476

DISCONNECTS AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SCOPE

A. Circuit breakers for panelboards.

B. Molded case circuit breakers for panelboards.

C. Non-Fusible safety switches.

1.02 SUBMITTALS

A. Submit product data according to the Conditions of the Contract and Division 1 Specification Sections.

1.03 REFERENCES

A. Comply with NFPA 70 “National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the “National Electrical Code," Article 100.

2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.01 SWITCHES

A. Enclosed Non-fusible Switch: NEMA KS 1, Type GD, handle lockable with 2 padlocks.

B. Enclosure: NEMA 4X 316 stainless steel, unless specified or required otherwise to meet environmental conditions of installed location.

2.02 CIRCUIT BREAKERS

A. Molded Case Circuit Breakers: The current interrupting capacity of the breaker shall be equal or greater to 22,000 amps, unless otherwise indicated.

B. Enclosure: NEMA 4X 316 stainless steel, unless specified or required otherwise to meet environmental conditions of installed location.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install enclosed switches and circuit breakers in locations, as indicated, according to manufacturer's written instructions.

B. Install enclosed switches and circuit breakers level and plumb.

C. Install wiring between enclosed switches and circuit breakers and control/indication devices.

D. Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer’s published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

END OF SECTION

SECTION 16709

SURGE PROTECTION DEVICES (SPD)

PART 1 – GENERAL

1.01 DESCRIPTION

A. The specified unit shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit shall be connected in parallel with the facility's wiring system.

B. All equipment shall have surge protection devices.

1.02 RELATED DOCUMENTS AND APPLICABLE STANDARDS

A. Systems shall be designed, manufactured, tested and installed in accordance with the following applicable documents and standards:

1. Underwriters Laboratories (UL1449 3rd Addition and UL 1283)
2. ANSI/IEEE (C62.41 and C62.45)
3. Military Standards (MIL – STD 220A)
4. National Electric Code (NEC)
5. Underwriter's Laboratories 248

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURER

PART 1 - Current Technologies
Power & Systems Innovations
PO Box 590223
Orlando, FL 32859-0223

Contact: John West Sr.
PART 2 - Phone (407) 380-9200
Phone (800) 260-2259
FAX (407) 380-3911 FAX
E-mail jwest@psihq.com
Internet www.psihq.com

Joslyn, AKA (Total Protection Solutions)
Total Protection Solutions
4366 LB McLeod Road
Orlando, FL 32804

Contact: Bob Levit
Phone 407-841-4405

FAX 407-841-4407
E-mail: bob@treborpower.com
Internet www.treborpower.com

PART 3 - Surge Suppression Inc
Surge Suppression Incorporated
P.O. Box 674
Destin, FL 32540-0674

Contact: Mike Barton
Phone (888) 987-8877
FAX (888) 900-8879
E-mail mbarton@surgesuppression.com

2.02 DEVICES

A. Surge Protection Devices (SPD's) shall be UL listed at or above the available fault current level at the point of SPD application by UL, Per UL 1449 latest edition.

B. The SPD shall be a parallel design using fast-acting energy protection that will divert and dissipate the surge energy.

C. Units shall have:

a. Minimum 10 mode operation for all 3 phase Y and high leg Delta configurations and six modes of protection for all 3 phase Delta "no Neutral" configurations.

b. One nanosecond or less response time for any individual component, and shall be self-restoring and fully automatic.

c. Extended noise filtration with a 10 kHz to 100 MHz range.

d. LED indication of unit failure to indicate the continuous positive operational status of each protected phase.

e. System Voltage shall be as indicated on the drawings.

f. The fusing system shall be capable of allowing the rated maximum single impulse surge current to pass through without fuse operation.

g. SPD's shall be installed with leads as shorts as possible (not to exceed 24 inches). SPD's may be mounted internally in Motor Control Centers, switchgear and switchboards. SPD's shall be mounted externally at panelboards and control panels.

h. All SPD panel units shall be guaranteed by the installing contractor and surge suppression manufacturer to be free of defects in materials and workmanship for a period of not less than 10 years from the date of substantial completion of the system to which the suppressor is installed.

i. For each SPD type or size used on this project provide the following submittal data:

1. Complete schematic data for suppressor, indicating part numbers, dimensional drawings and mounting arrangement.

2. Cut sheets which include Peak Surge Current "per mode", Let Through Current, UL tested voltage protection rating (VPR) and maximum Continuous Operating Voltage (MCOV).

3. Copy of Warranty Statement

2.03 APPLICATIONS

A. Surge Current RATING OF 150 kA PER MODE AT 480 Volt main breaker.

B. Surge Current RATING OF 150 kA PER MODE AT 480 Volt branch panels or control panels.

C. Surge Current RATING OF 40 kA PER MODE AT 208 or 240 Volt three phase or single phase branch panels.

2.04 FILTERING

A. The system shall provide a UL 1283 Listed Electromagnetic Interference Filter capable of attenuating noise levels produced by electromagnetic interference and radio frequency interference.

2.05 FUSING

A. Fuse component(s) identification and surge rating. The manufacture shall provide documentation demonstrating the tested surge current rating (8x20µsec) of the fuse. The surge rating of the fuse shall be greater than the combined surge current rating of all downstream connected suppression elements.

B. Fusing: Suppression component(s) identification and surge rating. The manufacturer shall provide documentation identifying the suppression element(s) connected in series with fuse element(s) and provide the suppression elements published 8x20µsec surge current rating. The rating of the suppression element(s) shall be less than the rating of upstream fusing element(s).

C. Fusing: Surge performance. All fusing shall be required to meet the single pulse surge current testing requirements of Section 2.2 above.

D. Fusing: Isolation. The unit shall have each MOV fused and designed to operate only in the event of an MOV failure within the SPD device.

E. Fusing Coordination: Units that can't demonstrate MOV-fuse coordination in 2.4.a and 2.4.d are not acceptable.

F. Fusing: UL Rating. All fusing shall be 200kAIC UL248 Recognized.

2.06 UL 1449 SUPPRESSED VOLTAGE RATING.

A. The unit shall be UL 1449 3rd Edition Listed and shall be as follows for L-N, L-G, N-G, and L-L, modes, inclusive of the disconnect switch: (Select appropriate product rating from below)

1. 40kA – 80kA rated products/120/208V units: L-N = 400V, L-G=500, N-G=500, and L-L=700
2. 60kA – 80kA rated products/277/480V units: L-N = 900V, L-G=1000, N-G=90, and L-L=1800
3. 100kA – 150kA rated products/120/208V units: L-N = 400V, L-G=500, N-G=500, and L-L=700
4. 100kA – 150kA rated products/277/480V units: L-N = 900V, L-G=1000, N-G=800, and L-L=1500
5. 200kA – 300kA rated products/120/208V units: L-N = 400V, L-G=500, N-G=500, and L-L=700
6. 200kA – 300kA rated products/277/48V units: L-N = 800V, L-G=1000, N-G=800, and L-L=1500

2.07 IN-FIELD TESTING

A. The unit shall be equipped with a performance data extraction protocol allowing unit performance data, including percent of protection remaining, to be transmitted to an internal, external status analyzer.

