
IFB NO. Y19-720-CH

INVITATION FOR BIDS

FOR

**HOLDEN AVENUE IMPROVEMENTS (FROM JOHN YOUNG PARKWAY TO
ORANGE BLOSSOM TRAIL {S.R. 441})**

VOLUME III

UTILITIES' SPECIFICATIONS

ORANGE COUNTY UTILITIES DEPARTMENT

HOLDEN AVENUE PHASE I UTILITY IMPROVEMENTS
(FROM JOHN YOUNG PARKWAY TO ORANGE BLOSSOM TRAIL – US 441)

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1 C. All schedules are given for the convenience of the County and the Contractor and are not
2 guaranteed to be complete. The Contractor shall assume all responsibility for the making
3 of estimates of the size, kind, and quantity of materials and equipment included in the
4 Work to be done under this Contract.

5 D. Intent:

- 6 1. All Work called for in the Specifications applicable to this Contract, but not shown on
7 the Drawings in their present form, or vice versa, shall be of like effect as if shown or
8 mentioned in both. Work not specified either in the Drawings or in the
9 Specifications, but involved in carrying out their intent or in the complete and proper
10 execution of the Work, is required and shall be performed by the Contractor as
11 though it were specifically delineated or described.
- 12 2. Items of material, equipment, machinery, and the like may be specified on the
13 Drawings and not in the Specifications. Such items shall be provided by the
14 Contractor in accordance with the specification on the Drawings.
- 15 3. The apparent silence of the Specifications as to any detail, or the apparent omission
16 from them of a detailed description concerning any Work to be done and materials to
17 be furnished, shall be regarded as meaning that only the best general practice is to
18 prevail and that only material and workmanship of the best quality is to be used, and
19 interpretation of these Specifications shall be made upon that basis.

20 E. Refer to the Contract for the order of precedence of items and documents.

21 1.04 PROTECTION AND RESTORATION

22 A. The Contractor shall be responsible for the preservation of all public and private property,
23 and shall use every means of protection necessary to prevent damage thereto. If any
24 direct or indirect damage is done to public or private property by or on account of any
25 act, omission, neglect, or misconduct in the execution of the Work on the part of the
26 Contractor, such property shall be restored by the Contractor, at his expense, to a
27 condition similar or equal to that existing before the damage was done, or the Contractor
28 shall make good the damage in other manner acceptable to the County/Professional.

29 B. Protection of Trees and Shrubs

- 30 1. Protect with boxes or other barricades.
- 31 2. Do not place excavated material so as to injure trees or shrubs.
- 32 3. Install pipelines in short tunnels between and under root systems.
- 33 4. Support trees to prevent root disturbance during nearby excavation.

34 C. Tree and Limb Removal

- 35 1. Tree limbs, which interfere with equipment operation and are approved for pruning,
36 shall be neatly trimmed and the tree cut coated with tree paint.
- 37 2. The County may order the Contractor, for the convenience of the County, to remove
38 trees along the line or trench excavation. The Contractor shall obtain any permits
39 required for removal of trees. Ordered tree removal shall be paid for under the
40 appropriate Contract Items.

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

16 1.05 PUBLIC NUISANCE

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

28 1.06 CONTRACTOR'S PAYMENTS TO COUNTY FOR OVERTIME WORK

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

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

4 1.07 MAINTENANCE OF SERVICE

5 A. Unless noted otherwise on the plans, the operation of the existing water, reclaimed
6 water or wastewater facility on each of the respective locations shall remain in
7 service until the transfer of service has been completed. The Contractor shall, prior
8 to interrupting any utility service (water, sewer, etc.) for the purpose of making cut-
9 ins to the existing lines or for any other purposes, contact the County and make
10 arrangements for the interruption which will be satisfactory to the County.

11 B. Utility lines that are damaged during construction shall be repaired by the
12 Contractor and service restored within 4-hours of the breakage. The County retains
13 the option of repairing any damage to utility pipes in order to expedite service to the
14 customers. The Contractor will remain responsible for all costs associated with the
15 repair.

16 1.08 TRANSFER OF SERVICE

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

20 1.09 LABOR

21 A. Supervision: The Contractor shall supervise and direct the Work efficiently and with
22 his best skills and attention. The Contractor shall have a competent, English
23 speaking superintendent or representative, who shall be on the site of the Project at
24 all working hours, and who shall have full authority by the Contractor to direct the
25 performance of the Work and make arrangements for all necessary materials,
26 equipment, and labor without delay.

27 B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all
28 costs that may be required to perform any of the Work shown on the Drawings or
29 specified herein to avoid any work stoppages due to jurisdictional disputes. The
30 basis for subletting work in question, if any, shall conform to precedent agreements
31 and decisions on record with the Building and Construction Trades Department,
32 AFL-CIO, dated June, 1973, including any amendments thereto.

33 C. Apprenticeship: The Contractor shall comply with all of the requirements of Section
34 446, Florida Statutes, for all contracts in excess of \$25,000 excluding roadway,
35 highway or bridge contracts and the Contractor agrees to insert in any subcontract
36 under this Contract the requirements of this Article.

1 1.10 MATERIALS AND EQUIPMENT

2 A. MANUFACTURER

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

32 1.11 MANUFACTURER'S SERVICE

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

1 1.12 INSPECTION AND TESTING

2 A. General

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

36 B. Cost

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

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

6 C. Shop Testing

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

20 D. Field Testing:

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

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

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

1 G. Inspection by existing utility owners: The Contractor shall pay for all inspections during
2 the progress of the work required and provided by the owner of all existing public
3 utilities paralleling or crossing the Work, as shown on the Drawings. All such inspection
4 fees shall be deemed included in the appropriate Contract Item or items, or if no specific
5 item is provided therefore, as part of the overhead cost of the Work, and no additional
6 payment will be made therefore.

7 H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida
8 Department of Environmental Protection, and other authorized governmental agencies
9 shall have free access to the site for inspecting materials and work, and the Contractor
10 shall afford them all necessary facilities and assistance for doing so. Any instructions to
11 the Contractor resulting from these inspections shall be given through the County. These
12 rights of inspections shall not be construed to create any contractual relationship between
13 the Contractor and these agencies.

14 1.13 PROJECT SITE AND ACCESS

15 A. RIGHT-OF-WAY AND EASEMENTS

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

30 B. ACCESS

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

1 1.14 UTILITIES

2 A. UTILITY CONSTRUCTION

3 1. Public utility installations and structures shall be understood to include all poles,
4 tracks, pipes, wires, conduits, house service connections, vaults, manholes and all
5 other appurtenances and facilities pertaining thereto, whether owned or controlled by
6 governmental bodies or privately owned by individuals, firms or corporations, used to
7 serve the public with transportation, traffic control, gas, electricity, telephone,
8 sewerage, drainage or water. Other public or private property, which may be affected
9 by the Work, shall be deemed included hereunder.

10 2. All open excavations shall be adequately safeguarded by providing temporary
11 barricades, caution signs, lights and other means. The Contractor shall, at his own
12 expense, provide suitable and safe bridges and other crossings for accommodating
13 travel by pedestrians and workmen. Bridges provided for access to private property
14 during construction shall be removed when no longer required.

15 3. The length of open trench will be controlled by the particular surrounding conditions,
16 but shall always be confined to the limits described by the County. If any excavation
17 becomes a hazard, or if it excessively restricts traffic at any point, the County may
18 require special construction procedures. As a minimum, the Contractor shall conform
19 to the following restoration procedures:

20 a. Interim Restoration: All excavations shall be backfilled and compacted as
21 specified by the end of each working day. For excavations within existing paved
22 areas; limerock base or soil cement base (match existing) shall be spread and
23 compacted to provide a relatively smooth surface free of loose aggregate material.
24 At the end of each workweek, the S-I asphaltic surface course shall be completed
25 and opened to traffic. Contractor shall coordinate his construction activity
26 including density tests and inspections to allow sufficient time to achieve this
27 requirement. All driveway cuts shall be backfilled, compacted, and limerock base
28 spread and compacted immediately after installation. Contractor shall coordinate
29 with the individual property owners prior to removing the driveway section. Any
30 utility crossing an existing roadway, parking lot or other paved area shall be
31 patched by the end of the working day.

32 b. All pipe and fittings shall be neatly stored in a location, which will cause the least
33 disturbance to the public. All debris shall be removed and properly disposed of
34 by the end of each working day.

35 c. Final Restoration Overlay: After completing all installations, and after testing of
36 the pipe (but no sooner than 30-days after applying the S-I asphaltic surface), final
37 restoration shall be performed. In no event shall final restoration begin after
38 substantial completion. Final restoration shall provide an S-III asphaltic overlay
39 as specified in an uninterrupted continuous operation until completion. Any
40 additional restoration required after testing shall be repaired in a timely manner at
41 no additional cost to the County.

42 d. Maintenance of all restored facilities shall be the Contractor's responsibility. This
43 maintenance shall be performed on an on-going basis during the course of
44 construction. The Contractor's Progress Schedule shall reflect the above
45 restoration requirements.

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

8 **B. EXISTING UTILITIES**

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

32 **C. NOTICES**

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

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

3 D. EXPLORATORY EXCAVATIONS

- 4 1. Exploratory excavations shall be conducted by the Contractor for the purpose of
5 locating underground pipelines or structures in advance of the construction. Test pits
6 shall be excavated in areas of potential conflicts between existing and proposed
7 facilities and at piping connections to existing facilities a minimum of 48-hours or
8 1,000-feet in advance of work. If there is a potential conflict, the Contractor shall
9 notify the County/Professional immediately. Information on the obstruction to be
10 furnished by the Contractor shall include: Location, Elevation, Utility Type, Material
11 and Size. Test pits shall be backfilled immediately after their purpose has been
12 satisfied and the surface restored and maintained in a manner satisfactory to the
13 County.

14 E. UTILITY CROSSINGS

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

20 F. RELOCATIONS

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

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

5 1.15 RELATED CONSTRUCTION REQUIREMENTS

6 A. PUBLIC INFORMATION OFFICER

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

26 B. TRAFFIC MAINTENANCE

- 27 1. Refer to Section 01570 – Maintenance of Traffic

28 C. BARRIER AND LIGHTS

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

36 D. DEWATERING AND FLOTATION

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

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

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

11 E. DUST AND EROSION CONTROL

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

29 F. LINES AND GRADES

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

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

7 G. TEMPORARY CONSTRUCTION

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

15 H. DAILY REPORTS

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

38 I. CLEANING

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

1 **SECTION 01025**

2 **MEASUREMENT AND PAYMENT**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

5 A. This Section specifies administrative and procedural requirements to define pay items
6 and determine payable amounts, and includes but is not limited to:

- 7 1. General Provisions
- 8 2. Cash Allowances
- 9 3. Work Not Paid for Separately
- 10 4. Measurement for Payment
- 11 5. Partial Payment for Stored Materials and Equipment

12 1.02 GENERAL PROVISIONS

13 A. This specification includes standard descriptions for all bid items. This Contract's
14 specific bid items are listed in the Bid Schedule.

15 B. The total Contract Amount shall cover the Work required by the Contract Documents. All
16 costs in connection with the successful completion of the Work, including furnishing all
17 materials, equipment, supplies, and appurtenances; providing all construction, equipment,
18 and tools; and performing all necessary labor and supervision to fully complete the Work,
19 shall be included in the unit and lump sum prices bid. All Work not specifically set forth
20 as a pay item in the Bid Form shall be considered a subsidiary obligation of the
21 Contractor and all costs in connection therewith shall be included in the prices bid.

22 C. If used, all estimated quantities stipulated in the Bid Schedule or other Contract
23 Documents are approximate and are to be used only (a) for the purpose of comparing the
24 bids submitted for the Work, and (b) as a basis for determining an initial Contract
25 Amount. The actual amounts of Work completed and materials furnished under unit
26 price items may differ from the estimated quantities. The County does not expressly or
27 by implication represent that the actual quantities involved will correspond exactly to the
28 quantities stated in the Bid Schedule; nor shall the Contractor plead misunderstanding or
29 deception because of such estimate or quantities or of the character, location or other
30 conditions pertaining to the Work. Payment to the Contractor will be made only for the
31 actual quantities of work performed or material furnished in accordance with the
32 Drawings and other Contract Documents, and it is understood that the quantities may be
33 increased or decreased as provided in the General Conditions.

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

28 1.03 CASH ALLOWANCES

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

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

3 1.04 WORK NOT PAID FOR SEPARATELY

4 A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay
5 items including their installation and no other separate payment will be made therefore.

6 B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for
7 the Work covered by the required bonds and no separate payment will be made.

8 C. Preparation of Site: Payment for preparation of site shall be included in pay items
9 proposed for the various items of Work and no separate payment will be made therefore.
10 Preparation of site includes setting up construction plant, offices, shops, storage areas,
11 sanitary and other facilities required by the specifications or state law or regulations;
12 providing access to the site; obtaining necessary permits and licenses; payments of fees;
13 general protection, temporary heat and utilities including electrical power; providing shop
14 and working drawings, certificates and schedules; providing required insurance;
15 preconstruction photographs and videos; clearing and grubbing; removal of existing
16 pavements, sidewalks and curbs; trench excavation, sheeting, shoring and bracing;
17 dewatering and disposal of surplus water; structural fill, backfill, compaction and
18 grading; testing materials and apparatus; maintenance of drainage systems; appurtenant
19 work; record drawing and close-out documentation; cleaning up; and all other work
20 regardless of its nature which may not be specifically referred to in a Bid Item but is
21 necessary for the complete construction of the project set forth by the Contract.

22 D. Permitting & Permit Fees.

23 E. The County reserves the right to delete any item included in the Schedule of Values and
24 decrease the Contract Price by the scheduled amount for the item deleted.

25 1.05 MEASUREMENT FOR PAYMENT

26 A. Methods of Measurement - Generally:

27 1. Units of measurement shall be defined in general terms as follows:

- 28 a. Linear Feet (LF)
- 29 b. Square Feet (SF)
- 30 c. Square Yards (SY)
- 31 d. Cubic Yards (CY)
- 32 e. Each (EA)
- 33 f. Sacks (SK)
- 34 g. Lump Sum (LS)

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

- 13 B. Lump Sum Contracts/Items - Generally:
14 1. Quantities provided in the Schedule of Values are for the purpose of estimating the
15 completion status for progress payments. Payment will be made for each individual
16 item on a percentage of completion basis as estimated by the Contractor and approved
17 by the County.
18 2. Adjustments to costs provided in the accepted Schedule of Values may be made only
19 by Change Order.
20 3. The County reserves the right to delete any item included in the Schedule of Values
21 and decrease the Contract Price by the scheduled amount for the item deleted.

22 1.06 MEASUREMENT AND PAYMENT ITEMS

23 A. ***Only those bid items included in the Bid Schedule are applicable for this Contract.*** The
24 County has standardized the measurement and payment items. Currently, there are
25 approximately 100 measurement and payment items describing approximately 300 bid
26 items. The sections and subsections are listed below.

- 27
28 10. General Requirements
29 10.1 General
30 11. Site Work
31 11.1 Miscellaneous
32 11.2 Road Work
33 11.3 Install/Replace Fence or Wall
34 11.4 Bypass Pumping
35 11.5 Abandon or Remove Pipe/Structure
36 12. Pressure Pipes
37 12.1 Pressure Pipe and Fittings and Restrained Joints
38 12.2 Valves
39 12.3 Tapping Sleeve and Valve Assembly
40 12.4 Cut-in Connections to Existing Main
41 12.5 Piping Appurtenances
42 12.6 Directional Drill
43 12.7 Pipe Bursting
44 13. Wastewater Collection System

- 1 13.1 Cleaning Sanitary Sewers
- 2 13.2 CCTV Sanitary Sewers
- 3 13.3 Install/Replace Sanitary Sewer
- 4 13.4 Install/Replace Sanitary Manholes
- 5 13.5 Sanitary Manhole Rehabilitation
- 6 13.6 Sanitary Service Laterals and Cleanouts
- 7 13.7 Cured-in-Place Pipe (CIPP) Liner
- 8 13.8 Sanitary Sewer Pipe Bursting
- 9 14. Pump Stations
- 10 14.1 Wastewater Duplex Pump Station
- 11 14.2 Wastewater Triplex Pump Station

12 All of the subsections have bid item measurement and payment descriptions. Several bid
 13 items in the Project Bid Schedule may be described with the same bid item measurement
 14 and payment description in Table A, "Measurement and Payment Items".
 15

16 **Table A**

BID ITEM	MEASUREMENT AND PAYMENT ITEMS <small>Pg 1</small>
U-1	<p>Mobilization, Demobilization, Bonds, and Permits (not to exceed 5% of the total of all bid items except bid items from U-1 to U-6) (LS)</p> <p>a. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment and all items shall be included in the lump sum price. <u>This lump sum price shall not exceed 5% of the total of all bid items from U-1 to U-6.</u></p> <p>b. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The costs of General Requirements (Section 01001), bonds, permits, and any required insurance, project signs, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including, but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field offices for the duration of the Contract.</p> <p>Payment of the remaining 25 percent of the applicable lump sum price for this item also consists of demobilization or the operations normally involved</p>

	in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work.
U-2	Preconstruction Audio-Video Documentation (LS)
	<p>a. Measurement: Measurement shall be based on the satisfactory submittal of a comprehensive pre-construction audio/visual documentation and construction photographs.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create a comprehensive pre-construction construction audio/visual documentation and construction photographs. Payment will be made once substantial completion has been awarded by Orange County.</p>
U-3	Indemnification (LS)
	<p>a. Payment: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, the County specifically agrees to give the Contractor a maximum of \$100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>
U-4	Project Record Documents (a minimum of 1% of the total of all bid items except bid items from U-1 to U-6) (LS)
	<p>a. Measurement: Measurement for this item shall be based on the percentage of the total value of work performed to date, proportional to the original contract amount and in accordance with the County requirements and specifications (Section 01720). Various items for Project Record Documents shall not be made for individual payment and all items shall be included in the lump sum price. <u>This lump sum price shall be a minimum of 1% of the total of all bid items except bid items from U-1 to U-6).</u></p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create the Project Record Drawings, including the certified as-built survey, in accordance with the County requirements and specifications.</p>
U-5	Maintenance of Traffic (LS)
	<p>a. Measurement: Measurement shall be based on satisfactory Maintenance of Traffic (MOT) in accordance with County requirements and Florida Department of Transportation (FDOT) standards.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian traffic including flag men, uniformed police officers, barricades, warning</p>

	lights/flashers, and safety ropes. Also included is furnishing, installing and maintaining a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special requirements for the safe and expeditious movements of traffic.
U-6	Unsuitable Materials (CY)
	<p>a. Measurement: Unsuitable Material shall be measured in actual cubic yards removed and disposed of in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual removed quantities.</p> <p>b. Payment: Payment will be made at the contract unit price bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to remove and dispose of unsuitable material including the removal of overburden.</p>
U-7	Remove Existing Gravity (LF)
	<p>a. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with the County requirements and specifications (Section 02080). Pipe removal shall be measured along the centerline without deduction for valves and fittings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Remove Existing Pipe and shall include all labor, materials, and equipment to sheet, shore, and brace; excavate; clearing and grubbing; restraining pipes to remain; grading; bypass system and piping; the use of tankers; temporary erosion control; temporary and permanent pavement repair; temporary utility connections and extensions; dewatering and related sampling; pumping and tanking of excess sewage; disposal; site restoration including sidewalks and curbing; groundwater treatment and disposal; completely drain and properly dispose of pipe contents; plug or cap; restoration, sod, clean-up; remove and salvage pipe of all services and sizes designated "to be removed" on the Drawings, backfill and compact; and all work necessary to complete the removal so the main and the new main are concurrently operational and ready for use with now disruption to utility service. Also included in this item is the removal and salvage of items (as listed in Specification Section 02080) attached to the piping to be removed.</p>
U-8 TO U-10	Remove Existing Forcemain (LF)
	<p>a. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with the County requirements and specifications (Section 02080). Pipe removal shall be measured along the centerline without deduction for valves and fittings. Also included in this item is the</p>

	<p>removal and salvage of items including air release valves and vaults.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Remove Existing Pipe and shall include all labor, materials, and equipment to sheet, shore, and brace; excavate; clearing and grubbing; restraining pipes to remain; grading; temporary erosion control; temporary and permanent pavement repair; temporary utility connections and extensions; dewatering and related sampling; pumping and tanking of excess sewage; disposal; connection to existing pipes; testing and clean-up; site restoration including sidewalks and curbing; groundwater treatment and disposal; completely drain and properly dispose of pipe contents; plug or cap; restoration, sod, clean-up; remove and salvage pipe of all services and sizes designated "to be removed" on the Drawings, backfill and compact; and all work necessary to complete the removal so the main and the new main are concurrently operational and ready for use with now disruption to utility service. Also included in this item is the removal and salvage of items (as listed in Specification Section 02080) all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
U-11	Remove Existing Manhole (EA)
	<p>a. Measurement: Measurement for Remove Existing Manhole shall be made per actual number of manholes satisfactorily excavated and removed in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment for Remove Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit prices shall be full compensation for furnishing all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole designated "to be removed" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole) disposal, clearing and grubbing, excavation, grading, temporary erosion control, temporary and permanent pavement repair, bypass system and piping, pumping and tanking of excess sewage, disposal, the use of tankers, sod and clean-up, site restoration and all work necessary to complete the removal.</p>
U-12	4" Forcemain with Fittings and Restrained Joints (LF)
	<p>a. Measurement: Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as</p>

	<p>stated in the proposal for Forcemain w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, bypass system and piping, tankers, grading, temporary erosion control, electronic disk markers, site restoration, concrete protective slabs, concrete curb and gutter, temporary and permanent pavement repair, groundwater treatment and disposal, all testing, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, all tie-ins, restrained HJ sleeves to fused HDPE adapters, HDPE adapters, metallic tracer wire, line locator, identification markers, removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions and all other items incidental to the construction of the pipelines.</p>
U-13	6” Forcemain with Fittings and Restrained Joints (LF)
	<p>a. Measurement: Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Forcemain w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, bypass system and piping, tankers, grading, temporary erosion control, electronic disk markers, site restoration, concrete protective slabs, concrete curb and gutter, temporary and permanent pavement repair, groundwater treatment and disposal, all testing, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, all tie-ins, restrained HJ sleeves to fused HDPE adapters, HDPE adapters, metallic tracer wire, line locator, identification markers, removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions and all other items incidental to the construction of the pipelines.</p>
U-14	10” Forcemain with Fittings and Restrained Joints (LF)
	<p>a. Measurement: Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p>

	<p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Forcemain w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, bypass system and piping, tankers, grading, temporary erosion control, electronic disk markers, site restoration, concrete protective slabs, concrete curb and gutter, temporary and permanent pavement repair, groundwater treatment and disposal, all testing, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, all tie-ins, line locator, identification markers, removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions and all other items incidental to the construction of the pipelines.</p>
U-15	12” Forcemain with Fittings and Restrained Joints (LF)
	<p>a. Measurement: Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Forcemain w/Fittings and RJs and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, bypass system and piping, tankers, grading, temporary erosion control, electronic disk markers, site restoration, concrete protective slabs, concrete curb and gutter, temporary and permanent pavement repair, groundwater treatment and disposal, all testing, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, tankers, metallic tracer wire, line locator, identification markers, removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions and all other items incidental to the construction of the pipelines.</p>
U-16	4” Plug Valve with Box (EA)
	<p>a. Measurement: Measurement for Plug Valve with Box shall be made per actual number of plug valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars.</p> <p>b. Payment: Payment for the Plug Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box</p>

	<p>extensions, test station box and cap, operating nut extensions, valve wrenches, restraining devices, covers, concrete collars, excavation, dewatering, sheeting, shoring, bracing, backfill, compaction, clearing and grubbing, flushing, testing, disinfection, temporary erosion control, jointing materials (including rings, joint restraints, polyethylene wrap, bolts and gaskets), trench safety, groundwater disposal, bedding material, test station for locating station for locating wires, etching “V” in curb, setting top of valve box to final grade, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-17	6” Plug Valve with Box (EA)
	<p>a. Measurement: Measurement for Plug Valve with Box shall be made per actual number of plug valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars.</p> <p>b. Payment: Payment for the Plug Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box extensions, test station box and cap, operating nut extensions, valve wrenches, restraining devices, covers, concrete collars, excavation, dewatering, sheeting, shoring, bracing, backfill, compaction, clearing and grubbing, flushing, testing, disinfection, temporary erosion control, jointing materials (including rings, joint restraints, polyethylene wrap, bolts and gaskets), trench safety, groundwater disposal, bedding material, test station for locating station for locating wires, etching “V” in curb, setting top of valve box to final grade, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-18	10” Plug Valve with Box (LF)
	<p>a. Measurement: Measurement for Plug Valve with Box shall be made per actual number of plug valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars.</p> <p>b. Payment: Payment for the Plug Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box extensions, test station box and cap, operating nut extensions, valve wrenches, restraining devices, covers, concrete collars, excavation, dewatering, sheeting, shoring, bracing, backfill, compaction, clearing and grubbing, flushing, testing, disinfection, temporary erosion control, jointing materials (including rings, joint restraints, polyethylene wrap, bolts and gaskets), trench safety, groundwater disposal, bedding material, test station for locating station for locating wires, etching “V” in curb, setting top of valve box to final grade, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-19	12” Plug Valve with Box (LF)
	<p>a. Measurement: Measurement for Plug Valve with Box shall be made per</p>

	<p>actual number of plug valves with valve boxes satisfactorily furnished and installed complete with covers and concrete collars.</p> <p>b. Payment: Payment for the Plug Valve with Box shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment to install the valve, valve box, valve box extensions, test station box and cap, operating nut extensions, valve wrenches, restraining devices, covers, concrete collars, excavation, dewatering, sheeting, shoring, bracing, backfill, compaction, clearing and grubbing, flushing, testing, disinfection, temporary erosion control, jointing materials (including rings, joint restraints, polyethylene wrap, bolts and gaskets), trench safety, groundwater disposal, bedding material, test station for locating station for locating wires, etching “V” in curb, setting top of valve box to final grade, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-20	6” Tapping Sleeve and Valve Assembly (EA)
	<p>a. Measurement: Measurement for Tapping Sleeve and Valve Assembly shall be made per actual number of tapping sleeves and valves satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Tapping Sleeve and Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a wet tap to an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, tapping valve, valve box extensions, operating nut extensions, valve wrenches, restraining devices, protection of potable water system, disinfection, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-21	10” Tapping Sleeve and Valve Assembly (EA)
	<p>a. Measurement: Measurement for Tapping Sleeve and Valve Assembly shall be made per actual number of tapping sleeves and valves satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Tapping Sleeve and Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a wet tap to an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, tapping valve, valve box extensions, operating nut extensions, valve wrenches, restraining devices, protection of potable water system, disinfection, restoration and all other items required for a complete, acceptable and operable installation.</p>

U-22	12” Tapping Sleeve and Valve Assembly (EA)
	<p>a. Measurement: Measurement for Tapping Sleeve and Valve Assembly shall be made per actual number of tapping sleeves and valves satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Tapping Sleeve and Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a wet tap to an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, tapping valve, valve box extensions, operating nut extensions, valve wrenches, restraining devices, protection of potable water system, disinfection, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-23	Line Stop Assembly (6” Diameter) (EA)
	<p>a. Measurement: Measurement for Line Stopping Assembly shall be made per actual number of line stops satisfactorily furnished and installed to permanently or temporarily stop the flow within the indicated main at the locations shown on the Drawings.</p> <p>b. Payment: Payment for the Line Stopping Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a permanent or temporary line stop on an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, flushing, testing, disinfection, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, plug, restraining devices, restraint of existing piping in accordance with the County requirements, swabbing, restoration and clean-up and all other items required for a complete, acceptable and operable installation.</p>
U-24	Line Stop Assembly (10” Diameter) (EA)
	<p>a. Measurement: Measurement for Line Stopping Assembly shall be made per actual number of line stops satisfactorily furnished and installed to permanently or temporarily stop the flow within the indicated main at the locations shown on the Drawings.</p> <p>b. Payment: Payment for the Line Stopping Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a permanent or temporary line stop on an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, flushing, testing, disinfection, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, plug, restraining</p>

	devices, restraint of existing piping in accordance with the County requirements, swabbing, restoration and clean-up and all other items required for a complete, acceptable and operable installation.
U-25	Line Stop Assembly (12" Diameter) (EA)
	<p>a. Measurement: Measurement for Line Stopping Assembly shall be made per actual number of line stops satisfactorily furnished and installed to permanently or temporarily stop the flow within the indicated main at the locations shown on the Drawings.</p> <p>b. Payment: Payment for the Line Stopping Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a permanent or temporary line stop on an existing main including clearing and grubbing, groundwater disposal, temporary erosion control, flushing, testing, disinfection, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, tapping sleeve, plug, retraining devices, restraint of existing piping in accordance with the County requirements, swabbing, restoration and clean-up and all other items required for a complete, acceptable and operable installation.</p>
U-26	Offset Air Release Valve Assembly (2" Diameter) (EA)
	<p>a. Measurement: Measurement for Offset Air Release Valve Assemblies shall be made per actual number of offset air release valves with enclosures satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Offset Air Release Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the valve including saddle, fittings, pipe, concrete pad, pre-cast vault or enclosure, clearing and grubbing, groundwater disposal, temporary erosion control, manhole rim and cover, flushing, testing and disinfection, excavation, sheeting, shoring, bracing, dewatering and sampling, backfill, compaction, grading, restoration and all other items required for a complete, acceptable and operable installation.</p>
U-27	Sanitary Sewer Gravity Main 8-inch PVC Diameter (LF)
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Sanitary Sewer Main and shall include all labor, materials, and equipment to construct the respective pipeline including</p>

	<p>coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering and related sampling, furnishing and installing pipe bedding, backfill, compaction, grading, applicable pavement restoration, all testing and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
U-28	Sanitary Sewer Gravity Main Connection to Existing Manhole (EA)
	<p>a. Measurement: Measurement for Sewer Main Connection to Existing Manhole shall be made per actual number of core bores and connections to existing manholes satisfactorily furnished and installed.</p> <p>b. Payment: Payment for Sewer Main Connection to Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete connection to an existing manhole including protection of existing utilities, clearing and grubbing, groundwater disposal, temporary erosion control, bypass system and piping, pumping and tanking of excess sewage, the use of tankers, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, wall seal, core drilling, and bench adjustment.</p>
U-29	Sanitary Manhole 4-foot Diameter (8' to 10' Depth) (EA)
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete sanitary manhole installation including clearing and grubbing, groundwater disposal, temporary erosion control, bypass system and piping, pumping and tanking of excess sewage, the use of tankers, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, gravity mains and force mains, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>

U-30	Adjust Existing Sanitary Manhole (EA)
	<p>a. Measurement: Measurement for Adjust Existing Sanitary Manhole shall be made per actual number of sanitary manholes satisfactorily raised or lowered to finished grade.</p> <p>b. Payment: Payment for Adjust Existing Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to adjust existing sanitary manholes to finished grade, including, but not limited to, removal and replacement of frame and cover with brick or adjustment rings; polyolefin sheeting for exterior joint sealing; jointing material, and adjustment of the manhole rim to finished grade, and which are not covered under any of the other pay items in the contract.</p>
U-31	Manhole Cone Replacement (EA)
	<p>a. Measurement: Measurement for Manhole Cone Replacement shall be made per actual number of sanitary manhole cone sections satisfactorily removed and replaced.</p> <p>b. Payment: Payment for Remove Manhole Cone Replacement shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove and replace the manhole cone section including excavation, sheeting, shoring and bracing; dewatering, backfill, and compaction; removal and replacement of frame and cover with brick or adjustment rings; polyolefin sheeting for exterior joint sealing; jointing material, and adjustment of the manhole rim to finished grade.</p>
U-32	Sewpercoat Existing Manhole (VF)
	<p>a. Measurement: Seal and Recoat Manhole shall be measured in vertical feet of manhole sealed and recoated. Manhole seal and recoat shall be measured along the center vertical length of the manhole.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Seal and Recoat Manhole and shall include, but is not necessarily limited to, all labor, equipment, services, supervision and materials for coating existing manholes as shown on the Contract Drawings. The work shall include all surface preparation, leak repair, crack repair, installation of the coating in accordance with the manufacturer's recommendations, and inspection of the finished coating system.</p>
U-33	Fiberglass Manhole Liner (48" Diameter) (EA)
	<p>a. Measurement: Measurement for Fiberglass Manhole Insert shall be made per actual number of fiberglass manhole insert rehabilitation systems satisfactorily furnished and installed, regardless of depth or diameter of manhole</p> <p>b. Payment: Payment for Furnish and Install Fiberglass Manhole Insert shall</p>

	<p>be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for the installation of the complete rehabilitation system as specified, including qualified personnel, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, cleaning and debris removal, removal and replacement of existing manhole corbel and riser section, fiberglass liner installation, benching, grout, pipe connections and stubouts, frame and cover with brick or adjustment rings, protection of existing utilities and structures, clean-up, and adjustment of the manhole rim to finished grade.</p>
U-34	CIPP Lining Existing Gravity (LF)
	<p>a. Measurement: CIPP Liner shall be measured in actual linear feet of furnished and satisfactorily installed cured-in-place liner in the sanitary sewer main from center of manhole to center of manhole, regardless of depth, in accordance with the County requirements and specifications (Section 02771). CIPP liner installation shall be measured along the length of the centerline of the rehabilitated sanitary sewer.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the Bid Schedule for CIPP Liner and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CIPP liner installation including pre and post CCTV inspection, sanitary sewer cleaning (medium cleaning), qualified personnel, providing and processing of liner material, service connection and manhole/wall interface sealing, all costs associated with providing cured CIPP samples for testing, blocking or plugging of incoming lines, grouting, leakage testing, reinstate service laterals, protection of existing utilities, structures, and property, restoration and clean-up.</p>

1

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

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

4

END OF SECTION

- 1 3. List each authorized Change Order and use additional sheets if necessary, list Change
2 Order number and dollar amount for the original item of work.
- 3 4. Each item shall have an assigned dollar value for the current pay period and a
4 cumulative value for the project to-date.
- 5 5. Submit stored material log, partial waivers of claims and mechanic liens, and Consent
6 of Surety with each application, as further explained below.

- 7 D. Contractor shall submit a stored material log with each application for payment that
8 identifies the type, quantity, and value of all stored material that tracks when the stored
9 materials were installed and deducts the installed material from the stored quantity at that
10 time. Include original invoices for all stored materials for which payment is requested.

- 11 E. Waivers of Claims and Mechanics Lien (Waivers): With each Application for Payment
12 the Contactor shall submit waivers of claims and mechanic liens from Subcontractors,
13 Sub-subcontractors, and suppliers for the construction period covered by the previous
14 application.
 - 15 1. The Contractor shall submit partial waivers on each item for the amount requested,
16 prior to deduction for retainage, on each item.
 - 17 2. When an application shows completion of an item, the Contractor shall submit final
18 or full waivers.
 - 19 3. The Contractor shall submit the final Application for Payment with, if not already
20 submitted, the final waivers from every entity involved with performance of work
21 covered by the Application that could lawfully be entitled to a payment claim or lien.
 - 22 4. Format of Waiver Forms: The Contractor shall submit executed waivers of claims and
23 liens on forms acceptable to the County.
 - 24 5. The County reserves the right to designate which entities involved in the Work must
25 submit waivers.

- 26 F. Transmittal of Pay Applications: Contractor shall submit four (4) executed copies of each
27 Application for Payment to the County. One (1) copy shall include all waivers of lien
28 and similar attachments.
 - 29 1. The Contractor shall transmit each Pay Application package with a transmittal form
30 that lists attachments and all appropriate information related to the application. The
31 transmittal form shall be acceptable to the County.
 - 32 2. The Contractor shall include a certification with each application stating that all
33 previous payments received from the County under the Contract have been applied by
34 the Contractor to discharge, in full, all obligations of the Contractor in connection
35 with the Work covered by prior applications for payment. The Contractor shall also
36 certify that all materials and equipment incorporated into the Work are free and clear
37 of all liens, claims, security interest, and encumbrances.

- 38 G. Initial Application for Payment Submittal: Administrative actions and submittals that
39 must precede or coincide with submittal of the initial Application for Payment include
40 the following:
 - 41 1. List of Subcontractors
 - 42 2. List of principal suppliers and fabricators
 - 43 3. Schedule of Values
 - 44 4. Contractor's Construction Progress Schedule (accepted)

- 1 5. List of Contractor's staff assignments
- 2 6. Copies of building permits
- 3 7. Copies of authorizations and licenses from governing authorities for performance of
- 4 the Work
- 5 8. Certificates of insurance and insurance policies
- 6 9. Performance and Payment bonds (if required)
- 7 10. Data needed to acquire County's insurance

8 H. Monthly Application for Partial Payment Submittals: Administrative actions and
9 submittals that must precede or coincide with submittal of Monthly Applications for
10 Partial Payment include the following, as applicable:

- 11 1. Relevant tests
- 12 2. Progressive As-builts Survey Drawings - one (1) paper copy and electronic copy
- 13 3. Table 01050-2 Asset Attribute Data -one (1) paper copy and electronic copy (see
- 14 Specification Section 01050 "Surveying and Field Engineering" Table 01050-2)
- 15 4. Table 01050-3 Pipe Deflection Table - one (1) paper copy and electronic copy (see
- 16 Specification Section 01050 "Surveying and Field Engineering" Table 01050-3)
- 17 5. Table 01050-4 Gravity Main Table - one (1) paper copy and electronic copy (see
- 18 Specification Section 01050 "Surveying and Field Engineering" Table 01050-4)
- 19 6. Boundary Surveys on 8 1/2"X11" format of fee simple and permanent easements for
- 20 pump stations, treatment facilities, and constructed pipe in easements
- 21 7. An electronic copy of all survey field notes
- 22 8. Partial Release of Lien
- 23 9. Partial Consent of Surety
- 24 10. Site photographs
- 25 11. Updated Progress Schedule: submit one (1) electronic copy and five (5) copies
- 26 12. Summary of Values
- 27 13. Pay Request
- 28 14. On-Site Storage of materials

29 I. Substantial Completion Application for Payment Submittal: Following issuance of the
30 Certificate of Substantial Completion, Contractor shall submit an Application for
31 Payment. This Application shall reflect any Certificates of Partial Substantial
32 Completion issued previously for the County's occupancy of designated portions of the
33 Work.

- 34 1. Administrative actions and submittals that shall precede or coincide with this
35 application include:
 - 36 a. Occupancy permits and similar approvals
 - 37 b. Warranties (guarantees) and maintenance agreements
 - 38 c. Test/adjust/balance records
 - 39 d. Maintenance instructions
 - 40 e. Meter readings
 - 41 f. Start-up performance reports
 - 42 g. Change-over information related to the County's occupancy, use, operation and
 - 43 maintenance
 - 44 h. Final Cleaning
 - 45 i. Application for reduction of retainage and consent of surety

1 **SECTION 01050**

2 **SURVEYING AND FIELD ENGINEERING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Professional Surveyor: Provide professional surveying and mapping work required for the
6 execution of the Contract, including verification of existing survey data, construction layout, and
7 production of the As-Built Drawings. This Work shall be performed by a Surveyor that is licensed
8 by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

9 B. Professional Engineer: The Contractor shall provide the services of a Registered
10 Professional Engineer currently licensed in the State of Florida for the required field
11 engineering services as applicable to the work.

12 1.02 REQUIREMENTS

13 A. Survey Services

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

23 B. Field Engineering Services

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

32 1.03 SUBMITTALS

33 A. Provide qualifications of the Surveyor or Engineer.

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

- 1 2. Submit name, address and telephone number of the Surveyor and/or Engineer, as
- 2 appropriate to the County for acceptance before starting survey or engineering work.
- 3 3. Submit written acknowledgement from the Surveyor stating that he has the hardware,
- 4 software and adequate scope of services in his agreement with the Contractor to fully
- 5 comply with the requirements of this specification.

6 B. On request, submit documentation verifying accuracy of survey work.

7 C. Surveyor shall submit certified Tables 01050 – 2, 3 and 4.

8 **PART 2 - PRODUCTS**

9 2.01 SURVEY DOCUMENTS

10 A. Survey documents shall comply with the Minimum Technical Standards of Chapter 5J-17
11 of the Florida Administrative Code (FAC) and Table 01050-1 Minimum Survey
12 Accuracies, whichever are more stringent. All coordinates shall be geographically
13 registered in the Florida State Plane Coordinate System using the contract Drawings
14 control points for horizontal and vertical controls.

15 B. The Surveyor shall not copyright any of their work related to this project.

16 C. For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique
17 asset ID for each utility (water, wastewater or reclaimed water) type, numbered
18 sequentially along the pipe run (including changes in direction) from start to finish of the
19 pipe in Table 01050-2 (Pipe Worksheet). Then branches and services of the same utility
20 type can be numbered. It is recommended that each utility numbering format be
21 distinguishable from the other. This will allow organization and convenient sorting after
22 the individual asset table worksheet tabs are combined in the spreadsheet program prior
23 to copying and pasting to the deflection table spreadsheet. The Microsoft Excel
24 spreadsheet template shall be provided by the County.. The numbering system shall be
25 approved by the County before commencing with production of the spreadsheet.
26

**Table 01050-1
Minimum Survey Accuracies**

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

TABLE 01050-2
Asset Attribute Data Examples

Hydrants Worksheet

A	C	D	E	F	G	H	I
ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments
FH-1	C-7	518456.40	1483743.63	49.53	Brand B	XJ7-B	
FH-2	C-9	518477.68	1483758.95	54.23	Brand B	XJ7-B	

Valves Worksheet

A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	Actuator Manufacturer	Comments
ARV-1	C300	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H	100XT						
ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum	Force Main	4	Brand G	1000						
BFP-1	C303	518086.00	1483282.88	78.21	Backflow Preventer	Reclaimed Water Main	8	Brand F	2000 fgs						
BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E	14 turbo						
BFV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D	230 vls	200	Yes	3 to 1	Yes	Brand C	
GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C	2225846	300	Yes	3 to 1	NO		
LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B	76r44						
PV-22	C405	576880.60	1539718.32	64.52		Force Main	12	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A	

Manhole Worksheet

A	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elev N	Invert Elev NE	Invert Elev E	Invert Elev SE	Invert Elev S	Invert Elev SW	Invert Elev W	Invert Elev NW	Manufacturer	Comments
SAN-MH01	AT-2	475216.00	1501637.12	115.89						110.22		110.12	Del Zotto	
SAN-MH02	AT-2	474895.63	1501636.02	114.98									Del Zotto	
SAN-MH03	AT-2	474849.33	1501600.22	115.18		109.96			109.86				Del Zotto	
SAN-MH04	AT-2	474850.21	1501416.85	115.91	109.19				108.56				Del Zotto	
SS-1	C1.05A	478117.70	1501622.99	118.13					113.73				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-2	C1.05A	478116.77	1501534.19	117.79	113.41				113.38				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-3	C1.05	478111.28	1501152.49	116.45	111.98				111.94				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-4	C1.05A	478105.19	1500781.07	115.72	110.76				110.75				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.

Meter Worksheet

A	C	D	E	F	G	H
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Comments
MM-1	C-6	576533.64	1539520.08	58.01	Water Main	
RWMM-1	C-6	576937.42	1539598.78	64.84	Reclaimed Water Main	

Fitting Worksheet

A	C	D	E	F	G	H	I
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments
FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4°	
FM-2	C-3	574840.74	1539856.91	51.73	Force Main	Bend 22-1/2°	
RW-1	C-4	574887.22	1539849.64	51.75	Reclaimed Water Main	Cross	
RW-2	C-4	574904.30	1539849.56	48.98	Reclaimed Water Main	Reducer	
WM-1	C-5	572532.38	1539848.16	54.42	Water Main	Tapping Saddle	
WM-2	C-5	572631.00	1539337.10	45.27	Water Main	Tee	

Cleanout Worksheet

A	C	D	E	F	G
ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
CO-1	C-6	576533.64	1539520.08	58.01	
CO-2	C-6	576937.42	1539598.42	64.84	Sanitary Service

1 **Pipes Worksheet**

Asset Attribute Table Examples												
A	C	D	E	F	G	H	I	J	K	L	M	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Construction Method	Material	Pressure Class	Manufacturer	Comments	
1												
2	CSNG-1	C-4	517827.57	1482195.46	78.83	Force Main	Bore & Jack (Casing)	PVC	DR18	Brand A		
3	CSNG-2	C-4	517848.20	1482195.31	78.38	Force Main	Bore & Jack (Casing)	PVC	DR18	Brand A		
4	RW-1	C-7	517731.98	1482237.24	80.42	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
5	RW-2	C-7	517732.85	1482338.10	80.94	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.07	1539372.90	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.75	1539375.00	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.20	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.50	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.20	106.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488952.90	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
12												

2
3 **Pump Station Worksheet**

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

4
5 **Well Worksheet**

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

6
7 **Easements Worksheet**

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

8
9 **Existing OC Utility Crossing**

Asset Attribute Table Examples								
A	C	D	E	F	G	H	I	
ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments	
1								
2								
3	CR-02	AT-1	474767.95	1500585.09	98.20	106.20	Force Main	
4	CR-03	AT-1	475239.63	1500596.35	99.10	113.88	Force Main	
5	CR-04	AT-1	475239.61	1500588.49	94.30	112.45	Reclaimed Water Main	
6	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
7	Conf-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main	
8								

10
11 **Grease Interceptor**

Asset Attribute Table Examples							
A	C	D	E	F	G	H	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Volume (Gallons)	Comments	
1							
2	GI-1	C-400	508387.30	1487203.18	89.70	1000.00	
3							
4							

1
2

TABLE 01050-3
Pipe Deflection Data EXAMPLE

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

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

Data that has been inputted Values in yellow are over spec

3

*Uses law of cosines to determine angle ABC and Ø.
 $\text{angle } ABC = \arccos((AB^2 + BC^2 - AC^2) / (2 * AB * BC))$
 $180 - \text{angle } ABC = \text{angle } ABC$
 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 law of sines, using the chord length AC and radius R.
 $\text{Since } \sin((\text{Ø}/2) * (\text{PI}/180)) = (\text{Chord}/2) / R \text{ and length } AC = \text{Chord}$
 $R = AC / (2 * \sin(\text{Ø} * \text{PI} / 360))$
 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.

4

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2
3
4

**TABLE 01050-4
Gravity Main Table**

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

5 **PART 3 - EXECUTION**

6 3.01 SURVEY FIELD WORK

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

1 be used by the Surveyor.

2 D. Use survey control points to layout such work tasks including but not limited to:

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

4 2. Locations for pipelines and all associated structures and appurtenances

5 E. The Surveyor shall reference and replace any project control points, boundary corners,

6 benchmarks, section corners, and right-of-way monuments that may be lost or destroyed,

7 at no additional cost to the County based on the original survey control.

8 3.02 SURVEY DOCUMENTS DELIVERABLES

9 A. All survey documents required under Section 01720 Project Record Documents, Part 2 –

10 Products, paragraphs 2.01 and 2.02.

11

12

END OF SECTION

SECTION 01065
PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. General

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

B. Building Permit (Orange County)

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

C. Construction Dewatering Permit

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

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

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

3

4

5

END OF SECTION

1 **SECTION 01070**

2 **ABBREVIATIONS AND SYMBOLS**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

5 A. Reference to the following standards of any technical society, organization or body shall
6 be construed to mean the latest standard, code or specification or tentative specification
7 adopted and published at the date of advertisement for bids, even though reference has
8 been made to an earlier standard. Such reference is hereby made a part of the Contract
9 the same as if herein repeated in full and in the event of any conflict between any of these
10 specifications, standard codes or tentative specifications and the Contract Documents, the
11 most stringent shall govern.
12

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

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

1 B. UNITS OF MEASUREMENT
2

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

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

1 C. TERMINOLOGY

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

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

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

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1 **SECTION 01091**

2 **REFERENCE SPECIFICATIONS**

3 **PART 1 - GENERAL**

4 1.01 GENERAL

5 A. Applicable Publications: Whenever in these Specifications references are made to
6 published specifications, codes, standards, or other requirements, it shall be understood
7 that wherever no date is specified, only the latest specifications, standards, or
8 requirements of the respective issuing agencies which have been published as of the date
9 that the Work is advertised for bids, shall apply; except to the extent that said standards
10 or requirements may be in conflict with applicable laws, ordinances, or governing codes.
11 No requirements set forth herein or shown on the Drawings shall be waived because of
12 any provision of or omission from said standards or requirements.

13 B. Assignment of Specialists: In certain instances, specification test requires (or implies)
14 that specific work is to be assigned to specialist or expert entities who must be engaged
15 for the performance of the Work. Such assignments shall be recognized as special
16 requirements over which the Contractor has no choice or option. These requirements
17 shall not be interpreted so as to conflict with the enforcement of building codes and
18 similar regulations governing the Work. They are not intended to interfere with local
19 union jurisdiction settlements and similar conventions. Such assignments are intended to
20 establish which party or entity involved in a specific unit of Work is recognized as
21 "expert" for the indicated construction processes or operations. Nevertheless, the final
22 responsibility for fulfillment of the entire set of Contract requirements remains with the
23 Contractor.

24 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

25 A. Without limiting the generality of other requirements of the Specifications, all Work
26 specified herein shall conform to or exceed the requirements of such referenced
27 documents which are not in conflict with the requirements of these Specifications or
28 applicable codes.

29 B. References herein to "Building Code" shall mean the Florida Building Code. The latest
30 edition of the code shall apply to the Work herein, including all addenda, modifications,
31 amendments, or other lawful changes thereto.

32 C. In case of conflict between codes, reference standards, Drawings, and the other Contract
33 Documents, the most stringent requirements shall govern. All conflicts shall be brought
34 to the attention of the Engineer for clarification and directions prior to ordering or
35 providing any materials or labor. The Contractor shall bid the most stringent
36 requirements.

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

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

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

6 END OF SECTION

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

34 1.04 PROGRESS MEETINGS

35 A. The County shall schedule progress meetings at least once per month as required by
36 progress of the Work with the first meeting approximately one (1) month after the pre-
37 construction meeting.

- 38 B. Attendance:
39 1. County
40 2. Contractor
41 3. Subcontractors as appropriate to the agenda
42 4. Suppliers as appropriate to the agenda
43 5. Others as appropriate

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

1 H. Revision to Minutes:

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

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

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

11 3.01 PRE-CONSTRUCTION MEETING

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

16 3.02 CONSTRUCTION PROGRESS MEETINGS

17 A. Contractor shall provide the following:

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

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

16 END OF SECTION

17

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1 1.02 REVIEW OF SHOP DRAWINGS AND SAMPLES

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

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

18 1.03 PRODUCT DATA

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

22 1.04 MANUFACTURERS' INSTRUCTIONS

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

26 1.05 SAMPLES

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

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

33 1.06 FIELD SAMPLES

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

37 1.07 DRAWINGS, PRODUCT DATA AND CERTIFICATES

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

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

17 1.08 SUBSTITUTIONS

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

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

6 1.09 AVAILABILITY OF SPECIFIED ITEMS

7 A. Verify prior to bidding that all specified items will be available in time for installation
8 during Construction for orderly and timely progress of the Work.

9 B. In the event that specified items will not be available, notify the County/Professional
10 prior to receipt of proposals.

11 1.10 OPERATING MANUALS

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

14 1.11 WARRANTIES, GUARANTEES AND BONDS

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

17 1.12 CADD FILES

18 A. The Professional's CADD files will be available on a limited basis to qualified firms at
19 the County's prerogative. The procedure for requesting such files is noted elsewhere in
20 these documents and there is a cost associated with handling and reproduction.
21 Recipients are cautioned that these files may not accurately show actual conditions as
22 constructed. Users are responsible to verify actual field conditions.

23 B. The Professional's Drawings are to be used only for background information. If the
24 Professional's Drawings are just reproduced and resubmitted (e.g. for ductwork
25 drawings) they will be rejected.

26 C. Copies of data furnished by the County/Professional to Contractor or Contractor to
27 County/Professional that may be relied upon are limited to the printed copies (also known
28 as hard copies). Files in electronic media format of text, data, graphics, or other types are
29 furnished only for the convenience of the receiving party. Any conclusion or information
30 obtained or derived from such electronic files will be at the user's sole risk. If there is a
31 discrepancy between the electronic files and the hard copies, the hard copies govern.

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

11 1.13 PROGRESS PHOTOGRAPHS

- 12 A. Photographs and digital pictures shall be in color. Provide 1 copy of each digital picture
13 on each of three (3) CDs and provide 1 print of each photograph in two (2) separate
14 albums.
- 15 B. Photographs shall be from locations to illustrate the condition of Construction and state
16 of progress adequately.
- 17 C. Provide up to 12 digital photographs of views randomly selected by the County, taken
18 prior to any construction and prior to each scheduled Application for Payment.
- 19 D. Deliver electronic images, prints, and negatives to the County.
- 20 E. Each print shall be single weight paper with glossy finish and the overall dimension shall
21 be 7-1/2-inch x 10-inches (19.05 x 25.4 cm). The print shall be clear, sharp and free of
22 distortion after the enlargement from the negative.
- 23 F. Provide loose-leaf albums for each set of photographs to hold prints with a maximum of
24 50-leaves per binder.
- 25 G. Each print shall be protected by flexible, transparent acetate or plastic sheet protector
26 leaves with metal reinforced holes. Two (2) extra leaves shall be provided in each
27 binder.
- 28 H. Capture and provide digital, ortho-rectified, true-color, aerial photographs of the
29 complete project site prior to start of Construction and at final completion. A final 6-inch
30 or less ground pixel resolution is required. If using traditional photography, the photos
31 will need to be captured at an appropriate scale and scanned at a high enough dpi to yield
32 a final ground pixel size of 6-inches or less. If captured digitally, a final 6-inches or less
33 ground sample distance is required. The final orthorectified photos shall use a projection
34 of NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet. All
35 orthophoto mosaics shall meet a final accuracy of plus or minus 5-feet.

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

29 1.14 PROJECT RECORD DOCUMENTS

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

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

33 **PART 3 - EXECUTION**

34 3.01 SUBMITTAL PROCEDURES

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

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

- 1 J. Submit Shop Drawings per the schedule of Shop Drawing submittals, inserted in 1 loose-
2 leaf binder, with tabs and index to the County/Professional. All individual submittal
3 sheets inserted in said binder must be clearly marked and referenced to proper paragraph
4 and subparagraph of specifications. Cross out any items on sheets which constitute
5 information not pertaining to equipment specified. Clearly mark all components that are
6 provided as "optional" by manufacturer. Shop Drawings shall be approved by the
7 Contractor prior to submittal to the County/Professional. Shop Drawings will be
8 reviewed by the County/Professional. After County/Professional approval, reproduce
9 and distribute in accordance with requirements herein.
- 10 K. All submissions of Shop Drawings, brochures and catalog cuts shall be accompanied by a
11 transmittal letter listing the Drawings submitted by number and title.
- 12 L. When engineering calculations and/or professional certification of performance criteria of
13 materials, systems, and/or equipment are required, the County is entitled to rely upon the
14 accuracy and completeness of such calculations and certifications submitted by the
15 Contractor. Calculations, when required, shall be submitted in a neat, clear and in an
16 easy to follow format. Such calculations and/or certifications shall be signed and sealed
17 by a Professional Engineer registered in the State of Florida.
- 18 M. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to
19 promptly report any inability to comply with provisions.
- 20 N. Prior to submission of Shop Drawings and samples, the Contractor shall stamp and sign
21 the submittals. Any submission which, upon examination by the County, shows evidence
22 of not having been thoroughly checked, or is not in compliance with the provisions of this
23 Section will be returned to the Contractor for completion before it will be considered for
24 review.
- 25 O. Notify the County of the need for making any changes in the arrangement of piping,
26 connections, wiring, manner of installation, etc., which may be required by the material
27 or equipment Contractor proposes to supply.
- 28 P. On resubmittals, direct specific attention in writing or on the revised Drawings or sample
29 to revisions other than the corrections required by County on previous submissions.
- 30 Q. All drawings, schematics, manufacturer's product data, certifications and other drawing
31 submittals required for a system specification shall be submitted at one time as a package
32 to facilitate interface checking.
- 33 R. The County will distribute Shop Drawings as follows for the indicated action taken:
34

SHOP DRAWING SUBMITTAL DISTRIBUTION

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

NOTES:

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

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

14 3.02 CONTRACTOR'S REVIEW

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

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

7 3.03 COUNTY'S / PROFESSIONAL'S REVIEW

- 8 A. Corrections or comments made on Shop Drawings during review do not relieve the
9 Contractor from compliance with the requirements of Drawings and Specifications. This
10 check is only for review of general conformance with the design concept of this Project
11 and general compliance with information given in Contract Documents. Any
12 substitutions or changes shall be properly noted.
- 13 B. No action will be taken on "rough-in" Shop Drawings for plumbing and electrical
14 connections when the items of equipment are not included in the same submittal.
- 15 C. Review Time:
- 16 1. On a normal basis, each submittal will be returned to the Contractor within 15
17 working days of the date it is received. Some submittals may require additional time.
- 18 2. If, for any reason, the above schedule cannot be met, the Contractor will be so
19 informed within a reasonable period and the Schedule of Submittals revised. If the
20 specific submittal affects the critical path, the Contractor shall immediately notify the
21 County/Professional in writing. In the event of separate submittals of individual
22 components of a system, these submittals may be held until all components of the
23 system are submitted, and the Contractor will be so notified.
- 24

25 END OF SECTION

SECTION 01301
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 SUMMARY

A. General

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

1.02 QUALITY ASSURANCE

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

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

1.03 DEFINITIONS

- A. Product: Manufactured material or equipment.

1.04 PROCEDURE FOR REQUESTING SUBSTITUTION

A. Substitution shall be considered only:

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

- B. Written request through Contractor only.

C. Transmittal Mechanics

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

D. Transmittal Contents

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

1.05 APPROVAL OR REJECTION

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

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

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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

28 1.03 QUALITY ASSURANCE

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

1 D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor
2 from the obligation to comply with the Contract Times and any sequence of Work
3 indicated in or required by the Contract Documents and to complete, within the Contract
4 Times, any Work omitted from that Progress Schedule.

5 E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any
6 interpretation of or variation from the Contract Documents, unless expressly approved by
7 the County through a written interpretation or by a separate, written notation on the
8 returned Progress Schedule Submittal.

9 1.04 MILESTONES AND SCHEDULE RECOVERY

10 A. The County will select Milestones and Milestone Dates on the basis of the As-Planned
11 Schedule. As the Official Schedule is revised, Milestone Dates will be revised
12 accordingly. Milestone Dates will serve as target dates.

13 B. Whenever any Activity slips by 14 or more Days from the Late Date for an activity in the
14 Official Schedule, Milestone Dates selected by the County, or a pertinent Contract Time,
15 the Contractor will deliver a Revision Submittal documenting the Contractor's schedule
16 recovery plan and/or a properly supported request for an extension in the Contract Time.
17 The narrative will identify the Delay and actions taken by the Contractor to recover
18 schedule, whether by adding labor, Subcontractors or construction equipment, activity re-
19 sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so
20 forth. Activity shortening and overlapping shall be explained as to their basis (and be
21 supported by increases in resources).

22 C. Upon evaluation of that Revision Submittal, if the County determines there is sufficient
23 cause, the County may withhold liquidated damages or provide a notice of intent to do so,
24 if schedule is indeed not recovered, and/or may give a notice of default.

25 1.05 PROGRESS SCHEDULE SOFTWARE

26 A. The scheduling software employed by the Contractor to process the Progress Schedule
27 will be the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM
28 scheduling software.

29 B. If the Contractor intends to use companion schedule reporting, analysis or graphics
30 software tools, the Contractor will furnish to the County descriptive materials and
31 samples describing such software tools.

32 1.06 NON-PERFORMANCE

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

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

4 1.07 REPORTS, SCHEDULES AND PLOTS

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

24 1.08 NARRATIVE REQUIREMENTS

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

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

6 1.09 ACTIVITY REQUIREMENTS

7 A. Separate activities will identify permits, design when included in the Work, construction,
8 Submittal preparation and review (and resubmission and re-review), deliveries (site or
9 storage), testing, start-up, commissioning and Punch List.

10 B. Activities will be detailed to the extent required to show the transition of trade Work.
11 Activities will delineate the progression of the Work.

12 C. Activities will not combine separate or non-concurrent items of Unit Price or lump sum
13 Work.

14 D. Activity durations will equal the Work Days required to sufficiently complete the Work
15 designated by the Activity, (i.e., when finish-to-start successors could start, even if the
16 Activity is not quite 100% complete). Installation Activities will last from 10 to 40
17 workdays. Submittal review activity durations shall conform to specified timeframes.

18 E. Activities will be assigned consistent descriptions and identification codes. Sort codes
19 will group Activities by meaningful schemes.

20 F. Activities will be assigned Activity Values as appropriate and needed to reasonably
21 allocate the Contract Amount to the time periods that they will be earned and eligible for
22 payment based on the Progress Schedule and Schedule of Values. Separate pay activities
23 may be used to simplify cost loading of the Progress Schedule. When used, pay activities
24 shall be loaded with the cost of Work that is included, at no cost, in related (generally,
25 concurrent) CPM activities. Pay activities shall not control the rate of progress; however,
26 their start and finish dates shall be consistent with those of their related CPM activities to
27 ensure accurate Early Date and Late Date cash-flow plots.

28 1.10 FLOAT TOLERANCES AND FLOAT OWNERSHIP

29 A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total
30 and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less
31 than negative 20-days of Float will be returned as "Revise and Resubmit," unless a time
32 extension is requested or the County assesses liquidated damages or gives notice of intent
33 to do so, in the event schedule is not recovered.

34 B. Float calculated from the definitions given in this Section supersede any conflicting Float
35 values in any early completion Progress Schedule.

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

4 1.11 SUBMITTALS

5 A. Each Progress Schedule Submittal will consist of a narrative, 5 copies of the required
6 reports and plots and an optical ROM data disk with the Contractor's corresponding
7 schedule and schedule layout files in Primavera ".XER" format.

8 B. The County will review Progress Schedule Submittals and return a review copy within
9 14-days after receipt and the Contractor shall, if required, resubmit within 7-days after
10 return of the review copy.

11 C. Requirements for the Initial Submittal:

12 1. Within 20-days after receipt of Notice to Proceed and prior to commencing Work on
13 the Project, prepare and submit to the County the Initial Submittal of the Progress
14 Schedule for the Work. The Initial Submittal will show the Work as awarded,
15 without delays, Change Orders or substitutions.

16 a. Activity Values will prorate Schedule of Values costs and/or pay items through to
17 Activities. Provide a cross-reference listing with two parts; a part that will list
18 each activity with the respective amounts allocated from each Schedule of Values
19 and Unit Price Item making up the total value of each activity and a second part
20 that will list the Schedule of Values and Unit Price Items with the respective
21 amounts allocated from each activity that make up the total value of each item.

22 2. After the As-Planned Schedule is established, the County will select Milestones and
23 record the Milestone Early and Late Dates. As the Official Schedule evolves,
24 Milestone Dates will be revised accordingly.

25 3. If the County refuses to endorse the Initial Submittal (or a resubmission) as
26 "Resubmittal Not Required," the As-Planned Schedule will not be established. In that
27 event, the Contractor will continue to submit Payment and Revision Submittals
28 reflecting progress and the Contractor's approach to remaining Work. The County
29 will rely on the available Payment and Revision Submittals, subject to whatever
30 adjustments it determines appropriate.

31 D. Requirements for Payment Submittals:

32 1. Payment Submittals with progress up to the closing date and updated Early Dates and
33 Late Dates for progress and remaining Activities will be due with each Progress
34 Payment. As-built data will consist of actual dates, percent complete, earned
35 payment, changes, Delays and other significant events occurring before the closing
36 date.

37 2. Activity percent complete and earned value should indicate a level of completion that
38 corresponds to the Application for Progress Payment for the same period. The earned
39 value should be calculated by the scheduling software as Activity Value times percent
40 complete. Explanation should be provided whenever the cumulative earned value of
41 activities in a Payment Submittal is not within 10% of the value of Work completed
42 as represented in the corresponding Application for Progress for Payment.

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

4 E. Requirements for Revision Submittals:

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

27 F. Retrospective Delay Analysis.

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

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

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

3

4

END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DEFINITION

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

1.02 REQUIREMENT

- A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the County. Progress payments on account of Unit Price Work will be based on the number of units completed and shall be prorated by the percent complete on the number of units installed not meeting all requirements of the Contract including testing
- B. No payment will be made for Work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the County.
- C. The equitable value of Work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.03 SUBMITTALS

- A. Submit 3 copies of a Preliminary Schedule of Values within 15-days after the recommended award of the Contract.
- B. Submit 3 copies of a proposed final Schedule of Values within 20-days after receipt of Notice to Proceed as per the General Conditions.
- C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by County. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.
- D. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- E. Coordinate listings with the Progress Schedule.
- F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid and provide corresponding schedule of value item number. Stored materials quantities shall not exceed installed quantities on bid tab or as required by the Contract Documents.

- 1 G. Submit a sub-schedule for each separate stage of Work specified in Section 01010
2 "Summary of Work."
- 3 H. The sum of values listed shall equal the total Contract Amount for the Work or the
4 Contract Amount for a part of the Work with a separate Contract Amount provided for by
5 the Contract Documents.
- 6 I. When the County requires substantiating information, submit data justifying line item
7 amounts in question.

8 **1.04 UNIT PRICE CONTRACTS**

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

13 **1.05 LUMP SUM CONTRACTS**

- 14 A. For lump sum contracts, if the Work involves separate facilities, e.g. multiple pump
15 stations, the cost of the Work shall be separated by each facility and into schedule of
16 value items. Break principal subcontract amounts down into these items; The lump sum
17 cost for each facility shall be submitted individually and split into the schedule of values
18 listed in items 1 through 17.
- 19 1. Mobilization/Demobilization at 5% of the base bid for the pump station.
 - 20 2. Project Record Documents at 1% of the base bid for the pump station.
 - 21 3. Indemnification at \$100.00 divided by the number of pump stations in the project.
 - 22 4. Demolition of existing pump station
 - 23 5. Bypass pumping
 - 24 6. Wetwell structure, liner, top slab, hatch covers and appurtenances
 - 25 7. Valve vault structure, hatch covers and appurtenances, drain piping and appurtenances
 - 26 8. Wetwell (mechanical): 316 stainless steel piping and appurtenances, pumps and base plates
 - 27 9. Valve vault (mechanical): piping, valves, and appurtenances
 - 28 10. Yard piping, fittings, valves, and appurtenances (outside of structures)
 - 29 11. Site work and access drive
 - 30 12. Chain link fence and gates
 - 31 13. Masonry walls and gates
 - 32 14. Odor control equipment, related piping, monitoring equipment, etc.
 - 33 15. Generator, fuel storage tank and related piping
 - 34 16. Electrical control panel, wiring, and connections
 - 35 17. Start-up and testing

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

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

38 **END OF SECTION**

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

35 2.02 CONSTRUCTION PHOTOGRAPHS

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

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

9 **PART 3 - EXECUTION**

10 3.01 VIDEO VIEWS REQUIRED

- 11 A. Complete coverage shall include all surface features within 100-feet of the Work area to
- 12 be used by the Contractor and shall be supported by appropriate audio description made
- 13 simultaneously with video coverage. Such coverage shall include, but not be limited to,
- 14 all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts,
- 15 headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults,
- 16 handrails, etc. located within the work zone. Video coverage shall extend to the
- 17 maximum height of all structures within this zone.

- 18 B. The video recorder shall take special efforts to point out and provide audio commentary
- 19 on cracking, breakage, damage, and other defects in existing features.

- 20 C. All video recording shall be done during times of good visibility. No video recording
- 21 shall be done during periods of visible precipitation, or when more than 10% of the
- 22 ground area is covered with standing water, unless otherwise authorized by County.

- 23 D. Prior to commencement of audio-video recording, the Contractor shall notify the County
- 24 in writing within 48-hours of the audio-video recording. The County may provide a
- 25 designated representative to accompany and observe all video recording operations.
- 26 Audio-video recording completed without a County Representative present will be
- 27 unacceptable unless specifically authorized by the County.

28 3.02 AUDIO-VIDEO REQUIREMENTS

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

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

18 3.03 PHOTOGRAPHS

- 19 A. A minimum of 3 views (top, upstream, and downstream) each shall generally be taken
20 prior to backfilling pipelines or structures. Photographs shall be provided for:
- 21 1. Utility conflicts/relocations
22 2. Manholes
23 3. Pump stations
24 4. Boring and jacking
25 5. Directional drilling pipe entrance and exit
26 6. Valve installation
27 7. Air release valve installation
28 8. Fire hydrant assembly
- 29 B. Photo Identification
- 30 1. Name of Project
31 2. Name of Structure
32 3. Orientation of View
33 4. Date & Time of Exposure
34 5. Film numbered identification of exposure
35

36 END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 SITE INVESTIGATION AND CONTROL

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

1.02 INSPECTION OF THE WORK

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

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

1.03 TIME OF INSPECTION AND TESTS

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

1.04 SAMPLING AND TESTING

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

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

1.05 RIGHT OF REJECTION

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

1.06 TESTING LABS

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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

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

11

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

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

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

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

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

22 **END OF SECTION**

1 **PART 3 - EXECUTION**

2 3.01 GENERAL

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

9 3.02 TRAFFIC CONSIDERATIONS

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

14 3.03 BYPASS OPERATION

15 A. The Contractor shall submit a bypass plan to the County and the bypass plan must be
16 approved before the bypass is operational to perform the Work. Contractor shall
17 maintain the wastewater system flow and no surcharging will be allowed to occur out of
18 the system.

19 B. Where Work requires the main or pump station to be taken out service after normal
20 working hours and bypass pumping is being used; the Contractor shall be responsible for
21 monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic
22 monitoring in lieu of on-site monitoring must be detailed in the comprehensive written
23 bypass plan.

24 C. The Contractor shall ensure that no damage will be caused to private property as a result
25 of bypass pumping operations. The Contractor will complete the Work as quickly as
26 possible and pass all tests and inspections before discontinuing bypassing operations and
27 returning flow to the wastewater manhole, main, or pump station.

28 D. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area
29 outside of the existing wastewater system.

30 E. The Contractor shall immediately notify the County should a sanitary sewer overflow
31 (SSO) occur. The Contractor shall take the necessary action to wash down, clean up and
32 disinfect the spillage area to the satisfaction of the County or other governmental agency.

33 F. The Contractor shall cease bypass operations and return flows to the new and/or existing
34 sewer when directed by the County. When bypass operations are complete, all bypass
35 piping shall be drained into the wastewater system prior to disassembly.

1 3.04 CONTRACTOR LIABILITY

2 A. The Contractor shall be responsible for all required pumping, equipment, piping, and
3 appurtenances to accomplish the bypass and for any and all damage that results directly
4 or indirectly from the bypass pumping equipment, piping and/or appurtenances. The
5 Contractor shall also be liable for all County personnel labor and equipment costs,
6 penalties and fines resulting from sanitary sewer overflows. It is the intent of these
7 specifications to require the Contractor to establish adequate bypass pumping as required
8 regardless of the flow condition.
9

10 END OF SECTION

- 1 E. Planning, maintenance and control of traffic shall be provided at the Contractor's
2 expense. The Contractor will bear all expense of maintaining the vehicle and pedestrian
3 traffic throughout the work area.
- 4 F. The Contractor will ensure all personnel involved in traffic control are and capable of
5 communicating with the public. The Contractor may be required to hire off-duty
6 uniformed police officers, in addition to flag persons, to direct and maintain traffic.
7 Locations and conditions requiring such uniformed police officers shall be as directed by
8 the County. The Contractor shall be required to utilize uniformed police officers for
9 work within FDOT maintained ROW, road closures affecting school traffic and during all
10 night work involving a road closure or crossing on nonresidential roads.
- 11 G. The Contractor will remove temporary equipment and facilities when no longer required,
12 restore grounds to original, or to specified conditions.

13 1.03 SUBMITTALS

- 14 A. Submit at Contractor's own expense a Traffic Control Plan for approval by the
15 controlling roadway agency (FDOT, Orange County Public Works or other local
16 government) having jurisdiction over the road for approval.
 - 17 1. The Traffic Control Plan will detail procedures and protective measures proposed by
18 the Contractor to provide for protection and control of traffic affected by the Work
19 consistent with the following applicable standards:
 - 20 a. Standard Specifications for Road and Bridge Construction, latest edition including
21 all subsequent supplements issued by the Florida Department of Transportation,
22 (FDOT Spec.).
 - 23 b. Manual of Traffic Control and Safe Practices for Street and Highway
24 Construction, Maintenance and Utility Operations, FDOT.
 - 25 c. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 26 B. All references to the respective agencies in the above referenced standards shall be
27 construed to also include the municipality as applicable for this Work.
- 28 C. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered
29 in the state of Florida and shall include proposed locations and time durations of the
30 following, as applicable:
 - 31 1. Pedestrian and public vehicular traffic routing.
 - 32 2. Lane and sidewalk closures, other traffic blockage and lane restrictions and
33 reductions anticipated to be caused by construction operations. Show and describe
34 the proposed location, dates, hours and duration of closure, vehicular and pedestrian
35 traffic routing and management, traffic control devices for implementing pedestrian
36 and vehicular movement around the closures, and details of barricades.
 - 37 3. Location, type and method of shoring to provide lateral support to the side of an
38 excavation or embankment parallel to an open travel-way.
 - 39 4. Allowable on-street parking within the immediate vicinity of worksite.
 - 40 5. Access to buildings immediately adjacent to worksite.
 - 41 6. Driveways blocked by construction operations.

- 1 7. Temporary traffic control devices, temporary pavement striping and marking of
- 2 streets and sidewalks affected by construction
- 3 8. Temporary commercial and industrial loading and unloading zones.
- 4 9. Construction vehicle reroutes, travel times, staging locations, and number and size of
- 5 vehicles involved.

6 D. Obtain and submit prior to erection, or otherwise impacting traffic, all required permits

7 from all authorities having jurisdiction, including Orange County Public Works, if

8 applicable.

9 **PART 2 - PRODUCTS**

10 2.01 MATERIALS AND EQUIPMENT

11 A. The Contractor shall furnish, erect, and maintain all necessary traffic control devices,

12 including flag person, in accordance with the Manual of Uniform Traffic Control Devices

13 for Streets and Highways published by the U.S. Department of Transportation, Federal

14 Highway Administration.

15 1. FLAG PERSONS

- 16 a. All flag persons used on this Project will adhere to the following requirements:
- 17 b. Any person acting as a flag person on this Project will have attended a training
- 18 session taught by a Contractor's qualified trainer before the start date of this
- 19 Contract.
- 20 c. The Contractor's qualified trainer will have completed a "Flag person Train the
- 21 Trainer Session" in the 5-years previous or before the start date of this Contract
- 22 and will be on file as a qualified flag person trainer.
- 23 d. The flag person trainer's name and Qualification Number will be furnished by the
- 24 Contractor at the Pre-Construction meeting. The Contractor will provide all flag
- 25 persons with the Flag Person Handbook and will observe the rules and regulations
- 26 contained therein. This handbook will be in the possession of all flag person
- 27 while flagging on the Project.
- 28 e. Flag persons will not be assigned other duties while working as authorized flag
- 29 persons.
- 30 f. Any person replacing flag person for break shall have the same training.

31 **PART 3 - EXECUTION**

32 3.01 NOTIFICATIONS

33 A. The Contractor will notify individual owners, owner's agents, and tenants of buildings

34 affected by the construction, with copies to the county, 72-hours in advance of any

35 construction activities.

36 B. The Contractor shall notify residents and pedestrians via variable message boards no later

37 than 10 days prior to the closure of any road, lane or pedestrian thoroughfare.

- 1 C. The Contractor shall notify Emergency Management Services agencies, Lynx and OCPS
2 no less than 7 days prior to such closures or whenever roads are impassable.
- 3 D. Implement closing of vehicle or pedestrian thoroughfare in accordance with the
4 construction drawings and the approved Traffic Control Plan.
- 5 E. The Contractor will immediately notify the County of any vehicular or pedestrian safety
6 or efficiency problems incurred as a result of the construction of the Project.