2.08 ENCLOSURE.

A. Outside - Units shall be provided in a NEMA type 4X plastic enclosure.
B. Interior – Units shall be provided in NEMA type 1 enclosure.

PART 3 – EXECUTION

3.01 SYSTEM TESTING

A. Upon completion of installation, a factory-authorized local service representative shall provide product startup testing services. The tests shall include:

1. On-line Testing: Verification that all suppression and filtering paths are operating with 100% protection as well as verification of proper facility neutral-to-ground bond by measuring neutral-to-ground current and voltage.

2. Off-line Testing: Impulse injection to verify the system tolerances as well as verification of proper facility neutral-to-ground bond. To be compared to factory benchmark test parameters supplied with each individual unit.

3.02 DOCUMENTATION AND REPORTING

A. A copy of the startup test results and the factory benchmark testing results shall be supplied to the engineer and the owner for confirmation of proper system function.

This letter shall also clarify that the integrity of all neutral-to-ground bonds were verified through testing and visual inspection, and that all grounding bonds were observed to be in place.

3.03 SYSTEM WARRANTY

A. The SPD system manufacturer shall warranty the entire system against defective materials and workmanship for a period of ten (10) years following substantial completion.

END OF SECTION

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APPENDIX 1

ORANGE COUNTY UTILITIES STANDARDS AND CONSTRUCTION SPECIFICATIONS MANUAL, APPENDIX D – LIST OF APPROVED PRODUCTS

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APPENDIX D **LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS** **FEBRUARY 11, 2011**

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Air Release	ARV Enclosure	**All ARV above ground enclosures shall be vented with tamper proof locking device**						
		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 GP3232 Base	Blue 36" Tall	AVG2036 Encl GP3232 Base	Pantone 36" Tall	AVG2036 Encl GP3232 Base	Green 36" Tall
			AVG2041 Encl GP3232 Base	Blue 41" Tall	AVG2041 Encl GP3232 Base	Pantone 41" Tall	AVG2041 Encl GP3232 Base	Green 41" Tall
		Safety-Guard/Hydro Guard	15100 Encl	Blue 34" Tall	15100 Encl	Pantone 34" Tall	15100 Encl	Green 34" Tall
	Air Release Valves	**Air Release Valves shall be Combination Type, 316 SS**						
		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	**Air Release Valve Frame and Cover**						
		US Foundry	NA	NA	NA	NA	USF 7665-HH-HJ	
Blow Off	Auto Blow Off	**Automatic Blow Off Valve**						
		Hydro Guard	HG-1 Standard Unit	Automatic	NA	NA	NA	NA
	Blow Off Valve	**Blow Off Valve - Fits standard 5-1/4 inch Valve Box**						
		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	**Casing End Seals. Annular space between pipe and steel casing shall be brick and mortar with end seals to secure ends.**						
		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	

APPENDIX D **LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS** **FEBRUARY 11, 2011**

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Casing Seals / Spacers	Casing spacer	**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.**						
		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	**Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 1 Zinc / Urethane / Fluoropolymer application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.**						
		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	**Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 2 Zinc / Epoxy / Urethane application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.**						
		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 Series N69	4.0 - 10.0 mils	Hi-Build Epoxoline II Series N69	4.0 - 10.0 mils	Hi-Build Epoxoline II Series N69	4.0 - 10.0 mils
			EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils
		PPG / Ameron	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

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Fittings	Fittings	**Ductile Iron Fittings C153 SSB / C110 FLG: (Water & Reclaimed Water fittings shall cement lined or holiday free fusion bonded epoxy lined) (Wastewater fittings interior shall be Protecto 401 and holiday free)**						
		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	Flow Meter	**Flow Meters With Replaceable Sensors**						
		EMCO	NA	NA	NA	NA	Unimag 4411E	
Hydrants	Hydrants	**Hydrants Shall open left, 1-1/2 Pentagon operating nut, NST hose & pumper thread, rotate 360 degrees, closed drains, epoxy on shoe in & out and 304 SS nuts & bolts below ground.**						
		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	**Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain ductile iron pipe to mechanical joint fittings, pipe and appurtenances.**						
		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)	**Bell Joint Restraints for Ductile Iron Pipe (4"-12") (New & 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)**						
		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	
		Tyler Union	TufGrip-Series 300C		TufGrip-Series 300C		TufGrip-Series 300C	
	DIP Bell Joint Restraints (16" & Greater)	**Ductile Iron Pipe Bell Joint Restraints for Ductile Iron Pipe (16" & 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 & reclaimed water piping 16" and greater shall have restraint gaskets or locking bells.**						
		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

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Joint Restraints	Ductile iron pipe Bell Joint Restraint Gaskets and Locking Bell (4" & Above)	**Bell Joint Restraint Gaskets and Locking Bell (4" & 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.**						
		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
		McWane Inc. DI Pipe Group	Sure Stop 350 Gasket	Gasket	Sure Stop 350 Gasket	Gasket	NA	NA
			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
		US Pipe	Field Lok 350 Gasket	Gasket	Field Lok 350 Gasket	Gasket	NA	NA
			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
	SS to DIP Transition Restraint	**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.**						
		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	**Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain PVC pipe to mechanical joint fittings, and appurtenances.**						
		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)	**PVC Bell Joint Restraints: PVC pipe Split Serrated on Bell End and Spigot End. (4" - 12") (New & Existing)**						
		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	

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Joint Restraints	PVC Bell Joint Restraints (16" & Greater)	**PVC Bell Joint Restraints: (16" & Greater) PVC pipe Split Serrated on Bell End and Spigot End. Water & Reclaimed Water Existing pipe only. Wastewater shall be new and existing pipe.**						
		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")	**C900 Bell & 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.**						
		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	**C905 Bell & 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.**						
		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
		North American Pipe Corp (NAPCO)	NA	NA	NA	NA	C905 Big Blue	Green
	HDPE C906 DR11	**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.**						
		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

APPENDIX D **LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS** **FEBRUARY 11, 2011**

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Pipe	Ductile Iron Pipe	**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.**						
		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	**Sample Stations - Bacteriological Sample Station with built in flush system, all internal piping to be 2", brass and includes lockable green enclosures.**						
		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	**Brass Service Saddles for 1" & 2" water & 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.**						
		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
	Service Saddles	**Service Saddles for 1" (CC) & 2" (Iron pipe threads) Water & 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.**						
		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
	Service Saddles for HDPE	**Service Saddles for 1" (CC) & 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.**						
		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	**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.**						
		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

APPENDIX D **LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS** **FEBRUARY 11, 2011**

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Services	Curb Stops	**Curb Stops - Straight Valves: Ball type compression 2" cts O.D. tubing by 2" FIP**						
		Ford	B41-777W		B41-777W		NA	NA
		AY McDonald	6102W-22		6102W-22		NA	NA
		Mueller	P25172		P25172		NA	NA
	Curb Stops	**Curb Stops - Straight Valves: ball type compression x compression**						
		Ford	B44-444W		B44-444W		NA	NA
		AY McDonald	6100W-22		6100W-22		NA	NA
		Mueller	P25146		P25146		NA	NA
	PE tubing	**Polyethylene tubing: AWWA C901. UV protection (SDR-9) 1-inch and 2-inch only. PE 3408 / PE 4710**						
		Charter Plastics	Blue Ice		Lav Ice		NA	NA
		Endot	Endopure Blue		Endocore Lavender		NA	NA
		JM Eagle	Pure-Core		NA	NA	NA	NA
Tapping Sleeves and Valves	Line Stops	**Line Stops**						
		JCM						
		Romac						
		Smith Blair						
	Tapping Sleeves	**Tapping Sleeves: (Mechanical joint for taps on cast iron, ductile iron, PVC & AC pipe, including size on size) with stainless steel nuts and bolts.**						
		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	**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**						
		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

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	**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.**						
		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	**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.**						
		Clow	Style #1450		Style #1450		NA	NA
		Dezurik	BAW		BAW		NA	NA
		Mueller / Pratt	LINSEAL III / Groundhog		LINSEAL III / Groundhog		NA	NA
	Check Valves	**Valves (Check) 4-inch and Larger (8 mil epoxy lined)**						
		American Flow Control	NA		NA		Series 600 or 50 line	
		Clow / M&H / Kennedy	NA		NA		106	
		Mueller	NA		NA		Series 2600	
	Gate Valves 4" - 12"	**Gate Valves 12" and smaller - resilient seated only AWWA C509 or C515. Valve seat shall be leak-tight in both directions at 150 psi.**						
		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	**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.**						
		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

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Valves	Plug Valves	**Plug Valves - Bi-directional, MJ & 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 minimium 100 PSI in both directions.**						
		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
		Val-Matic	NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up
			NA	NA	NA	NA	5700 or 5900 (MJ)	4" & up
Valve Boxes	Valve Boxes with Locking Lids (Cast Iron)	**Two piece standard screw type Heavy Duty Valve Boxes with Locking Lids (Cast Iron) and type of service cast in heavy duty traffic lid (H20 loading) ASTM A48**						
		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	**For mains equal to, or greater than, 16" diameter or equal to greater than 6' feet deep**						
		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 MVB875 Guide Plate	Blue Water Locking Lid	MVB050CR thru MVB130CR with Extension Stem MVB875 Guide Plate	Purple Square Locking Reclaim Lid	MVB050C thru MVB130C with Extension Stem MVB875 Guide Plate	Green Sewer locking Lid

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Coatings	Anti-Graffiti Paint	**Block Walls-Anti-Graffiti Paint per Section 3119 Coatings & Linings**						
		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-Graffitiant (PWS-15 Super Strength)	Professional Phase II Cleaner
	Coatings for Existing Manholes	**Rehabilitation corrosion protection system per Section 3119 Coatings & Linings. Interior coating for force main connections to existing concrete manholes only. New precast structures and existing pump stations shall be lined.**						
		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	**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.**						
		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	**Locating Marker Systems - Wastewater Locator balls placed at all sanitary sewer cleanouts**						
		3M	NA	NA	NA	NA	3M™ EMS 4" Extended Range 5' Ball Marker 1404-XR	
	Fittings SDR 35	**Fittings, Adapters and Plugs - Gravity PVC ASTM-D3034, Min SDR26/ SDR 35**						
		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	

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
PVC Pipe a	Flexible Pipe Connectors	**Flexible Pipe Connectors and Transitions**						
		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	**Frame and Cover**						
		USF Fabrication Inc.	NA	NA	NA	NA	USF 225-AS	
	Adj Ring	**Top Adjusting Rings - HDPE with heavy duty loading (H-20)**						
		Ladtech, Inc	NA	NA	NA	NA	24R, 24S with Rope Sealant CS2455	
	Hatches	**Wet Well and Valve Vault Access Frames and Covers (Include the term "Confined Space" etched or cast into the cover with recessed lock & hasp. Frames and covers per manufacturers specifications.**						
		Halliday Products	NA	NA	NA	NA	S1R or S2R Series	
		USF Fabrication Inc.	NA	NA	NA	NA	APS or APD Series	
	Precast Concrete Structures	**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.**						
		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	**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.**						
		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	**Interior Liner for New or existing Precast Manhole and Precast Wetwell Structures per Section 3119 Coatings & Linings**						
		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	

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Precast Concrete Structures	Heat Shrink Seal	**Heat Shrink Seal - Precast structures shall be primed with manufacturer approved primer prior to application of heat shrunk encapsulation.**						
		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	
	Jointing Material	**Jointing Material Min. 2" width for all products to ensure squeeze out with manufacturer approved primer.**						
		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	**Resilient Connector Pipe Seals, Manhole - Gravity less than 12-inch and less than 15-ft deep**						
		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	**Cast in Place Pipe Seals, Manhole - Gravity Greater Than or Equal to 12-inch and all pipe sizes greater than 15-ft deep**						
		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	**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**						
		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	

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Generator	Gen	**Generator Systems, Fixed Shall be UL 2200 Certified.**						
		Caterpillar	NA	NA	NA	NA	CAT Diesel Generator Set	
		Cummins Power Generation	NA	NA	NA	NA	Diesel Generator Set	
	Fuel Tanks	**Generator Fuel Tanks. Shall be UL2085 certified.**						
		Convault	NA	NA	NA	NA	CVT-3SF or CVT-3FF	
		Phoenix	NA	NA	NA	NA	Envirovault	
	GR	**Generator Receptacle (GR)**						
		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	**Generator Transfer Switch**						
		Russelectric	NA	NA	NA	NA	RMTD Series with model 2000 controller	NEMA 12/3R 316SS Enclosure
Odor Control Units	Biotrickling Filters	**Biotrickling filters**						
		BioAir	NA	NA	NA	NA		
		Biorem	NA	NA	NA	NA	Biosorbens BTF	
		Envirogen	NA	NA	NA	NA	BTF	
		Siemens	NA	NA	NA	NA	Zabocs BTF	
	Carbon Adsorption Units	**Carbon Adsorption Units**						
		Calgon	NA	NA	NA	NA		
		Pure Air Filtration	NA	NA	NA	NA		
		Siemens	NA	NA	NA	NA		
Pressure Gauges	Pressure Gauges	**Pressure Gauges shall have Diaphragm Seals. Oil filled.**						
		Ashcroft	NA	NA	NA	NA	10 1008SL 02L 60# 25 200SS 02T XYTSE	Gauge Diaphragm Seal
		Trerice	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	Pumps	**Submersible Pumps**						
		ABS	NA	NA	NA	NA		
		Flygt	NA	NA	NA	NA		

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Pumps	Floats	**Float Regulator (FR) - Duplex and Triplex Pump Stations**						
		Atlantic Scientific	NA	NA	NA	NA		Roto-Float
	Radar	**Radar - Pulse Burst Radar Transmitter. Input 24 VDC and Output 4-20 mA**						
		Magnetrol	NA	NA	NA	NA		R82-520A-011
Pump Station Main Ser	Main Srvc Disconne	**Main Service Disconnect Breaker**						
		Square D	NA	NA	NA	NA		H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)
	Surge Protector Device	**Surge Protector - UL 1449, 3rd Edition listed and labeled, minimum 10 year warranty, NEMA LS-1 and IEEEC62, 41/45 tested with NEMA 4X enclosure, internal fusing, voltage and phase to match service. Rated 80,000 amps per mode for Duplex & 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.**						
		Current Technology (Power & Systems	NA	NA	NA	NA		XN-80, TG-150 or CurrentGuard 150 Plus Series
		Josyln 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	**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**						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
Pump Station Control Panel	Control Panel	**Control Panel Supplier**						
		ECS	NA	NA	NA	NA		
		Sta-Con Inc	NA	NA	NA	NA		
	Enclosure	**Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop**						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
	Mnts	**Mounting Channel for Enclosures**						
		Unistrut Stainless Steel	NA	NA	NA	NA		1" 5/8 x 1" 5/8 316 SS
	Seal-off	**Explosion-Proof Sealoff**						
		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