7 3.02 GENERAL TRAFFIC CONTROL

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

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

21 3.03 TEMPORARY SHORING

- 22 A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side
23 of an excavation or embankment parallel to an open travel-way. Provide shoring when a
24 theoretical 2:1 or steeper slope from the bottom of the excavation or embankment
25 intersects the existing ground line closer than 5-feet (1.5 m) from the edge of pavement of
26 the open travel-way.
- 27 B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary
28 to maintain traffic at locations shown on the Traffic Control Plan and other locations
29 determined during construction.
30

31 END OF SECTION

1 **SECTION 01580**

2 **PROJECT IDENTIFICATION AND SIGNS**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

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

14 1.02 SUBMITTALS

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

25 1.03 PROJECT IDENTIFICATION SIGN

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

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

4 1.04 INFORMATIONAL SIGNS

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

10 **PART 2 - PRODUCTS**

11 2.01 SIGN MATERIALS

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

30 **PART 3 - EXECUTION**

31 3.01 PROJECT IDENTIFICATION SIGN

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

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

8 3.02 MAINTENANCE

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

17 3.03 REMOVAL

- 18 A. Remove signs, framing, supports, and foundations at Substantial Completion of the
19 Work.
- 20 B. Leave areas clean and patch as required to remove any traces of temporary signs.
21

22 END OF SECTION

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

7 1.04 TEMPORARY HEAT AND COOLING

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

16 1.05 TEMPORARY VENTILATION

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

19 1.06 TEMPORARY WATER SERVICE

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

25 1.07 TEMPORARY SANITARY FACILITIES

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

29 1.08 BARRIERS

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

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

4 1.09 FENCING

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

15 1.10 ACCESS ROADS

- 16 A. Provide and maintain uninterrupted public access to existing buildings. Construction
17 activities will not interfere with access. If Contractor fails to maintain public access after
18 2 written notices within a 24-hour period, the County reserves the right to correct such
19 situation and back charge the Contractor.
- 20 B. Construct and maintain temporary roads accessing public thoroughfares to serve
21 Construction area.
- 22 C. Extend and relocate access roads as Work progress requires. Provide detours necessary
23 for unimpeded traffic flow.
- 24 D. Provide and maintain access to fire hydrants, free of obstructions.
- 25 E. Designated existing on-site roads may be used for Construction traffic. Repair or restore
26 any damaged areas caused as a result of Construction activity. Such repair will be to a
27 like-new condition.

28 1.11 PARKING

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

1 1.12 FIELD OFFICES (FOR UTILITIES DEPARTMENT)

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

31 1.13 SPECIFIC REQUIREMENTS FOR THE FIELD OFFICES

- 32 Provide the following for the exclusive use of the County: (Unless otherwise noted, the quantity
33 should be sufficient for the duration of the Work.)
- 34 A. Office Furnishings: The furniture will be delivered and placed as directed by the County.
- 35 B. Desks: Flat top, double pedestal, with one box and one file drawer in each pedestal, 60-inches
36 by 30-inches. Total quantity will be three (3).

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

33 1.14 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

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

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

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

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

7 **END OF SECTION**

1 **SECTION 01610**

2 **DELIVERY, STORAGE AND HANDLING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. This Section specifies the general requirements for the delivery, handling, storage and
6 protection for all items required in the construction of the Work.

7 B. Deliver, handle and store products in accordance with manufacturer's recommendations
8 and by methods and means that will prevent damage, deterioration, and loss including
9 theft and protect against damage from climatic conditions. Control delivery schedules to
10 minimize long-term storage of products at the site and overcrowding of construction
11 spaces. In particular, provide delivery/installation coordination to ensure minimum
12 holding or storage times for products recognized to be flammable, hazardous, easily
13 damaged, or sensitive to deterioration, theft and other sources of loss. Damaged or
14 defective items, in the opinion of the County, will be replaced at no cost to the County.

15 1.02 REQUIREMENTS

16 A. The Contractor is responsible for all material, equipment and supplies sold and delivered
17 to the County under this Contract until final inspection of the Work and acceptance
18 thereof by the County.

19 B. All materials and equipment to be incorporated in the Work will be handled and stored by
20 the Contractor before, during and after shipment in a manner to prevent warping,
21 twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any
22 kind whatsoever to the material or equipment.

23 C. All materials and equipment, which in the opinion of the County, have become so
24 damaged as to be unfit for the use intended or specified, will be promptly removed from
25 the site of the Work, and the Contractor will receive no compensation for the damaged
26 materials or equipment or for its removal.

27 D. In the event any such material, equipment and supplies are lost, stolen, damaged or
28 destroyed prior to final inspection and acceptance, the Contractor will replace same
29 without additional cost to the County.

30 1.03 DELIVERY

31 A. Transport and handle items in accordance with manufacturer's instructions.

- 1 B. The County and the Contractor's project superintendent must be on-site to accept all
2 deliveries shipped directly to the job site. If the project superintendent is not present for a
3 delivery, that delivery may be rejected by the County. If any delivery is rejected due to
4 non-availability of the Contractor's project superintendent, delivery shall be rescheduled
5 at no additional cost to the County.
- 6 C. Schedule delivery to reduce long-term on-site storage prior to installation and/or
7 operation. Under no circumstances will materials or equipment be delivered to the site
8 more than 1-month prior to installation without written authorization from the County.
- 9 D. Coordinate deliveries in order to avoid delay in, or impediment of, the progress of the
10 Work.
- 11 E. Schedule deliveries to the site not more than 1-month prior to scheduled installation
12 without written authorization from the County.
- 13 F. Coordinate delivery with installation to ensure minimum holding time for items that are
14 hazardous, flammable, easily damaged or sensitive to deterioration.
- 15 G. All items delivered to the site will be unloaded and placed in a manner that will not
16 hamper the Contractor's normal construction operation or those of Subcontractors and
17 other Contractors and will not interfere with the flow of necessary traffic.
- 18 H. Deliver products in undamaged condition, in manufacturer's original containers or
19 packaging, with identifying labels intact and legible. Maintain packaged materials with
20 seals unbroken and labels intact until time of use.
- 21 I. Immediately on delivery, inspect shipments with the County to ensure compliance with
22 requirements of Contract Documents and accepted submittals, and that products are
23 properly protected and undamaged. If the Contractor does not notify the County
24 regarding the delivery and the County rejects any part of the delivery, there will be no
25 additional cost to the County for the material to be returned. For items furnished by
26 others (i.e. County), perform inspection in the presence of the County. Provide written
27 notification to the County of any problems.
- 28 J. Promptly remove damaged material and unsuitable items from the job site, and promptly
29 replace with material meeting the specified requirements, at no additional cost to the
30 County.

31 1.04 STORAGE AND HANDLING

- 32 A. Provide equipment and personnel to handle products by methods recommended by the
33 manufacturer to prevent soiling or damage to products or packaging, with seals and labels
34 intact and legible.
- 35 B. The Contractor is responsible for securing a location for on-site storage of all material
36 and equipment necessary for completion of the Work. The location and storage layout
37 will be submitted to the County at the Pre-Construction conference.

- 1 C. Manufacturer's storage instructions will be carefully studied by the Contractor and
2 reviewed with the County. These instructions will be carefully followed and a written
3 record of this kept by the Contractor.
- 4 D. All material delivered to the job site will be protected from dirt, dust, dampness, water,
5 and any other condition detrimental to the life of the material from the date of delivery to
6 the time of installation of the material and acceptance by the County.
- 7 E. When required or recommended by the manufacturer, the Contractor will furnish a
8 covered, weather protected storage structure providing a clean, dry, non-corrosive
9 environment for all mechanical equipment valves, architectural items, electrical and
10 instrumentation equipment, and special equipment to be incorporated into this Project.
- 11 F. Arrange storage in a manner to provide easy access for inspection. Make periodic
12 inspections of stored products to assure that products are maintained under specified
13 conditions and free from damage or deterioration.
- 14 G. Should the Contractor fail to take proper action on storage and handling of equipment
15 supplied under this Contract within 7-days after written notice to do so has been given,
16 the County retains the right to correct all deficiencies noted in previously transmitted
17 written notice and deduct the cost associated with these corrections from the Contract
18 Amount. These costs may be comprised of expenditures for labor, equipment usage,
19 administrative, clerical, engineering, and any other costs associated with making the
20 necessary corrections.

21 1.05 SPECIFIC STORAGE AND HANDLING

22 (Additional specific storage and handling requirements may be found in the specification
23 sections addressing the material requirements.)

- 24 A. All mechanical and electrical equipment and instruments subject to corrosive damage by
25 the atmosphere if stored outdoors (even though covered by canvas) will be stored in a
26 weather tight building to prevent damage. The building may be a temporary structure on
27 the site or elsewhere, but it must be satisfactory to the County. The building will be
28 provided with adequate ventilation to prevent condensation. Maintain temperature and
29 humidity within range required by manufacturer.
- 30 1. All equipment will be stored fully lubricated with oil, grease and other lubricants
31 unless otherwise instructed by the manufacturer. Mechanical equipment to be used in
32 the Work, if stored for longer than 90-days, will have the bearings cleaned, flushed
33 and lubricated prior to testing and startup, at no extra cost to the County.
 - 34 2. Moving parts will be rotated a minimum of once weekly to ensure proper lubrication
35 and to avoid metal-to-metal "welding." Upon installation of the equipment, the
36 Contractor will start the equipment, at least half load, once weekly for an adequate
37 period of time to ensure that the equipment does not deteriorate from lack of use.

- 1 3. Lubricants will be changed upon completion of installation and as frequently as
2 required thereafter during the period between installation and acceptance. New
3 lubricants will be put into the equipment at the time of acceptance. Prior to
4 acceptance of the equipment, the Contractor will have the manufacturer inspect the
5 equipment and certify that its condition has not been detrimentally affected by the
6 long storage period. Such certifications by the manufacturer will be deemed to mean
7 that the equipment is judged by the manufacturer to be in a condition equal to that of
8 equipment that has been shipped, installed, tested and accepted in a minimum time
9 period. As such, the manufacturer will guaranty the equipment equally in both
10 instances. If such a certification is not given, the equipment will be judged to be
11 defective. It will be removed and replaced at the Contractor's expense.
- 12 4. Electric motors provided with heaters will be temporarily wired for continuous
13 heating during storage. Upon installation of the equipment, the Contractor will start
14 the equipment, at least half load, and once weekly for an adequate period of time to
15 insure that the equipment does not deteriorate from lack of use.
- 16 B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent
17 mixing with foreign matter.
- 18 C. Cement and lime will be stored under a roof and off the ground and will be kept
19 completely dry at all times.
- 20 D. Brick, block and similar masonry products will be handled and stored in a manner to
21 minimize breakage, chipping, cracking and spilling to a minimum.
- 22 E. Precast Concrete will be handled and stored in a manner to prevent accumulations of dirt,
23 standing water, staining, chipping or cracking.
- 24 F. All structural and miscellaneous steel and reinforcing steel will be stored off the ground
25 or otherwise to prevent accumulations of dirt or grease, and in a position to prevent
26 accumulations of standing water and to minimize rusting. Beams will be stored with the
27 webs vertical.
- 28 G. Metals will be stored dry, all under cover and vented to prevent build-up of humidity, all
29 off ground to provide air circulation.
- 30 H. Lumber will be stacked to provide air circulation. Store materials for which maximum
31 moisture content is specified in an area where moisture content can be maintained.
- 32 I. Gypsum wallboard systems will be stored to protect all metal studs, furring, insulation
33 boards, batts, accessories and gypsum board to prevent any type of damage to these
34 materials. Rusted material components, damp or wet insulation or gypsum boards will
35 not be accepted.

1 J. Acoustical materials will be delivered to the job site in unbroken containers labeled and
2 clearly marked. Materials will not be removed from containers until ready to install, but
3 will be stored in dry area with cartons neatly stacked. Before installation, acoustical
4 board will be stored for not less than 24-hours in the Work area at the same temperature
5 and relative humidity.

6 K. Linear items will be stored in dry area with spacers to provide ventilation. Stack linear
7 items to prevent warping, complying with manufacturer's instructions.

8 L. Paints and other volatile materials will be stored within approved safety containers. No
9 glass jugs will be permitted. Storage areas will be equipped with not less than 2 fire
10 extinguishers (CO2 type) sufficient to discharge a distance of 25-feet when fully charged
11 and have current tags. No other building materials will be stored in this area. Used rags
12 will be removed daily. Clean rags will be stored in metal closed containers.

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

14 **PART 3 - EXECUTION (NOT USED)**
15

16 **END OF SECTION**

- 1 A. In the progress payment request that coincides with or is the first request following, the date
2 substantial completion is claimed, show 100% completion or list incomplete items, the value
3 of incomplete Work, and reasons for the Work being incomplete. Inspection procedures
4 include supporting documentation for completion as indicated in these Contract Documents.
- 5 B. Submit a statement showing an accounting of changes to the Contract Sum.
- 6 C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements,
7 final certifications and similar documents in accordance with Section 01740 "Warranties
8 and Bonds."
- 9 D. Obtain and submit lien releases enabling the County's full, unrestricted use of the Work
10 and access to services and utilities.
- 11 E. Consult with County before submitting Record Documents in accordance with Section
12 01720 "Project Record Documents."
- 13 F. Submit Operation and Maintenance Manuals.
- 14 G. Make final changeover of permanent locks. Submit keys and keying schedule.
- 15 H. Deliver tools, spare parts, extra stock, and similar items.
- 16 I. Complete final cleaning requirements necessary for Substantial Completion.

17 1.05 FINAL CLEANING.

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

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

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

9 1.06 OPERATION AND MAINTENANCE MANUALS

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

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

19 1.07 SUBSTANTIAL COMPLETION INSPECTION PROCEDURES

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

27 1.08 PREREQUISITES FOR FINAL ACCEPTANCE.

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

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

1 **SECTION 01720**

2 **PROJECT RECORD DOCUMENTS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

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

15
16 The Asset Attribute Data and Pipe Deflection Table forms can be found on the County's
17 web site:
18 [http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementPro](http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx)
19 [gram.aspx](http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx)

20 1.02 DEFINITIONS

- 21 A. As-Built Drawings: Drawings prepared by the Contractor's Surveyor depicting the actual
22 location of installed utilities for the completed Work.
- 23 B. Record Documents: All documents in subsections 1.04 and 2.02 in this specification.
- 24 C. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided
25 that meets the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.
- 26 D. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional
27 Surveyor and Mapper pursuant to Chapter 472, F.S.
- 28 E. Survey Map Report: As a minimum the Survey Map Report shall identify any corners
29 that had to be reset, measurements and computations made, pump station and easement
30 boundary issues, locations of constructed improvements outside boundaries, and
31 accuracies obtained.

32 1.03 QUALITY ASSURANCE

- 33 A. Delegate the responsibility for maintenance of the Record Documents to one person on

1 the Contractor's staff as approved by the County.

2 B. Thoroughly coordinate changes within the Record Documents, making adequate and
3 proper entries on each page of specifications and each sheet of Drawings and other
4 documents where such entry is required to show progress and changes properly.

5 C. Make entries within 24-hours after receipt of information has occurred.

6 **1.04 RECORD DOCUMENTS AT SITE**

7 A. Maintain at the site and always available for County's use one (1) record copy of:

8 1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental
9 Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract
10 Documents

11 2. Change Orders, Verbal Orders, and other modifications to Contract

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

14 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests

15 5. Field test records, inspection certificates, manufacturer certificates and construction
16 photographs

17 6. Paper copies of the Progressive As-Built Drawings

18 7. Current Surveyor's tables for the Assets Attribute Data, Pipe Deflection Data, and
19 Gravity Main Data

20 B. Maintain the documents in an organized, clean, dry, legible condition and protected from
21 deterioration, loss and damage until completion of the Work, transfer of all record data to
22 the final As-built Drawings for submittal to the County.

23 C. Store As-Built Documents and samples in Contractor's office apart from documents used
24 for construction. Do not use As-Built document for construction purposes. Label each
25 document "AS-BUILT" in neat large printed letters. File documents and samples in
26 accordance with CSI/CSC format.

27 D. Record information concurrently with construction progress. Do not conceal any Work
28 until required information is recorded.

29 **PART 2 - PRODUCTS**

30 **2.01 AS-BUILT DRAWINGS**

31 A. Maintain the electronic As-Built Drawings to accurately record progress of Work and
32 change orders throughout the duration of the Contract.

33 B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.

34 C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected
35 or other means. In the event of overlapping changes, use different colors for entries of

1 the overlapping changes.

2 D. Design call-outs shall have a thin strike line through the design call-out and all As-Built
3 information must be labeled (or abbreviated "AB") and be shown in a bolder text that is
4 completely legible.

5 E. Make entries in the pertinent other documents while coordinating with the County for
6 validity.

7 F. Entries shall consist of graphical representations, plan view and profiles, written
8 comments, dimensions, State Plane Coordinates, details and any other information as
9 required to document field and other changes of the actual Work completed. As a
10 minimum, make entries to also record:

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

28 2.02 RECORD DOCUMENTS

29 A. Three (3) paper copy sets and three (3) digital media sets of the following final Record
30 Documents below.

- 31 B. The following documents shall be signed and sealed by the Surveyor:
- 32 1. Asset Attribute Data Form (see Specification Section 01050 "Surveying and Field
33 Engineering," Table 01050-2 for an example)
 - 34 2. Boundary Survey of fee simple sites (pump station, etc.) and permanent easements
35 with the respective Survey Map Reports
 - 36 3. Boundary Survey and Survey Map Report for the location of constructed pipes within
37 any easements and right-of-way. As a minimum the Survey Map Report shall
38 identify or describe the locations where the pipe centerline was constructed within 3-
39 feet of the easement or right-of-way boundary, where the pipe was constructed
40 outside the easement or right-of-way boundary, any corners that had to be reset,
41 measurements and computations made, pump station boundary issues, and accuracies

- 1 obtained. Survey map report shall be dated after the Work within the right-of-ways
2 or easements have been completed.
- 3 4. Gravity Main Table (see Specification Section 01050 "Surveying and Field
4 Engineering", Table 01050-4 for an example)
- 5 5. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field
6 Engineering" Table 01050-3 for an example). An electronic blank table will be
7 supplied by the County.
- 8 C. Digital sets of the final Record Documents including but not limited to:
- 9 1. Scanned digital copies of the final As-Built Drawings
- 10 2. Electronic Survey documents electronically sealed by the Surveyor
- 11 3. Final Record Documents
- 12 4. Digital file of As-Built Drawing in the Engineer's current version of AutoCAD file
13 (dwg) format
- 14 D. Pump station site Boundary Survey and Map Report.
- 15 E. New Boundary Survey to re-establish easement corners, right-of-way monuments, or
16 pump station site corners with monuments if destroyed by the Work.
- 17 F. Scanned Documents: Scan Record Documents reflecting changes from the Contract
18 Documents.
- 19 G. The scanned "As-Built" Drawing sets shall be complete and include the title sheet,
20 plan/profile sheets, cross-sections, and details. Each individual sheet contained in the
21 printed set of the As-Built Drawings shall be included in the electronic drawings, with
22 each sheet being converted into an individual tif (tagged image file). The plan sheets
23 shall be scanned in tif format Group 4 at minimum of 400 dpi resolution to maintain
24 legibility of each drawing. Then, the tif images shall be embedded into a single pdf
25 (Adobe Acrobat) file representing the complete plan set. Review all Record Documents
26 to ensure a complete record of the Project.
- 27 H. Provide an encompassing digital AutoCAD file that includes all the information of the
28 As-Built Drawings and any other graphical information in the As-Built Drawings. It
29 shall include the overall Work, utility system layout and associated parcel boundaries and
30 easements. Feature point, line and polygon information for new or altered Work and all
31 accompanying geodetic control and survey data shall be included. The surveyor's
32 certified As-Built Asset Attribute Data shall be added to the As-Built Drawings and
33 Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).

34 **PART 3 - EXECUTION**

35 3.01 PRE-CONSTRUCTION MEETING

- 36 A. Pre-construction Meeting: It is recommended that the Surveyor attend the Pre-
37 construction meeting. At the pre-construction meeting the Contractor shall be provided
38 with a blank electronic version of the spreadsheet for the tables: Asset Attribute Data and

1 Pipe Deflection. The Contractor's surveyor shall use these tables to input the data and
2 shall not alter the table format or formulas.

3 3.02 CONSTRUCTION PROGRESS MEETINGS

4 A. Contractor shall provide progressive Record Documents described below:

- 5 1. Construction Contract, As-Built Drawings, Specifications, General Conditions,
6 Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all
7 other Contract Documents.
- 8 2. Specifications and Addenda: Record manufacturer, trade name, catalog number and
9 supplier of each product and item of equipment actually installed as well as any
10 changes made by Field Order, Change Order or other.
- 11 3. Change orders, verbal orders, and other modifications to Contract.
- 12 4. Written instructions by the County as well as correspondence related to Requests for
13 Information (RFIs).
- 14 5. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
- 15 6. Field test records, inspection certificates, manufacturer certificates and construction
16 photographs.
- 17 7. As-Built Asset Attribute Data Form: Surveyor shall obtain field measurements of
18 vertical and horizontal dimensions of constructed improvements. The monthly
19 submittal shall include the Surveyor's certified statement regarding the constructed
20 improvements being within the specified accuracies as described in Specification
21 Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey
22 Accuracies or if not, indicating the variances.
- 23 8. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to
24 include as a minimum the pipe segment identification, pipe lengths, manhole inverts
25 and tops, and slopes for gravity mains. Surveyor shall certify the data entered are
26 correct and indicate if the minimum slopes have not been met.
- 27 9. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC
28 manufacturer deflection allowance, allowable angle of offset and radius of curvature,
29 laying length of pipe, and coordinates. Surveyor shall certify the data entered are
30 correct and indicate if the deflection allowance, offset or radius of curvature exceeds
31 the manufacturer's recommendations.

32 3.03 FINAL RECORD DOCUMENTS SUBMITTAL

33 A. Submit the Final Record Documents within 20-days after Substantial Completion.

- 34 1. Participate in review meetings as required and make required changes and promptly
35 deliver the Final Record Documents to the County.

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37

END OF SECTION

SECTION 01740
WARRANTIES AND BONDS

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PART 1 - GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

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

1.03 DEFINITIONS

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

1.04 SUBMITTALS

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

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

27 1.05 WARRANTY REQUIREMENT

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

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

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

29 **PART 3 - EXECUTION**

30 3.01 DELIVERABLES

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

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

8 B. Warranties

- 9 1. Furnish an extended warranty for sanitary sewer main liner certified by the
- 10 manufacturer for specified material properties for a particular job. The manufacturer
- 11 warrants the liner to be free from defects in raw materials for 1-year from the date of
- 12 acceptance. During the warranty period, any defects which affect the integrity or
- 13 strength of the pipe shall be repaired at the Contractor's expense in a manner
- 14 acceptable to the County.
- 15 2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer
- 16 for specified material properties for a particular job. The manufacturer warrants the
- 17 liner to be free from defects in raw materials for 1-year from the date of acceptance.
- 18 During the warranty period, any defects which affect the integrity or strength of the
- 19 pipe shall be repaired at the Contractor's expense in a manner acceptable to the
- 20 County.
- 21

22 END OF SECTION

1 **SECTION 02080**

2 **ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

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

8 1.02 QUALITY ASSURANCE

9 A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary
10 permits and licenses for performing the Work and shall furnish a copy of same to the
11 County prior to commencing the Work. The Contractor shall comply with the
12 requirements of the permits. All removal or abandonment of asbestos pipe material shall
13 be performed by a licensed asbestos abatement Contractor or Subcontractor registered in
14 the State of Florida.

15 B. Notices: Contractor shall issue written notices of planned Work to companies or local
16 authorities owning utility conduit, wires, or pipes running to or through the project site.
17 Copies of said notices shall be submitted to the County.

18 C. Standards:

- 19 1. Florida Administrative Code, Chapter 62-204.800
20 2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61,
21 Subpart M, latest revision
22 3. Occupational Safety and Health Act, 29 CFR
23 4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection
24 Rule
25 5. Florida Statute 455.300
26 6. Asbestos pipe handling best management practices provided at the end of this section

27 D. Quality Control

- 28 1. It shall be the responsibility of the Contractor to provide supervision and inspections
29 to ensure that the existing piping is removed and disposed, salvaged, or abandoned as
30 designated in the Drawings and as specified herein.
31 2. Asbestos Pipe
32 a. All removal or abandonment of pipe material containing asbestos shall be
33 performed by a licensed asbestos abatement Contractor or Subcontractor.

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

12 1.03 SHOP DRAWINGS AND SUBMITTALS

- 13 A. Shop Drawings
14 1. Submittals shall be submitted to the County for review and acceptance prior to
15 construction in accordance with the General Conditions and specifications Section
16 01300 "Submittals."
17 2. Shop Drawings shall be submitted to the County for review and acceptance prior to
18 construction in accordance with these specifications for the following:
19 a. Grout
20 b. Caps and plugs
21 c. Credentials of licensed asbestos abatement Contractor including current
22 certification.

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

24 **PART 3 - EXECUTION**

25 3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

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

- 1 4. Structures shall be removed in accordance with Section 02050 "Demolition of
2 Existing Structures."
- 3 C. Removal of material to be salvaged
- 4 1. Pipe designated on the Drawings to be removed and salvaged shall be completely
5 drained and the contents properly disposed. The pipe shall then be thoroughly
6 pressure washed, palletized on wooden skids to a dimension not exceeding the
7 recommendation of the manufacturer, and conveyed to the County at the location
8 designated by the County.
- 9 2. Items to be salvaged:
- 10 a. Air release valves
- 11 b. Sanitary manhole rings and covers
- 12 c. Isolation valves
- 13 d. Valve boxes
- 14 e. Fire hydrant and valve assemblies
- 15 D. Abandonment
- 16 1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in
17 place, drained, and its contents properly disposed. Pipe requires end caps or plugs.
18 All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole
19 rings and covers shall be removed and disposed of or salvaged as specified above.
- 20 2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with
21 grout and each end of the pipe shall be plugged in a manner acceptable to the County.
- 22 3. Grout: Where designated on the Drawings, pipe to be abandoned shall be filled with
23 grout in accordance with Section 03600 "Grouting."
- 24 4. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint
25 fitting that will prevent soil or other deposits from entering the pipe.
- 26 E. Asbestos Pipe Handling Best Management Practices
- 27 1. Projects will require worker documentation before entering the regulated Work area.
28 A copy of: their current training certificate (workers and their supervisor); current
29 medical condition showing the doctor approved their working with asbestos and
30 wearing a respirator; signed acknowledgment forms; and current record (6-months) of
31 each workers respirator fit test will be required from all workers.
- 32 2. Projects also require air monitoring. OSHA will accept historic data on air
33 monitoring within 12-months of the Project, provided the data is from a project of
34 like material and conditions with a crew of the same experience, supervision, and
35 training. Otherwise, monitoring is required throughout the Project. OSHA requires
36 two (2) types of personnel air monitoring, full shift and 30-minute excursion level
37 (when highest levels are anticipated).
- 38 3. Some provisions should be made for worker showering or otherwise washing
39 following work before removing respirators, etc. Even if direct exposure is not
40 anticipated, and at a minimum, a source of water to rinse the respirators, wash
41 workers faces and hands, and (in the event of unanticipated direct exposure) some
42 place to shower is required. The workers will also need a change room and some
43 place to keep their street clothes and personal possessions.

- 1 4. Proposals to remove asbestos pipe sections by cutting must address how the cutting
2 debris will be captured and kept from becoming airborne. Soil that could be
3 considered contaminated may also have to be removed.
- 4 5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution
5 endorsement in their liability insurance in case of asbestos fiber release. A
6 contingency plan, in case the project does not run as smoothly as expected, should be
7 developed and include emergency phone numbers kept on site during the Project.
- 8 6. Daily logs of the asbestos removal work should be kept, and should include sign in
9 sheets for the workers and whatever air monitoring was done. Accident reports and
10 other reports or correspondence if something unusual happened should also be
11 included.
- 12 7. Waste receipts must be kept through all stages of transport from the site to, and
13 including, the acceptance at the dumpsite where the material will be abandoned.
14 Amount of material removed must be equal to the amount of material to be turned
15 into to the dump.
- 16 8. The primary Contractor will give "approval for tear down" at project completion,
17 indicating that all asbestos removal operations are complete and whether there is a
18 need for any air monitoring. Air monitoring, if not required by any governing agency
19 or approved permit as discussed previously, may also be required by the County if
20 documentation to the general public pertaining to contamination is deemed necessary.
21 This air monitoring is normally done by collecting area samples downwind of the
22 project at the barrier tape or just inside it. It requires a source of electricity to run the
23 pumps, which is often provided by a generator.
24

25

END OF SECTION

- 1 D. Concrete block: hollow, non-load bearing type.
- 2 E. Concrete: exterior grade not less than 1-inch thick.
- 3 F. Rock Bags: conforming to FDOT Specifications.

4 2.03 TURBIDITY CONTROL

- 5 A. Conforming to FDOT Design Standards Index 103 - Turbidity Barriers.

6 **PART 3 - EXECUTION**

7 3.01 EROSION CONTROL

- 8 A. Minimum Procedures for Grassing Are:

- 9 1. Scarify slopes to a depth of not less than 6-inches and remove large clods, rock,
- 10 stumps and roots larger than 1/2-inch in diameter and debris.
- 11 2. Sow seed within 24-hours after the ground is scarified with either mechanical seed
- 12 drills or rotary hand seeders.
- 13 3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2-inches.
- 14 4. Apply netting over mulched areas on sloped surfaces.
- 15 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and
- 16 growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and
- 17 seed eroded areas.

18 3.02 SEDIMENTATION CONTROL

- 19 A. Install and maintain silt fence, silt dams, traps, barriers and appurtenances as shown on
- 20 the approved descriptions and working Drawings. Hay bales which deteriorate and filter
- 21 stone which is dislodged shall be replaced.

22 3.03 TURBIDITY CONTROL

- 23 A. Install and maintain turbidity barriers daily and as described in FDOT Index #103.

24 3.04 PERFORMANCE

- 25 A. Should any of the temporary erosion and sediment control measures employed by the
- 26 Contractor fail to produce results which comply with the requirements of the State of
- 27 Florida, the Contractor shall immediately take whatever steps are necessary to correct the
- 28 deficiency at his own expense.

29 **END OF SECTION**

1 **SECTION 02140**

2 **DEWATERING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

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

8 1.02 QUALITY ASSURANCE

- 9 A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the
10 State of Florida, to design the temporary dewatering system. The Contractor shall submit
11 conceptual plan for the dewatering system prior to commencing work. The dewatering
12 system installed shall be in conformity with the overall construction plan and certification
13 of this shall be provided by the Geotechnical Engineer. The dewatering system shall be
14 designed by a firm who regularly engages in the design of dewatering systems and who is
15 fully experienced, reputable and qualified in the design of such dewatering systems.

- 16 B. The dewatering of any excavation areas and the disposal of the water shall be in strict
17 accordance with the latest revision of all local and state government rules and regulations.

- 18 C. Permits: The Contractor shall obtain and pay respective fees for all local, state, and
19 federal permits (including the Orange County, St. Johns River Water Management
20 District, and/or South Florida Management District discharge permits) required for the
21 withdrawal, treatment and disposal/discharge of water from the dewatering operation,
22 prior to start of work.

- 23 D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

24 1.03 SHOP DRAWINGS AND SUBMITTALS

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

- 28 B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified
29 laboratory for the parameters listed in the FDEP "Generic Permit for the Discharge of
30 Produced Ground Water from Any Non-Contaminated Site Activity" to the FDEP and the
31 County. The submitted information shall show the location of the work, where the water
32 will be going to, as well as an estimate for the amount, rate and duration of discharge
33 being proposed.

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

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

9 **PART 3 - EXECUTION**

10 3.01 GENERAL

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

1 3.02 DEWATERING AND DISPOSAL

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

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

4 3.03 GROUNDWATER TREATMENT (IF REQUIRED)

5 A. If concentrations of tested groundwater quality parameters exceed those allowable in the
6 FDEP Generic Permit for the Discharge of Produced Groundwater from any Non-
7 Contaminated Site Activity (62-621.300(2), F.A.C.), the Contractor shall treat the
8 effluent.

9 B. The Contractor shall immediately notify the County and discuss the parameters that
10 exceed allowable limits.

11 C. The Contractor shall meet with the FDEP to determine alternatives that are acceptable to
12 the FDEP.

13 D. The Contractor shall apply for and obtain any and all permits and/or treatment approvals
14 that FDEP requires including but not limited to:

- 15 1. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)).
16 Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or
17 diesel fuel contamination; or
- 18 2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The
19 coverage is available only through the individual NPDES permit issued by FDEP,
20 allows discharges from sites with general contaminant issues i.e. ground water and/or
21 soil contamination other than petroleum fuel contamination; or
- 22 3. Generic Permit for the Discharge of Produced Ground Water from Any Non-
23 Contaminated Site Activity (62-621.300(2), F.A.C.); or
- 24 4. Generic Permit for Stormwater Discharge from Large or Small Construction
25 Activities (62-621.300(4)(a), F.A.C.); or
- 26 5. An Individual Wastewater Permit (62-604.300(8) (a)

27 E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and
28 County to attain compliance for all excess limits encountered during dewatering
29 activities. Treatment may include, but is not limited to: Chemical, Biological,
30 Electrolysis or any combination of the three.

31 F. The Contractor shall make every effort to minimize the spread of contamination into
32 uncontaminated areas. Provide for the health and safety of all workers at the job site and
33 make provisions necessary for the health and safety of the public that may be exposed to
34 any potentially hazardous conditions. Ensure provision adhere to all applicable laws,
35 rules or regulations covering hazardous conditions and will be in a manner commensurate
36 with the level of severity of the conditions.

37 G. If necessary, provide contamination assessment and remediation personnel to handle site
38 assessment, determine the course of action necessary for site security and perform the
39 necessary steps under applicable laws, rules and regulations for additional assessment
40 and/or remediation work to resolve the contaminations issue.

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

8 3.04 REMOVAL

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

14 END OF SECTION

1 1.02 QUALITY ASSURANCE

2 A. Testing laboratory employed by the County will make such tests as are deemed advisable.
3 The Contractor shall schedule his work to permit a reasonable time for testing before
4 placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for
5 initial testing shall be paid by the County; however, tests which have to be repeated
6 because of the failure of the tested material to meet specification shall be paid for by the
7 Contractor and the cost of re-testing shall be deducted from payments due the Contractor.

8 B. Standards

- 9 1. AASHTO: American Association of State Highway and Transportation Officials
10 2. ANSI: American National Standards Institute
11 3. ASCE: American Society of Civil Engineers
12 4. ASTM: American Society for Testing and Materials
13 5. AWWA: American Water Works Association
14 6. OSHA 29 CFR Subpart P – Excavations and Trenches a) 1926.650, 1926.651,
15 1926.652
16 7. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry

17 1.03 JOB CONDITIONS

18 A. Existing Utilities

- 19 1. The Contractor is responsible for subsurface verification of existing utilities prior to
20 construction. Locate existing utilities in the area of work in accordance with
21 Sunshine State One Call regulations, Chapter 556, "Underground Facility Damage
22 Prevention and Safety Act", FS.
23 2. Should uncharted or incorrectly charted piping or other utility be encountered during
24 excavation, notify the County. Keep all facilities in operation and repair damaged
25 utilities to the satisfaction of the County.
26 3. Damage and repair costs to such piping or utilities are the Contractor's responsibility.
27 4. If utilities are to remain in place, the Contractor shall provide adequate means of
28 protection.

29 B. Test borings and the sub-surface exploration data if previously done on the site will be
30 made available upon request and are for the Contractor's information only.

31 1.04 PROTECTION

32 A. Sheet piling and Bracing

- 33 1. Requirements of the Trench Safety Act shall be adhered to at all times.

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

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

4 B. Pumping and Drainage:

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

1 1.05 TESTING AND INSPECTION SERVICE

2 A. The County will provide a geotechnical testing and inspection service. The services
3 include testing soil materials and quality control testing during filling and backfilling
4 operations. Samples of soil materials shall be furnished to the testing service by the
5 Contractor. The County shall pay costs of initial geotechnical testing. The Contractor
6 shall pay for any subsequent testing required due to failure and laboratory stand-by
7 charges incurred.

8 B. The Contractor shall provide monthly density testing reports to the County during
9 backfilling activities. Density testing reports not submitted in a timely manner shall
10 result in rejection of the pipe installed and rejection of the density testing reports until
11 such time that density re-testing is coordinated and repeated at the Contractors expense.

12 C. Density testing scheduled subsequent to backfilling activities shall be coordinated with,
13 and witnessed by the County. Failure by the Contractor to coordinate or have the County
14 present shall result in rejection of the submitted density testing reports and re-testing at
15 the Contractor's expense.

16 D. Dewatering systems shall not be removed until compaction/density testing has been
17 completed.

18 **PART 2 - PRODUCTS**

19 2.01 MATERIALS

20 A. General:

- 21 1. All fill material shall be subject to the review and acceptance of the County.
22 2. All fill material shall be free of organic material, trash, or other objectionable
23 material. The Contractor shall remove excess or unsuitable material from the job site.

24 B. Common Fill Material: Common fill shall consist of mineral soil, substantially free of
25 clay, organic material, muck, loam, wood, trash, and other objectionable material which
26 may be compressible or which cannot be compacted properly. Common fill shall not
27 contain stones larger than 3-1/2-inches in any dimension in the top 12-inches or 6-inches
28 in any dimension in the balance of fill area. Common fill shall not contain asphalt,
29 broken concrete, masonry, rubble or other similar materials. It shall have physical
30 properties that allow it to be easily spread and compacted during filling. Additional
31 common fill shall be no more than 12 % by weight finer than the No. 200 mesh sieve,
32 unless finer material is approved for use in a specific location by the County. Select
33 Common Fill shall be as specified as above from common fill, except that the material
34 shall contain no stones larger than 1/2-inches in largest dimension, and shall be no more
35 than 5 % by weight finer than the No. 200 mesh sieve.

1 C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand
2 having the following gradation:
3

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

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

8 Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay,
9 loam or organic matter, conforming to ASTM C33 stone size No. 89 and with particle
10 size limits as follows:
11

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

12 E. Class II Soils**:

- 13 1. GW: Well graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or
14 more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
- 15 2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent
16 or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
- 17 3. SW: Well graded sands and gravelly sands, little or no fines. More than passes No.
18 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
- 19 4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 % passes
20 No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.

21

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

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

1 F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as
2 follows:
3

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

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

6 **PART 3 - EXECUTION**

7 3.01 PREPARATION

8 A. Clearing:

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

12 3.02 EXCAVATION

13 A. General: Excavations for roadways, structures, and utilities must be carefully executed in
14 order to avoid interruption of utility service.

15 B. Excavating for Roadways/Structures/Utilities:

- 16 1. Excavation shall be made to such dimensions as will give suitable room for building
17 the foundations and the structures, for bracing and supporting, for pumping and
18 draining, and for all other work required.
19 a. Excavation for precast or prefabricated structures shall be carried to an elevation
20 2-feet lower than the proposed outside bottom of the structure to provide space for
21 the select backfill material. Prior to placing the select backfill, the excavation
22 shall be measured by the County to verify that the excavation has been carried to
23 the proper depth and is reasonably uniform over the area to be occupied by the
24 structure.
25 b. Excavation for structures constructed or cast in place in dewatered excavations
26 shall be carried down to the bottom of the structure where dewatering methods are
27 such that a dry excavation bottom is exposed and the naturally occurring material
28 at this elevation leveled and left ready to receive construction. Material disturbed
29 below the founding elevation in dewatered excavations shall be replaced with
30 Class B concrete.
31 c. Footings: Cast-in-place concrete footing sides shall be formed immediately after
32 excavation.
33 2. Immediately document the location, elevation, size, material type and function of all
34 new subsurface installations, and utilities encountered during the course of
35 construction.