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Pump Station Control Panel	AL	**Alarm Light / With Base and Globe (AL)**						
		American Electric	NA	NA	NA	NA	F32552	
		Red Dot Globe Red Dot Base	NA	NA	NA	NA	VGLR-01 VA-01	
	AH	**Alarm Horn (AH)**						
		Wheelock	NA	NA	NA	NA	3IT-115-R	
	Fuse	**Fuses (F)**						
		Bussmann	NA	NA	NA	NA	FNQ-R or KTK-R	
	HOA	**Hand-Auto-Off Selector (HOA)**						
		Square D	NA	NA	NA	NA	9001-SKS43B	
	HSS	**Horn Silence Button (HSS)**						
		Square D	NA	NA	NA	NA	9001-SKR1RH5	
	Inter-lock	**Mechanical Interlock**						
		Square D	NA	NA	NA	NA	S29354	
	Breakers	**Control Panel Main Circuit Breaker (MCB) With S29450 Circuit Breaker Auxiliary Switch**						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		Emergency Circuit Breaker (ECB) With S29450 Circuit Breaker Auxiliary Switch						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		Motor Circuit Breaker (MB)						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		Control Circuit Breaker/ GFCI Receptacle Breaker/ SCADA Breaker						
		Square D	NA	NA	NA	NA	QOU120	
	MS	**Motor Starter (MS)**						
		Square D	NA	NA	NA	NA	Type S Class 8536	
	OL	**Overload Heater(OL)**						
		Square D	NA	NA	NA	NA	Part number will vary with size needed	
	OR	**Overload Reset**						
		Square D	NA	NA	NA	NA	9066-RA1	
	Transformer	**Control Circuit Transformer (XMFR)**						
		Square D	NA	NA	NA	NA	9070TF75D23	120/24 Volt .075 KVA
		Main Circuit Transformer (MCT)						
		Square D	NA	NA	NA	NA	9070T2000D1	480/120 2KVA
	SPB	**Supplemental Protector Breaker - 3 pole, 1-amp for Phase Monitor**						
		Square D	NA	NA	NA	NA	MG24532	

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Pump Station Control Panel	PM	**Phase Monitor (PM)**						
		MPE 240 V.	NA	NA	NA	NA	001-230-118-OVG5	
		MPE 480 V.	NA	NA	NA	NA	002-480-123-OVG5	
	Pump Alternator	**Pump Automatic Alternator (PAA)**						
		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	**Alt. Test Switch**						
		Carling Technologies	NA	NA	NA	NA	6GG5E-78	
		Honeywell	NA	NA	NA	NA	2TL1-50	
	Relay	**Relay**						
		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	**Relay Base**						
		IEDC 8 Pin Relay Base 600 Volt	NA	NA	NA	NA	SR2P-06	
	Duplex Receptacle / GFCI	**Duplex Receptacle/GFCI (DR) Upgraded to 20 Amp**						
		Hubbell	NA	NA	NA	NA	GFTR20BK	
		Pass & Seymour	NA	NA	NA	NA	2095TRBK	
	ETM	**Elapse Time Meter (ETM)**						
		Reddington	NA	NA	NA	NA	711-0160	
	Grounding	**Grounding System**						
		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	**Terminal Strip (TS)**						
		Marathon	NA	NA	NA	NA	Series 200	
		Square D	NA	NA	NA	NA	9080GR6	
	TS	**Terminal Strip End Blocks and End Clamps**						
		Square D	NA	NA	NA	NA	9080GM6B & 9080GH10	

APPENDIX D **LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS** **FEBRUARY 11, 2011**

Cat.	Desc	Manufacturer	Water Model #	Water Comments	Reclaimed Water Model #	Reclaimed Water Comments	Wastewater Model #	Wastewater Comments
Pump Station Control Panel	PL	**Pilot Light (PL) 24 Volt with 1819 Bulb**						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelight 930507X	
	RL	**Run Indicator Light (RL) 120 Volt**						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X With 120MB Bulb	
	MT	**Moisture and Temperature Failure Light (MT) 120 Volt with 120MB Bulb**						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X	
Sluice	Sluice Gate	**Sluice Gate for Wet Well with Motorized Operator**						
		BNW	NA	NA	NA	NA	Model 77 - 316 SS	
		Fontaine	NA	NA	NA	NA	Model 20 - 316 SS	
VFD	VFD	**Variable Frequency Drives**						
		Square D	NA	NA	NA	NA		

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APPENDIX 2

GEOTECHNICAL REPORT

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Report of Subsurface Exploration and Geotechnical Engineering Evaluation

NWRF 24-Inch Reclaimed Water Main – Northern Extension
Orange County, Florida
September 14, 2012
Project No. H1125129

Prepared for:
CPH Engineers, Inc.
Orlando, Florida

Prepared by:
Nodarse & Associates
A Terracon Company
Winter Park, Florida

NODARSE
A Terracon COMPANY

September 14, 2012

CPH Engineers, Inc.
1117 East Robinson Street
Orlando, Florida 32801

Attn: Mr. Jay Morris, P.E.
P: [407] 425-0452
F: [407] 648-1036
E: jmorris@cphengineers.com

RE Report of Subsurface Exploration and Geotechnical Engineering Evaluation
NWRF 24-Inch Reclaimed Water Main – Northern Extension
Orange County, Florida
Project No. H1125129

Dear Mr. Morris:

Nodarse & Associates, a Terracon Company (Terracon) is pleased to present this report of our subsurface exploration and geotechnical engineering evaluation for the referenced project. The purposes of this study were to explore subsurface conditions along the proposed water main alignment and to use the data obtained to provide geotechnical engineering recommendations to assist in the design and construction of the water main for the above-referenced project. This report describes our exploration procedures, exhibits the data obtained and presents our geotechnical engineering recommendations for the installation of the proposed water line.

1.0 PROJECT DESCRIPTION

The project consists of installation of about 3,600 lineal feet of 24-inch ductile iron pipe (DIP) water main associated with the Orange County Utilities NWRF Northern Extension in Orange County, Florida. It is our understanding that the water main is proposed to be installed at an average depth of about 3 feet, and that open-trench construction techniques will be used for installation of the water main.

2.0 SITE CONDITIONS

Review of the USGS "Apopka, Florida" Quadrangle Map, excerpted in **Exhibit A-1** in the **Appendix,** shows that natural ground surface elevation within the project alignment ranges from about +65 to +100 feet NGVD. Nearby lakes are indicated to have water levels ranging in elevation from about +60 to +71 feet with an average elevation of about +66 feet.

Review of the United States Department of Agriculture (USDA)/Soil Conservation Service (SCS) Map of Orange County, Florida, excerpted in **Exhibit A-2** in the **Appendix,** indicates that the near surface soil types present along the alignment consist of:

Soil Type	Description	Depth to Seasonal High Groundwater Table Under Natural Conditions
4	Candler Fine Sands, 0 to 5% Slopes	Greater than 80 inches
5	Candler Fine Sands, 5 to 12% Slopes	Greater than 80 inches

Based on review of the St. John's River Water Management District (SJRWMD) potentiometric maps of the upper Floridan Aquifer for this project area, the estimated elevation of the artesian head is near approximately +60 feet, NGVD, for the project alignment. Artesian conditions are not anticipated to be a concern for this project.

3.0 SUBSURFACE EXPLORATION

The general subsurface soil conditions along the project alignment were explored and evaluated from the following:

- Six (6) manual auger borings (HA-1 to HA-6) performed to depths of about 5 to 7 feet below existing grade in the areas of open-trench pipe construction.
- Visual classification of recovered soil samples with soil classification.
- Laboratory testing of recovered soil samples for soil classification as well as corrosion series testing.

Borings were located in the field by referencing existing site features and measuring from selected features. The locations should be considered approximate, and are presented on **Exhibit A-3** in the **Appendix**.

The hand auger boring procedure consisted of manually turning a 3-inch diameter, 6-inch long sampler into the soil until it was full. The sampler was then retrieved and the soils in the sampler were visually examined and classified. The procedure was repeated until the desired termination depth was achieved or until the sampler could not be advanced deeper due to encountered obstruction(s)/debris (boring HA-5). Samples of representative strata were obtained for further visual examination and classification in our laboratory.

4.0 SOIL AND GROUNDWATER CONDITIONS

Subsurface conditions encountered in the borings are described below and shown on **Exhibit A-3** in the **Appendix**. Descriptions of the soils encountered in the borings are accompanied by the Unified Soil Classification symbol (SP, SC, etc.) based on visual examination and limited laboratory testing. Stratification boundaries between soil types should be considered approximate as the actual transition between soil types may be gradual and soils are stratified with regard to their anticipated engineering characteristics.

In general, the borings encountered fine sand (SP) from the existing ground surface to the boring termination depths. An exception to this generalization occurs at Boring HA-6 where silty fine sand (SM) was encountered from a depth of about 3.5 to 5.5 feet. Also, it should be noted that Boring HA-5 was terminated at a depth of about 5 feet due to encountered trash debris (appeared to be pieces of plastic and rubber). For details at the boring locations, refer to the individual boring profiles on **Exhibit A-3** in the **Appendix**.

Groundwater Table: Groundwater was not observed to the boring termination depths of 5 and 7 feet in the manual auger borings at the time of drilling (August 2012). Groundwater levels regularly fluctuate throughout the year, and therefore, may be different at other times. Groundwater levels at the site will also vary due to fluctuations in the amount of local rainfall.

For purposes of design and construction, the normal seasonal high groundwater levels are estimated to be below the termination depths of the borings.

It should be understood that an estimate of the normal seasonal high groundwater levels are based on the review of available published historical data. It does not imply or guarantee that under certain circumstances of high rainfall conditions or alterations to this or adjoining sites or significant changes in the operating characteristics of adjoining drainage features, that groundwater levels can not be higher than the estimate given above.

5.0 LABORATORY TESTING

Laboratory testing included two (2) single sieve (-200) analyses and two (2) moisture content tests. The purpose of this testing was to assist in classification of soil samples. Test results are presented adjacent to the boring profiles on **Exhibit A-3** in the **Appendix.**

Corrosion Series Testing: A series of corrosion tests were performed on a soil sample obtained from two (2) of the borings. These results indicate that the substructure environment should be classified as moderately and extremely aggressive for use in selection of an appropriate class of concrete and steel, respectively, in accordance with the Florida Department of Transportation (FDOT) Standards. The environmental classifications are based on the Structures Design Guidelines. The corrosion series test results are summarized in **Table 1** in the **Appendix.**

Redox Potential: A soil sample was obtained from two (2) of the borings for redox potential and sulfide testing. The redox potential and sulfide test results are summarized in **Table 1** in the **Appendix.**

The Ductile Iron Pipe Research Association (DIPRA) uses a 10-point soil evaluation procedure to determine whether corrosion protection measures, such as polyethylene encasement, are warranted due to local soil conditions. The 10-point system considers soil properties such pH, resistivity, sulfides, and redox potential; and assigns a corresponding point value based on laboratory results for the properties in question. Corrosion protection is recommended in soils with a total point value of 10 points based on this system.

Based on results of laboratory testing from soil samples obtained from the borings, the tested soils do not achieve a value of 10 points or more, based on the DIPRA publication, which implies that additional corrosion protection is not necessary.

A summary of the soil evaluation is presented on **Table 2** in the **Appendix.**

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained in our field exploration and our experience with similar subsurface conditions and construction types. If the proposed water main alignment or installation depths are significantly different from those previously described, or if subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review and modify, if necessary, the following recommendations in regards to such changes. The general guidelines included in this report are not intended to supersede any more stringent requirements mandated by Orange County specifications.

General Site Preparation: It is our understanding that the top of the proposed water main is proposed to be at about 3 feet below existing grade for the pipeline. The following general procedures are recommended for site preparation:

- All excavations required for pipe construction and installation should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavations not steeper than 1.5 Horizontal to 1 Vertical (1.5H: 1V) to provide for adequate worker safety.
- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed braced excavation, trench shield or sheet piling would be required to stabilize installation trenches. All shields, shoring and bracing systems or sheet piling should be designed and reviewed by an experienced Professional Engineer registered in the State of Florida. Adjacent traffic loads and induced vibrations among other factors should be included in the design of these stabilization systems.
- It should be noted that strict moisture control of soils at this site should be anticipated during construction due to the relatively low fines content. Moisture control of soils at this site will most likely be necessary to achieve the necessary compaction requirements.
- It should be noted that trash debris (pieces of plastic and rubber) was encountered in boring HA-5 at a depth of about 5 feet. Difficult excavation conditions should be anticipated by the Contractor in the area of boring HA-5, and may be encountered in other locations along the proposed alignment. Special equipment may be required to excavate and/or penetrate the trash debris material, if encountered. The Contractor shall be prepared to properly dispose of this material off-site, if encountered.

Pipe Subgrade: Based on our understanding of the construction depths for the proposed pipeline, we offer the following recommendations:

- The soils encountered in the borings appear suitable to support the proposed water main.
- If unsuitable soils (soft clays, organics, hardpan, etc.) are encountered during construction, they should be removed to a depth of 1 foot below the pipe bottom and to the horizontal extent of the bedding, replaced with well-draining granular sands with a fines content of 10% or less passing the No. 200 U.S. Standard sieve by weight and compacted to at least 98% of the soils' modified Proctor maximum dry density (ASTM D-1557).
- If trash debris is encountered during construction, it should be completely removed below the pipe bottom and to the horizontal extent of the bedding, replaced with well-draining granular sands with a fines content of 10% or less passing the No. 200 U.S.