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

16 3.03 DRAINAGE

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

32 3.04 UNDERCUT

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

1 3.05 FILL AND COMPACTION

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

4
5 STRUCTURES AND ROADWORK
6

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

7 B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or
8 elsewhere in the Contract Documents.

9 C. Excavations shall be backfilled to the original grade or as indicated on the Drawings.
10 Deviation from this grade because of settling shall be corrected. The backfill operation
11 shall be performed to comply with all rules and regulations and in such a manner that it
12 does not create a nuisance or safety hazard.

13 D. Embankments shall be constructed true to lines, grades, and cross sections shown on the
14 plans or ordered by the County. Embankments shall be placed in successive layers of not
15 more than 8-inches in thickness, loose measure, for the full width of the embankment. As
16 far as practicable, traffic over the Work during the construction phase shall be distributed
17 so as to cover the maximum surface area of each layer.

18 E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other
19 than those specified herein, such request shall be in writing to the County. Acceptance
20 will be considered only after the Contractor has performed tests, at the Contractor's
21 expense, to identify the material used and density achieved throughout the backfill area
22 utilizing the method of backfill requested. The County's acceptance shall be in writing.

23 F. One compaction test location shall be required for each 300 linear feet of pipe and for
24 every 100 square feet of backfill around structures as a minimum. The County may
25 determine that more compaction tests are required to certify the installation depending on
26 field conditions. The locations of the compaction tests within the trench shall be in
27 conformance with the following schedule:

- 28 1. At least one test at the spring line of the pipe.

- 1 2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for
2 pipes 24-inches and larger.
- 3 3. One test at an elevation of 1-foot above the top of pipe.
- 4 4. One test for each 2-feet of backfill placed from 1-foot above the top of the pipe to
5 finished grade elevation.
- 6 5. Density testing is required for sanitary sewer manholes. Tests shall be staggered
7 around the manhole within 3-feet of the structure's outside diameter.
 - 8 a. First test shall be 1-foot above the structure base.
 - 9 b. Second test shall be 2-feet above the first test and subsequent tests every 2-feet up
10 the finished grade.
- 11 6. The Contractor shall provide additional compaction and testing prior to commencing
12 further construction if the County's testing reports and inspection indicate that the fill
13 has been placed below specified density.
- 14 7. The Contractor shall coordinate testing with the County approved testing laboratory
15 and shall provide monthly test results to the County in a timely manner during
16 construction activities. Density testing scheduled subsequent to backfilling activities
17 shall be coordinated with the County and witnessed by the County representative.
18 Failure by the Contractor to coordinate or have the County representative present
19 shall result in rejection of the submitted density testing reports and re-testing at the
20 Contractor's expense. Density testing reports not submitted in a timely manner shall
21 result in rejection of the pipe installed and rejection of the density testing reports until
22 such time that density re-testing is coordinated and repeated at the Contractor's
23 expense as deemed necessary by the County's representative.
- 24 8. Dewatering systems shall not be removed until compaction/density testing has been
25 completed.
- 26

27

END OF SECTION

- 1 B. Do not spread the mixture when the wind is blowing to such an extent that proper and
2 adequate compaction cannot be maintained or when sand, dust, etc., are being deposited
3 on the surface being paved to the extent that the bond between layers will be diminished.
- 4 C. Field compaction density and thickness testing frequencies of the asphalt shall be tested
5 once every 300-linear feet of paving per 24-foot wide strip, staggered left, center, and
6 right of centerline. Where less than 300-linear feet of asphalt is placed in 1-day, provide
7 minimum of 1 test for each per day's construction at a location designated by the County.
- 8 D. Asphalt extraction gradation shall be tested from grab samples collected once every
9 1,800-square yards of asphalt delivered to the site, or a minimum of once per day. Obtain
10 the results in a timely manner (no later than the end of the day) so that adjustments can be
11 made if necessary.
- 12 E. On initial use of a Type S mix design at a particular plant, as a minimum, run an
13 additional extraction gradation analysis if more than 500-tons [450-metric tons] of
14 mixture are produced on the first day of production.
- 15 F. Tolerances for Quality Control Tests (Extraction Gradation Analysis) shall be in
16 accordance with FDOT Specification Section 331.

17 1.04 SHOP DRAWINGS AND SUBMITTALS

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

32 **PART 2 - PRODUCTS**

33 2.01 GENERAL

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

- 1 B. Type S Asphalt Concrete (Type S-1 or S-3) is required. The equivalent fine Type SP
 2 (Superpave) Asphalt Concrete mixture (Traffic Level C) meeting the requirements of
 3 FDOT Specification Section 334 may be selected as an alternate at no additional cost to
 4 the County. The equivalent mixes are as follows:
 5 1. Type S-1: Type SP-12.5
 6 2. Type S-3: Type SP-9.5
- 7 C. Asphalt plant and equipment shall meet the requirements in FDOT Specification Section
 8 320.

9 2.02 AGGREGATE

- 10 A. Coarse Aggregate, Stone, Slag, or Crushed Gravel shall meet the requirements in FDOT
 11 Specification Section 901.
- 12 B. Fine Aggregate shall meet the requirements in FDOT Specification Section 902.
- 13 C. Aggregate gradation shall meet the following:
 14
 15

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

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

- 16
- 17 D. Use clean aggregate containing no deleterious substances. Do not use coarse or fine
 18 aggregate which contains more than 0.5% of phosphate.
- 19 E. In laboratory tests, and for the purpose of proportioning the paving mixture, consider all
 20 material passing the No. 10 [2.00-mm] sieve and retained on the No. 200 [75 μm] sieve
 21 as fine aggregate, and the material passing the No. 200 [75 μm] sieve as mineral filler.

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

7 2.03 ASPHALT CEMENT

8 A. Superpave PG Asphalt Binder or Recycling Agent shall meet the requirements in FDOT
 9 Specification Section 916.

10 B. Mineral Filler shall meet the requirements in FDOT Specification Section 917.

11 C. Marshall design mix shall be in accordance with the following:
 12
 13

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

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

* The maximum Flow value during production shall not exceed one point more than shown in the Table.

** The ratio of the percentage by weight of total aggregate passing the No. 200 sieve to the effective asphalt content expressed as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.

14

15 2.04 BITUMINOUS MIXTURE

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

1 **PART 3 - EXECUTION**

2 3.01 GENERAL

3 A. Set up, install and maintain temporary traffic control devices and detours as necessary in
4 accordance with Specification Section 1570 "Maintenance of Traffic."

5 B. Asphalt pavements, including all surface courses and base courses, where shown to be
6 open cut and removed on the Drawings or specified in the Project Manual, shall be
7 removed to a line back from each edge of the trench, other excavation, or to the limits
8 indicated on the Drawings. Pavements shall be cut straight, clean and square with a
9 power saw or other tools and equipment suitable for the Work.

10 C. Asphalt pavements, where shown to be milled on the Drawings or specified in the Project
11 Manual, shall be milled according to FDOT Specification Section 327.

12 D. Asphalt mixtures shall meet the general construction requirements specified in FDOT
13 Specification Section 330.

14 E. Spread the mixture only when the surface upon which it is to be laid has been previously
15 prepared, is intact, firm, and properly cured, and is dry. Do not spread mixture that
16 cannot be finished and compacted during daylight hours.

17 F. Deliver the asphalt cement from the asphalt plant at a temperature not to exceed 350°F
18 and equip the transport tanks with sampling and temperature sensing devices meeting the
19 requirements of FDOT. Maintain the asphalt cement in storage within a range of 230°F
20 to 350°F in advance of mixing operations. Maintain constant heating within these limits,
21 and do not allow wide fluctuations of temperature during a day's production.

22 G. Produce a homogeneous mixture, free from moisture and with no segregated materials,
23 that meets all specification requirements for the mixture, including compliance with the
24 Marshall Properties. Also apply these requirements to all mixes produced by the drum
25 mixer process and all mixes processed through a hot storage or surge bin, both before and
26 after storage.

27 3.02 PREPARATION OF APPLICATION SURFACES

28 A. Prior to the laying of the mixture, clean the surface of the base or pavement to be covered
29 of all loose and deleterious material by the use of power brooms or blowers,
30 supplemented by hand brooming where necessary.

31 B. Where an asphalt mix is to be placed on an existing pavement or old base that is irregular,
32 and wherever the plans indicate, bring the existing surface to proper grade and cross-
33 section by the application of patching or leveling courses.

34 C. Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep
35 and dispose of all loose material from the paving area.

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

7 3.03 PLACING MIXTURE

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

1 3.04 APPLICATION OF LEVELING COURSES

2 A. Before spreading any leveling course, fill all depressions in the existing surface more
3 than 1-inch deep by spot patching with leveling course mixture, and then compact them
4 thoroughly.

5 B. Place all courses of leveling by the use of two (2) motor graders; equip one with a
6 spreader box. Use other types of leveling devices after they have been approved by the
7 County.

8 C. When the total asphalt mix provided for leveling exceeds 50-lb/yds² [27-kg/m²], place the
9 mix in two or more layers, with the average spread of any layer not to exceed 50-lb/yd²
10 [27-kg/m²]. When using Type S-3 Asphaltic Concrete for leveling, do not allow the
11 average spread of a layer to be less than 50-lb/yd² [27-kg/m²] or more than 75-lb/yd² [40-
12 kg/m²]. The Contractor may vary the rate of application throughout the Project as
13 directed by the County. When leveling in connection with base widening, the County
14 may require placing all the leveling mix prior to the widening operation.

15 3.05 COMPACTING MIXTURE

16 A. The coverage is the number of times the roller passes over a given area of pavement.
17 Regardless of the rolling procedure used, complete the final rolling before the surface
18 temperature of the pavement drops below 160°F.

19 B. Seal Rolling: Provide two (2) coverages with a tandem steel-wheeled roller (either
20 vibratory or static), weighing 5 to 12-tons, following as close behind the spreader as
21 possible without pick-up, undue displacement, or blistering of the material. Use
22 vibratory rollers in the static mode for layers of 1-inch or less in thickness.

23 C. Intermediate Rolling: Provide five (5) coverages with a self-propelled pneumatic-tired
24 roller, following as close behind the seal rolling operation as the mix will permit.

25 D. Final Rolling: Provide one (1) coverage with a tandem steel-wheeled roller (static mode
26 only), weighing 5 to 12-tons, after completing the seal rolling and intermediate rolling,
27 but before the surface pavement temperature drops below 160°F.

28 E. Operate the self-propelled, pneumatic-tired roller at a speed of 6 to 10-mph. For each
29 roller, do not exceed an area of coverage of 4,000 yd²/hour; if rolling Type S Asphaltic
30 Concrete, do not exceed an area of coverage of 3,000 yd²/hour.

31 F. Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling
32 of the surface for the required number of passes does not delay any other phase of the
33 laying operation and does not result in excessive cooling of the mixture before
34 completing the rolling. In the event that the rolling falls behind, discontinue the laying
35 operation until the rolling operations are sufficiently caught up.

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

22 3.06 JOINTS

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

34 3.07 SURFACE REQUIREMENTS

- 35 A. Obtain a smooth surface on all pavement courses placed, and then straightedge all
36 intermediate and final courses with a 15-foot rolling straightedge. Furnish a 15-foot
37 [4.572-m] manual straightedge, and make it available at the job site at all times during the
38 paving operation for checking joints and surface irregularities.

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

3 3.08 ACCEPTANCE REQUIREMENTS

- 4 A. Upon completion of the final surface or friction course, the County will test the finished
5 surface with a 15-foot rolling straightedge. Correct all deficiencies in excess of 3/16-
6 inch.

- 7 B. If correction is made by removing and replacing the pavement, remove the full depth of
8 the course and extend at least 50-feet on either side of the defective area for the full width
9 of the paving lane.

- 10 C. If correction is made by overlaying, cover the length of the defective area and taper
11 uniformly to a featheredge thickness at a minimum distance of 50-feet on either side of
12 the defective area. Extend the overlay the full width of the roadway. Maintain the
13 specified cross slope. The County may adjust, as necessary, the mix used for the overlay
14 for this purpose.

- 15 D. The maximum deficiency from the specified thickness as follows:
16 1. For pavement of a specified thickness of 2-1/2-inches or more: 1/2-inch
17 2. For pavement of a specified thickness less than 2-1/2-inches: 1/4-inch

- 18 E. Where the deficiency in thickness is: (1) in excess of 3/8-inch for pavement of less than
19 2-1/2-inches in specified thickness, or (2) in excess of 3/4-inch for pavement of specified
20 thickness of 2-1/2-inches or more, correct the deficiency either by replacing the full
21 thickness for a length extending at least 50-feet from each end of the deficient area.

- 22 F. For any case of excess deficiency of the pavement, if approved by the County for each
23 particular location, correct the deficient thickness by adding new surface material, and
24 compact it to the same density as the adjacent surface. The County will determine the
25 area to be corrected and the thickness of new material added.

26 3.09 REPAIR AND RESTORATION

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

30 3.10 SIGNALIZATION, PAVEMENT STRIPING AND MARKING

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

- 1 B. The Contractor shall be responsible for coordinating, inventorying, and replacing all
2 temporary and permanent pavement striping and markings damaged during the asphalt
3 pavement milling, removal, and replacement process.
- 4 C. Temporary pavement striping and markings shall be paint or reinforced retro-reflective
5 removal tape. Foil back tape is not acceptable. Permanent pavement striping and
6 markings shall be alkyd thermoplastic tape and raised reflective pavement markers.
7

8 END OF SECTION

1 **SECTION 02578**

2 **SOLID SODDING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

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

11 1.02 SHOP DRAWINGS AND SUBMITTALS

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

17 **PART 2 - PRODUCTS**

18 2.01 GENERAL

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

21 2.02 GRASS SOD

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

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

5 2.03 FERTILIZER

6 A. Commercial fertilizers shall comply with the state fertilizer laws.

7 B. The numerical designations for fertilizer indicate the minimum percentages (respectively)
8 of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash
9 contained in the fertilizer.

10 C. The chemical designation of the fertilizer shall be 6-6-6. At least 50% of the nitrogen
11 shall be derived from organic sources. At least 50 % of the phosphoric acid shall be from
12 normal super phosphate or an equivalent source, which will provide a minimum of two
13 units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card
14 attached to each bag or other container.

15 2.04 WATER FOR GRASSING

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

18 **PART 3 - EXECUTION**

19 3.01 PREPARATION OF GROUND

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

23 3.02 APPLICATION OF FERTILIZER

24 A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 - 7.0.

25 B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700-
26 pounds per acre, or 16-pounds per 1,000 square feet, by a spreading device capable of
27 uniformly distributing the material at the specified rate. Immediately after spreading, the
28 fertilizer shall be mixed with the soil to a depth of approximately 4-inches.

29 C. On steep slopes, where the use of a machine for spreading or mixing is not practicable,
30 the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a
31 depth of approximately 2-inches.

1 3.03 PLACING SOD

- 2 A. The sod shall be placed on the prepared surface, with edges in close contact and shall be
3 firmly and smoothly embedded by light tamping with appropriate tools.
- 4 B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of
5 the pieces shall be staggered to avoid a continuous seam along the line of flow. Along
6 the edges of such staggered areas, the offsets of individual strips shall not exceed 6-
7 inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer
8 pieces of sod shall be tamped so as to produce a featheredge effect.
- 9 C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding
10 by means of wooden pegs driven through the sod blocks into firm earth at suitable
11 intervals.
- 12 D. Sod which has been cut for more than 72-hours shall not be used unless specifically
13 authorized by the County after the inspection thereof. Sod which is not planted within
14 24-hours after cutting shall be stacked in an approved manner, maintained, and properly
15 moistened. Any pieces of sod that, after placing, show an appearance of extreme dryness
16 shall be removed and replaced by fresh, uninjured pieces.
- 17 E. Sodding shall not be performed when weather and soil conditions are, in the County's
18 opinion, unsuitable for proper results.

19 3.04 WATERING

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

25 3.05 MAINTENANCE

- 26 A. The Contractor shall maintain, at his expense, the sodded areas in a satisfactory condition
27 until final acceptance of the Project. Such maintenance shall include repairing of any
28 damaged areas and replacing areas in which the establishment of the grass stand does not
29 appear to be developing satisfactorily.
- 30 B. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure
31 to provide routine maintenance shall be at the Contractor's expense.
32

33 END OF SECTION

1 **SECTION 02661**

2 **WASTEWATER FORCE MAINS**

3 **PART 1 - GENERAL**

4 1.01 WORK INCLUDED

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

7 1.02 QUALITY ASSURANCE

8 A. Design Requirements

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

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

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

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

1 1.03 SHOP DRAWINGS AND SUBMITTALS

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

- 4 1. Certified test reports on pipe
- 5 2. Details of restrained and flexible joints
- 6 3. Detailed laying schedule for pipe
- 7 4. Valves and valve boxes

8 B. Acceptance of Material: The County reserves the right to sample and test any pipe or
9 fitting after delivery and to reject all pipe and fittings represented by any sample which
10 fails to comply with the specified requirements.

11 1.04 JOB CONDITIONS

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

23 **PART 2 - PRODUCTS**

24 2.01 GENERAL

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

27 2.02 MATERIALS

28 A. Pipe Fittings, Valves, and Ancillary Equipment shall be installed as shown on the
29 Drawings and as specified in Division 15.

30 B. Additional Work: Additional items of construction, necessary for the complete
31 installation of the systems, shall conform to specific details shown on the Drawings and
32 shall be constructed of first-class materials conforming to the applicable portions of these
33 specifications.

1 **PART 3 - EXECUTION**

2 3.01 PREPARATION

3 A. Bedding: Upon satisfactory installation of the pipe bedding material as specified in
4 Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the
5 pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand
6 digging. The pipe shall be laid in the prepared trench, true to line and grade, the pipe
7 barrel shall receive continuous, uniform support and no pressure will be exerted on the
8 pipe joints from the trench bottom.

9 B. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter
10 before being gently lowered into the trench and shall be kept clean during laying
11 operations by means of plugs or other methods acceptable by the County. During
12 suspension of work for any reason at any time, a suitable stopper shall be placed in the
13 end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

14 3.02 INSTALLATION

15 A. Pipe Identification/Location

16 1. All PVC wastewater mains shall be solid green in color. All lettering shall appear
17 legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as
18 is acceptable for the intended use.

19 2. All HDPE wastewater mains shall be either a solid green or black with four co-
20 extruded equally spaced green stripes of the same material as the pipe. Stripes
21 painted on the pipe outside surface shall not be acceptable.

22 3. If main is located over 30-feet from the edge of the pavement or in an easement, the
23 Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers
24 over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where
25 fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers
26 shall include a decal and shall be colored purple for reclaimed water service.

27 4. All mains (PVC and HDPE) shall be installed with a continuous, insulated 10-gauge
28 copper wire installed directly above the pipe for location purposes. Locate wire shall
29 terminate in a test station box and be capable of extending 12-inches above the top of
30 the box. Directionally drilled pipe shall be installed with two insulated 10-gauge
31 copper wires.

32 B. Pipe:

33 1. Gradient: Lines shall be laid straight, and depth of cover shall vary to provide
34 uniform gradient or slope to pipe, whether grading is completed or proposed at time
35 of pipe installation. When a grade or slope is shown on the Drawings, batter boards
36 with string line paralleling design grade, or other previously approved means, shall be
37 used by the Contractor to assure conformance to required grade.

- 1 2. Pipe Joint Deflection: No joint deflection or pipe bending is allowed in PVC pipe.
2 The maximum allowable tolerance in the joint due to variances in installation is 0.75°
3 (degrees), (3-inches per joint per 20-ft stick of pipe). No bending tolerance in the
4 pipe barrel shall be acceptable. Alignment changes shall be made with sleeves and
5 fittings as shown in Drawings. Deflection in fittings and sleeves shall not exceed
6 75% of the limits recommended by the fitting manufacturer.
- 7 3. Rejects: Any pipe found defective shall be immediately removed from the site and
8 replaced with sound pipe at the Contractor's expense.
- 9 4. Joint Compounds: No sulfur base joint compound shall be used.
- 10 5. Thrust restraints shall be accomplished by the use of mechanical restraining devices
11 unless specifically identified otherwise on the Drawings or herein. Restraining devices
12 are specified in Section 15064 "Polyvinyl Chlorine Pipe and Fittings", respectfully.

13 C. Installing Valves and Boxes

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

29 D. Concrete Encasement

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

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

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

3 3.03 CLEANING

4 A. General: At the conclusion of the Work the Contractor shall thoroughly clean the new
5 pipe lines by flushing with water or other means to remove all dirt, stones or other
6 material which may have entered the line during the construction period.

7 B. Flushing 12-inch pipes and less: Flushing to remove all sand and other foreign matter
8 from pipelines shall only be permitted for mains 12-inches and smaller. Flushing shall be
9 accomplished through full pipe size connections at full pipe depth. The velocity of the
10 flushing water shall be at least 4-feet per second. Flushing shall be terminated at the
11 direction of the County. The Contractor shall dispose of the flushing water without
12 causing a nuisance or property damage. The Contractor shall arrange and pay for the
13 source of flushing water with the County or others.

14 C. Swabbing in lieu of flushing: New mains may be hydraulically or pneumatically cleaned
15 with a polypropylene swabbing device to remove dirt, sand and debris from main. If
16 swabbing access and egress points are not provided in the design drawings, it will be the
17 responsibility of the Contractor to provide temporary access and egress points for the
18 cleaning, as required. Passage of cleaning poly swabs through the system shall be
19 constantly monitored, controlled and all poly swabs entered into the system shall be
20 individually marked and identified so that the exiting of the poly swabs from the system
21 can be confirmed. Cleaning of the system shall be done in conjunction with the initial
22 filling of the system for its hydrostatic test. After initial slow-fill, pipe shall sit full for 24
23 hours to facilitate cleaning and collection of debris from interior of pipe. The Contractor
24 shall insert flexible polyurethane foam swabs (2-pounds per cubic foot density) complete
25 with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain
26 there until the pipeline construction is completed. The line to be cleaned shall only be
27 connected to the existing distribution system at a single connection point. Locate and
28 open all new in-line valves beyond the point of connection on the pipeline to be cleaned
29 during the swabbing operation. At the receiver or exit point for the poly swab, the
30 Contractor is responsible for creating a safe environment for collection of debris, water
31 and the swab. Considerations shall be made for protecting surrounding personnel and
32 property and safe retrieval of the swab. Only County personnel shall operate the supply
33 valve from the existing distribution system. Cleaning and flushing shall be accomplished
34 by propelling the swab down the pipeline to the exit point with potable water. Flushing
35 shall continue until the water is completely clear and swab is retrieved.

1 3.04 FIELD QUALITY CONTROL

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

9 B. Pressure and Leakage Tests of Pressure Piping

10 1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all
11 pressure piping. Tests shall be conducted on segments between valves and no more than
12 2,000 linear feet is to be tested at one time unless otherwise acceptable by the County.

13 2. Standard: AWWA C600, Section 5 (DI pipe) and AWWA C605 Section 7 (PVC pipe)
14 with the exceptions required herein and the exception that the Contractor shall furnish
15 all gauges, meters, pressure pumps and other equipment needed to test the lines.

16 3. Hydrostatic Pressure Test

17 a. Test Pressure: Test pressure will be 50% above the normal working pressure, but
18 not less than 100-psi, unless otherwise noted on the Drawings.

19 b. Test Duration: Test shall be for a period of 2-hours. If during the test, the integrity
20 of the tested line is in question, the County may require a 6-hour pressure test.

21 c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser and angle
22 globe valves shall be provided at each dead-end to bleed air from the line.

23 4. Hydrostatic Leakage Test

24 a. General: Following the pressure test, the Contractor shall perform the leakage
25 test. The line shall be filled with water and all air removed for the test. The
26 Contractor shall provide a pump to maintain the test pressure for the entire test
27 period.

28 b. Test Pressure: Maximum operating pressure as determined by the County but not
29 less than 100-psi unless otherwise noted.

30 c. Test duration: 2-hours.

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

32 L = Allowable leakage (gallons per hour)

33 S = Length of pipe tested (feet)

34 D = Nominal diameter of pipe (inches)

35 P = Average test pressure maintained (psig)

36
37
38 e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage
39 eliminated regardless of the measured total leakage.

40 f. Leakage Measurement: The amount of water required to maintain the test
41 pressure is the leakage.
42

43 END OF SECTION

SECTION 02761

CLEANING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The work covered in this section consists of cleaning sewer lines and manholes prior to the internal television inspection(s) for new or existing wastewater systems.
- B. Gravity Main and Sewer Lateral Cleaning:
The intent of gravity main cleaning is to remove debris that may be causing a reduction in flow capacity, potential sewer backups, or that limits the ability to evaluate the structural condition of the pipe segment. On all sewers, CONTRACTOR shall perform sewer cleaning work to an acceptable level as necessary to perform a thorough television inspection of the sewer. An acceptable level is defined as the removal of all debris, or enough debris to restore a minimum of 95 percent of the internal pipe height throughout the pipe segment cleaned. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall be televised without attempting to clean it to the 95 or 98 percent condition, pending approval by UTILITIES.
- C. Water for Cleaning:
The CONTRACTOR will be responsible for obtaining a transient water meter and paying for water used during course of cleaning.
- D. Recovering of Equipment:
The CONTRACTOR will be responsible for recovering any equipment that becomes lodged or lost in the pipeline including, but not limited to, any cost associated with required evacuation, restoration of roads and easements, repairs to pipes and manholes as needed to restore the pipeline and appurtenances back to their original conditions. Video documentation of pre-removal conditions (See Section 01101) will apply prior to any excavation.

1.02 CLEANING EQUIPMENT

- A. Hydraulically Propelled Equipment:
The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. Special precautions to prevent flooding of the sewers and public or private property shall be taken at all times.
- B. High-Velocity Jet (Hydro-Cleaning) Equipment:

CLEANING SANITARY SEWER SYSTEMS

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All high-velocity sewer-cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size mains. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tanks, auxiliary engines, pumps, and hydraulically driven hose reel.

C. Mechanically Powered Equipment:

Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be used. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

D. Vacuum machines may be used for removal of materials from manholes when other cleaning equipment is used to dislodge and transport material to the access point.

E. Combination Cleaner:

For cleaning small and large diameter sewer, the CONTRACTOR may use a combination hydraulic high volume water and solids separation system. Water volume of up to 250 gpm at 2000 psi+ will move solids to the downstream manhole in high flow conditions. The separation system will dewater solids to 95 percent (passing a paint filter test) and transfer them to a dump truck, if needed, for transport to a sewage treatment plant, approved landfill, or other location specified by the Project Manager or designee. Sewer water will be filtered to a point where it can be used in the pump for continuous cleaning. No by-passing of sewer flows will be necessary. The unit shall be capable of 24-hour operation and the unit shall not leave the manhole until a section is fully cleaned.

1.03 SUBMITTALS

A. A daily log shall be maintained to record the location of the manholes and sewer lines cleaned, lengths of the lines cleaned, method of cleaning, line sizes and volume and type of debris moved. Observations are to be recorded on a cleaning report form.

B. Weigh tickets and disposal manifests from licensed disposal facility.

CLEANING SANITARY SEWER SYSTEMS

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. The equipment shall remove dirt, grease, rocks, sand, and other materials and obstructions from the sewer mains, laterals and manholes.
- B. A high velocity sewer cleaner will be used for the majority of the cleaning work. Other equipment, such as bucket machines, rod machines, hydraulic root cutters, vacuum trucks and balling equipment, appropriate to the need, shall be available.

3.02 CLEANING PRECAUTIONS

- A. All necessary precautions shall be taken to protect the sewer from damage during all cleaning and preparation operations. Precautions shall also be taken to insure that no damage is caused to public or private property adjacent to or served by the sewer or its branches. The CONTRACTOR shall pay for and restore, at no additional costs to UTILITIES, any damage caused to public or private property because of such cleaning and preparation operations.
- B. Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to insure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. When possible, the flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. All requirements shall be met when accessing a fire hydrant including but not limited to meters, backflow preventers and properly trained personnel. It shall be the CONTRACTOR's responsibility to meet all state and local requirements.

3.03 CLEANING

- A. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning attempted again. If results of the cleaning are favorable, the CONTRACTOR will proceed with the TV inspection. All sludge, dirt, sand, rocks and other solid or semi solid materials resulting from the cleaning operation shall be removed from the downstream manhole of the section being cleaned. The CONTRACTOR shall not be responsible for removing mortar or other material that is securely attached to the pipe walls or joints.
- B. Materials shall be disposed of from the site at least once at the end of each workday. The CONTRACTOR will be responsible for the disposal of materials removed from

CLEANING SANITARY SEWER SYSTEMS

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the sewer system. All sewer cleaning efforts shall require documentation of all quantities and types of materials removed during cleaning.

- C. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment approved by UTILITIES. Cleaning shall consist of normal hydraulic jet cleaning to facilitate the internal CCTV inspection.
 - 1. Types of cleaning of sanitary sewers
 - a. Light cleaning consists of a maximum of one pass of the jet nozzle. Light cleaning of laterals will consist of flushing water into a cleanout.
 - b. Medium cleaning consists of two to four passes of the jet nozzle. Medium cleaning of laterals will consist of one to four passes with a jet nozzle.
 - c. Heavy cleaning consists of five or more passes of the jet nozzle such as removing heavy grease, debris and roots.
 - 2. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to UTILITIES. The equipment shall be capable of removing dirt, grease, rocks, sand, debris, other materials and obstructions from the sewer lines and manholes.
 - 3. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. The intent of preparatory cleaning is to provide sufficient cleaning to ensure camera passage and the internal conditions of the pipeline can be fully assessed.
 - 4. If UTILITIES establishes that a particular section of the pipeline cannot be adequately cleaned due to broken, collapsed, or void areas, then inspection will be attempted up to the obstruction.

3.04 ROOT REMOVAL

- A. Roots shall be removed in the designated sections and manholes where root intrusion is a problem and where authorized by the Project Manager or designee. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Any roots that could prevent the proper application of chemical sealants, or could prevent the proper seating and application of cured-in-place liners shall be removed. Procedures may include the use of mechanical equipment such as, rodding machines, bucket machines, winches using root cutters, porcupines and equipment such as high-velocity jet cleaners. Chemical root treatment shall be used before or following the root removal operation, depending on the manufacturer's recommendation. The CONTRACTOR shall capture and remove all roots from the line.

3.05 CHEMICAL ROOT TREATMENT

CLEANING SANITARY SEWER SYSTEMS

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- A. To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an acceptable herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation, so designated by UTILITIES, shall be replaced by the CONTRACTOR at no additional cost to UTILITIES. All safety precautions as recommended by the manufacturer shall be adhered to for handling and application of the herbicide.

3.06 MATERIAL REMOVAL AND DISPOSAL

- A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. CONTRACTOR shall provide appropriate screening to stop passing of materials into downstream sewers. All solid or semisolid materials dislodged during cleaning operations shall be removed from the sewer by CONTRACTOR at the downstream manhole of the sewer section being cleaned. The passing of dislodged materials downstream of the sewer segment being cleaned shall not be permitted. In such an event, as observed or detected by UTILITIES or any third party, CONTRACTOR shall be responsible for cleaning the affected downstream sewers in their entirety, at no additional cost to UTILITIES.
- B. These materials shall become the property of the CONTRACTOR, shall be removed from the site at the end of each workday, and shall be disposed of in a lawful manner by CONTRACTOR. Copies of records of all disposals shall be furnished to UTILITIES, indicating disposal site, date, amount and a brief description of material disposed. Disposal manifests from the licensed disposal facility shall be submitted with invoices.
- C. The CONTRACTOR shall keep his haul route and work area(s) neat, clean, and reasonably free of odor, and shall bear all responsibility for the cleanup of any spill.

3.07 ACCEPTANCE OF CLEANING OPERATION

- A. Acceptance of sanitary sewer cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of UTILITIES. If television inspection shows the cleaning to be unsatisfactory, the CONTRACTOR shall be required to re-clean and re-inspect the sewer line at no additional cost until the cleaning is shown to be satisfactory.

In addition, on all sanitary sewers which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the CONTRACTOR shall use a high pressure cleaner to draw the water out of the pipe, or other means, to allow the full circumferential view of the pipe and identification of pipe defects, cracks, holes and location of service connections.

END OF SECTION

CLEANING SANITARY SEWER SYSTEMS

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1 **SECTION 02762**

2 **TELEVISIONING SANITARY SEWER SYSTEMS**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

5 The Work covered within this Section is for the internal closed circuit television (CCTV)
6 inspection of sanitary sewer pipes. The Contractor shall perform sewer-televising work as
7 necessary to thoroughly document the condition of all sewers, service lateral connections,
8 and manhole corbel, barrel and cone-sections in the study area. The sanitary sewer and
9 service laterals shall be carefully inspected to determine alignment, grade variations,
10 separated joints, location and extent of any deterioration, breaks, obstacles, obstructions,
11 debris, quantities of infiltration/inflow and the locations of service connections.

12 The quality of all Work specified in this Section shall meet or exceed the requirements of the
13 National Association of Sewer Service Companies (NASSCO) Recommended Specifications
14 for Sewer Collection System Rehabilitation (latest edition), except as described in this
15 Section. Applicable portions of this Section that inadvertently fall below those standards
16 shall be corrected and maintained at the NASSCO standards as a minimum requirement, at
17 no additional cost to the County.

18 1.02 REQUIREMENTS

19 A. The Contractor shall inspect the sewer interior using a color closed circuit television
20 camera (CCTV) and document the inspection on a digital recorder. All inspection video
21 shall be captured in either MPEG or Windows Media Video (.WMV) file format and
22 saved portable hard drives for submittal. Each inspected main line sewer reach,
23 referenced manhole to manhole, and each inspected sewer lateral referenced to the
24 property address and corresponding sewer main should have an associated MPEG or
25 WMV file. Digital photographs (.JPG files), inspection reports (.PDF files) and any
26 handwritten inspection logs or field maps shall accompany the video inspections for each
27 sewer reach (manhole-to-manhole) or lateral inspected.

28 B. Contractor shall provide inspection video, data and reports in accordance with the
29 requirements specified herein. Contractor shall provide all video on portable hard drive
30 as specified. All Work will conform to current NASSCO Pipeline Assessment
31 Certification Program (PACP) coding conventions and all software used by the
32 Contractor will be PACP compliant. An electronic database will be provided by the
33 Contractor in a PACP exported format approved by the County.

34 C. The Contractor shall provide comments as necessary to fully describe the existing
35 condition of the sewer on the inspection forms.

- 1 D. Contractor shall be responsible for modifications to equipment and/or inspection
2 procedures to achieve report material of acceptable quality.
- 3 E. No Work shall commence prior to approval of the submitted material by the County.
4 Once accepted, the report material shall serve as a standard for the remaining Work.

5 1.03 QUALITY ASSURANCE

- 6 A. Refer to Section 01101-"Special Requirements (Gravity Inspection Only)" for
7 Contractor's Qualification requirements.
- 8 B. Each CCTV field inspection supervisor shall be NASSCO PACP certified. Use of PACP
9 certified technicians to review/document defects in the office (post process) is not
10 acceptable.
- 11 C. The inspection Contractor must have an internal quality assurance/quality control
12 program in place and all inspection data shall be subjected to the procedures prior to
13 submittal to the County. The County will perform QA/QC audits on submitted data.
- 14 D. QA/QC shall be performed by NASSCO PACP certified personnel.

15 1.04 SUBMITTALS

- 16 A. Submittals shall be submitted to the County for review and acceptance prior to
17 construction in accordance with the General Conditions and specifications Section 01300
18 "Submittals."
- 19 B. The following deliverables shall be submitted on a portable hard drive at the completion
20 of inspection:
- 21 1. Inspection videos saved in MPEG format or Windows Media video format
22 2. Electronic version (.pdf) of the pipe inspection reports
23 3. PACP export pipe inspection database (.mdb)
24 4. Inspection digital photographs in JPEG format
25 5. Map of sub area depicting area inspected, inspection status, asset identification
26 numbers and mark ups
27 6. QA/QC report
- 28 C. The above deliverables shall be submitted monthly to the County for approval.
29 Application for payment shall be made after review and approval by the County.
- 30 D. The sewer inspection video, report documents, and sewer inspection database shall be in
31 accordance with County data standards and NASSCO PACP.

32 1.05 NOTIFICATION

- 33 Contractor shall notify the County a minimum of 48-hours prior to performing any inspection
34 work. No payment will be made for inspections performed without proper notification.

1 **PART 2 - PRODUCTS**

2 2.01 EQUIPMENT

3 A. Closed Circuit Television Camera: The television camera used for the inspection shall be
4 one specifically designed and constructed for sanitary sewer inspection. Lighting for the
5 camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The
6 camera shall be operative in 100 % humidity/submerged conditions. The CCTV camera
7 equipment will provide a view of the pipe ahead of the equipment and of features to the
8 side of the equipment through turning and rotation of the lens. The camera shall be
9 capable of tilting at right angles along the axis of the pipe while panning the camera lens
10 through a full circle about the circumference of the pipe. The lights on the camera shall
11 also be capable of panning 90° (degrees) to the axis of the pipe.

12 The radial view camera must be solid-state color and have remote control of the
13 rotational lens. The camera shall be capable of viewing the complete circumference of
14 the pipe and manhole structure, including the cone-section or corbel. Cameras
15 incorporating mirrors for viewing sides or using exposed rotating heads are not
16 acceptable. The camera lens shall be an auto-iris type with remote controlled manual
17 override.

18 If the equipment proves to be unsatisfactory, it shall be replaced with adequate
19 equipment. The camera unit shall have sufficient quantities of line and video cable to
20 inspect 2 complete, consecutive sewer reaches with access approximately 750-feet apart.

21 The camera, television monitor, and other components of the video system shall be
22 capable of producing picture quality to the satisfaction of the County. The television
23 camera, electronic systems and monitor shall provide an image that meets the following
24 specifications, or approved equal:

- 25 1. The gray scale shall show equal changes in brightness ranging from black to white
26 with a minimum of five stages.
- 27 2. With the monitor control correctly adjusted, the 6-colors; Yellow, Cyan, Green,
28 Magenta, Red, and Blue, plus black and white shall be clearly resolved with the
29 primary colors in order of decreasing luminance. The gray scale shall appear in
30 contrasting shades of gray with no color tint.
- 31 3. The picture shall show no convergence or divergence over the whole of the picture.
32 The monitor shall be at least 13-inches diagonally across the picture tube.
- 33 4. The live picture on the CCTV monitor shall be capable of registering a minimum of
34 470 lines horizontal resolution and be a clear, stable image with no interference.
- 35 5. Lighting intensity shall be remote controlled and shall be adjusted to minimize
36 reflective glare. Lighting and camera quality shall provide a clear in-focus picture of
37 the entire inside periphery of the sewers and laterals for all conditions except
38 submergence. Under ideal conditions (no fog in the sewer) the camera lighting shall
39 allow a clear picture up to 5 pipe diameter lengths away for the entire periphery of the
40 sewer. The lighting shall provide uniform light free from shadows or hot spots.
- 41 6. The camera light head shall include a high-intensity side viewing lighting system to
42 allow illumination of internal sections of lateral sewer connections.