Standard sieve by weight and compacted to at least 98% of the soils' modified Proctor maximum dry density (ASTM D-1557).

- In-place density testing of the pipe subgrade soils should be performed at a frequency of at least one test per 300 lineal feet of pipe alignment to verify this compaction is achieved.
- The bedding soil beneath the pipe should be properly shaped to completely support the pipe section and areas should be excavated to accommodate any bells or other raised portions of the pipe to help avoid point loading conditions.
- A minimum separation of 2 feet between the bottom of the compacted subgrade level and the groundwater level is recommended during construction and backfilling operations.
- After the subgrade soils have been prepared as recommended above, the pipe may be installed.

Pipe Backfill Soils: Regarding the pipe subgrade soils, we offer the following recommendations:

- Compaction of backfilled soils around the pipe should be accomplished in loose lift thicknesses no thicker than 12 inches.
- The majority of soils encountered in the borings performed during the exploration should be suitable for use as pipe backfill.
- Unsuitable materials (trash debris, soft clays, organics, hardpan, etc.), if encountered, should not be used as pipe backfill.
- From one (1) foot above the pipe to the finished grade elevation, compaction should be accomplished with a small plate or hand-guided drum-type vibratory compactor. Fill should be placed on both sides of the pipe to avoid pipe displacement or unequal pressure on the pipe. Extreme caution should be exercised when operating vibratory equipment near existing structures. Smaller hand compactors should be utilized in all restricted areas, such as beneath pipe haunches and to one (1) foot above the pipe to help provide uniform compaction around the pipe.
- At least one (1) density test per 300 lineal feet of pipe length per lift should be performed to verify that the soil has been compacted to at least 98% of its Modified Proctor maximum dry density (ASTM D-1557).
- Care should be taken to also test the haunch area and to 1 foot above the pipe on this same frequency of one (1) test per 300 lineal feet of pipe installed.
- If compaction difficulties arise during construction, the Geotechnical Engineer should be consulted to provide further recommendations.

Difficult Drilling/Excavation: As previously mentioned, the Contractor should be made aware that trash debris was encountered in boring HA-5 during our field exploration and may be encountered in other locations along the proposed alignment.

The Contractor should be made aware that this material may be present along the water line alignment and should take the appropriate steps to handle it during construction. The Contactor shall anticipate the need for special equipment and/or procedures to facilitate excavations, dewatering, and penetration along the alignment. The Contractor shall be prepared to properly dispose of this material off-site, if encountered.

Temporary Dewatering: Groundwater was not observed to the termination depths of the borings at the time of drilling. Seasonal high groundwater levels are estimated to be below the boring termination depths at the boring locations. Based on this information and the proposed embedment depths of the pipes, dewatering is not anticipated to be required to facilitate construction, backfill and compaction in the dry.

However, if dewatering will be needed, we offer the following recommendations:

- Dewatering operations at this site for pipe installation should be accomplished with a properly designed dewatering system operating outside the excavation limits.
- The dewatering system should be adequate to lower groundwater levels to at least 2 feet below the lowest compaction surface and keep it there during backfilling to facilitate excavations in the dry and proper compaction of bedding and backfill soils.
- The Contractor should review the boring profiles prior to implementing the dewatering system to be aware of anticipated soils.
- The construction should be sequenced so that the dewatering system is not turned off until the pipe has enough weight placed over it to counteract an uplift force equivalent to the height of standing water above the base of the pipe. The resisting weight of soil over the pipe should be calculated using the buoyant unit weight of the soil.

7.0 REPORT LIMITATIONS

This report is based on the results of a limited number of borings and may not accurately reflect conditions between or away from boring locations. Variations of the subsoil conditions between or away from the borings may occur. If conditions not discussed in this report are observed, we request the opportunity to review our recommendations.

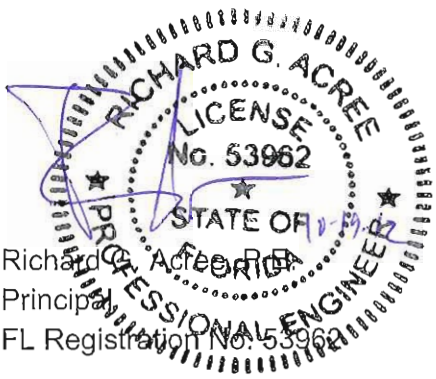
8.0 CLOSURE

Terracon appreciates the opportunity to be of service to you on this project. If you should have questions concerning the contents of this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NODARSE & ASSOCIATES, INC.
A Terracon Company

Elias N. Jammal, P.E.
Senior Project Engineer
FL Registration No. 60126



Richard G. Acree, P.E.
Principal
FL Registration No. 53962

Attachment: Appendix

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APPENDIX

TABLES

TABLE 1
CORROSION SERIES TESTING RESULTS
NWRF 24-INCH RECLAIMED WATER MAIN - NORTHERN EXTENSION
ORANGE COUNTY, FLORIDA
N&A PROJECT NO. H1125129

Boring Number	Sample Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	Redox Potential (mV)	Sulfides	Substructural Environmental Classification	
								Concrete	Steel
HA-2	1.0	6.4	37,000	60	24.9	223.9	Trace	Slightly Aggressive	Moderately Aggressive
HA-5	3.5	5.9	31,000	60	57.9	220.7	Trace	Moderately Aggressive	Extremely Aggressive

TABLE 2
SOIL TEST EVALUATION FOR DUCTILE IRON PIPE
NWRF 24-INCH RECLAIMED WATER MAIN - NORTHERN EXTENSION
ORANGE COUNTY, FLORIDA
N&A PROJECT NO. H1125129

Soil Characteristics	Points
Resistivity (ohm-cm)	
<1500	10
1500-1800	8
1800-2100	5
2100-2500	2
2500-3000	1
>3000	0
pH	
0-2	8
2-4	5
4-6.5	0
6.5-7.5	0
7.5-8.5	0
>8.5	3
Redox Potential (mV)	
>100	0
50-100	3.5
0-50	4
<0	5
Sulfides	
Positive	3.5
Trace	2
Negative	0
Moisture	
Poor drainage, continuously wet	2
Fair drainage, generally moist	1
Good drainage, generally dry	0

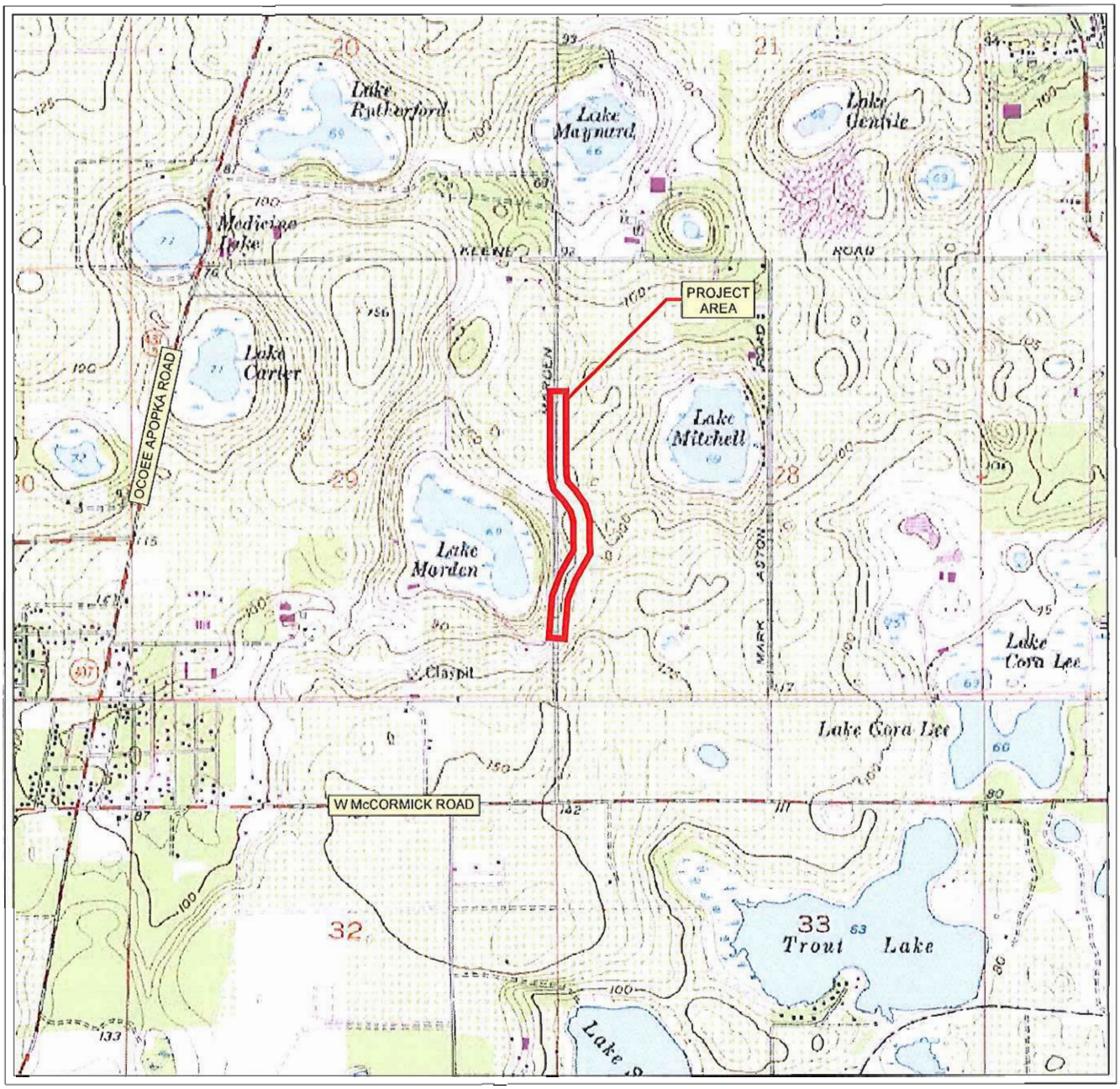
Soil Test Results (worst case)		Point Value
Resistivity	31,000 - 37,000	0
pH	5.9 - 6.4	0
Redox potential	221 - 224	0
Sulfides	Trace	2
Moisture	Good Drainage, Generally Dry	0
	Total Points	**2**

Corrosion protection is recommended where total point value is 10 or more.

Source: "Polyethylene Encasement" publication, Ductile Iron Pipe Research Association, May 2007 revision

EXHIBITS

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 1000 2000

MILES

1 .5 0 1

FEET

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

SECTIONS: 28 AND 29
TOWNSHIP: 21 SOUTH
RANGE: 28 EAST

APOPKA, FLORIDA
1960; PHOTOREVISED 1980
7.5 MINUTE SERIES (QUADRANGLE)

N

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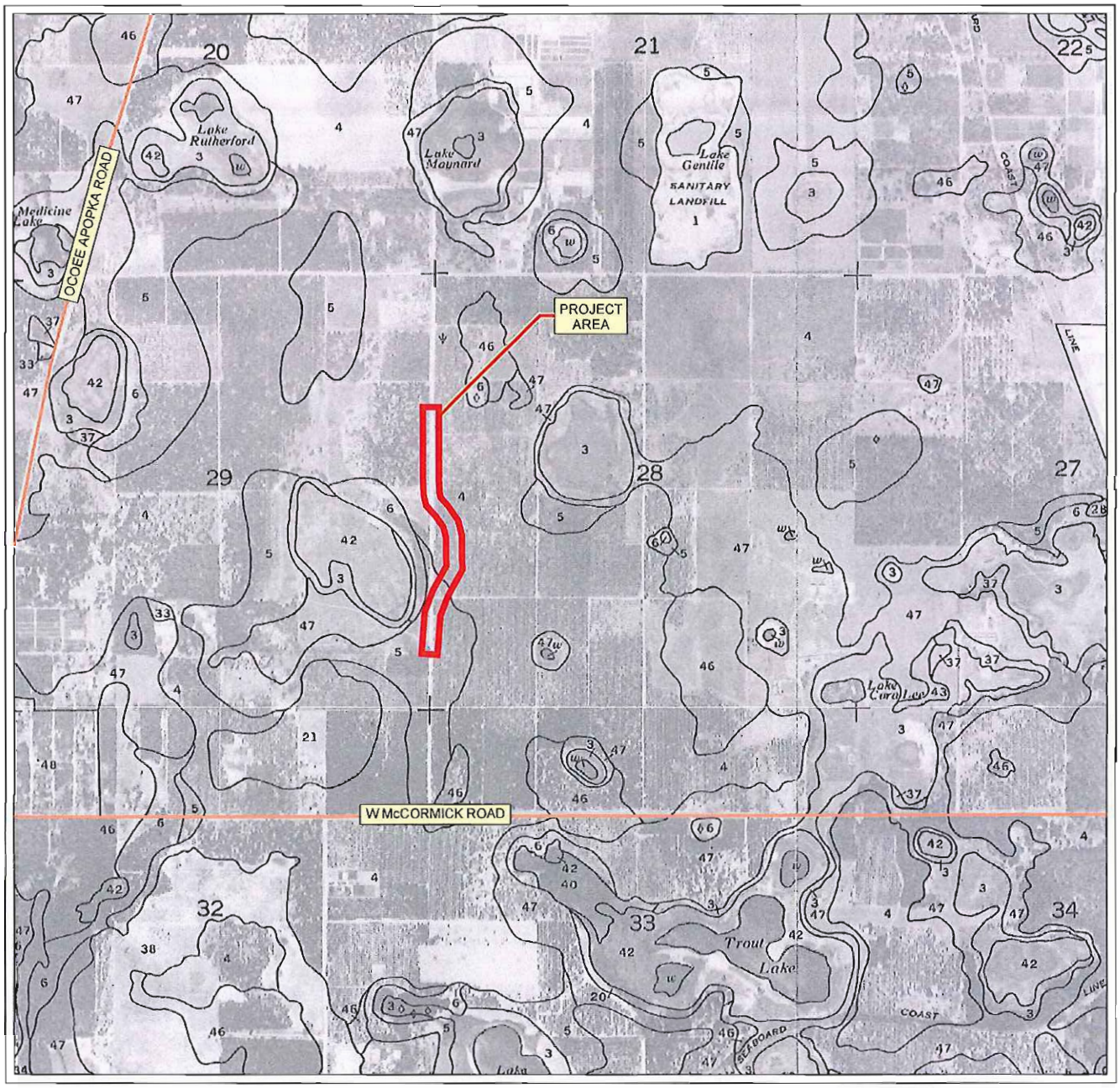
Project Mngr:	EJ
Drawn By:	MG
Checked By:	EJ
Approved By:	RA