- 1 7. Camera focal distance shall be remotely adjustable through a range of 6-inches to
2 infinity.
- 3 8. Picture quality and definition shall be to the satisfaction of the County.
- 4 9. The monitor and software shall also be able to capture and save screen images of
5 typical sewer details and all defects. Screen images shall be embedded into the pipe
6 inspection report document submitted with the inspection video.
- 7 10. The video camera shall be capable of displaying on screen data as specified in
8 paragraph 3.08 herein.
- 9 11. Depth gage: The camera shall have a depth gage or approved method to measure
10 deflection in the pipe and joint separation approved by the County.
- 11 12. The camera shall have zoom capabilities to be able to view the entire depth of a 20-
12 foot deep manhole from the bottom during inspection.

13 B. Lateral Video Camera

14 Lateral cameras may be push type or launched from the sewer main line. Lateral cameras
15 shall be color, shall be self-leveling, and equipped with a footage counter to provide on-
16 screen display of footage measurement. Monitor resolution shall be as specified above in
17 paragraph 2.01 A Close Circuit Television Camera, or approved equal

18 C. Video Capture System

19 The video and audio recordings of the sewer inspections shall be made using digital video
20 equipment. A video enhancer may be used in conjunction with, but not in lieu of, the
21 required equipment. The digital recording equipment shall capture sewer inspection on
22 DVD disks or hard drive, with each sewer reach inspection recorded as an individual
23 movie file (.MPEG, .MPG, or .WMV) or approved equal. The video files will be named
24 in accordance with the County file naming convention contained in paragraph 3.11
25 herein.

- 26 1. The video file names will be referenced in the inspection database and in an
27 inspection report generated in PDF format. The pipeline collection and real time
28 video capture and data acquisition systems shall be provided.
- 29 2. The system shall use the most current PACP compliant application software and shall
30 be fully object oriented or approved equal. It shall be capable of printing pipeline
31 inspection reports with captured images of defects or other related significant visual
32 information on a standard color printer.
- 33 3. The imaging capture system shall store digitized color picture images and be saved in
34 digital format on a DVD, hard drive or approved equal. Also, this system shall have
35 the capability to supply the County with inspection data reports for each line segment.
- 36 4. The Contractor shall have the ability to store the compressed video files in industry
37 standard and approved County format and be transferable with the PACP compliant
38 inspection database.
- 39 5. The Contractor's equipment shall have the ability to "Link". "Linking" is defined as
40 storing the video time frame code with each observation or defect with the ability to
41 navigate from/to any previously recorded observation or defect instantaneously.
- 42 6. The system shall be able to produce data reports to include, at a minimum, all
43 observation points and pertinent data. All data reports shall match the defect severity
44 codes in accordance with PACP naming conventions

- 1 7. The data-sorting program shall be capable of sorting all data stored using generic sort
2 key and user defined sort fields.
- 3 8. Camera footage, date & manhole numbers shall be maintained in real time and shall
4 be displayed on the video monitor as well as the video character generators
5 illuminated footage display at the control console.
- 6 9. Digital video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding having a
7 resolution of 352 pixels (x) by 240 pixels (y) (minimum) and an encoded frame rate
8 of 29.97 frames per second. The digital recording shall include both audio and video
9 information that accurately reproduces the original picture and sound of the video
10 inspection. The video portion of the digital recording shall be free of electrical
11 interference and shall produce a clear and stable image. The audio portion shall be
12 sufficiently free of background and electrical noise so as to produce an oral report that
13 is clear and discernible.
- 14 10. Inspection software shall be PACP compliant versions of CUES Granite XP,
15 WinCan, Flexidata, or approved equal.
- 16 11. The CCTV equipment/software shall be capable of producing digitized images of all
17 sewer line defects, manhole defects, and sewer line service connections in .jpeg
18 format. Contractor shall plan to take digital still images of each defect, construction
19 features and service connection to clearly depict it. More images may be necessary
20 depending upon the condition of the pipe.

21 2.02 REPORTING CAPABILITIES

- 22 A. The CCTV system shall be capable of printing pipeline inspection reports with pipeline
23 schematics and captured images of defects and other related significant visual
24 information. The system shall have the ability to display any combination of the
25 following formats and features simultaneously.

26 The following information is mandatory for all inspections:

- 27 1. Inspection Information: Refers to the area of pipe to be inspected between 2 manholes
28 or the address of the lateral to be inspected.
 - 29 a. Project Name
 - 30 b. Surveyed by (Operator/Surveyor's name)
 - 31 c. Operator/Surveyor Certificate number
 - 32 d. System Owner
 - 33 e. Date
 - 34 f. Drainage Area (tributary pump station number)
 - 35 g. Time
 - 36 h. Sheet number (report sheet number)
 - 37 i. Street Name and Number
 - 38 j. Locality (Orange County)
 - 39 k. Additional Location Information (e.g. backyard, parking lot, etc)
 - 40 l. Upstream Manhole Number (County standard Asset Number)
 - 41 m. Upstream MH rim to invert (depth)
 - 42 n. Downstream Manhole Number (County standard Asset Number)
 - 43 o. Downstream MH rim to invert (depth)
 - 44 p. Direction of inspection (Upstream or Downstream)

- 1 q. DVD Identification Number
- 2 r. Flow control (e.g. plugged, lift station, bypassed, not controlled)
- 3 s. Type of Pipe
- 4 t. Pipe Height
- 5 u. Pipe Width
- 6 v. Pipe Shape
- 7 w. Pipe Material
- 8 x. Lining Material (for lined sewers)
- 9 y. Pipe Joint Length
- 10 z. Purpose of Inspection (new line, year-end warranty, CIP R/R project, etc.)
- 11 aa. Pre Cleaning (jetter, heavy cleaning, no pre-cleaning)
- 12 bb. Media Number (Video file name)
- 13 cc. Weather
- 14 dd. Additional information/Comments
- 15 2. Observation Data: Refers to the portion of pipe where an observation is discovered.
- 16 Observations shall be noted by text descriptions and defect code number using PACP
- 17 defects codes, still frame pictures and video clips captured and recorded. Each
- 18 observation shall include the following:
- 19 a. Actual observation footage
- 20 b. Video reference
- 21 c. Location of defect; clock position
- 22 d. Code (Group/Descriptor/Modifier/Severity)
- 23 e. Whether it is a continuous defect
- 24 f. Whether the defect occurs at a joint
- 25 g. Severity level
- 26 h. DVD Identification number
- 27 i. DVD counter
- 28 j. Final footage
- 29 k. Video clip ID for each observation
- 30 l. Image reference (file name of photos)
- 31 m. Remarks (as appropriate or needed)
- 32 3. Formats: Standard and/or custom designed reports shall have the following formats
- 33 available and shall be able to be produced in hard copy or viewed on the monitor.
- 34 a. Site Observation: Displays detailed site observation reports in landscape or
- 35 portrait views.
- 36 b. Directory Report: Displays a list of all the projects sorted by pump station number
- 37 and manhole number.
- 38 c. Picture Reports: Displays site data and include full size single photos or half size
- 39 double photos of discrepancies.
- 40 d. Pipe Run: Displays a graphical display of the site indicating footage,
- 41 observations, and comments.
- 42 e. Project Data: Displays the project, client, and Contractor information.
- 43 f. Custom Sort: Creates user-defined reports of selected site, project, and
- 44 observation data.

1 **PART 3 - EXECUTION**

2 3.01 GENERAL

- 3 A. Prior to inspection the Contractor shall obtain pipe and manhole asset identification
4 numbers from the County to be used during inspections. Inspections performed using
5 identification numbers other than the County assigned numbers will be rejected.
- 6 B. Inspection shall not commence until the sewer section to be televised has been
7 completely cleaned in conformance with Specification Section 02761 "Cleaning Sanitary
8 Sewer Systems."
- 9 C. Inspection of newly installed sewers (not yet in service) shall not begin prior to
10 completion of the following:
11 1. Pipe air testing
12 2. All manhole work, including installation of inverts
13 3. Installation of all lateral services
14 4. Vacuum tests of all manholes
- 15 D. After the sewer main and/or lateral cleaning operation is completed, the line sections
16 shall be visually inspected internally by means of color closed-circuit television. The
17 television inspection shall be performed one line section at time.
- 18 E. CCTV inspection shall require a minimum of 2 certified personnel with PACP
19 certifications.
20 1. One (1) person shall have PACP certification that will lead or supervise each field
21 CCTV crew for inspection and a minimum of 2-years in the role of a lead person.
22 2. One (1) person shall have PACP certification serving in the role as a QA/QC
23 management supervisor
- 24 F. Contractor shall perform sewer-televising work within 24-hours of said sewer being
25 cleaned. If said sewer is not televised within the required 24-hour time limit, the sewer
26 shall be re-cleaned prior to televising at no additional expense to the County.
- 27 G. The Contractor shall also inspect and document all manholes included in this Work. The
28 video recording shall begin as the camera is lowered down the manhole all the way to the
29 preset footage and continuously throughout the pipe reach until the down stream manhole
30 is reached.
- 31 H. The Contractor shall lower the camera into the start manhole and record the camera entry
32 into the sewer, observing the manhole as the camera enters.
- 33 I. The camera shall pan the periphery of the start and finish manhole from casting to invert.
34 To achieve this, the CCTV camera operator shall pan and zoom the manhole to obtain the
35 best possible image of the manhole, including the wall, cone and chimney section(s).
- 36 J. The depth of each manhole shall be measured to the nearest 1/10th of a foot and
37 documented on the inspection forms. Estimates of manhole depths will not be accepted.

- 1 K. The CCTV camera shall be positioned as close to the spring line as possible while
2 maintaining the required equipment stability.
- 3 L. Wherever possible the inspections shall be performed in the upstream to downstream
4 direction. All sewer segments shall be recorded in a logical order in the same direction
5 they are cleaned and televised.
- 6 M. In the event that access to some manholes is restricted, permission may be granted by the
7 County to direct the camera through the sewer in an upstream direction, against the flow.
- 8 N. When sewer conditions prevent forward movement of the camera, the camera shall be
9 withdrawn, and Contractor shall televise the line from the opposite direction.
- 10 O. The camera shall be directed through the sewer in a downstream direction, with the flow,
11 at a uniform, slow rate. In no case will the video camera record while moving at a speed
12 greater than 30-feet per minute. If, during the course of the Project, the inspection is
13 rejected due to camera speeds exceeding 30-feet per minute, the inspection recordings
14 shall be redone, at no additional cost to the County.
- 15 P. If a new manhole is discovered in the field that was not on current maps, a new manhole
16 identification number will be assigned by County. The County shall assign the manhole
17 the next number above the highest manhole number within the sub area. The data / video
18 files shall then be re-named to include the new MH ID, and a new CCTV inspection shall
19 be started from the new MH ID. Contractor shall consult with the County for assignment
20 of new manhole identification numbers. Contractor shall note in the inspection form
21 comments that a new manhole ID has been assigned as well as provide a marked up map
22 indicating the newly found manhole and assigned manhole ID.
- 23 Q. Flow levels within existing sewers to be inspected shall not exceed 5% of the pipe
24 diameter. If water levels prevent adequate televising of the sewer, then conducting the
25 Work during low flow periods or other methods like plugging and bypass pumping shall
26 be implemented.
- 27 R. For inspection of new sewers (not yet in service), the Contractor shall introduce clean
28 water into the upstream manhole and keep water flowing until flow is observed at the
29 downstream manhole location.
- 30 S. The survey unit shall be slowed, stopped, or backed up to perform detailed inspections of
31 significant features. The camera shall be stopped at all defects, changes in material,
32 water level, size, side connections, manholes, junctions, or other unusual areas. When
33 stopped at the defect or feature, the operator shall pan the camera to the area and along
34 the circumference of the pipe.
- 35 T. The camera unit shall be paused long enough at areas suspected of leaking to determine if
36 a leak exists currently or if deposits have occurred.
- 37 U. The operator shall also record audio of the type of defect or feature, clock position,
38 footage, extent or other pertinent data.

- 1 V. Digital photographs or screen captures shall be taken at all laterals; defects and general
2 condition photographs shall be taken at least every 200-feet.
- 3 W. At the Contractor's discretion or direction of the County, the camera shall be stopped or
4 backed up (when conditions allow) to view and analyze conditions that appear to be
5 unusual or uncommon for a sound sewer. The lens and lighting shall be readjusted, if
6 need be, in order to ensure a clear, distinct, and properly lighted feature.
- 7 X. Audio shall be recorded during each inspection by the operating technician, electronic
8 voice text recognition or approved equal on the inspection video as the sewer is inspected
9 and shall include the sewer location, identification of beginning and terminating
10 manholes including location (address or cross streets), inspection direction, length of
11 inspection, side sewer identification, flow information, complete descriptions of the
12 sewer line conditions as they are encountered, description of the rehabilitation work,
13 reason for termination, and other relevant commentary to the inspections. Voice
14 descriptions should be made:
- 15 1. At points of pipe failure or weakness
 - 16 2. At points of infiltration
 - 17 3. At the location of service connections
 - 18 4. At points where unusual conditions are noted, and
 - 19 5. At points where digital still photos are taken.
- 20 In addition, the audio reports shall include the distance traveled on the specific run, a
21 description of abnormal conditions in the sewer and side sewer connections as they are
22 encountered, explanations for pausing, backing up, or stopping the survey, and the final
23 measured center to center distances between consecutive manholes. The audio portion of
24 the composite video shall be sufficiently free from electrical interference and background
25 noise to provide complete intelligibility of the oral report. Audio dubbing after the
26 inspection is prohibited.
- 27 Y. Video recordings shall include a continuous video display/readout of similar information,
28 as described in paragraph 3.08 herein. A separate digital video file shall be made for
29 each pipe reach inspected.
- 30 Z. Contractor shall coordinate with the County prior to commencement of Work to ensure
31 inspection is accomplished in a manner acceptable to the County.
- 32 AA. If the video and/or audio recording is of poor quality, the County has the right to require a
33 re-submittal of the affected sewer sections and no payment will be made until an
34 acceptable video and audio recording is made, submitted to, and accepted by the County.
- 35 BB. Measurement for location of defects and actual length of pipe shall be by means of a
36 calibrated meter on the camera with a digital readout on the video monitor. This readout
37 shall be included in the video recording. Marking on cable, or the like, which would
38 require interpolation for depth of manhole, will not be allowed. Measurement will be
39 accurate to 1-foot per 100-feet of inspected pipe.

- 1 CC. The Contractor inspection units shall be equipped with adequate back up equipment and
2 spare parts so field repairs to equipment can be made and down time is minimized.
- 3 DD. The Contractor shall be responsible for all traffic control measures required to perform
4 the Work.
- 5 EE. Lateral inspections shall be performed from the main line using a lateral launch camera or
6 shall be pushed from cleanouts to the sewer main using sewer rods. Lateral camera travel
7 measurements shall be displayed on screen and on the captured video.
- 8 FF. If lateral inspections are performed from the sewer main as part of the main line
9 inspection, the lateral shall be logged in the main line inspection report per PACP
10 requirements and the "comment" field of the main line inspection report shall be used to
11 document the lateral identification number, defects observed, footage of all lateral
12 defects, connecting pipes and clean outs. If lateral inspections are not performed as part
13 of the main sewer inspection, a separate PACP pipe inspection record shall be created for
14 each lateral. Refer to paragraph 3.10 for numbering requirements.

15 3.02 PRE-CONSTRUCTION INSPECTION

16 A. Procedure

- 17 1. Prior to any repair work, the entire sewer line (from manhole to manhole) shall be
18 televised. The pre-construction inspection shall be used to determine whether the line
19 has been cleaned sufficiently; to confirm the location and nature of defects; and to
20 confirm that the proposed method of repair is proper method for the defects observed.
- 21 2. The camera shall be moved through the line in either direction at a moderate rate,
22 stopping when necessary to permit documentation of the sewer's condition. In no
23 case will the television camera be pulled at a speed greater than 30-feet per minute.
24 Manual winches, power winches, TV cable, and power rewinds or other devices that
25 do not obstruct the camera view or interfere with proper documentation of the sewer
26 conditions shall be used to move the camera through the sewer line. If, during the
27 inspection operation, the television camera will not pass through the entire manhole
28 section, the Contractor shall set up his equipment so that the inspection can be
29 performed from the opposite manhole (reverse set-up).
- 30 3. When manually operated winches are used to pull the television camera through the
31 line, telephones, radios or other suitable means of communication shall be set up
32 between the 2 manholes of the section being inspected to insure good communication
33 between members of the crew.
- 34 4. The importance of accurate distance measurements is emphasized. The location of
35 defects shall be within ± 2 feet.
- 36 5. During the internal inspection the television camera shall be temporarily stopped at
37 each defect along the line. The Contractor shall record the nature and location of the
38 defect. Where defects are also active infiltration sources, the rate of infiltration in
39 gallons per minute shall be estimated by the Contractor and recorded. The camera
40 shall also be stopped at active service connections where flow is discharging. Flows
41 from service connections that are determined to be infiltration/inflow shall also be
42 recorded.

1 B. Documentation of Television Inspection

- 2 1. Television Inspection Logs: Printed location records shall be kept by the Contractor
3 and will clearly show the location in relation to an adjacent manhole of each
4 infiltration point observed during inspection. In addition, other points of significance
5 such as locations of building sewers, unusual conditions, roots, storm sewer
6 connections, broken pipe, presence of scale and corrosion, and other discernible
7 features will be recorded and a copy of such records will be supplied to the County.
8 The Contractor shall record all visual observations on a "Television Inspection
9 Report" form.
- 10 2. Once recorded, the digital data shall be labeled and become the property of the
11 County. The Contractor shall have all readings and necessary playback equipment
12 readily accessible for review by the County during the Project.

13 3.03 POST CONSTRUCTION INSPECTION

14 A. Procedure

- 15 1. After the sewer line rehabilitation has been completed, the entire sewer line from
16 manhole to manhole shall be televised. The post construction inspection shall be used
17 to determine whether or not all of the approved sewer line defects and infiltration
18 sources previously located have been fully repaired to the satisfaction of the County.
- 19 2. The camera shall be moved through the line in either direction at a moderate rate,
20 stopping when necessary to permit documentation of the sewer's condition. In no
21 case will the television camera be pulled at a speed greater than 30-feet per minute.
22 Manual winches, power winches, TV cable, power rewinds or other devices that do
23 not obstruct the camera view or interfere with proper documentation of the sewer
24 conditions shall be used to move the camera through the sewer line. If, during the
25 inspection operation, the television camera will not pass through the entire manhole
26 section, the Contractor shall set up his equipment so that the inspection can be
27 performed from the opposite manhole or direction.(reverse-setup)
- 28 3. When manually operated winches are used to pull the television camera through the
29 line, telephones, radios or other suitable means of communication shall be set up
30 between the 2 manholes of the section being inspected to insure good communication
31 between members of the crew.
- 32 4. The importance of accurate distance measurements is emphasized. The location of
33 defects shall be within 1-foot.
- 34 5. During the internal inspection the television camera shall be temporarily stopped at
35 each repair. The camera shall also be stopped at any unnoticed or non-repaired point
36 source of infiltration.

37 3.04 SEWER BYPASSING AND DEWATERING

38 Contractor shall be responsible for bypassing sewer flow around his work and dewatering of
39 sewer lines in accordance with the requirements of Section 01516 "Collection System
40 Bypass". Where sags or submerged sections of the sewer are encountered during TV
41 inspection, the Contractor shall first complete inspection of the entire reach to determine the
42 extent of such areas prior to dewatering the sewer. Dewatered sections of the sewer shall
43 then be TV inspected.

1 On all sewer mains which have sags or dips, to an extent that the television camera lens
2 becomes submerged during the television inspection, the Contractor shall use a high pressure
3 cleaner to draw the water out of the pipe, or other means, to allow inspection of the pipe and
4 identification of pipe defects, cracks, holes and location of service connections.

5 3.05 LINEAR MEASUREMENT

6 The CCTV camera location footage counter shall be zeroed at the beginning of each
7 inspection. The survey unit location entered on the footage counter at the start of the
8 inspection shall allow for the distance from the accepted start of the length of the sewer to the
9 initial point of observation of the camera (pre-set footage). In the case of resuming an
10 inspection at an intermediate point within a sewer reach, the footage counter shall be set to
11 start at the distance from the upstream maintenance hole to that point, as previously recorded
12 by the counter. The Contractor shall ensure that the footage counter starts to register
13 immediately when the survey unit starts to move.

14 The lateral camera shall be pushed from cleanouts to the sewer main and be equipped with a
15 footage counter to display and record inspection footage. Maximum rate of travel shall be
16 30-feet per minute when recording.

17 Prior to commencing inspections, the Contractor shall demonstrate compliance with the
18 linear measurement tolerance specified below:

19 A. The equipment shall measure the location of the camera unit in 1-foot increments from
20 the beginning (upstream end) of each continuous section. This footage location must be
21 displayed on the CCTV monitor and recorded on the videotapes.

22 B. The accuracy of the measured location shall be within + 0.5% of the actual length of the
23 sewer-reach being surveyed, or 1-foot, whichever is greater.

24 3.06 MEASUREMENT OF SAGS

25 The CCTV camera shall be equipped with a measuring device capable of accurately
26 measuring the depth of standing water up to 3-inches. The measuring device shall be
27 mounted to the front of the unit and be capable of being read as the unit advances through the
28 pipe.

29 3.07 CCTV MONITOR DISPLAY

30 The images displayed on the CCTV monitors will be a view of the pipe above the water
31 surface as seen by the CCTV camera as the unit is conveyed through the sewer.

32 The camera lighting shall be fixed in intensity prior to commencing the survey and the white
33 balance set to the color temperature emitted. In order to ensure color constancy, no variation
34 in illumination shall take place during the survey.

1 The video equipment shall be checked using an approved test card with a color bar prior to
2 commencing each day's survey. The camera shall be positioned centrally and parallel to the
3 test card at a distance where the full test card just fills the monitor screen. The card shall be
4 illuminated evenly and uniformly without any reflection.

5 3.08 DATA DISPLAYS

6 A. The CCTV images shall include an initial data display that identifies the sewer reach
7 being surveyed and a survey status display that provides continuously updated
8 information on the location of the survey unit as the survey is being performed. These
9 data displays shall be in alphanumeric form. The size and position of the data shall not
10 interfere with the main subject of the monitor picture.

11 B. The on-screen display should be white during inspections where the background behind
12 the display is dark and, conversely, black where the background is light.

13 C. At the beginning of each reach of sewer being inspected, the following information shall
14 be electronically generated and displayed on the CCTV monitors as well as included in
15 the audio track:

- 16 1. Date of survey
- 17 2. Inspection company name and inspector
- 18 3. Street name or location
- 19 4. Manhole number to manhole number (in order of inspection)
- 20 5. Direction of survey (upstream or downstream)
- 21 6. Time of start of survey

22 D. During inspections, the following information shall be electronically generated,
23 automatically updated, and displayed on the CCTV monitors:

- 24 1. Survey unit location in the sewer line in feet and tenths of feet from adjusted zero
- 25 2. Sewer diameter
- 26 3. Upstream and downstream manholes reference numbers as per approved Drawings or
27 County GIS.
- 28 4. During Lateral inspections the video display shall contain the lateral location and the
29 footage of the camera within the lateral.

30 3.09 PHOTOGRAPHS

31 During CCTV inspections, screen captures will be taken from the monitor images and saved
32 electronically by the in-sewer inspection crew of typical conditions every 200-feet and at all
33 defects, construction features, manholes and laterals. The screen capture shall have the pipe
34 reach (identified by the upstream and downstream manholes), survey direction, footage, and
35 date when photograph was taken. The annotation shall be clearly visible and in contrast to its
36 background, shall have a figure size no greater than 1/4-inch, and shall be type-printed. The
37 annotation shall be positioned on the front of the photograph so as to not interfere with the
38 subject of the photograph. Photograph files shall be named by the video capture system and
39 automatically referenced to the logged defect.

1 The image of the sewer shall fill the photographic image. Photographs must clearly and
2 accurately show what is displayed on the monitor, which shall be in proper adjustment.
3 Where significant features exist within 6-feet of each other, 1 photograph shall be made to
4 record these features. Where there is a continuous feature, photographs shall not be taken at
5 intervals of less than 6-feet unless absolutely necessary to show a change in the feature.

6 The images shall be kept electronically, copied to a hard drive, and submitted with the
7 inspection videos, database and reports.

8 3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES

9 A. The Contractor will be required to use the manhole numbering as shown on sewer maps
10 provided by the County when performing the inspections for this project.

11 B. The County inspection forms and standard defect codes shall be used. The defect codes,
12 inspection forms, inspection database and inspection protocols shall be in accordance
13 with the National Association of Sewer Service Companies (NASSCO) Pipeline
14 Assessment and Certification Program (PACP).

15 C. When lateral inspections are performed as part of the main sewer inspection, lateral
16 numbers shall be referenced in the "comment" field of the main sewer PACP report. The
17 lateral number shall be as follows:

18 <Upstream Manhole ID>_<footage>_<clock position>_<L>

19 Example: 39550020_212_02_L

20 D. When lateral inspections are not performed as part of the main sewer inspection, the main
21 sewer inspection shall be performed first to obtain the footage and clock positions needed
22 to identify the lateral.

23 3.11 DELIVERABLES

24 The Contractor will be required to submit the following deliverables at the completion of the
25 post construction video inspection. The pre-construction video inspection deliverables shall
26 be as defined in 3.02 of this specification.

27 A. Inspection Reports to include:

- 28 1. Inspection session header information (see required fields above)
- 29 2. Defect log report including photo captures from CCTV video
- 30 3. Schematic drawing of pipe showing defects
- 31 4. Format:
 - 32 a. Adobe Acrobat PDF files: 1 report PDF per pipe
 - 33 b. Main sewer inspection report file name:

34 <upstream MH ID>_<downstream MH ID>_<Date (year_mo_day format)>.PDF

35 Example: 30060002_30060001_2010_02_16.pdf

1 c. Lateral inspection report file name:
2 <upstream MH ID>_<footage>_<clock position>_<L>_<Date (year_mo_day format)>.PDF_
3 Example: 30060002_210_02_L_2010_02_16.pdf

4 B. Inspection video files on portable hard drive, typed labels shall be attached to the face of
5 each hard drive. The typed index labels shall include the following information:

- 6 1. Content (CCTV)
- 7 2. Contractor name
- 8 3. Purpose of Survey
- 9 4. Tributary Pump station number
- 10 5. Reaches included (from Manhole Number ## to Manhole Number ##)
- 11 6. Date of survey
- 12 7. Contract Number / Delivery Order Number (if applicable)

13 C. Main sewer video files shall be MPEG or Windows Media File named according to the
14 following standard:

15 <Upstream MH ID>_<Downstream MH ID>-<Inspection>_<Date (year month day)>.wmv
16 Example: 39540008-39540007_20090805.wmv

17 In instances where a reverse set up is necessary to perform or complete the inspection the
18 file name shall incorporate a "R" at the end of the file name to indicate "reverse"
19 direction. Using the file example above, if the inspection from the upstream end was
20 halted due to an obstruction and the pipe was televised from the opposite end, the video
21 file from the downstream to upstream direction would be assigned the following file
22 name:

23 Example:39540008-39540007_20090805_R.wmv

24 D. Lateral connection inspection video files shall be MPEG or Windows Media File named
25 according to the following standard:

26 <Upstream MH ID>_<footage>_<clock position>_<L>_<date (year_mo_day format)>.wmv
27 Example: 39540008_145_10_L_2009_08_05.wmv

28 E. Electronic Inspection Data stored and exported in a NASSCO Pipeline Assessment and
29 Certification Program (PACP) compliant Microsoft Access database (.MDB) version 4.4
30 or newer delivered on DVD or portable hard drive.

31 F. Inspection photograph digital files (jpeg) indexed to NASSCO PACP compliant database.

32 G. Map of sub area depicting area inspected, inspection status, asset identification numbers
33 and mark ups,

34 H. Acceptable media for the video recordings portable hard drive.

- 1 I. Inspection data noted above shall be provided to the County weekly throughout the
2 inspection work.
- 3 J. Contractor Quality Control report detailing data validation performed, pipe inspection
4 records reviewed and results.
- 5 K. All inspection data shall be submitted on a portable hard drive. Each hard drive shall be
6 filled with as much data as practical to minimize the number of hard drives submitted.
7 Sections of a single segment of sewer main shall not be recorded to more than 1 hard
8 drive. Video footage of recorded segments shall be grouped by area and shall be
9 submitted in sequential order relating to the area mapping designation.
- 10 L. Upon approval by the County of all, or portions of, the data delivered via the portable
11 hard drives, the approved CCTV data shall be delivered to the County on a portable hard
12 drive labeled with project information. The hard drive shall clearly indicate the date of
13 the inspection, the designated segment(s) of sewer mains(s) contained on the disk, the
14 name of the project, the project CIP number, the pump station number, and Contractor
15 name. The hard drive shall contain separate digital files for each manhole-to-manhole
16 section.
- 17 M. The database shall be comprehensive for the entire project, and additional data shall be
18 added to the database each week.

19 3.12 ACCEPTANCE

- 20 A. Inspection deliverables will be validated to check conformance with the specified
21 requirements for file names, formats, quantity, resolution, data table references, in
22 addition to checks for null fields, asset numbers, duplicate records, connectivity, material,
23 size, and depth. Any data not passing the data validation checks will be returned to the
24 Contractor for resubmittal.
- 25 B. Inspection submittals will be reviewed for quality control. A minimum of 5% of the
26 submitted inspections will be randomly reviewed. A quality control check will be
27 performed for each CCTV operator and each operator must exceed 90% accuracy.
28 Reference Section 01101 "Special Requirements (Gravity Inspection Only)."
- 29 C. Throughout the duration of the project, should the County discover inaccuracies in data
30 or quality issues with any of the videos, Contractor shall re-inspect those segments at no
31 additional cost to the County. The County will provide comments regarding acceptance
32 of the data within 21-days of receiving the data from the Contractor. Neither the CCTV
33 inspections nor the WORK inspected is accepted by the County until such time that an
34 acceptance letter is issued by the County.
35

36 END OF SECTION

1 **SECTION 02765**

2 **SMOKE TESTING WASTEWATER COLLECTION SYSTEMS**

3 **PART 1 - GENERAL**

4 1.01 SCOPE

5 It is the intent of these specifications to provide for the smoke testing materials and procedures to
6 be used in the investigation of the sanitary sewer facilities as shown on the Project Maps. All
7 materials and procedures shall be consistent with these specifications, the Orange County Smoke
8 Testing Guidance Document, current industry standards, and as approved by the County.

9 The nature of the smoke testing inspections shall be to confirm system connectivity, identify
10 gravity sewer system defects and to provide a permanent record of the defects including type,
11 location, and severity. Inspections will be performed by introducing non-toxic smoke into
12 the sanitary sewer pipes using a high capacity blower, observing smoke exiting vent stacks
13 and at defect locations, and documenting the defects.

14 1.02 REQUIREMENTS

15 A. The Contractor shall inspect the gravity sanitary sewer system using high capacity
16 (minimum 4,500 cfm) blower, non-toxic smoke, sub-meter GPS equipment, safety
17 equipment suitable for the field conditions and a digital camera for documentation.

18 B. All inspections shall be recorded on Orange County standard smoke testing forms.

19 C. All inspection forms shall be scanned and submitted as a single .PDF file (each page
20 numbered).

21 D. All inspection data shall be entered into a database provided by the County.

22 E. The database shall be submitted along with the scanned .PDF file and all digital
23 photographs in .JPG format (see Part 3 for image naming and resolution requirements).

24 1.03 QUALITY ASSURANCE

25 A. Refer to Section 01101 "Special Requirements (Gravity Inspection Only)" for Contractors'
26 Qualification requirements.

27 B. Each Smoke Testing field supervisor shall be NASSCO PACP certified. Use of PACP
28 certified technicians to review/document defects in the office (post process) is not acceptable.

29 C. The Smoke Testing Contractor must have an internal quality assurance/quality control
30 program in place and all inspection data shall be subjected to the procedures prior to
31 submittal to the County. The County will perform QA/QC audits on submitted data.

- 1 D. QA/QC shall be performed by NASSCO MACP certified personnel.
- 2 E. The field crew will be of sufficient size to properly operate the smoke generation
3 machine and provide full coverage of the area to visually locate smoke discharged from
4 defects.
- 5 F. All Contractors' employees performing the smoke testing under the provisions of these
6 specifications shall be properly trained and thoroughly experienced in the use of the
7 equipment and procedures.
- 8 G. A list of employees to be used shall be provided to the County. The information
9 provided shall include the name and a copy of the driver's license of each individual.
10 Each employee shall wear a photo ID identifying him by name, the name and contact
11 information for the company. All job supervisors will have business cards with contact
12 information for the supervisor and company to provide to residents if requested.
- 13 H. The Contractor shall take appropriate action to ensure that his employees are polite to the
14 public in all aspects of the Work and that immediate assistance is provided to property
15 owners if needed.

16 1.04 SHOP DRAWINGS AND SUBMITTALS

17 The following submittals are required:

- 18 A. Submittals shall be submitted to the County for review and acceptance prior to
19 Construction in accordance with the General Conditions and specifications Section 01300
20 "Submittals."
- 21 B. Refer to Section 01101 "Special Requirements (Gravity Inspection Only)" for
22 qualification submittals.
- 23 C. Smoke production product information and Material Safety Data Sheets.
- 24 D. The following deliverables shall be submitted at the completion of inspection:
25 1. Electronic version (.pdf) of the smoke test field reports
26 2. Populated Orange County Standard smoke testing database (.mdb or Excel) saved on
27 CD-R's, DVD, or portable hard drives
28 3. Smoke test digital photographs in JPEG format saved on CD-R's, DVD or portable
29 hard drives
30 4. Quarter section maps depicting smoke testing results
31 5. Table of defects, recommended corrective action and cost estimates that includes
32 physical property address, owner's name, and owner's mailing address.
33 6. QA/QC report
- 34 E. The above deliverables shall be submitted to the County for approval.
- 35 F. The manhole inspection reports and database shall be in accordance with County data
36 standards and NASSCO MACP.

1 G. The Contractor shall submit 1 example of previous Work for approval. The example
2 shall consist of 1 CD or DVD of previous smoke testing inspection documentation. The
3 submitted example shall be the work of the field supervisor or foreman to be used on this
4 Project.

5 H. Contractor shall be responsible for modifications to equipment and/or inspection
6 procedures to achieve report material of acceptable quality. No Work shall commence
7 prior to approval of the submitted material by the County. Once accepted, the report
8 material shall serve as a standard for the remaining Work.

9 1.05 NOTIFICATION

10 Contractor shall notify the County a minimum of 48-hours prior to the startup of smoke
11 testing work or re-startup following delays due to weather. Contractor will provide County
12 the location for the next days Work at the end of each day. No payment will be made for
13 work performed without proper notification.

14 **PART 2 - EQUIPMENT**

15 2.01 GENERAL

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

18 2.02 BLOWERS

19 A. The Contractor shall provide a portable blower designed and built specifically for the use
20 of smoke testing. The blower shall be self contained and capable of producing a
21 minimum of 4,500-cubic feet of air per minute.

22 B. The base of the blower shall have appropriate adapters and seals to make a good
23 connection to the manhole without excessive loss of air and smoke.

24 2.03 SMOKE PRODUCTION

25 A. Smoke bombs will not be allowed on County smoke testing projects.

26 B. Smoke Fluid, or approved equal, shall produce continuous smoke that can be controlled
27 by the testing crew. The smoke generated shall be white to gray smoke, leaving no
28 residue, and shall be non-toxic and non-explosive.

29 C. The Contractor shall supply the MSDS sheet for the Smoke Fluid to the County

1 2.04 OTHER EQUIPMENT

2 In addition to the blower, the Contractor shall provide all other equipment, tools, and
3 incidentals required to perform smoke testing as required by these specifications including,
4 but not limited to, sewer line stoppers, sand bags, cameras, sub-meter GPS units, confined
5 space entry equipment, and traffic control equipment.

6 **PART 3 - EXECUTION**

7 3.01 WORK PROGRESS

8 A. The Work shall generally progress as follows:

- 9 1. A list of all work permits required for Work in State and/or County Highways will be
10 provided by the County prior to bidding. The Contractor shall apply for and obtain
11 work permits for all Work to be performed in State and/or County Highways. All
12 required insurances, traffic control measures, and other terms of the permit shall be
13 provided to the satisfaction of the County.
- 14 2. The Contractor shall have all required submittals reviewed, including, but not limited
15 to, the field inspection forms and database deliverable, by the County. Work shall not
16 proceed until acceptance of all submittals by the County.
- 17 3. The County shall provide to the Contractor a spreadsheet listing all physical property
18 addresses, owner's name, and owner's mailing address to be used for Pre-notification
19 mailers and summary of defects and corrective actions.
- 20 4. Pre-Notifications: The Contractor shall provide a mailed notice 10 to 14-days prior to
21 commencement of smoke testing to all affected residents. The County approved
22 mailer template will be provided by the County to the Contractor for completion of
23 contact information, printing and distribution by the Contractor.
- 24 5. Daily Notifications
 - 25 a. The Contractor shall notify, by hand delivery, a County approved door hanger to
26 each address, all residences and businesses in the area to be tested. County
27 approved notifications will be provided to the Contractor for printing and
28 distribution. The Contractor shall place door hangers on all residences and
29 business 2 to 7-days prior to smoke testing at those specific addresses. Door
30 hangers shall be an on-going process throughout the Project and shall be limited
31 to the area provided in the look-ahead schedule. Door Hangers shall not be
32 placed for areas which will not be tested within 7-days. If smoke testing is
33 delayed for more than 7-days due to rain, etc., the area shall be re-notified by door
34 hangers. Logs will be maintained to document notification of special needs
35 facilities such as hospitals, nursing homes, schools, high-rise buildings, etc. The
36 logs will include the facility name, date, time and individual notified.
 - 37 b. The day of the testing, the Contractor shall check with all residents who expressed
38 special concerns or special needs/notification prior to testing. These needs will be
39 accommodated to the satisfaction of the County prior to smoke testing that section
40 of the sewer system.
- 41 6. Other Notifications: The County will be responsible for prior notifications to the
42 County Commissioners Office, Fire Department, and all contacts.

- 1 7. It shall be the Contractors' responsibility to keep adequate records of all notifications
- 2 for which they are responsible and to produce them upon request by the County.
- 3 Failure to comply with this requirement may be cause to suspend the Contractors'
- 4 operations until compliance is achieved.
- 5 8. Perform the smoke testing (Refer to Section 3.03).
- 6 9. Prepare and provide the smoke testing data documents.

7 3.02 WORK SCHEDULE

- 8 A. Upon award of the Contract and prior to commencing any Work, the Contractor shall
- 9 provide a complete Work Schedule to the County for review and approval. The schedule
- 10 shall be submitted at least 2-weeks prior to the start of smoke testing. The Work
- 11 Schedule shall be typed and shall indicate the planned progress for the proposed Work.
- 12 The Contractor shall provide a 1-week look-ahead schedule and coordinate with the
- 13 County the exact locations of Smoke Testing for the upcoming week. This information
- 14 will be transmitted to the Fire Rescue Department by the County.

- 15 B. The submitted schedule shall be accompanied by a map or detailed schedule of streets to
- 16 be smoke tested each workday.

- 17 C. The Work Schedule shall indicate the following:
- 18 1. Street name (when in easements - the names of the abutting streets)
- 19 2. Street limits (cross streets or property addresses)
- 20 3. Upstream and downstream manhole numbers (from Project Maps)
- 21 4. Date of testing
- 22 5. Starting time
- 23 6. Ending time

- 24 D. Acceptable Periods of Work
- 25 1. The Contractor shall not commence testing before 8:00 a.m. and shall terminate
- 26 testing no later than 5:00 p.m. each day.
- 27 2. No testing shall be performed on weekends or holidays, unless otherwise approved by
- 28 the County.
- 29 3. If the Contractor wishes to test before 8:00 a.m. or after 5:00 p.m. in commercial
- 30 areas or high traffic areas, such testing shall be shown on the submitted Work
- 31 Schedule and is subject to the approval of the County.
- 32 4. Work times in Commercial areas shall be scheduled prior to the opening of the
- 33 majority of the businesses in that area.

- 34 E. Contractor shall not perform smoke testing on days that, in the opinion of the County,
- 35 will hinder the results of the test (For example, when high winds, heavy rains, or
- 36 excessively high groundwater levels would interfere with the effectiveness of the testing).

1 3.03 PERFORMING THE SMOKE TESTS

2 A. PROCEDURES

3 1. Safety

- 4 a. The Contractor and his personnel shall be aware of and shall follow all Federal,
5 State, and Local safety laws and regulations.
- 6 b. No entry into any part of the collection system shall be permitted until the
7 Contractor has demonstrated that on-site personnel has been trained in applicable
8 confined space safety procedures and has the equipment on-site to allow those
9 procedures to be followed.
- 10 c. The Contractor shall minimize the physical entry of personnel into the sanitary
11 sewer facilities. If required, manhole entry shall be in accordance with Federal,
12 State, and local regulations for confined space entry and other regulations that
13 may apply. The Contractor shall provide all safety equipment required for
14 manhole entry operations, including harnesses, ventilation equipment, etc.
- 15 d. Traffic Control: The Contractor shall be responsible for Maintenance of Traffic.
16 The area of work shall at all times be protected by means of an adequate number
17 of cones, barricades, flags, or by other means necessary to properly and safely
18 protect both vehicular and pedestrian traffic. Flag persons shall be provided in all
19 streets.
- 20 e. Work on Orange County Roads and Florida Department of Transportation roads
21 require an approved Maintenance of Traffic (MOT) plan, in accordance with
22 Orange County Public Works (OCPW) and FDOT requirements. Further
23 requirements for traffic control may be imposed by the County.
- 24 f. Any condition deemed to be an unsafe condition shall be immediately corrected
25 by the Contractor. The failure of the County or his representatives to bring a
26 potentially dangerous situation to the Contractors' attention shall not relieve the
27 Contractor from his responsibility for providing a safe work area.

28 2. Unless otherwise approved by the County, the sections of sewer subject to testing
29 shall:

- 30 a. Consist of a central manhole, where the blower will be positioned, and an
31 upstream and downstream manhole and the sewer pipe between them with 3
32 manholes and 2 pipe sections, lengths should not exceed 800-feet.
- 33 b. Consist of 3 manholes and 2 pipe sections. This allows a run of 400 to 800-feet of
34 pipe. Distances greater than 400-feet radius may be tested where the length is in
35 excess of 400-feet due to inaccessible manholes (i.e., buried, locked gates, etc.).
36 Where smoke is not adequate, regardless of the length, dual blowers will be
37 placed in adjacent manholes in an attempt to increase pressure to smoke test the
38 sewer. Where sags or blockages prevent adequate smoke tests, the Contractor
39 will note on the inspection form the area where no smoke was observed.

- 1 3. The walk through for locating defects will not begin until smoke is highly visible with
2 a smoke plume emanating from the plumbing vents of houses at the end of the setup
3 location (maximum 400-foot radius) from the smoke testing machine. A colored
4 locate flag will be placed at the location of the defect. Walkers shall traverse not only
5 the sidewalk but between all homes and in back yards looking for illegal connections
6 including patio, pool and roof drain connections, leakage at house laterals, broken or
7 missing clean-out caps and storm drain cross connections. Defect flags will be
8 provided by the County.
- 9 4. Flow Control: It is the intent of this specification that the smoke testing be
10 accomplished without the need for bypass pumping. The Contractor shall provide
11 temporary plugs, sandbags, or flow barriers as required to contain an adequate
12 volume of smoke within the section of sewer being tested, or to limit the extent of
13 sewer subjected to pressurized smoke. The Contractor shall monitor the resulting
14 surcharged sewer at the manhole upstream of the section of sewer being tested, and
15 prevent overflow conditions from occurring by removing the flow barriers or
16 removing sewage by vacuum trucks.
- 17 5. All smoke testing information shall be accurately and neatly recorded on field
18 worksheets and on 200 scale maps (1 in. = 200ft.) or other maps of suitable scale as
19 provided by the County. The final report and information will be transferred to a
20 computer generated log sheet together with related digital photographs taken during
21 the project execution.
- 22 6. The County may authorize QA/QC testing of specific line segments previously tested
23 to determine the quality of testing performed and/or establish if soil conditions are
24 sufficiently dry to continue smoke testing into new areas. Any re-testing will follow
25 the same procedures except the re-smoke testing data deliverable will be separated
26 from the original testing data and provided as supplemental information in an
27 appendix to the report.

28 B. TEST DOCUMENTATION

- 29 1. For each sewer main tested, the Contractor shall prepare a field log identifying each
30 point of smoke exfiltration from:
 - 31 a. Roof gutters
 - 32 b. Sewer cleanouts
 - 33 c. Leakage in house laterals
 - 34 d. Patio or area drains
 - 35 e. Storm drain cross connections
 - 36 f. Any other source not stated above
 - 37 g. Indicate if roof vents showed evidence of smoke
- 38 2. Defects shall be logged as "private", "Water Reclamation" (for public owned
39 infrastructure, or "commercial."
- 40 3. Each smoke defect, as identified above, shall be referenced by sketch and
41 dimensioned to permanent landmarks and include the house or lot numbers. A
42 separate sketch shall be prepared for each defect and attached to the field form.
- 43 4. Contractor shall obtain sub-meter GPS coordinates of each defect where possible.
44 The coordinates will be included in the Final Report, Excel summary. County will
45 provide the format for GPS deliverables to include State Plane Coordinate System to
46 be used along with preferred base station to be used for post-processing, if required.

- 1 5. In addition to GPS coordinates, the Contractor shall obtain measurements to the
- 2 nearest 0.1-inch for each observed defect from a minimum of 2 nearby structures or
- 3 permanent landmarks. These measurements shall be shown on the defect sketch
- 4 page.
- 5 6. A photograph of all leaks using a digital camera shall be included in the field log.
- 6 Photographs of smoke evidence shall have a location indicated in the photograph
- 7 using a defect flag, provided by the County.
- 8 7. All photographs shall be clearly cross-referenced to the typed and/or computer
- 9 generated log indicating the location of the leak.
- 10 8. Once the defect has been flagged the Smoke Testing Contractor shall take a digital
- 11 picture (delivered in 640 x 480 resolution with time and date stamp on the digital
- 12 photograph) showing the smoke billowing from the defect, flag, unique number, and
- 13 physical features at or near the defect.
- 14 9. Flags will be left in place at the locations of broken laterals, connected yard drains,
- 15 area drains, pool/hot tub drains, roof drains, and broken caps.
- 16 10. Pictures without smoke plume from the located defect or missing visible unique
- 17 number are unacceptable.
- 18 11. For defects where capturing a picture of the smoke does not capture the defect (e.g.
- 19 connected downspout), a second photo of the actual defect shall be obtained.
- 20 12. The Contractor will provide a self-standing sign (sandwich board) at each defect with
- 21 minimum 4-inch tall numbers physically located at each defect part of the picture
- 22 where possible. There shall be a unique number for each defect, clearly visible in the
- 23 picture and noted on the report, Record Drawings and summary spreadsheet. In the
- 24 event multiple crews are working each crew will be assigned a series of unique
- 25 numbers.
- 26 13. The smoke testing report shall reference the manhole numbers shown on the Project
- 27 Maps. Common descriptions of defects shall utilize the current defect codes provided
- 28 by the County.
- 29 14. All photographs and PDF data sheets shall be renamed following the following
- 30 County standard:

31 Pump Station Sub-area, Upstream MH ID, S, Photo number, .jpg/pdf

32 Example: 39540043S012.jpg or pdf
 33 Pump Station Sub-Area = 3954
 34 Upstream MH ID = 0043
 35 Smoke Test Defect = S
 36 Photograph Number = 012
 37 Format Type = jpg or pdf

- 38 C. Defective or missing clean out caps discovered during testing shall be replaced by the
- 39 smoke testing Contractor during testing. The inspection report will document the original
- 40 defect location (without measurements or GPS) and notation that the repair has been
- 41 made. A before and after photo will be taken at each repair location. Clean out caps will
- 42 be provided by the Contractor.

1 3.04 SMOKE TESTING DELIVERABLES

- 2 A. The Contractor shall prepare a Smoke Testing Report and submit in electronic format and
3 a minimum of 4 hard copy reports. The report shall contain:
- 4 1. Contractor letterhead, name of smoke tester, date, address of defect, description of
5 defect, manhole to manhole (using County standard Asset numbering), digital
6 photograph number, inflow potential rating of defect, quarter section number, footage
7 smoked, and sketch/map with measurements for exact location of defect.
 - 8 2. Scanned field forms and sketches in PDF format.
 - 9 3. An Excel table of all defects listing the defect number, location, address, description
10 of defect, and inflow potential rating.
 - 11 4. Submit a minimum of 4 complete copies of the report and the electronic report to the
12 County for review. Upon receiving the County's review and comments, the
13 Contractor shall edit or revise the report and/or electronic report as necessary and
14 resubmit a copy of the final report (1 hard copy and the electronic report) to the
15 County.
- 16 B. The Contractor shall return 1 set of the quarter section maps showing all the defects for
17 the Project to the County.
- 18 C. Digital photographs, renamed and re-sized to 640 x 480 resolution shall be submitted on
19 DVDs or portable hard drive.

20 3.05 ACCEPTANCE

21 Inspection submittals will be reviewed for quality control. A minimum of 5% of the
22 submitted inspections will be randomly reviewed. A quality control check will be performed
23 for each CCTV operator and each operator must exceed 90% accuracy. Reference Section
24 01101 "Special Requirements (Gravity Inspection Only)."
25

26 END OF SECTION

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- 1 2. **Installation Crew:** At least 1 person other than the Superintendent from the CIPP
2 installation crew shall have a minimum of 1-year of CIPP experience totaling at least
3 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed
4 qualifications must be on the project site during all installation activities.
- 5 3. **Boiler Technician:** Contractor shall provide the name and information for the boiler
6 technician who will perform the actual Work. The boiler technician must have a
7 minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a
8 similar position was held.
- 9 4. **Lateral Cutter Technician:** Contractor shall provide the name and information for
10 the technician who will perform the actual Work. The lateral cutter technician must
11 have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in
12 which a similar position was held.
- 13 5. **Lead CCTV inspector** shall be NASSCO PACP certified to report liner defects.
- 14 6. The final decision to accept or reject the product, manufacturer, and/or installer lies
15 solely with the County. The named Manufacturer, Field Superintendent, CIPP Lead
16 Installer, Boiler Technician, and Lateral Cutter must be employed to perform the
17 Work, unless changes are specifically authorized by the County.

18 1.03 PERFORMANCE WORK STATEMENT

- 19 A. The Contractor shall submit, before any lining WORK is performed, to the County a
20 Performance Work Statement (PWS) which clearly defines the CIPP product delivery in
21 conformance with the requirements of these contract documents. The PWS shall contain
22 at a minimum the following:
 - 23 1. Contractor's certificate of compliance that clearly indicates that the CIPP will
24 conform to the project requirements as outlined in Specification Section 01010
25 Summary of Work and as delineated in these specifications.
 - 26 2. A detailed installation plan describing:
 - 27 a. All preparation work (cleaning operations, pre-CCTV inspections, by-pass
28 pumping, and traffic control)
 - 29 b. Installation procedure and method of curing
 - 30 c. Service reconnection
 - 31 d. Quality control and testing to be performed
 - 32 e. Post-CCTV inspection
 - 33 f. Warrantees
 - 34 g. Description of the proposed CIPP lining technology.
 - 35 3. A detailed plan for identifying all active service connections during mainline installation.
 - 36 4. The qualifications of the Contractor.
 - 37 a. Name, business address and telephone number
 - 38 b. Personnel names, experience, and certifications for Field Superintendent, CIPP
39 lead Installer, Lateral Cutter, Boiler Technician, and Lead CCTV NASSCO
40 PACP Certificated Inspector to be directly involved with this project. The
41 Contractor shall sign and date the information provided and "certify that to the
42 extent of his knowledge, the information is true and accurate, and that the
43 supervisory personnel will be directly involved with and used on this project".
44 Substitutions of personnel and/or methods will not be allowed without written
45 authorization of the County.

- 1 c. Specialty technicians shall be certified by the equipment manufacturer and/or its
2 authorized representative. Certifications shall be submitted to the
3 County/Professional.
- 4 5. Proposed manufacturer's technology data shall be submitted for all CIPP products
5 and all associated technologies to be furnished.
- 6 6. All tools and equipment required for a complete installation of the CIPP.
 - 7 a. Clearly describe all equipment including proposed back-up equipment to be
8 furnished for this project.
 - 9 b. Identify redundant tools and equipment to be kept on the job site in the event of
10 equipment breakdown.
 - 11 c. The Contractor shall outline the mitigation procedure to be implemented in the
12 event of key equipment failure during the installation process for the CIPP.
- 13 7. A detailed description of the Contractor's proposed procedures for the removal of any
14 existing blockages in the pipeline that may be encountered during the cleaning
15 process.
- 16 8. Detailed public notification plan for stage notification to residences affected by the
17 CIPP installation.
- 18 9. An odor control plan that will ensure that project specific odors will be minimized at
19 the project site and surrounding area.
- 20 10. Outline specific repair or replacement procedures for potential defects that may occur
21 in the installed CIPP. Repair or replacement procedures shall be as recommended by
22 the CIPP system manufacturer and shall be submitted prior to any Work.
 - 23 a. Repairable defects that may occur in the installed CIPP shall be specifically
24 defined by the Contractor based on the manufacturer's recommendations,
25 including a detailed step-by-step repair procedure, resulting in a finished product
26 meeting the requirements of the specifications.
 - 27 b. Un-repairable defects that may occur to the CIPP shall be clearly defined by the
28 Contractor based on the manufacturer's recommendations, including a
29 recommended procedure for the removal and replacement of the CIPP.

30 1.04 REFERENCES

31 A. Codes, Specifications, and Standards

- 32 1. Codes, specifications, and standards referred to by number or title shall form a part of
33 this specification to the extent required by the references thereto. Latest revisions
34 shall apply, unless otherwise shown or specified.
- 35 2. All American Society for Testing and Materials (ASTM) Standards noted below shall
36 be to the latest revised version.
 - 37 D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical
38 Reagents
 - 39 D638 – Standard Test Method for Tensile Properties of Plastics
 - 40 D790 – Standard Test Methods for Flexural Properties of Un-reinforced and
41 Reinforced Plastics and Electrical Insulating Materials
 - 42 D792 – Standard Test Methods for Density and Specific Gravity of Plastics by
43 Displacement
 - 44 D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe
45 and Fittings

- 1 D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- 2 D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and
- 3 Creep-Rupture of Plastics
- 4 D3567 – Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-
- 5 Reinforced Thermosetting Resin) Pipe and Fittings
- 6 D3681 – Standard Test Method for Chemical Resistance of “Fiberglass (Glass Fiber
- 7 Reinforced Thermosetting Resin) Pipe and Fittings
- 8 D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
- 9 F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by
- 10 Inversion and Curing of a Resin-impregnated Tube
- 11 F1743 – Standard Practice for Rehabilitation of existing pipelines and conduits by
- 12 pulled-in-place installation of cured-in-place thermo setting resin pipe
- 13 F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by
- 14 the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-
- 15 Place Thermosetting Resin Pipe (CIPP)
- 16 F2561 - Standard Practice for Rehabilitation of a Sewer Service lateral and Its
- 17 Connection to the Main Using a One Piece Main and Lateral Cured-in-Place
- 18 Liner

19 1.05 PRE-TREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER

- 20 A. CIPP liner systems using resins containing styrene or other regulated chemicals that will
- 21 be discharged into the wastewater system shall be required to reduce the concentration of
- 22 Styrene in the cure water prior to discharge to the sanitary sewer. The discharge limits are
- 23 as follows:
- 24

	Discharge Limits to South WRF Service Area		Discharge Limits to Northwest WRF Service Area		Discharge Limits to Eastern WRF Service Area	
	Maximum Styrene Concentration Limit for Discharge to South WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to South WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Northwest WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Northwest WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Eastern WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Eastern WRF (Pounds/Day)
< 500,000	7	29	1	4	3.5	14
< 250,000	14	29	2	4	7.0	14
< 100,000	35	29	5	4	17.5	14

- 25
- 26 1. A single day’s or line segment water discharge in excess of 500,000 gallons per day
- 27 shall require approval by the County’s Environmental Compliance Section for
- 28 separate concentration limit evaluation and approval.”

- 29 B. CIPP liner systems using resins containing styrene or other regulated chemicals that will
- 30 be discharged into the wastewater system shall require a pre-treatment plan to remove the
- 31 regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit
- 32 the pre-treatment plan to the County for approval prior to discharge. The information
- 33 required shall include:

- 1 1. MSDS for all chemicals used in the process and that will be discharged into the
- 2 wastewater system
- 3 2. Representative analytical data that was performed in the past for the proposed
- 4 process, as collected from the wastewater stream
- 5 3. The addresses and mapped locations of the discharge
- 6 4. The total duration of discharge request
- 7 5. The anticipated discharge temperature. Discharges in excess of 140°F are not
- 8 permitted
- 9 6. The Contractor shall submit for approval a summary table of pre-treatment design
- 10 calculations in Excel containing the following information:
- 11 a. Dates of discharge of each section
- 12 b. Lining section numbers using the OCUD numbering system
- 13 c. Length and diameter of each section
- 14 d. Volume (in gallons) of inversion water of each section
- 15 e. Volume (in gallons) of cool down water of each section
- 16 f. Total volume (in gallons) of inversion and cooling water of each section
- 17 g. Regulated chemical (in pounds) in discharge volume of each section
- 18 h. Reduction chemical (in pounds) to meet post-treatment concentration limit
- 19 i. Reaction time period (in hours) to achieve post-treatment concentration limit
- 20 j. Cool down time period (in hours)
- 21 k. Regulated chemical post-treatment concentration limit (in PPM)
- 22 7. The Contractor shall provide pre-treatment and post-treatment sampling and
- 23 laboratory analysis of the process wastewater and submit the results to the County for
- 24 verification.

- 25 C. After curing, the Contractor shall obtain a post-treatment cure water sample at each site
- 26 and submit for laboratory analysis. ,
- 27 1. The following laboratory analysis is required:
- 28 a. One (1) sample to be collected from the treated water line segment and analyzed
- 29 for “Styrene” using EPA Method 8260.
- 30 b. One (1) “Trip Blank” sample, analyzed for “Styrene” using EPA Method 8260.
- 31 2. The Contractor shall submit the analytical report to the County for approval.
- 32 3. The Contractor shall be responsible for all costs related to laboratory analytical
- 33 testing of the water samples collected.
- 34 4. Sampling shall continue for each successive lining segment until the laboratory
- 35 results verify the Contractor’s competency in determining the amount of styrene
- 36 reduction tablets/material required for a given water volume. Competency will be
- 37 determined by meeting the stated discharge limits.
- 38 5. Once the sample results demonstrate that the discharge limits have been met the
- 39 Contractor shall follow similar styrene reduction procedures for subsequent lining
- 40 segments, but sampling will not be required.
- 41 6. Should samples from three locations not meet the discharge limits, the County may
- 42 require the Contractor to hold cure water in place until laboratory results confirm the
- 43 water is below the discharge limits.
- 44 7. The County reserves the right to obtain samples at any site on any line segment to
- 45 ensure compliance with the discharge limits.”

- 1 D. The service areas for each of the proposed lining subareas are as follows:
- 2 1. (Subarea Name) (Subarea Number) is/are located in the Eastern WRF service area.
- 3 2. (Subarea Name) (Subarea Number) is/are located in the South WRF service area
- 4 3. (Subarea Name) (Subarea Number) is/are located in the Northwest WRF service area.

5 1.06 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

- 6 A. It shall be the responsibility of the Contractor to schedule and perform his work so as to
- 7 result in no overflows or spills of sewage or combined sewage from the system. If
- 8 sewage flows are such that they interfere with the Contractor's ability to perform work,
- 9 the Contractor shall be responsible for scheduling his work during low flow periods or
- 10 provide bypass pumping. Bypass pumping shall be provided only with the specific
- 11 written approval of the County.

- 12 B. In the event of overflows caused by the Contractor's work activities, the Contractor shall
- 13 immediately take appropriate action to contain and stop the overflow, clean up the
- 14 spillage, disinfect the area affected by the spill, and notify the County in a timely manner.

- 15 C. Contractor will indemnify and hold harmless the County for any fines or third-party
- 16 claims for personal or property damage arising out of a spill or overflow that is fully or
- 17 partially the responsibility of the Contractor. Should fines subsequently be imposed as a
- 18 result of any overflow for which the Contractor is fully or partially responsible, the
- 19 Contractor shall pay all such fines and all of the County's legal, engineering, and
- 20 administrative costs in defending such fines and claims associated with the overflow.

- 21 D. If the Contractor is required to hold cure water due to unacceptable styrene testing
- 22 results, the Contractor shall be required to provide bypass pumping or other means to
- 23 insure wastewater service is not disrupted during the hold period.

24 1.07 SHOP DRAWINGS AND SUBMITTALS

- 25 A. Submittals shall be submitted to the County for review and acceptance prior to
- 26 construction in accordance with the General Conditions and specifications Section 01300
- 27 "Submittals." Submittals shall include the following:
- 28 1. Performance Work Statement shall be provided with a table of contents and tabbed
- 29 sections.
- 30 2. Product:
- 31 a. A list of projects from the Manufacturer that total a minimum of 500,000 linear
- 32 feet of liner installed in the United States. An Excel spread sheet shall be
- 33 included listing as a minimum the name of projects, linear footage of main,
- 34 completion date, contract amount, name of owner, address, contact person, and
- 35 phone number.
- 36 b. Fabric tube – manufacturer and description of product components
- 37 c. Flexible membrane (coating) material and recommended repair (patching)
- 38 procedure if applicable
- 39 d. Raw resin data – manufacturer and description of product components

- 1 e. Manufacturer's shipping, storage and handling recommendations for all
2 components of the CIPP system
- 3 f. All MSDS sheets for all materials to be furnished
- 4 g. Tube wet-out and cure method including:
- 5 (1) A complete description of the proposed wet-out procedure for the proposed
6 technology
- 7 (2) The manufacturer's recommended cure method for each diameter and
8 thickness of CIPP liner to be installed including the curing medium and the
9 method of application
- 10 3. Quality Control Plan
- 11 a. Defined responsibilities of the Contractor's personnel for assuring that all quality
12 requirements are met. These will be assigned by the Contractor to specific
13 personnel.
- 14 b. Proposed procedures for quality control, product sampling and testing shall be
15 defined and submitted as part of the Plan.
- 16 c. Proposed methods for product performance controls, including the method of and
17 frequency of product sampling and testing both in raw material form and cured
18 product form.
- 19 d. Inspection forms and guidelines for quality control inspections shall be prepared
20 in accordance with the standards specified within this specification.
- 21 e. The manufacturer shall furnish a check list containing key elements of the CIPP
22 installation criteria that is important for the County to ensure that quality control
23 and testing requirements are performed in accordance with these specifications.
- 24 4. Engineering design calculations shall be submitted in a timely fashion prior to
25 construction, in accordance with the Appendix of ASTM F-1216, for each length of
26 liner to be installed including the thickness of each proposed CIPP. It will not be
27 acceptable for the Contractor to submit a design for the most severe line condition
28 and apply that design to all of the line sections. All calculations shall include data
29 that conforms to the requirements of these specifications.
- 30 a. These calculations shall be performed and certified by a Professional Engineer
31 registered in the State of Florida.
- 32 b. The manufacturer shall certify as to the compliance of its materials to the values
33 used in the calculations.
- 34 5. The liner manufacturer shall submit a tabulation of time versus temperature. This
35 tabulation shall show the lengths of time that exposed portions of the liner will endure
36 without self-initiated cure or other deterioration beginning. This tabulation shall be at
37 5°F (degrees Fahrenheit) increments ranging from 70°F to 100°F. The manufacturer
38 shall also submit his analysis of the progressive effects of such "pre-cure" on the
39 insertion and cured properties of the liner
- 40 6. Certified copies of test reports of factory tests required by the applicable standards
41 and this Section.
- 42 7. Manufacturer's installation instructions and procedures.
- 43 8. CIPP Installation Record (Shot Record) to include shot number and corresponding
44 manhole to manhole pipe reaches for each scheduled installation, design thickness,
45 actual thickness delivered to the site, pipe diameter, relength, total length of shot,
46 and number of laterals.

- 1 9. Wastewater pre-treatment plan including data, measurements, assumptions,
2 calculations and procedures for the pre-treatment of CIPP process wastewater
3 containing regulated chemicals.
- 4 10. Manufacturer's detailed procedures for repairing liners that have been installed
5 incorrectly or that have failed during installation.
- 6 11. Contractor's procedures and materials for service renewal including time and duration
7 of sewer service unavailability and a complete description of the methods he intends
8 to use to reconnect the existing laterals.
- 9 12. Sampling procedures and locations for obtaining representative samples of the
10 finished liner.
- 11 13. Sampling tests for compliance by an independent laboratory shall be made according
12 to the applicable ASTM specification and the manufacturer's quality control program.
- 13 B. A final certificate of compliance with this specification shall be provided by the
14 manufacturer for all lining material furnished.

15 1.08 WARRANTY

- 16 A. The materials used for the project shall be certified by the manufacturer for the specified
17 purpose. The Contractor shall warrant the liner material and installation for a period of
18 one (1) year. During the Contractor warranty period, any defect which may materially
19 affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the
20 Contractor's expense in accordance with procedures in these specifications and as
21 recommended by the manufacturer.
- 22 B. On any work completed by the Contractor that is defective and/or has been repaired, the
23 Contractor shall warrant this work for an additional one (1) year.

24 1.09 DELIVERY, STORAGE, AND HANDLING

- 25 A. The Contractor shall be responsible for the delivery, storage, and handling of products.
26 No products shall be shipped to the job site without the approval of the County.
- 27 B. Keep products safe from damage. Promptly remove damaged products from the job site.
28 Replace damaged products with undamaged products.
- 29 C. The wet-out facility shall write the Shot number, total wet-out length, thickness, pipe
30 width, and resin type on each bag delivered to the project.

31 **PART 2 - PRODUCTS**

32 2.01 GENERAL

- 33 A. The materials used shall be designed, manufactured, and intended for sanitary sewer pipe
34 relining and the specific application in which they are used. The materials shall have a
35 proven history of performance in sewer relining and rehabilitation.

- 1 B. Pipe lining products pre-approved by the County include: Insituform Technologies
2 (CIPP Liner), National Liner (CIPP Liner), LMK Enterprises (Performance Liner),
3 Steven's Technologies (CIPP Liner 2 part 100% epoxy), Inner Cure Technologies
4 (Reichold/Dion CIPP Liner), Lanzo Lining Services (Lanzo CIPP Lining System), and
5 Premier Pipe (Premier Pipe CIPP Lining System), Layne Inliner (CIPP Liner), and Miller
6 Pipeline (CIPP Liner). All products must meet the specification herein and will require
7 approval prior to installation.
- 8 C. All materials, shipped to the project site, shall be accompanied by test reports certifying
9 that the material conforms to the ASTM listed herein. Materials shall be shipped, stored,
10 and handled in a manner consistent with written recommendations of the CIPP system
11 manufacturer to avoid damage. Damage includes, but is not limited to, gouging,
12 abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage
13 locations, shall be approved by the County. All damaged materials shall be promptly
14 removed from the project site at the Contractor's expense and disposed of in accordance
15 with all current applicable agency regulations.
- 16 D. The finished pipe liner in place shall be fabricated from materials which when complete
17 are chemically resistant to and will withstand internal exposure to domestic sewage
18 having a pH range of 5 to 11 and temperatures up to 150°F.
- 19 E. Take all necessary field measurements of the existing pipe (including diameter, ovality
20 and length) prior to manufacturing liners.
- 21 F. The minimum length shall be that deemed necessary by the Contractor to effectively span
22 the distance from the inlet to the outlet of the respective manholes unless otherwise
23 specified. The Contractor shall verify the lengths in the field before manufacturing.

24 2.02 STRUCTURAL REQUIREMENTS

- 25 A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the
26 site and pipe conditions. The CIPP design shall assume no bonding to the original pipe
27 wall.
- 28 B. The Contractor must have performed long-term testing for flexural creep of the CIPP
29 pipe material installed by his company. Such testing results are to be used to determine
30 the long-term, time dependent flexural modulus to be utilized in the product design. The
31 long-term modulus shall not exceed 50 percent of the short-term value for the resin
32 system and shall be verifiable through testing. The materials utilized for the contracted
33 project shall be of a quality equal to or better than the materials used in the long-term test
34 with respect to the initial flexural modulus used in the CIPP design.
- 35 C. The Contractor shall submit, prior to installation of the lining materials, certification of
36 the compliance with these specifications and/or the requirements of the CIPP system.
37 Certified material test results shall be included that confirm that all materials conform to
38 these specifications. Materials not complying with these requirements will be rejected.

1 D. The design thickness of the CIPP shall be arrived at using standard engineering
 2 methodology as found in ASTM F1216 and the physical properties. In no case shall the
 3 finished thickness of the cured liner be less than 4.5 millimeters. The required cured
 4 structural CIPP wall thickness shall be based, as a minimum, on the physical properties
 5 described in TABLE 02771 - 1 Minimum Physical Properties and per the design of the
 6 Professional Engineer and in accordance with the design equations in ASTM F 1216
 7 Appendix X1 and the following design parameters:
 8

Design Considerations	Criteria
Tube Design	ASTM F 1216 Appendix X1
Hydrostatic Buckling	ASTM F 2561 Section 6.1 and 6.1.1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 % of the short-term value of the resin system
Ovality	2 %
Groundwater Depth*	100% depth from pipe invert to surface
Soil Depth*	As indicated on the plans
Lining enhancement factor (K)	7
Soil Modulus**	1,000 psi
Soil Density**	120 pcf
Live Load**	One (1) H20 passing truck
Design Condition	Fully deteriorated
Minimum Long-Term Life	50 years

9 *Denotes multiple line segments may require a table of values

10 **Denotes information required for fully deteriorated design conditions

11
 12
 TABLE 02771-1
 Minimum Physical Properties

Property	Standard	Cured Composite per ASTM F1216 (PSI)
Flexural Strength (short term)	ASTM D790	4,500
Flexural Modulus of Elasticity (short term)	ASTM D790	250,000

13 E. When multiple layers are present, the layers of the finished CIPP shall be uniformly
 14 bonded. It shall not be possible to separate any two layers with a probe or point of a
 15 knife blade so that the layers separate cleanly or such that the knife blade moves freely
 16 between the layers. If separation of the layers occurs during testing of the field samples,
 17 new samples will be cut from the work. The composite of the materials will, upon
 18 installation inside the host pipe, exceed the minimum test standards specified by the
 19 American Society for Testing Methods. Any reoccurrence may be cause for rejection of
 20 the work.

1 2.03 CURED-IN-PLACE LINER

2 A. Fabric

- 3 1. The Contractor shall determine the minimum tube length necessary to effectively
4 span the designated run between manholes. The Contractor shall verify the lengths in
5 the field prior to ordering and prior to impregnation of the tube with resin, to ensure
6 that the tube will have sufficient length to extend the entire length of the run. The
7 Contractor shall also measure the inside diameter of the existing pipelines in the field
8 prior to ordering liner so that the liner can be installed in a tight-fitted condition.
- 9 2. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric
10 and meet the requirements of ASTM F-1216, ASTM F1743, or ASTM D5813. The
11 tube shall be constructed to withstand installation pressures, have sufficient strength
12 to bridge missing pipe, and stretch to fit irregular pipe sections.
- 13 3. The wet out tube shall have a relatively uniform thickness that when compressed at
14 installation pressures will equal or exceed the calculated minimum design CIPP wall
15 thickness.
- 16 4. The flexible tube shall be fabricated to a size that when installed will neatly fit
17 (minimum 99.75%) the internal circumference of the existing sanitary sewer lines
18 (including services). Allowance shall be made for circumferential stretching during
19 insertion so that the final cured product is snug against the wall of the host pipe.
- 20 5. The outside layer of the tube shall be coated with an impermeable, flexible membrane
21 that will contain the resin and allow the resin impregnation (wet out) procedure to be
22 monitored.
- 23 6. The tube shall contain no intermediate or encapsulated elastomeric layers. No
24 material shall be included in the tube that may cause delamination in the cured CIPP.
25 No dry or unsaturated layers shall be evident.
- 26 7. The wall color of the interior pipe surface of CIPP after installation shall be a
27 relatively light reflective color so that a clear detailed examination with closed circuit
28 television inspection equipment may be made.
- 29 8. Seams in the tube shall be stronger than the non-seamed felt material.
- 30 9. The tube shall be marked for a distance at regular intervals along its entire length, not
31 to exceed five feet. Such markings shall include the Manufacturers name or
32 identifying symbol.
- 33 10. Unless otherwise specified, the Contractor will use a polyester filter felt tube and a
34 resin and catalyst system compatible with the inversion process and having the
35 minimum physical properties for the cured pipe identified in Table 02771 - 1
36 Minimum Physical Properties.

37 B. Resin

- 38 1. The resin system shall be a corrosion resistant polyester or vinyl ester resin and
39 catalyst system or epoxy and hardener system that when properly cured within the
40 tube composite, meets the minimum requirements of ASTM F1216, ASTM F1743 or
41 F2019, the physical properties given herein these specifications Section 02771 and
42 those, which are to be utilized in the design of the CIPP for this project.
- 43 2. The resin used shall not contain non-strength enhancing fillers.
- 44 3. The Contractor shall submit the resin characteristics, including filler identification, to
45 the County for approval prior to lining activities.

- 1 4. The resin shall produce a CIPP that will comply with the structural and chemical
2 resistance requirements of the specification.

3 **PART 3 - EXECUTION**

4 3.01 PREPARATION

5 A. Prior to any lining of a pipe so designated.

- 6 1. It shall be the responsibility of the Contractor to remove all internal debris and clean
7 the existing sewer line and/or lateral in accordance with the recommendations of the
8 liner manufacturer prior to installation of the liner and in accordance with Section
9 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be
10 cleaned.
11 a. Preparation of the interior surface shall be accomplished by a thorough high-
12 pressure water-jet cleaning. The pipe shall be left free of all loose sand, rock, or
13 other deleterious materials. Any roots in the pipe shall be either removed or cut
14 off flush with the interior.
15 b. If conditions such as broken pipe and major blockages are found that will prevent
16 proper cleaning or where additional damage would result if cleaning is attempted
17 or continued, the Contractor shall notify the County immediately. The County
18 will determine what course of action will be taken to complete the project.
19 c. Precautions shall be taken by the Contractor to ensure that no damage or flooding
20 of public or private property is caused by the cleaning operation.
21 d. The County shall inspect the prepared pipe for cleanliness and smoothness before
22 the Contractor is authorized to proceed with pipe lining operations.
23 2. Certified PACP personnel trained in locating breaks, obstacles and service
24 connections by closed circuit television shall perform inspection of existing sewer
25 lines. The interior of the line shall be carefully inspected in accordance with Section
26 02762 "Televising Sanitary Sewer Systems" to determine the location of laterals in
27 any condition that may prevent proper installation of the liner pipe into the lines.
28 Such conditions shall be noted so they can be corrected. A digital data video and a
29 suitable log shall be prepared by the Contractor during the Work and provided to the
30 County a minimum of two weeks prior to liner installation.
31 3. The Contractor shall provide for the flow of sewage around the section or sections of
32 pipe designated for lining as specified in Section 01516 "Collection System Bypass."
33 a. Flow control shall be exercised as required to ensure that no flowing sewage
34 comes into contact with sections of the sewer under repair.
35 b. A sewer line plug shall be inserted into the sewer upstream from the section to be
36 repaired. The plug shall be so designed that all or any portion of the sewage
37 flows can be released. During the review, testing and installation portion of the
38 operation, flows shall be shut off in order to properly install the cured-in-place
39 pipe lining. The upstream manholes shall be constantly monitored for degree of
40 surcharging. After the installation is complete, flows shall be restored to normal
41 level.
42 c. Wherever lines are blocked off and the possibility of backing up the sewage and
43 causing harm to public and private property is foreseen, it shall be the
44 Contractor's responsibility to bypass flow from manhole to manhole.