Project No.	H1125129
Scale	AS SHOWN
File No	H1125129
Date:	8-21-12

NODARSE
A Terracon COMPANY

TOPOGRAPHIC VICINITY MAP
GEOTECHNICAL ENGINEERING REPORT
NWRF
24" RECLAIMED WATER MAIN - NORTHERN EXTENSION
ORANGE COUNTY, FLORIDA

EXHIBIT
A-1



SCALE 1" = 2000'

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

U.S.D.A. SOIL SURVEY FOR ORANGE COUNTY, FLORIDA
ISSUED: AUGUST 1989

N

SECTIONS: 28 AND 29
TOWNSHIP: 21 SOUTH
RANGE: 28 EAST

SOIL LEGEND	
4	CANDLER FINE SAND, 0 TO 5 PERCENT SLOPES
5	CANDLER FINE SAND, 5 TO 12 PERCENT SLOPES

Project Mngr:	EJ
Drawn By:	MG
Checked By:	EJ
Approved By:	RA

Project No.	H1125129
Scale:	AS SHOWN
File No.	H1125129
Date:	8-21-12

NODARSE
A Terracon COMPANY

SOILS MAP

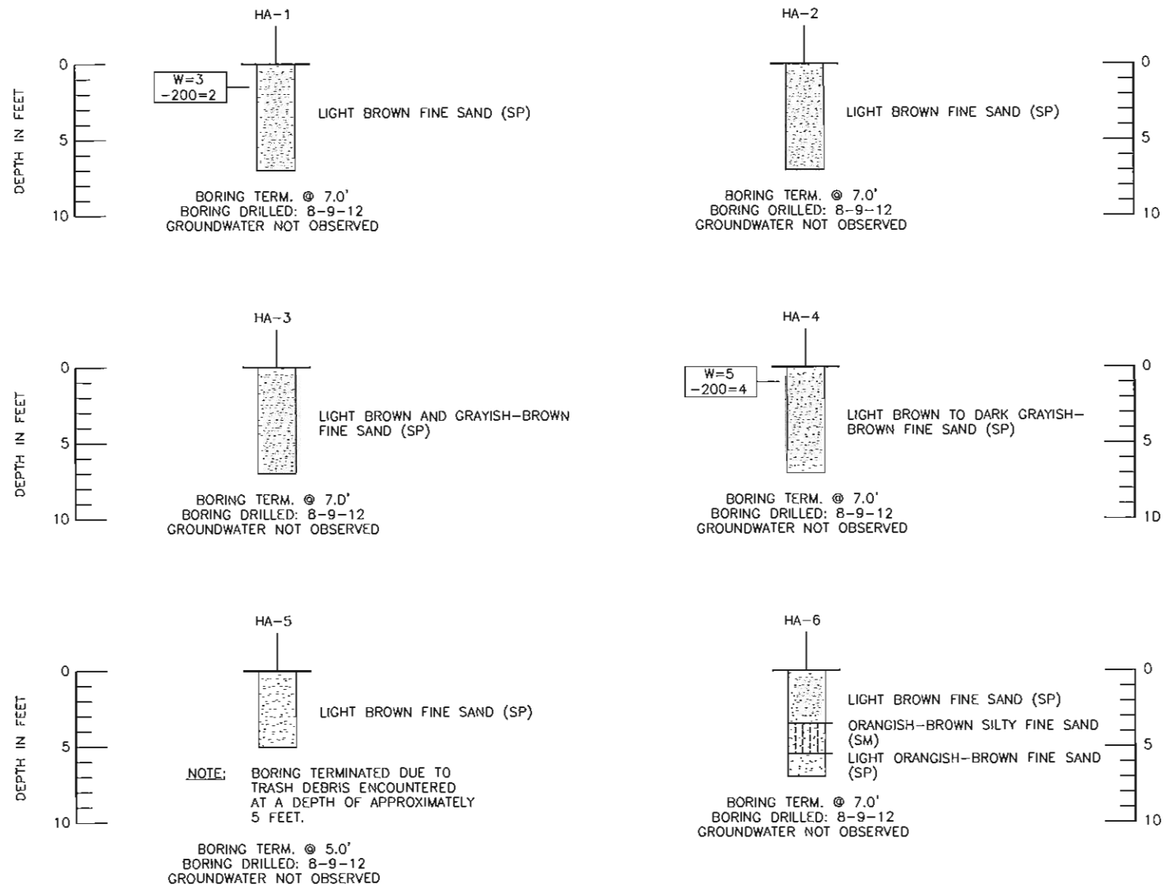
GEOTECHNICAL ENGINEERING REPORT
NWRF
24" RECLAIMED WATER MAIN - NORTHERN EXTENSION
ORANGE COUNTY, FLORIDA

EXHIBIT
A-2

N:\Projects\2012\H1125129\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\Cad\H1125129-Exhibit-A-2.dwg

LEGEND

APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING



LEGEND

SAND

SILTY SAND

(SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL

W=D
-200=0 NATURAL MOISTURE CONTENT (%)
FINES PASSING No. 200 SIEVE (%)

NOTES:

1) LAYER BOUNDARIES ARE APPROXIMATE AND REPRESENT SOIL LAYERS AT EACH TEST HOLE LOCATION ONLY. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED.

2) BASED ON A REVIEW OF THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT POTENTIOMETRIC MAPS OF THE UPPER FLORIDAN AQUIFER FOR THIS PROJECT AREA, THE POTENTIAL ARTESIAN HEAD ELEVATION IS ESTIMATED TO BE +60 FEET NGVD.

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: N/A

SUBSTRUCTURE:

STEEL: EXTREMELY AGGRESSIVE

CONCRETE: MODERATELY AGGRESSIVE (pH=5.9)

Sep14, 2012-2:42pm

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

RICHARD G. ACREE, P.E.
P.E. LICENSE NUMBER 53962
NODARSE AND ASSOCIATES, INC.
1675 LEE ROAD
WINTER PARK, FLORIDA 32789
CERTIFICATE OF AUTHORIZATION No. 8830
NODARSE A Terracon COMPANY

DRAWN BY:	MG 8-21-12
CHECKED BY:	EJ 8-21-12
DESIGNED BY:	
CHECKED BY:	

ORANGE COUNTY UTILITIES DEPARTMENT

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
-	ORANGE	-

SHEET TITLE: REPORT OF AUGER BORINGS

REF. DWG. NO.:

PROJECT NAME: NWRF
24" RECLAIMED WATER MAIN - NORTHERN EXTENSION

SHEET NO.: -

NODARSE A TERRACON COMPANY No. H1125129

EXHIBIT: A-3

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