- 1 d. Bypassing shall be accomplished using sewer plugs with pump connections, by
2 pumping down surcharged manholes, or by other methods acceptable to the
3 County. All bypassed flow must be discharged to a sanitary sewer. Bypassed
4 flow shall not be allowed to enter any storm line, drainage ditch or street gutter.
5 e. During a bypass operation, the pump shall be manned continuously; the
6 Contractor shall maintain the pump and bypass equipment; and shall be
7 responsible for any damages to public or private property due to the malfunction
8 of same.
- 9 4. The Contractor shall clear the line of obstructions such as solids, dropped joints,
10 protruding service connections or collapsed pipe that will prevent the insertion of the
11 liner pipe. If inspection reveals an obstruction that cannot be removed by
12 conventional sewer cleaning equipment, then the County shall be notified
13 immediately.
- 14 5. Do not install liner if ground water temperatures and/or ambient temperatures are
15 excessive for the product installation procedures.
- 16 6. Notification of Public or Customers: Customers shall be notified by the Contractor
17 with door hangers at least 3 days prior to the shutdown of any lateral services. The
18 door hanger shall be approved by the County and advise the customers of when the
19 Work will begin, expected date of completion, the type of work, and contact person
20 for any questions and the door hanger. When it is necessary to shut down a private
21 sewer lateral while work is in progress and before the laterals are reconnected, the
22 customers shall be notified by the Contractor. No sewer or water service is to remain
23 shut down for more than a period of 8-hours unless the Contractor provides substitute
24 services for the residents. Commercial sewer services shall be maintained at all times
25 that the business is open. No sewage from the services or main line shall be
26 discharged on the ground or in waterways.
- 27 7. Contractor shall coordinate pump stations, force main and sanitary sewer operation,
28 bypass and shutdown control with the County
- 29 8. Traffic Control: The Contractor shall provide all traffic control measures required for
30 the safety of the public, workers and equipment during the Work and in accordance
31 with FDOT and the County.
- 32 9. The Contractor shall provide critical backup equipment to insure that the lining
33 operation progresses without interruption. Required backup equipment shall include
34 at a minimum 1 additional lateral cutter system and 1 additional CCTV camera
35 system.

36 3.02 INSTALLATION OF LINER

- 37 A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer's
38 specifications as described and submitted in the Performance Work Statement. CIPP
39 installation shall be in accordance with the applicable ASTM Standards with the
40 following modification:
- 41 1. Prior to installation and as recommended by the manufacturer remote temperature
42 gauges or sensors shall be placed inside the host pipe to monitor the temperatures
43 during the cure cycle. Liner and/or host pipe interface temperature shall be monitored
44 and logged during curing of the liner.

- 1 2. The heat source shall be fitted with suitable monitors to gauge the temperature of the
2 incoming and outgoing heat source. Another such gauge shall be placed between the
3 impregnated reconstruction tube and the pipe invert at the remote manhole to
4 determine the temperatures during cure. The resin manufacturer shall recommend
5 temperature in the line during the cure period.
- 6 3. The wet-out tube shall be positioned in the pipeline using the method specified by the
7 manufacturer. Care should be exercised not to damage the tube as a result of
8 installation. The tube shall be inverted through an existing manhole or approved
9 access point and fully extend to the next designated manhole or termination point.
10 Sufficient excess resin will be provided to insure excretion into cracked pipe and/or
11 joints of the host pipe after curing.
- 12 4. After inversion is completed, the Contractor shall supply suitable heat source and
13 recirculation equipment. The equipment shall be capable of delivering the heat
14 source throughout the section uniformly to raise the temperature above the
15 temperature required to affect a cure of the resin. This temperature shall be
16 determined by the resin/catalyst system employed. Temperatures shall be monitored
17 and recorded throughout the installation process to ensure that each phase of the
18 process is achieved at the manufacturer's recommended temperature levels. Copies of
19 these records shall be given to the County at the completion of each installation.
- 20 5. Curing shall be accomplished by utilizing the appropriate medium in accordance with
21 the manufacturer's recommended cure schedule. The curing source input and output
22 temperatures shall be monitored and logged during the cure cycles if applicable. The
23 manufacturer's recommended cure method and schedule shall be used for each line
24 segment installed, and the liner wall thickness and the existing ground conditions
25 with regard to temperature, moisture level, and thermal conductivity of soil, per
26 ASTM Standards as applicable, shall be taken into account by the Contractor.
- 27 6. For heat cured liners, if any temperature sensor or multiple sensors do not reach the
28 temperature as specified by the manufacturer to achieve proper curing or cooling, the
29 installer can make necessary adjustments to comply with the manufacturer's
30 recommendations. The system computer should have an output report that
31 specifically identifies each installed sensor station in the length of pipe, indicates the
32 maximum temperature achieved and the sustained temperature time. Each sensor
33 should record both the maximum temperature and the minimum cool down
34 temperature and comply with manufacturer's recommendations.
- 35 7. For UV cured liners, all light train sensor readings, recorded by the tamper proof
36 computer, shall provide output documenting the cure along the entire length of the
37 installed liner. The cure procedure shall be in accordance with the manufacturer's
38 recommendation as included in the performance work statement.
- 39 8. Temperatures and curing data shall be monitored and recorded by the Contractor
40 throughout the installation process to ensure that each phase of the process is achieved
41 as approved in accordance with the CIPP system manufacturer's recommendations.
- 42 9. The Contractor shall immediately notify the County of any delays taking place during
43 the insertion operation. Such delays shall possibly require sampling and testing by an
44 independent laboratory of portions of the cured liner at the County's discretion. The
45 cost of such test shall be borne by the Contractor and no extra compensation will be
46 allowed. Any failure of sample tests or a lack of immediate notification of delay shall
47 be automatic cause for rejection of that part of the Work at the County's discretion.

- 1 10. Initial cure shall be deemed to be completed when inspection of the exposed portions
2 of cured pipe appear to be hard and sound and the remote temperature sensor
3 indicates that the temperature is of a magnitude to realize an exotherm. The cure
4 period shall be of a duration recommended by the resin manufacturer, as modified for
5 the cured-in-place inversion process, during which time the recirculation of the heat
6 source and cycling of the heat exchanger to maintain the temperature continues.
7 Contractor shall retain a resin-impregnated sample (wick) to provide verification of
8 the curing process taking place in the host pipe.
- 9 11. The Contractor shall cool the hardened pipe to a temperature below 100°F before
10 relieving the static head in the inversion standpipe. Cool-down may be accomplished
11 by the introduction of cool water into the inversion standpipe to replace water being
12 drained and disposed per the approved pre-treatment plan. Care shall be taken in the
13 release of the static head so that a vacuum will not be developed that could damage
14 the newly installed pipe.
- 15 12. Seal the area where the line enters or leaves each manhole. Finish the inside of the
16 manhole with a quick set cement grout to raise the invert to the grade of the liner
17 pipe. Also use this grout to dress up around the end of the liner. This space may be
18 sealed with a mechanical seal, chemical seal, or combination of both. The Contractor
19 shall seal the liner at all manhole reconnections with an approved product, compatible
20 with the liner, to completely seal any annular space present.
- 21 13. If the pipe liner fails to make a tight seal due to broken or misaligned pipe at the
22 manhole wall or other reason, the Contractor shall apply a seal at that point.
- 23 14. The temperature of water discharged to the sewer system from processing liners shall
24 not exceed 100°F maximum or the level allowed by State or Local standards. When
25 draining water, care shall be exercised not to create a vacuum in the line.
- 26 15. After the liner has been installed, all active, existing services shall be temporarily
27 reinstated. This shall be done without excavation in pavement areas, and in the case
28 of non-man-entry pipes, from the interior of the pipeline by means of a 360° (degree)
29 television camera and a cutting device that re-establishes the service connection.
30 When a remote cutting device is used and a cleanout is available, then a mini-camera
31 down the service may also be used to assist the operator in cutting or trimming. All
32 coupons shall be recovered at the downstream manhole and removed.
- 33 16. The cost for maintaining sanitary sewer service for the property owners shall be
34 included in the prices bid and no additional compensation will be allowed.

35 3.03 POST INSTALLATION

36 A. Service Lateral Renewal

- 37 1. The number of service connections on some sewer segments may exceed the number
38 of buildings actually served. It is the Contractor's responsibility to determine through
39 dye testing, or other acceptable methods, the services that are live and require
40 reinstatement prior to commencing lining of the sewer main.
- 41 2. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the
42 County.

- 1 3. The exact location and number of service connections or side sewers shall be verified
2 during the initial television inspection. It shall be the Contractor's responsibility to
3 accurately field locate all existing service connections or side sewers and establish
4 means for access for flow control. The Contractor shall reconnect all service
5 connections or side sewers to the liner pipe as indicated in accordance with the
6 Contract Documents.
 - 7 4. The Contractor shall be responsible for restoring/correcting, without any delay, all
8 missed or faulty reconnections, as well as any damage caused to property owners for
9 not reconnecting the services soon enough or for not giving notice to the property
10 owners.
 - 11 5. Any lateral not initially reinstated by the Contractor that proves to be active shall be
12 reinstated by the Contractor at no additional cost to the County and the Contractor
13 shall be responsible for any resulting property damage of floods.
 - 14 6. All existing service connections shall be reconnected by a remote controlled cutting
15 device directed internally by a television camera or by internal manual cutting. Cuts
16 shall be made by experienced operators so that no blind attempts or holes are made in
17 the liner pipe. Locations shall be verified carefully to match earlier tapes for accurate
18 lateral location, especially where dimples are not well defined. The County reserves
19 the right to require service connection by excavation at the Contractor's expense at
20 any location if the quality or workmanship of the cut is not satisfactory.
 - 21 7. A 2-pass process of utilizing a cutter to open the lateral followed by wire brush (or
22 similar) attachment to complete the cutting flush with the lateral walls should be
23 utilized, or approved alternate. It shall be properly aligned, invert to invert, to the
24 existing connection with no obstructions to the flow. Resin slugs shall be removed as
25 necessary from reinstated service connections. Any mis-cuts shall be repaired at no
26 cost to the County and shall be performed utilizing an additional thinner liner to
27 prevent water from entering behind the liner to the full satisfaction of the County. All
28 coupons cut from the liner for reopening of lateral connections shall be retrieved from
29 the sewer, accounted for by the Contractor, and turned over to the County.
 - 30 8. Service connections shall be reinstated to at least 95% of the original area as it enters
31 the host pipe.
 - 32 9. All service connections and side sewers to be reconnected to the main sewer, shall be
33 cleaned up to a length of 1-foot from the inside face of the existing wall of the main
34 pipe. All deposits within the first foot of the service connection or side sewer in the
35 service connections shall be removed and laterals reinstated.
 - 36 10. Contractor shall provide a sound, smooth transition from laterals/side sewers to the
37 main sewer. Contractor shall submit for approval a detailed repair plan for the
38 permanent repair of any gaps between the installed liner and the face of the
39 lateral/side sewer connections.
 - 40 11. For PVC laterals or laterals that have been previously lined with cured-in-place pipe
41 the Contractor shall take care during the reinstatement to avoid damage to the lateral
42 pipe.
- 43 B. Each pipe lined shall be post-CCTV inspected in accordance with Section 02762
44 "Televising Sanitary Sewer Systems" as soon as practical after processing to assure
45 complete curing.

- 1 1. The Contractor shall not reactivate any section of lined sewer pipe until authorized to
2 do so by the County. Segments not fully conforming to these Specifications must be
3 immediately brought to the County's attention with a proposed method of correction.
- 4 2. Immediately prior to conducting the post-lining CCTV, the Contractor shall
5 thoroughly clean the newly installed liner removing all debris and build-up that may
6 have accumulated, at no additional cost to the County.
- 7 3. The post-CCTV inspection documentation shall be submitted within 5 working days
8 of the liner installation. The County may at its discretion suspend any further
9 installation of CIPP until the post-installation documentation is submitted.
10 a. As a result of this suspension, no additional working days will be added to the
11 contract, nor will any adjustment be made for increase in cost

12 C. Defects

- 13 1. The liner shall be continuous and free of all visual and material defects except those
14 resulting from pre-lined conditions (such conditions shall be brought to the attention
15 of the County prior to lining).
- 16 2. There shall be no damage, deflection, holes, delaminating, uncured resin or other
17 visual defects in the liner.
- 18 3. The liner surface shall be smooth and free of waviness throughout the pipe.
- 19 4. No visible leakage through the liner or at manhole or service lateral connections will
20 be allowed.
- 21 5. Any defects located during the inspection shall be corrected by the Contractor to
22 conform to the requirements of the specifications and to the satisfaction of the
23 County.
- 24 6. Defects in the installed CIPP shall be identified and defined as specified in Section
25 02762 Televising Sanitary Sewer Systems.
- 26 7. Repairable defects that may occur in the installed CIPP shall be specifically defined
27 by the Contractor based on manufacturer's recommendations, including a detailed
28 step-by-step repair procedure, resulting in a finished product meeting the
29 requirements of these contract specifications.
- 30 8. Un-repairable defects that may occur to the CIPP shall be clearly defined by the
31 Contractor based on the manufacturer's recommendations, including a recommended
32 procedure for the removal and replacement of the CIPP.

33 D. Manhole Connections

- 34 1. Where liners of any type are installed in 2 or more continuous manhole segments, the
35 liner invert through the intermediate manholes shall be left intact. Final finishing of
36 the installation in those intermediate manholes shall require removal of the top of the
37 exposed liner and neat trimming of the liner edge where it touches the lip of the
38 manhole bench.
- 39 2. Reinstate openings for all manhole drop assemblies after relining mainline sewer
40 a. Outside drop assemblies shall be lined with a cured-in-place liner compatible with
41 the mainline liner, for the full length of the drop assembly and bend.
42 b. Inside drop assemblies are not required to be relined.
- 43 3. A seal consisting of a resin mixture or hydrophilic seal compatible with the installed
44 CIPP shall be applied at manhole/wall interface in accordance with the CIPP system
45 manufacturer's recommendations.

1 E. Portions of any piece of liner material removed during installation shall be available for
2 inspection and retention by the County.

3 3.04 TESTING

4 A. The physical properties of the installed CIPP shall be verified through field sampling and
5 laboratory testing. All testing shall be furnished by the Contractor. All materials testing
6 shall be performed at the Contractor's expense, by an independent third party laboratory
7 selected by the County as recommended by the CIPP manufacturer. All tests shall be in
8 accordance with applicable ASTM test methods to confirm compliance with the
9 requirements in these documents.

10 B. The Contractor shall pay for all testing included in this section

11 C. The Contractor shall provide samples for testing from the actual installed CIPP liner.
12 The Contractor shall determine sampling location and procedures to ensure representative
13 samples are obtained from the finished liner, subject to the approval by the County. The
14 contractor shall provide removable sizing sleeves, when possible, to collect liner samples,
15 which accurately replicate the host pipe diameter.

- 16 1. A minimum of 1 sample shall be taken of the first segment installed or as directed by
17 the County.
18 2. A minimum of 2 samples shall be taken for each 2,500 lineal feet of liner material
19 installed or for each manufacturing lot, if less, or as directed by the County.
20 3. A minimum of 6 samples per project shall be taken for each type of liner furnished or
21 as directed by the County.
22 4. A sample shall be cut from a section of cured liner that has been inverted or pulled
23 through a like diameter pipe which has been held in place by a suitable heat sink such
24 as sand bags.
25 5. All curing, cutting, and identification of samples shall be witnessed by the County.

26 D. Tests of the samples shall be conducted in accordance with ASTM standards

- 27 1. Short term flexural properties: The initial tangent flexural modulus of elasticity and
28 flexural strength shall be measured in accordance with test methods in ASTM D790.
29 2. Fiber reinforced flexural properties: specimens should be sampled in accordance with
30 ASTM F1743, section 8.1.2 and flexural properties shall be determined in accordance
31 with ASTM F1743, section 8.1.3 along the longitudinal and circumferential axis of
32 the install CIPP.
33 3. Fiber reinforced tensile properties: Where the CIPP is reinforced with oriented
34 continuous or discontinuous fibers to enhance the physical properties of the CIPP,
35 specimens shall be sampled in accordance with ASTM F1743, section 8.1.2 and
36 tensile properties shall be determined in accordance with ASTM D3039 and tested
37 along the longitudinal axis and circumferential axis of the installed CIPP.

1 4. CIPP wall thickness shall be determined in a manner consistent with ASTM D5813,
2 section 8.1.2. Thickness measurements shall be made in accordance with the practice
3 in ASTM D3567 for ASTM D5813, section 8.1. Deduct from the measured values
4 the thickness of any plastic coating or CIPP layer not included in the structural design
5 of the CIPP. The average thickness shall be calculated using all measured values and
6 shall meet or exceed the minimum design thickness. The minimum wall thickness at
7 any point shall not be less than 87.5% of the approved specified thickness.

8 E. The installed CIPP thickness shall be measured for each liner shipment to the job site. If
9 the CIPP thickness does not meet that specified in the contract and submitted as the
10 approved design by the Contractor, then the liner shall be repaired or removed. The
11 samples shall be made by core drilling 2-inch diameter test plugs at random locations
12 selected by the County. As an alternative the Contractor may use industry proven, non-
13 destructive methods for confirming the thickness of the installed CIPP if it can be shown
14 the calibrated thickness is the same as core test plugs.

15 3.05 ACCEPTANCE

16 A. Liner

- 17 1. It is the intent of these specifications that the completed liner with all appurtenances
18 shall be essentially equivalent in final quality and appearance to new sewer
19 installation.
- 20 2. The finished liner shall be continuous over the entire segment between manholes and
21 homogenous throughout.
- 22 3. The finished liner shall be fully rounded and as free as commercially practicable from
23 visible defects, including but not limited to damage, deflection, holes, delamination,
24 ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.
- 25 4. Where a defect in the liner requires removal of a section of the liner in the County's
26 opinion, the Contractor shall make all repairs as required by the County and shall
27 install a segmental liner, compatible with the liner, to accomplish a continuous
28 finished liner.
- 29 5. The pipe shall be neatly and smoothly cut off at each manhole. The manhole trough
30 shall be raised to the invert of the liner to preclude snagging and shoaling of debris.

31 B. Defects: Any defect which will or could affect the structural integrity, strength of the
32 lining, flow impairment, or leaks shall be repaired as outlined below or in accordance
33 with the approved repair or replacement procedures as recommended by the CIPP system
34 manufacturer. The repair or replacement of the defects will be at the Contractor's
35 expense.

36 1. Leaks

- 37 a. There shall be no visible infiltration through the liner, around the liner at manhole
38 connections, at lined service connections or in lined services. Contractor shall
39 repair any visible leaks and the repair method shall be approved by the County.

40 2. Wrinkles/Fins

- 41 a. Wrinkles outside the flow line of the pipeline:

42 (1) Wrinkles/fins in height up to a maximum of 5% of the inside diameter of the
43 host pipe are acceptable

- 1 (2) Wrinkles/fins over 5%, particularly those of a longitudinal configuration, may
2 be acceptable and should be evaluated, by the project engineer for acceptance,
3 on a case-by-case basis.
- 4 b. Wrinkles in the flow line:
 - 5 (1) Wrinkles/fins projecting more than 5% into the flow that are generally
6 longitudinal in their orientation may be deemed acceptable by the County on a
7 case-by-case basis by considering any potential operation and maintenance
8 issues that would result from their being left in place.
 - 9 (2) Wrinkles/fins in the lower third or flow line of the finished CIPP (based upon
10 the depth of flow) that are generally circumferential in their orientation should
11 not exceed 0.5-inches, whichever is smaller. Acceptability of larger
12 wrinkles/fins meeting this characterization shall be, on a case-by-case basis by
13 the County with consideration given to potential operations and maintenance
14 issues that would result from their being left in place.
- 15 c. Repair when wrinkles/fins are removed:
 - 16 (1) Wrinkles should be fully cured, tight and the resin should be homogeneous
17 across the full width of the wrinkle.
 - 18 (2) In most cases, when wrinkles/fins are removed from the installed CIPP, the
19 resin in the liner pipe is fully cured and homogeneous and no further repair is
20 required. If a repair is required the manufacturer should be contacted for the
21 correct repair procedure.
- 22 3. Blisters should be probed and punctured to determine the existence of water behind
23 the blister.
 - 24 a. No action required unless the pipe is leaking at the blisters.
- 25 4. Lifts in Liner
 - 26 a. Soft lifts should be re-processed by the Contractor to fully cure the CIPP.
 - 27 b. Hard lift shall be removed and a new short liner as required being equivalent to
28 the original installed CIPP.
- 29 5. A bulge in the invert caused by residual debris left in the pipe that impedes the flow
30 characteristics of the pipeline should be cut out.
 - 31 a. Cut out the section of the bulge and replace with a new short liner equivalent to
32 the original product or as recommended by the manufacturer.
- 33 6. Pinholes: the area where the liner has pinholes should be patched with a short-liner
34 repair or the liner removed and replaced as recommended by the manufacturer.
- 35 7. Soft spot in liner needs to be reheated and hardened or cut out and replaced or as
36 recommended by the manufacturer.
- 37 8. Dry tube or white spots are not acceptable and shall be removed and a patch repair
38 shall be performed or as recommended by the manufacturer.
- 39 9. Liner surface peeled off
 - 40 a. Cut out a representative sample of the CIPP
 - 41 b. Test physical properties and remaining CIPP thickness to verify that the contract
42 design requirements are met.
 - 43 c. Replace liner or as recommended by the manufacturer
- 44 10. Hole in the liner is not acceptable
 - 45 a. Small holes can be repaired with epoxy
 - 46 b. Short liner installed over larger holes or as recommended by the manufacturer
- 47 11. Cracks in liner are unacceptable and shall be repaired

- 1 12. Loose liner seam tape shall be removed to prevent potential hang-up of debris.
- 2 13. Annular space between host pipe and liner at manhole
- 3 a. If leaking between the host pipe and the CIPP, inject a hydrophilic type grout to
- 4 stop the leakage.
- 5 b. If the pipe is located in groundwater, inject a hydrophilic type grout to stop
- 6 possible future leakage.
- 7 c. If the pipe is not in groundwater, a cementitious grout can be used to fill the
- 8 space.
- 9 14. Liner delamination
- 10 a. Cut out the section of delaminated liner and replace with a new short liner
- 11 equivalent to the original product or as recommended by the manufacturer.
- 12 15. CIPP discoloration
- 13 a. Obtain a sample for testing the CIPP physical properties. Follow manufacturer's
- 14 recommendations for repair.
- 15 b. Remove and replace the CIPP physical if the physical properties do not meet the
- 16 contract minimum requirements.
- 17 c. No action required if the tested samples meet the physical properties.
- 18 16. Improper repair of CIPP: duct tape is not an acceptable repair for any situation.
- 19 17. The CIPP should fit tight inside the host pipe.
- 20 a. If the CIPP does not fit tightly against the original pipe at its termination point(s),
- 21 the full circumference of the CIPP exiting the existing host pipe should be sealed
- 22 by filling with a resin mixture compatible with the CIPP.
- 23 18. Overcut connection not allowed
- 24 a. Opening cut to match bottom of service pipe to eliminate debris build-up
- 25 b. If an overcut is made, grout the interface between the connection and the mainline
- 26 c. Install a connection hat
- 27 d. Install a short liner, then re-cut the service connection opening
- 28 19. Leakage between CIPP and host pipe at service connection
- 29 a. Leakage shall be stopped
- 30 b. Grout the interface between the connection and the mainline
- 31 c. Install a connection hat
- 32 20. Connection hat issue
- 33 a. Coating from mainliner not removed before installing the hat
- 34 b. Loose material shall be removed
- 35 c. Remove and replace the connection hat as recommended by the manufacturer
- 36 21. Undercut service connection
- 37 a. Finish cut with brush to create a smooth opening
- 38 22. Resin slug in service connection
- 39 a. If not blocking the flow from the service connection and slug does not impede
- 40 more than 20% of the connection opening, no action required
- 41 b. If blocking the flow, remove slug or dig up and replace the connection

42 C. Service Connections

- 43 1. The CIPP lateral lining shall not inhibit the CCTV post video inspection of the
- 44 mainline or service lateral pipes.
- 45 2. Reinstatement of all lateral connections shall be done neatly and smoothly.

1 3.06 CLEAN-UP AND RESTORATION

2 A. The Contractor shall not allow the site of the Work to become littered with trash and
3 waste material, but shall maintain the site in a neat and orderly condition throughout the
4 construction period.

5 B. On or before completion, the Contractor shall clean and remove from the site of the Work
6 all surplus and discarded materials, temporary structures, stumps and portions of trees,
7 and debris of any kind. He shall leave the site of work in a neat and orderly condition,
8 similar or equal to that prior to construction.

9 C. All private and public property along or adjacent to the Work disturbed by construction
10 operations shall be restored to a condition similar or equal to that existing prior to
11 construction.

12 D. Before final acceptance by the County, the Contractor shall replace and/or restore any
13 water, sewer, drain, and gas lines and appurtenances; electrical, telephone, telegraph
14 conduits and wires, both underground and aboveground, and appurtenances; traffic
15 signals, fire and police alarm systems and appurtenances; sidewalks, curbs, gutter,
16 drainage ditches and pavements and all other public utility facilities and appurtenances
17 along or adjacent to the Work that may have been disturbed by construction operations.

18 E. Conditions permitting, property cleanup and restoration shall begin and be prosecuted to
19 completion on a timely basis as set forth herein.

20 3.07 PROGRESSIVE CIPP INSTALLATION RECORD (SHOT RECORD)

21 A. The Contractor shall provide a progressive CIPP Installation Record (Shot Record) with
22 monthly application for partial payments. The progressive shot record shall indicate
23 quantities actually installed and deviations to the parameters included in the shot record
24 (i.e. shot number and corresponding manhole to manhole pipe reaches for each scheduled
25 installation, design thickness, actual thickness delivered to the site, pipe diameter, reach
26 length, total length of shot, and number of laterals).

27 B. Monthly partial payments will not be approved without prior approval of the progressive
28 CIPP Installation record (Shot Record) including verification and acceptance of all
29 quantities by the County.

30 3.08 WARRANTY INSPECTION

31 A. The County shall conduct the warranty television inspection within 1-year following
32 completion of the project. If it is found that any of the CIPP has developed abnormalities
33 since the completion of the project, the abnormalities shall be repaired and/or replaced
34 by the Contractor promptly as per these specifications and as recommended by the
35 manufacturer.

36 END OF SECTION

SECTION 02774
WASTEWATER GRAVITY COLLECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

1.02 QUALITY ASSURANCE

- A. Storage: PVC pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the PVC pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- B. Tests: Certified records of tests made by the manufacturer or by a reliable commercial laboratory shall be submitted with each shipment of pipe. All pipe shall be inspected upon delivery and that which does not conform to the requirements of these specifications shall be rejected and must be immediately removed by the Contractor. The Contractor shall furnish and provide samples of pipe for the performance of such additional tests as the County may deem necessary.

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. Precast manholes
 - 2. Manhole frames, covers, and other castings
 - 3. Manufacturer's certified test report on castings
 - 4. Certification of admix installation from pre-caster
 - 5. Certified test records for polyvinyl chloride pipe
 - 6. Mill Test Certificates on ductile iron pipe
 - 7. Manhole pipe connections
 - 8. Coal tar epoxy
 - 9. Special interior linings
- B. Record Information: The Contractor shall submit to the County the elevations of the center of the manhole covers and inverts of all pipes in the manholes.

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 MATERIALS

- A. Ductile Iron Pipe and Fittings: Ductile iron pipe shall meet the requirements of Section 15062 "Ductile Iron Pipe and Fittings."
- B. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."
- C. Precast Concrete Manholes
 - 1. Precast manholes shall conform to the requirements of ASTM Designation C 478.
 - a. The minimum shell thickness shall be 5-inches.
 - b. Lifting holes through the structures are not permitted.
 - c. The design of the structure shall include a precast base of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
 - d. Where drop structures are required, the design of the structure shall include a precast base, for the drop structure, of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
 - e. New manholes shall contain a crystalline waterproofing concrete admix. Crystalline waterproofing concrete admix shall be added to the concrete during the batching operation. Admix concentration shall be added based upon manufacturer design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admix was added to the concrete for all precast manholes. Colorant shall be added and provided at the admix manufacturing facility, not at the concrete batch plant. Contractor shall provide certification from the pre-caster that the admix was installed in accordance with the manufacturers recommendations.
 - 2. Top sections shall be eccentric, except that concrete top slab shall be used where shallow cover requires a top section less than 3-feet deep.
 - 3. New manholes shall be lined with Interior Linings where shown on the Drawings.
- D. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:
 - 1. Manhole bottoms, Class A
 - 2. Precast manholes, Class A (4,000-psi)
 - 3. Pipe and riser encasement, Class C
 - 4. Protective slabs, Class C

- E. Castings: Gray iron castings for manhole frames, covers, adjustment rings, and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the Drawings. The words SANITARY and ORANGE COUNTY, FLORIDA shall be cast in all manhole covers as shown on the Drawings. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings unless otherwise specified.
- F. Brick: Brick for manhole construction shall be dense, hard burned, shale, or clay brick conforming to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption shall be between 5 and 25-grams of water absorbed in 1-minute by dried brick, set flat face down, in 1/8-inch of water.
- G. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.
- H. Pipe Adapter: Connection of PVC gravity sewer lines to precast manholes and wetwells shall be made by using a flexible boot type manhole coupling adapter.
- I. Interior Linings (existing structures): Interior surfaces of existing manholes and wetwells shall be coated or lined to resist corrosion where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.
- J. Interior Linings (proposed structures): Interior surfaces of new wetwells shall be lined. Interior surfaces of new manholes shall be lined where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.
- K. Joint Sealer: Joint sealer material for precast manhole structures shall be pre-formed flexible plastic conforming to Federal Specification SS-S-00210 (GSA-FSS). Seal all exterior joints with Portland Type II cement after setting of joint sealer and placement of manhole section to form a watertight joint.
- L. Non-Shrink Mortar: Non-shrink mortar shall be used for filling annular spaces and holes in precast manholes and wetwells.
- M. Manhole Encapsulation: Manhole cones, riser rings, iron frame, cover, and all joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 98-mils (2.5-mm).
 - 1. Wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate via primer provided by the manufacturer. The wrap shall be applied with a high intensity propane torch.
 - 2. Heat shrink-wrap for all barrel section joints of manholes shall be a minimum 9-inch width. Corbel section, riser rings, and ring and cover shall have a minimum 12-inch width wrap.
 - 3. Adhesive tap materials shall not be allowed.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Upon satisfactory excavation of the pipe trench, as specified in Section 02220 "Excavating, Backfilling and Compacting" a continuous trough for the pipe barrel and recesses for the pipe bells shall be excavated by hand digging so that, when the pipe is laid in the trench, true to line and grade, the pipe barrel will receive continuous uniform support and the bell will receive no pressure from the trench bottom.
- B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

3.02 INSTALLATION

A. Sewer Pipe

1. General

- a. Laying of pipe shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt, stones, and other foreign material. The spigot ends of the pipe and/or pipe gaskets shall be lubricated lightly with a lubricant as specified by the pipe manufacturer and approved by the County. Sufficient pressure shall be applied to the pipe so as to properly seat the socket into the bell of the pipe. Any damage to the pipe due to over-exertion shall be replaced at the Contractor's expense. All pipe shall be laid straight, true to the lines and grades shown on the Drawings.
- b. Variance from established line and grade, at any point along the length of the pipe, shall not be greater than 1/32-inch per inch of pipe diameter and not to exceed 1/2-inch, provided that any such variation does not result in a level or reverse sloping invert.
- c. Any pipe, which is disturbed or found to be defective after installation, shall be taken up and relayed or replaced at the Contractor's expense.
- d. Approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossing.

2. PVC Pipe

- a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the County.
- b. Lowering pipe into trench: Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.

3. Building Laterals/Service Connections

- a. Service connections shall be constructed in accordance with the details as indicated on the Drawings.
- b. Sewer lateral pipe shall be extended to the right-of-way and plugged at the right-of-way line to avoid leakage (unless otherwise indicated on the Drawings). All connections and changes of direction shall be made using standard fittings designed for that purpose.
- c. Locator balls shall be placed under all sanitary sewer service cleanouts.

- d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the County.
4. PVC C-900 DR 14 Pipe Section: PVC C-900 DR 14 pipe shall be substituted for the specified PVC pipe where:
 - a. The sewer or service pipe is to be constructed with less than 30-inches of cover between the top of the pipe and the final top of pavement or ground line.
 - b. The PVC sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. The DR 14 pipe shall extend a minimum of 10-feet on each side of the point of crossing.
 - c. The lateral separation of the sewer pipe and potable water piping is less than 10-feet.

B. Manholes:

1. Manhole excavation and bedding at manhole junctions shall be performed in accordance with the provisions of Section 02220 "Excavating, Backfilling and Compacting" of these specifications.
2. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section using 2,500-psi concrete. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stubouts.
3. The first pipe joint outside the manhole shall be located a minimum distance of 24-inches from the outside surface of the manhole.
4. Precast manhole tops shall terminate at such elevations to permit laying brick courses under the manhole frame to make allowance for future street grade adjustments.
5. Frames and covers shall be set accurately to conform to the finished grade.
6. Outside drop connections shall be made in accordance with the details shown on the Drawings.
7. Drop connection base slab extensions on precast manholes shall be manufactured monolithically with the manhole elements at the casting yard. The manufacturer shall submit for approval the method of drop manhole construction.
8. Where additional pipe connections or modifications of existing factory made openings are required on new or existing precast concrete manholes or wetwells, all cutting relative thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically noted that such connections to existing manholes or wetwells shall be installed in accordance with the details for new units shown on the Drawings, and shall be caulked watertight with non-shrink grout.
9. Connection of the pipe entering the manhole shall be made by using a flexible boot type manhole coupling adapter. At the entry into the manhole, no part of the horizontal pipe shall rest against the concrete.
10. Manholes shall be completed as the work progresses so that testing may be conducted as prescribed in paragraph 3.03 Field Quality Control.

- C. Concrete encasement: Class C concrete encasement shall be constructed in accordance with details shown on the Drawings.

1. The County may order the line encased when:
 - a. The sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. Encasement shall extend a minimum of 10-feet on each side of the point of crossing. In lieu of encasement, the sewer line may be constructed of PVC DR 14 pipe and shall be laid such that both joints will be a distance of 10-feet from the crossing.
 - b. The maximum width for trench excavations is exceeded. The Contractor shall construct concrete encasement around the pipe for the length of the excessive excavation. No payment will be made for the concrete encasement required due to excessive trench widths.
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

D. Concrete protective slabs: Concrete protective slabs as shown on the Drawings shall be constructed over gravity sewers that have less than 3-feet of cover from finished grade.

E. Connections to existing structures: Proposed sewer lines shall be connected to the existing manholes by core drilling the proper size opening and installing a flexible boot type manhole adapter as specified in paragraph 2.01.H of this Section.

F. Invert channels (benching) shall be provided for all new manholes and existing manholes which are connected into. No brick shall be allowed in construction of the manhole invert. Inverts shall be poured using 2,500-psi concrete.

3.03 FIELD QUALITY CONTROL

A. Workmanship: Sewers and appurtenances shall be built watertight. The sewage must be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewers, or sections thereof, will be tested and gauged and if leakage is above the allowable limits specified, the sewer will be rejected.

B. Inspection: On completion of each block or section of sewer, or such other times as the County may direct, the block or section of sewer shall be cleaned, tested, and inspected.

1. Each section of the sewer shall show, on examination from either end, a full circle of light between manholes.
2. Each manhole or other appurtenance to the system shall be of the specified size and form, be watertight (no leakage allowed by visual inspection), and be constructed with the top set permanently to specified position and grade. All repairs shown necessary by the inspection shall be made; broken or cracked pipe replaced; all deposits removed and the sewer left true to line and grade, entirely clean and ready for use.
3. No pipe shall exceed a deflection of 5%. After the final backfill has been in place at least 30-days, the Contractor shall perform deflection testing using a rigid ball or mandrel with a diameter of not less than 95% of the base inside diameter or average inside diameter of the pipe, depending which is specified in the ASTM standard to which the pipe is manufactured. If the mandrel does not pass the completed section of sewer, the entire section of sewer will be rejected.

C. Closed Circuit Television Inspection:

1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.
2. The video internal inspection will be performed in 2 stages. The first inspection shall be within 30-days after the installation of the gravity sewer pipe provided the road base is in place and the manhole rings and covers are to grade. The second inspection of the gravity sewer pipe shall be before the end of the 1-year warranty period.
3. If the first or second video inspection reveals cracked, broken, or defective pipe, or pipe misalignment resulting in vertical sags in excess of 1-1/2-inch or a ring deflection in excess of 5%, the Contractor shall be required to repair or replace the pipeline. Successful passage of both the low-pressure air exfiltration test and video inspection is required before acceptance by the County.
4. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to the County for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

D. Low Pressure Air Exfiltration Testing:

1. The Contractor shall provide all labor, equipment, and materials and shall conduct all testing required under the direction of the County
2. Low pressure air testing shall conform to the requirements of UNI-B6-79 "Recommend Practice for Low-Pressure Air Testing of Installed Sewer Pipe", as published by UNI-Bell Plastic Pipe Association.
3. During sewer Construction, all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. Where necessary, the Contractor shall restrain caps, plugs, or short pipe lengths such that blowouts are prevented.
4. Each test section shall not exceed 400-feet in length and shall be tested between adjacent manholes.
5. Before testing, Contractor shall install monitoring wells at each manhole to determine groundwater level and adjust test pressure accordingly. In no case shall the test pressure exceed 9.0-psig. All pressurizing equipment shall include a regulator or relief valve set no higher than 9.0-psig to avoid over-pressurizing.
6. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0-psig greater than the average backpressure of any groundwater above the invert of the pipe, but not greater than 9.0-psig.
7. When temperatures have been equalized and pressure stabilized at 4.0-psig greater than the average groundwater backpressure, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5-psig greater than the average groundwater backpressure. At a reading of 3.5-psig greater than the average groundwater backpressure, timing shall commence with a stopwatch or other timing device that is at least 99.8% accurate.
8. If the time shown in the table, for the designated pipe size and length, elapses before the air pressure drops 1-psig; the section under-going test shall have passed. The test may be discontinued once the prescribed time has elapsed.

9. If the pressure drops 1-psig before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
10. Should the section fail to meet test requirements, the Contractor shall determine the source or sources of leakage, and make all necessary repairs and shall repeat the test until the test section is within established limits. All corrective work shall be at the Contractor's expense.

E. Correction of Non-Conforming work:

1. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the County. Non-conforming work shall be defined as failure to adhere to any specified or implied directive of these technical special provisions and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, water standing in any pipe segment or structure, visible or detectable leakage, and failure to pass any specified test or inspection.

**Table 02774-1
Test Time Table**

TEST TIME:											
For sewer diameter between 8 inches and 36 inches inclusive, the pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as listed below:											
SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP											
1 Pipe Dia. (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Feet							
				100	150	200	250	300	350	400	450
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.148 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:26	71:13	89:02	106:50	124:38	142:26	160:15
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

END OF SECTION

1 2.02 MATERIALS

2 A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to
3 the following or acceptable equivalent.

4 B. Lumber: Douglas Fir/Larch No. 2 grade, seasoned, surfaced on four sides.

5 C. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association.
6 (Minimum 3/4-inch thickness).

7 D. Form Ties: Use form ties which do not leave an open hole through the concrete and
8 which permit neat and solid patching at every hole. Use embedded rods with integral
9 waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will
10 not be permitted.

11 E. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating
12 which effectively prevents absorption of moisture; prevents bonding with concrete; is
13 non-staining to concrete; and leaves the concrete with a paintable surface.

14 F. Chamfer Strips: Chamfer strips shall be polyvinyl strips or acceptable equal, designed to
15 be nailed in the forms to provide a 3/4-inch chamfer (unless indicated otherwise) at
16 exposed edges of concrete members.

17 **PART 3 - EXECUTION**

18 3.01 INSTALLATION

19 A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure
20 resulting from the placement and vibration of concrete and shall be sufficiently rigid to
21 maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar,
22 and shall be adequately braced against lateral, upward or downward movement.

23 B. Coating of Forms: Apply form coating to board forms prior to placing reinforcing. Keep
24 form coatings off steel reinforcing, items to be embedded, and previously placed concrete.

25 C. Form Erection:

26 1. Provide a means of holding adjacent edges, ends of panels, and ends of sections
27 tightly together and in accurate alignment so as to prevent the formation of ridges,
28 fins, offsets, or similar surface defects of the finished concrete. Insure that forms may
29 be removed without damage to the surface of the finished concrete.

30 2. Provide a positive means of adjustment of shores and struts. Insure that all settlement
31 is taken up during concrete placing.

32 3. Temporary openings shall be provided in wall forms to limit the free fall of concrete to a
33 maximum of 6-feet unless an elephant trunk is used. Such openings shall be located to
34 facilitate placing and consolidation and shall be spaced no more than 8-feet apart.
35 Temporary openings shall also be provided in the bottom of the wall, column forms, and
36 elsewhere as necessary to facilitate cleaning and observation immediately prior to
37 placing.

- 1 4. Do not embed any form-tying device or part thereof other than metal in concrete.
- 2 5. Form surfaces of concrete members except where placement of the concrete is against
- 3 the ground. The dimensions of concrete members shown on the Drawings apply to
- 4 formed surfaces, except where otherwise indicated.

5 D. Form Reuse: Reuse only forms which maintain a uniform surface texture on exposed
 6 concrete surfaces. Apply light sanding between uses to obtain such a uniform texture.
 7 Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side of
 8 the plug.

9 E. Removal of Forms

- 10 1. Forms and shoring for elevated structural slabs, girders, and/or beams shall remain in
- 11 place until the concrete has reached a compressive strength equal to the specified 28-
- 12 day compressive strength as determined by test cylinders. Do not remove supports
- 13 and re-shore. The following table indicates the minimum allowable time after the last
- 14 concrete is placed before forms, shoring, and/or bracing may be removed.

Structural Item	Minimum Allowable Time
Bottom side of slabs, girders, beams	When concrete reaches specified 28-day compressive strength
Vertical sides of girders, beams	48-hours
Walls not supporting vertical or horizontal loads	48-hours
Walls supporting vertical or horizontal loads	When concrete reaches specified 28-day compressive strength
Footings, pipe encasements, pipe supports	24-hours

- 17 2. Do not remove forms from concrete which has been placed with outside air
- 18 temperature below 50° F without first determining if the concrete has properly set
- 19 regardless of the minimum times specified in the table above. Do not apply heavy
- 20 loading on recently poured concrete. Immediately after forms are removed, the
- 21 surface of the concrete shall be carefully examined and any irregularities in the
- 22 surface shall be repaired and finished as specified.

24 F. Formed Openings: Openings shall be of sufficient size to permit final equipment
 25 alignment without deflection or offsets of any kind. Where the items pass through the
 26 wall, allow space for packing to ensure watertightness. Provide openings with
 27 continuous keyways with waterstops where required. Provide a slight flare to facilitate
 28 grouting and the escape of entrained air during grouting. Provide reinforcement as
 29 indicated and specified. Reinforcing steel shall be at least 2-inches clear from the
 30 opening.

1 G. Embedded Items: Set anchor bolts and other embedded items accurately and hold
2 securely in position in the forms until the concrete is placed and set. Check all special
3 castings, channels, or other metal parts that are to be embedded in the concrete prior to
4 and again after concrete pour. Check all nailing, blocks, plugs, and strips necessary for
5 the attachment of trim, finish, and similar work prior to concrete pour.

6 H. Pipes and Wall Spools Cast in Concrete

- 7 1. Install wall spools, wall flanges, and wall anchors before placing concrete. Do not
8 weld, tie or otherwise connect the wall spools to the reinforcing steel.
9 2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or
10 pedestals. Carry concrete supports to firm foundations so that no settlement will be
11 possible during Construction.

12 I. Form Tolerances

- 13 1. Failure of the forms to produce the specified concrete surface tolerance shall be
14 grounds for rejection of the concrete work. Rejected Work shall be repaired or
15 replaced at no cost to the County.
16 2. The following table indicates tolerances or allowable variations from dimensions or
17 positions of structural concrete work:
18

	Maximum Tolerance
Sleeves and inserts	+1/4-inch to -1/4-inch
Projected ends of anchors	+1/4-inch to -0.0-inch
Anchor bolt setting	+1/4-inch to -1/4-inch
Finished concrete	+ 1/4-inch to -1/4-inch in 10 feet of length

19
20 The planes or axes from which the above tolerances are to be measured shall be as
21 follows:
22

Sleeves and inserts	Centerline of sleeve or insert
Projected ends of anchors	Plane perpendicular to the end of the anchor as located on the Drawings
Anchor bolt setting	Centerline of anchor bolts
Finished concrete	The concrete surface as located on the Drawings

- 23
24 3. Where equipment is to be installed, comply with manufacturer's tolerances if more
25 stringent than above.
26

27 END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This Section specifies reinforcing steel and welded wire mesh for cast-in-place or precast concrete structures.
- B. Related Work:
 - 1. Section 03100 "Concrete Formwork"
 - 2. Section 03300 "Cast-in-Place Concrete"
 - 3. Section 03410 "Precast Concrete Structures"

1.02 QUALITY ASSURANCE

- A. Standards: Unless otherwise indicated, all materials, workmanship, and practices shall meet all requirements of the current editions of the following standards:
 - 1. Standard Building Code
 - 2. ACI 318 Building Code Requirements for Reinforced Concrete
 - 3. ACI 315 Details and Detailing of Concrete Reinforcement
 - 4. CRSI Manual of Standard Practice, MSP-2

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Complete shop drawings shall be submitted for comment, including bar lists and placing drawings. Drawings shall show the type, spacing, and location of metal bar supports, the grade of the reinforcing and the name of the manufacturer. The type of coupler splice devices shall be designated.

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 MATERIALS

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed billet steel bars of a USA manufacturer.
- B. Welded Wire Fabric: ASTM A185, galvanized.
- C. Metal Bar Supports: CRSI MSP-2, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports.
- D. Coupler Splice Devices: Cadweld tension couplers capable of developing the ultimate strength of the bar, as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal where acceptable to the County.

2.03 FABRICATION

- A. Fabrication shall meet all requirements of the specified standards. Unless otherwise indicated, the following shall apply:
 - 1. Hooks shall be standard hooks.
 - 2. Bottom bars shall extend a minimum of 6-inches into supporting members.
 - 3. Minimum cover shall be measured to the outermost stirrup, tie or bar.
 - 4. Splices are permitted only where indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and AC1315. Top and bottom bars in slabs formed on earth shall be supported on precast concrete block supports except where such bars are properly supported from formwork. Precast concrete block supports are not required in slabs formed on tremie concrete but may be used at the Contractor's option.
- B. Placing Reinforcing: Placing of reinforcing steel and welded wire fabric shall conform to CRSI MSP-2, ACI 315, and the Drawings. Reinforcing shall be securely tied and supported to prevent displacement during concrete placement.
- C. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires, plus 2-inches. Fabric shall not be extended through expansion joints or construction joints in slabs on grade except as otherwise indicated on the Drawings.
- D. Coupler Splice: Unless indicated on the Drawings or where conventional lap splices cannot be achieved, full positive tension connections shall be provided. Such devices shall be installed in accordance with the recommendations of the manufacturer.

- E. Dowels: Dowels shall be wired in position prior to placing concrete.
- F. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being embedded in concrete.
- G. Welding: Welding of reinforcing will not be permitted.
- H. Place reinforcement a minimum of 2-inches clear of any metal pipe or fittings.

END OF SECTION

- 1 2. Materials: Satisfactory evidence shall be submitted indicating those materials to be
2 used (including cement, aggregates and admixtures) meet the specified requirements.
- 3 3. Design Mix: The design mix to be used shall be prepared by qualified persons and
4 submitted for review. Submit affidavit as to design mix performance over the
5 preceding 6-months. The design of the mix is the responsibility of the Contractor
6 subject to the limitations of the Specifications. Acceptance of this submission will be
7 required only as minimum requirements of the Specifications have been met. Such
8 acceptance will in no way alter the responsibility of the Contractor to furnish concrete
9 meeting the requirements of the Specifications relative to strength and slump.
- 10 4. Ready Mix Concrete: Provide delivery tickets or weigh master's certificate per ASTM
11 C 94, including weights of cement and each size aggregate, amount of water in the
12 aggregate, and amount of water added at the plant. The amount of water added on the
13 job shall be written on the ticket.

14 **PART 2 - PRODUCTS**

15 2.01 GENERAL

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

18 2.02 MATERIALS

19 A. Cement

- 20 1. Cement for all concrete shall be domestic Portland cement that conforms to the
21 requirements of ASTM Designation C 150 Type I, Type II or Type III. All sanitary
22 sewer manholes, wetwells, pumping stations, tanks and structures exposed to
23 wastewater shall be constructed with Type II cement. Type III cement for high early
24 strength concrete shall be used only for special locations and only with the review and
25 acceptance of the County. Type I cement may be used for buildings and tremie
26 concrete.
- 27 2. Only 1 brand of cement shall be used in any individual structure unless acceptable by
28 the County. Cement that has become damaged, partially set, lumpy or caked shall not
29 be used and the entire contents of the sack or container that contains such cement will
30 be rejected. No salvaged or reclaimed cement shall be used.
- 31 3. Fly ash shall not be used in either Class A or Class B concrete.

32 B. Aggregates:

- 33 1. ASTM C 33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No.
34 89.
- 35 2. In addition to requirements of ASTM C 33 for structures exposed to wastewater, the
36 following shall apply:
 - 37 a. Soft particles: 2% (2.0 percent)
 - 38 b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1% (1.0 percent)
 - 39 c. Total of soft particles and chert as a soft impurity: 2% (2.0 percent)
 - 40 d. Flat and elongated particles (long dimension > 5 times short dimension): 15%.

- 1 C. Water: Clean and free from injurious amounts of deleterious materials.
- 2 D. Air Entraining Admixture: ASTM C 260.
- 3 E. Water Reducing and Retarding Admixture: ASTM C 494, Type D. Admixture shall not
4 contain calcium chloride.
- 5 F. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concsive 1001-LPL or
6 acceptable equal.
- 7 G. Waterproofing Material: Concrete admixture shall be manufactured and supplied by an
8 approved manufacturer as shown in the Appendix D "List of Approved Products."

9 2.03 MIXES

10 A. General Requirements

- 11 1. Mix Design: Proportioning shall be on the basis of field experience and/or trial
12 mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests
13 and standard deviation shall be submitted. Proportioning for small structures may be
14 by the water/cement ratio under special review and acceptance by the County.
15 Concrete mix design shall comply with the Standard Building Code requirements.
- 16 2. Air Content: 5% plus or minus (\pm) 1% (Class A and B).
- 17 3. Slump: 4-inches plus or minus (\pm) 1-inch. 8-inches plus or minus (\pm) 1-inch for
18 tremie concrete.
- 19 4. Water/cement ratio = 0.45 maximum (all concrete exposed to hydrostatic loading),
20 0.50 maximum (all other concrete).
- 21 5. Minimum Compressive Strength at 28-days
22 a. Class A, 4,000-psi: Water and wastewater structures inclusive of tanks, ditches,
23 pumping stations, tremie concrete and other structures in contact with process
24 water.
25 b. Class B, 3,000-psi: Building structures, curb and gutters, slabs, walks,
26 encasements, thrust blocks, and pipe supports, etc. not in contact with process
27 water.
28 c. Class C, 2,500-psi: Mix wherever specified in the standard drawings such as
29 A103, A112, A303, A406 and A407-2.

30 B. Production of Concrete

- 31 1. General: Concrete shall be ready mixed and shall be batched, mixed and transported
32 in accordance with ASTM C 94, except as otherwise indicated.
- 33 2. Air Entraining Admixture: Air entraining admixture shall be charged into the mixture
34 as a solution and shall be measured by means of an acceptable mechanical dispensing
35 device. The liquid shall be considered a part of the mixing water.

- 1 3. Waterproofing admixture: New concrete structures shall contain a crystalline
2 waterproofing concrete admixture. Crystalline waterproofing concrete admixture
3 shall be added to the concrete during the batching operation. The admixture
4 concentration shall be added based upon manufacturer design percent concentration
5 of admixture to the required weight of cement. The amount of cement shall remain
6 the same and not be reduced. A colorant shall be added to verify the admixture was
7 added to the concrete for all precast structures. Colorant shall be added and provided
8 at the admixture manufacturing facility, not at the concrete batch plant. It is
9 recommended that the admixture be added first to the rock and sand and blended
10 thoroughly before adding cement and water or per the manufacturer's
11 recommendations. Concrete structures without crystalline waterproofing admixture
12 or admixture without colorant for field verification shall be rejected. Contractor shall
13 provide certification the admixture was installed in accordance with the
14 manufacturer's recommendations.
- 15 4. Water Reducing and Retarding Admixture: Water reducing and retarding admixture
16 shall be added and measured as recommended by the manufacturer. The addition of
17 the admixture shall be completed within 1-minute after addition of water to the
18 cement has been completed, or prior to the beginning of the last 3/4 of the required
19 mixing, whichever occurs first. Admixtures shall be stored, handled and batched in
20 accordance with the recommendations of ACI 68.
- 21 C. Delivery Tickets: In addition to the information required by ASTM C 94, delivery tickets
22 shall indicate the cement content and the water/cement ratio.
- 23 D. Temperatures: The temperature of the concrete upon delivery from the truck shall not
24 exceed 90° F.
- 25 E. Modifications to the Mix: No modifications to the mix shall be made in the plant or on
26 the job which will decrease the cement content or increase the water/cement ratio beyond
27 that specified.

28 **PART 3 - EXECUTION**

29 3.01 PREPARATION

- 30 A. Preparations before Placing: No concrete shall be placed until the review and acceptance
31 of the County has been received. Acceptance will not be granted until forms are clean
32 and reinforcing and all other items required to be set in concrete have been placed and
33 thoroughly secured. The County shall be notified a minimum of 24-hours before
34 concrete is placed.
- 35 B. Conveying:
- 36 1. General: Concrete shall be handled from the truck to the place of final deposit as
37 rapidly as practicable by methods which will prevent segregation or loss of
38 ingredients to maintain the quality of the concrete. No concrete shall be placed more
39 than 90-minutes after mixing has begun for that particular batch.

- 1 2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear
2 opening equal to no less than 1/3 of the maximum interior horizontal area, or 5 times
3 the maximum aggregate size being used. Side slopes shall be no less than 60°
4 (degrees). Controls on gates shall permit opening and closing during the discharge
5 cycle.
- 6 3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing
7 during the placing of concrete.
- 8 4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of
9 concrete of more than 6-feet.
- 10 5. Chutes: Chutes shall be metal or metal lined and shall have a slope not exceeding 1
11 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than
12 20-feet long and chutes not meeting the slope requirements may be used only if they
13 discharge into a hopper before distribution.
- 14 6. Pumping Equipment: Pumping equipment and procedures shall conform to the
15 recommendations contained in the report of ACI Committee 304 on "Placing Concrete
16 by Pumping Methods," ACI 304.2R-71. The specified slump shall be measured at the
17 point of discharge. The loss of slump in pumping shall not exceed 1-1/2-inches.
- 18 7. Conveying equipment Construction: Aluminum or aluminum alloy pipe for tremies or
19 pump lines and chutes, except for short lengths at the truck mixer shall not be
20 permitted.
- 21 8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete
22 operation.

23 3.02 APPLICATION

24 A. Placing:

- 25 1. General: Concrete shall be deposited continuously, or in layers of such thickness (not
26 exceeding 2-feet in depth) that no concrete will be deposited on concrete that has
27 hardened sufficiently to cause the formation of seams or planes of weakness.
- 28 2. Supported Elements: At least 2-hours shall elapse after depositing concrete in
29 columns or walls before depositing in beams, girders, or slabs supported thereon.
- 30 3. Segregation: Concrete shall be deposited as nearly as practicable in its final position
31 to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to
32 procedures that will cause segregation.
- 33 4. Concrete Underwater: All concrete, except that indicated on the Drawings as tremie
34 concrete, shall be placed in the dry.

35 B. Seals and Tremie Concrete

36 1. General

- 37 a. Wherever practicable, all foundation excavations shall be dewatered and the
38 concrete deposited in the dry. Where conditions are encountered which render it
39 impracticable to dewater the foundation before placing concrete, a concrete
40 foundation seal shall be placed. The foundation shall then be dewatered, and the
41 balance of the concrete placed in the dry.

- 1 b. When seal concrete is required to be placed, the satisfactory performance of the
2 seal in providing a watertight excavation for placing structural concrete shall be
3 the responsibility of the Contractor. Seal concrete placed by the Contractor,
4 which subsequently fails to perform properly, shall be repaired as necessary to
5 perform its required function, at the expense of the Contractor.
- 6 2. Method of Placing: Concrete deposited underwater shall be carefully placed in the
7 space in which it is to remain by means of a tremie, a closed-bottom dump bucket of
8 not less than 1-cubic yard capacity, or other approved method, and shall not be
9 disturbed after it is deposited. All seal concrete shall be deposited in 1 continuous
10 pour. No concrete shall be placed in running water. All formwork designed to retain
11 concrete underwater shall be watertight, and the design of the formwork and
12 excavation sheeting shall be by a Professional Engineer, registered in the State of
13 Florida.
- 14 3. Use of Tremie: The tremie shall consist of a tube having a minimum inside diameter
15 of 10-inches, and shall be constructed in sections having tight joints. No aluminum
16 parts that have contact with the concrete will be permitted. The discharge end shall
17 be entirely seated at all times, and the tremie tube kept full to the bottom of the
18 hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised
19 (but not out of the concrete at the bottom) until the batch discharges to the bottom of
20 the hopper, after which the flow shall be stopped by lowering the tremie. The means
21 of supporting the tremie shall be such as to permit the free movement of the discharge
22 end over the entire top surface of the Work, and shall permit it being lowered rapidly
23 when necessary to choke off or retard the flow. The flow shall preferably be
24 continuous, and in no case shall be interrupted until the Work is completed. Special
25 care shall be exercised to maintain still water at the point of deposit.
- 26 4. Use of Bottom-dump Bucket: When the concrete is placed by means of a bottom-
27 dump bucket, the bucket shall be lowered gradually and carefully until it rests upon
28 the concrete already placed. The bucket shall then be raised very slowly during the
29 discharge travel; the intent being to maintain, as nearly as possible, still water at the
30 point of discharge and to avoid agitating the mixture. Aluminum buckets will not be
31 permitted.
- 32 5. Time of Beginning Pumping: Pumping to dewater a sealed cofferdam shall not
33 commence until the seal has set sufficiently to withstand the hydrostatic pressure, and
34 in no case earlier than 72-hours after placement of the concrete.
- 35 C. Consolidating Concrete:
- 36 1. General: Concrete shall be consolidated by means of internal vibrators operated by
37 competent workmen.
- 38 2. Vibrators: Vibrators shall have a minimum head diameter of at least 2-inches, a
39 minimum centrifugal force of 700-pounds and a minimum frequency of 8,000
40 vibrations per second.
- 41 3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be
42 supplemented by others having a minimum head diameter of 1-1/2-inches, a
43 minimum centrifugal force of 300-pounds and a minimum frequency of 9,000
44 vibrations per second.

- 1 4. Spare Vibrator: One (1) spare vibrator for each 3 in use shall be kept on the site
2 during all concrete placing operations.
3 5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately
4 18-inches apart. The duration of each insertion shall be from 5 to 15-seconds.
5 Concrete shall not be transported in the forms by means of vibrators.

- 6 D. Protection: Rainwater shall not be allowed to increase the amount of mixing water, or to
7 damage the surface finish. Concrete shall be protected from construction over-loads.
8 Design loads shall not be applied until the specified strength has been attained.

9 3.03 CONCRETE FINISHING AND CURING

- 10 A. All slabs exposed to view shall receive a steel trowel finish without local depressions or
11 high points and apply a light hair-broom finish. Do not use stiff bristle brooms or
12 brushes. Leave hair-broom lines parallel to the direction of slab drainage.

- 13 B. All other slabs and footings shall receive a smooth steel trowel finish.

- 14 C. All walls of structures or parts of buildings exposed to view shall receive the following:
15 1. Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie
16 holes.
17 2. Any surface not receiving a special applied finish, shall receive a slurry finish
18 consisting of 1 part cement and 1-1/2 parts sand by damp loose volume. Dampen
19 surfaces and then apply the slurry with clean burlap pads or sponge rubber floats.
20 Remove any surplus by scraping and then rubbing with clean burlap.
21 3. Surfaces that will receive a special applied finish shall be of even color, have no pits,
22 pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff bristle
23 fiber brush shall produce no dusting or dislodging of cement or sand.

- 24 D. All concrete shall be wet cured a minimum of 7-days; or if not to receive special finishes,
25 coatings or concrete toppings, an acceptable curing compound may be utilized.

- 26 E. All surface defects shall be repaired by removing defective concrete down to sound
27 concrete and repairing with patching mortar. Finished repair shall match adjacent
28 concrete and be cured as specified.

29 3.04 TESTING

- 30 A. A testing laboratory, acceptable by the County, shall perform required testing. The
31 Contractor shall pay for all tests indicating a failure to comply with the Specifications.
32 The Contractor shall keep the laboratory informed of his schedule.

1 B. Standard laboratory compressive test cylinders shall be obtained by the laboratory when
2 concrete is discharged at the point of placing (i.e., discharge end of pumping equipment),
3 and cylinders shall be made and cured in accordance with the requirements of ASTM
4 Designation C 31. A set of 4 cylinders shall be obtained for each 50-cubic yards, or
5 fraction thereof, placed each day for each type of concrete. The cylinders shall be cured
6 under laboratory conditions and shall be tested at 7 and 28-days of age in accordance
7 with the requirements of ASTM Designation C 39.

8 C. The testing laboratory shall make slump tests of Class A and Class B concrete as it is
9 discharged from the mixer at the point of placing. Slump tests shall be made for each 25-
10 cubic yards or "pour" of concrete placed. Slump tests may be made on any batch, and
11 failure to meet specified slump requirements shall be sufficient cause for rejection of that
12 batch.
13

14 END OF SECTION

1 1.04 INSPECTION

- 2 A. The quality of all materials, the process of manufacture, and the finished sections shall be
3 subject to inspection and acceptance by the County. Such inspection may be made at the
4 place of manufacture or at the site after delivery, or at both places, and the sections shall be
5 subject to rejection at any time due to failure to meet any of the specification requirements;
6 even though sample sections may have been acceptable as satisfactory at the place of
7 manufacture. Sections rejected after delivery to the job shall be marked for identification
8 and shall be removed from the job at once. All damaged sections will be rejected. If
9 damaged sections have already been installed; they shall be acceptably repaired if
10 authorized by the County, or removed and replaced at the Contractor's expense.
- 11 B. At the time of inspection, the sections will be carefully examined for compliance with the
12 ASTM designation specified and the acceptable manufacturer's drawings. All sections
13 shall be inspected for general appearance, dimension, "scratch strength", blisters, cracks,
14 roughness, and soundness. The surface shall be dense and close textured.
- 15 C. Imperfections may be repaired subject to the review and acceptance of the County after
16 demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be
17 carefully inspected before final review and acceptance. Cement mortar used for repairs shall
18 have a minimum compressive strength of 4,000-psi at the end of 7-days and 5,000-psi at the
19 end of 28-days, when tested in 3-inch by 6-inch cylinders stored in the standard manner.
20 Epoxy mortar may be utilized for repairs subject to the review and acceptance of the County.

21 **PART 2 - PRODUCTS**

22 2.01 GENERAL

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

25 2.02 PRECAST CONCRETE SECTIONS

- 26 A. Precast concrete wetwell sections, manhole barrel and eccentric top sections shall
27 conform to specifications for precast reinforced concrete manhole sections, ASTM
28 Designation C478, except as otherwise specified below or as shown on the Drawings.
29 Details of precast sections shown on the Drawings, including thickness and reinforcing,
30 shall supersede ASTM C-478 when such details are more stringent than ASTM C-478.
31 The method of construction shall conform to the detailed Drawings appended to these
32 specifications and the following additional requirements:
- 33 1. The minimum wall thickness for the various size barrel sections shall be 5-inches, or
34 as indicated in the Drawings.
 - 35 2. Barrel sections shall have tongue and groove joints. Joints shall be sealed with cold
36 adhesive preformed plastic gaskets set in double rows on the tongue and in the groove
37 prior to setting the next section. Gaskets shall be K.T. Snyder "Ram-Nek", Conseal "CS-
38 102" or acceptable equal. All extension joints shall be sealed with Portland Type II
39 cement after setting of gasket and placement of manhole section into a watertight joint.

- 1 3. Type II cement shall be used except as otherwise accepted.
- 2 4. New concrete structures shall contain a crystalline waterproofing concrete admix for
- 3 all new concrete structures including but not limited to manholes, ARV vaults,
- 4 wetwells, and wetwell top slabs. Crystalline waterproofing concrete admix shall be
- 5 added to the concrete during the batching operation. Admixture concentration shall
- 6 be added based upon manufacturer's design percent concentration of admixture to the
- 7 required weight of cement. The amount of cement shall remain the same and not be
- 8 reduced. A colorant shall be added to verify the admixture was added to the concrete.
- 9 Colorant shall be added and provided at the admixture manufacturing facility, not at
- 10 the concrete batch plant. It is recommended that the admixture be added first to the
- 11 rock and sand and blended thoroughly before adding cement and water or per the
- 12 manufacturer's recommendations. Concrete structures without crystalline
- 13 waterproofing admixture or admixture without colorant for field verification shall be
- 14 rejected. Contractor shall provide certification from the pre-caster that the admixture
- 15 was added in accordance with the manufacturer's recommendations. Concrete
- 16 admixture shall be manufactured and supplied by an approved manufacturer as shown
- 17 in Appendix D "List of Approved Products."
- 18 5. The date of manufacture and the name or trademark of the manufacturer shall be
- 19 clearly marked on the inside of each precast section. Each section must be inspected
- 20 and stamped by an accredited testing laboratory.
- 21 6. Sections shall be cured by an acceptable method for at least 28-days.
- 22 7. Manhole top sections shall be eccentric except that precast concrete slabs shall be
- 23 used where cover over the top of the pipe is less than 4-feet for all manholes. Lift
- 24 rings or non-penetrating lift holes shall be provided for handling precast manhole
- 25 sections. Non-penetrating lift holes shall be filled with non-shrink grout after
- 26 installation of the manhole sections.
- 27 8. Precast concrete slabs over top section, where required, shall be capable of supporting
- 28 the overburden plus a live load equivalent to ASHTO H 20 loading.
- 29 9. The tops of bases shall be suitably shaped to mate with the adjoining precast section.
- 30 10. Precast leveling rings for setting cast iron frames over manholes shall be 2-inch thick
- 31 and have 1 (one) Number 2 continuous reinforcing steel bar.
- 32 11. Concrete surfaces shall have form oil, curing compounds, dust, dirt, and other
- 33 interfering materials removed by brush sand blasting and shall be fully cured prior to
- 34 delivery.
- 35 12. Interior surfaces of manholes, wetwells and valve vaults shall be lined in accordance
- 36 with Appendix D "List of Approved Products."
- 37 13. Manholes to be installed around existing gravity sewers shall consist of a cast-in-
- 38 place concrete base slab and precast concrete barrel and top sections; lined per
- 39 Section 3410 – 2.01.11. The base slab shall be as shown on the Drawings and include
- 40 a joint which is compatible with the bottom barrel section and acceptable to the
- 41 County. The bottom barrel section shall include an inverted "U-shaped" slot to allow
- 42 installation of the section over existing pipes. Flow channels shall be provided within
- 43 the manholes as shown on the Drawings. Annular space between the existing pipe
- 44 and slot shall be made watertight with non-shrink grout. Existing pipes shall be
- 45 removed within the manhole and outlets plugged watertight with non-shrink grout as
- 46 shown on the Drawings.

1 14. The manholes shall have an invert channel shaped to correspond with the lower half
2 of the pipe. The top of the shelf shall be at the elevation indicated and shall be sloped
3 to drain toward the flowing through channel. Every effort shall be made by the
4 Contractor to construct watertight structures.

5 **PART 3 - EXECUTION**

6 3.01 INSTALLATION

- 7 A. All manholes and other precast structures shall be set in the dry.
- 8 B. Manholes and other precast structures shall be constructed to the dimensions as shown on
9 the Drawings and as specified herein.
- 10 C. The base structure may be cast-in-place concrete as specified in Division 3. The concrete
11 structure shall be placed on the required crushed stone base as shown in the Drawings
12 over a dry sub base of structural fill that has been compacted to 95% (percent) of the
13 maximum dry density as determined by the modified proctor test, ASTM D1557. The
14 tops of the cast in place bases shall be shaped to mate with the precast barrel section and
15 shall be adjusted in grade so that the top of the dome section is at the correct elevation.
- 16 D. Precast bases conforming to all requirements of ASTM C478 and other requirements for
17 precast sections may be used and shall be set on a sub base as described above.
- 18 E. Precast concrete structure sections shall be set vertically with sections in true alignment
19 with a 1/4-inch maximum tolerance per 5-feet of depth. The outside and inside joint shall
20 be filled with a non-shrink mortar and finished flush with the adjoining surfaces. Allow
21 joints to set for 24-hours before backfilling. Backfilling shall be accomplished bringing
22 the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be
23 caulked with non-shrink grout to the satisfaction of the County. The Contractor shall
24 install the precast sections in a manner that will result in a watertight joint.
- 25 F. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole
26 sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation.
- 27 G. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be
28 done prior to setting them in place to prevent any subsequent jarring which may loosen
29 the mortar joints.
- 30 H. Cast iron frames shall be placed over precast concrete leveling rings, shimmed and set in
31 cement mortar to the required grade. No more than 3 courses of leveling rings shall be
32 used.
33

34 **END OF SECTION**

1 1.04 REFERENCE STANDARDS

2 A. Unless otherwise specified, materials shall conform to the following:
3

Structural Steel	ASTM A36
Welded and Seamless Steel Pipe	ASTM A53
Gray Iron Castings	ASTM A48, Class 30
Galvanizing, general	ASTM A123
Galvanizing, hardware	ASTM A153
Galvanizing, assemblies	ASTM A386
Aluminum (Extruded Shapes) 6061 T6 (Alum. alloy)	
Aluminum (Extruded Pipe)	6063 T6 (Alum. alloy)
Aluminum Bar Structural	6061 T6 (Alum. alloy)
Bolts and Nuts ASTM, A307	
Stainless Steel Bolts, Fasteners	AISI, Type 316
Stainless Steel Plate and Sheet, Wire	AISI, Type 316
Welding Rods for Steel	AWS Spec. for Arc Welding

4 **PART 2 - PRODUCTS**

5 2.01 GENERAL

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

8 2.02 ANCHORS, BOLTS, AND FASTENING DEVICES

9 A. Anchors, bolts, and other fastening devices shall be furnished as necessary for installation
10 of the work of this Section.

11 B. Compound masonry anchors shall be of the type shown or required and shall be Star Slug
12 compounded masonry anchors manufactured by Star Expansion Industries, by Phillips
13 Drill Co., Rahplug, or acceptable equal. Anchors shall be minimum "2-unit" type.

14 C. The bolts used to attach the various members to the anchors shall be the sizes shown or
15 required. Stainless steel shall be attached to concrete or masonry by means of stainless
16 steel machine bolts and iron or steel shall be attached with steel machine bolts unless
17 otherwise specifically noted.

18 D. For structural purposes, unless otherwise noted, expansion bolts shall be Wej it "Ankr
19 Tite", Phillips Drill Co. "Wedge Anchors", Hilti "Kwik Bolt", or acceptable equal. When
20 length of bolt is not called for on the Drawings, the length of bolt provided shall be
21 sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the
22 reinforcing steel within the concrete.

1 E. Materials for anchor or expansion bolts shall be as noted on the Drawings. If no specific
2 material is listed, hot dipped galvanized steel shall be used. All hardware inside
3 wetwells, manholes, or other wetted areas shall be 316 Stainless Steel.

4 2.03 ALUMINUM ITEMS

5 A. Prefabricated checker plate aluminum hatches shall be Type "JD", or "KD" as
6 manufactured by Bilco Co., equal type by Babcock Davis Associates, Inc.; or acceptable
7 equal, sized as shown. Hatches with any single dimension over 3-feet 6-inches shall be
8 double leaf type. Hatches shall be designed for a live load of 300-pounds per square foot.
9 Hatches shall be watertight.

10 B. Check plate aluminum cover plates shall be fabricated to the details shown and installed
11 at the locations shown.

12 C. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames
13 for hatches, beams, grates, etc., shall be furnished complete with welded strap anchors
14 attached. Furnish all miscellaneous aluminum shown but not otherwise detailed.
15 Structural shapes and extruded items shall conform to the detail dimensions or the plans
16 within the tolerances published by the American Aluminum Association.

17 2.04 STEEL ITEMS

18 A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the
19 Drawings. All pipe sleeves shall have anchors centered on the circumference as shown.

20 B. Miscellaneous steel pipe for sleeves, lifting attachments, and other uses as required shall
21 be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

22 2.05 CAST IRON ITEMS

23 A. Outside pipe clean out frames and covers shall be heavy duty, R 6013 R 6099 series as
24 manufactured by Neenah Foundry Co., or acceptable equal. All outside pipe cleanouts
25 shall be 6-inch diameter.

26 B. Trench drain shall be of length shown on the Drawings and shall be heavy duty, cast iron,
27 open grate lid type, Series R 4990 Type A as manufactured by Neenah Foundry Co., or
28 acceptable equal.

1 C. Gray iron castings for manhole frames, covers, adjustment rings, and other items shall
2 conform to ASTM A48, Class 30B. Castings shall be true to pattern in form and
3 dimensions and free of pouring faults and other defects which would impair their strength
4 or otherwise make them unfit for the service intended. The seating surfaces between
5 frames and covers shall be machined to fit true. No plugging or filling will be allowed.
6 Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting
7 patterns shall conform to those shown or indicated on the Drawings. All manhole frames
8 and covers shall be traffic bearing to meet AASHTO H 20 loadings. Frames shall be
9 suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

10 **PART 3 - EXECUTION**

11 3.01 FABRICATION

12 A. All miscellaneous metalwork shall be formed true to detail, with clean, straight, sharply
13 defined profiles and smooth surfaces of uniform color and texture and free from defects
14 impairing strength or durability.

15 B. Connections and accessories shall be of sufficient strength to safely withstand stresses
16 and strains to which they will be subjected. Steel accessories and connections to steel or
17 cast iron shall be steel, unless otherwise specified. Threaded connections shall be made
18 so that the threads are concealed by the fitting.

19 C. Welded joints shall be rigid and continuously welded or spot-welded as specified or
20 shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be
21 close fitting and jointed where least conspicuous.

22 D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding
23 in Building Construction of the AWS and shall only be done where shown, specified, or
24 permitted by the County. All welding shall be done only by welders certified as to their
25 ability to perform welding in accordance with the requirements of the AWS code.
26 Component parts of built up members to be welded shall be adequately supported and
27 clamped or held by other adequate means to hold the parts in proper relation for welding.

28 E. Welding of aluminum work shall be on the unexposed side as much as possible in order
29 to prevent pitting or discoloration.

30 F. All aluminum finish exposed surfaces, except as specified below, shall have
31 manufacturers' standard mill finish. Aluminum handrails shall be given an anodic oxide
32 treatment in accordance with the Aluminum Association Specification AA C22 A41. A
33 coating of methacrylate lacquer shall be applied to all aluminum before shipment from
34 the factory.

1 G. Castings shall be of good quality, strong, tough, even grained, smooth, free from scale,
2 lumps, blisters, sand holes, and defects of any kind which render them unfit for the
3 service for which they are intended. Castings shall be thoroughly cleaned and will be
4 subjected to a hammer inspection in the field by the County. All finished surfaces shown
5 on the Drawings and/or specified shall be machined to a true plane surface and shall be
6 true and seat at all points without rocking. Allowances shall be made in the patterns so
7 that the thickness specified or shown shall not be reduced in obtaining finished surfaces.
8 Castings will not be acceptable if the actual weight is less than 95% (percent) of the
9 theoretical weight computed from the dimensions shown. The Contractor shall provide
10 facilities for weighing castings in the presence of the County showing true weights,
11 certified by the supplier.

12 H. All steel finish work shall be thoroughly cleaned of all loose mill scale, rust, and foreign
13 matter before shipment and shall be given 1 shop coat of primer in accordance with
14 Section 09865 "Surface Preparation and Shop Prime Painting." Abrasions in the field
15 shall be touched up with primer immediately after erection. Final painting shall be in
16 accordance with Section 09900 "Painting."

17 I. Galvanizing shall be the hot dip zinc process after fabrication. Following all
18 manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled,
19 fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be
20 adherent and shall be the normal coating to be obtained by immersing the items in a bath
21 of molten zinc and allowing them to remain in the batch until their temperature becomes
22 the same as the bath. Coating shall be not less than 2-ounces per square foot of surface.

23 3.02 INSTALLATION

24 A. Install all items furnished except items to be imbedded in concrete or masonry, which
25 shall be installed under Division 3 or Division 4 respectively. Items to be attached to
26 concrete or masonry after such work is completed shall be installed in accordance with
27 the details shown. Fastening to wood plugs in masonry will not be permitted. All
28 dimensions shall be verified at the site before fabrication is started.

29 B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a
30 protective coating of an approved heavy bitumastic troweling mastic applied in
31 accordance with the manufacturer's instructions prior to installation.

32 C. Where aluminum is embedded in concrete, apply a heavy coat of approved bitumastic
33 troweling mastic in accordance with the manufacturer's instructions prior to installation.

34 D. Where aluminum contacts masonry or concrete, provide a 1/32-inch neoprene gasket
35 between the aluminum and the concrete or masonry.

36 E. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc chromate
37 primer and provide a 1/32-inch neoprene gasket between the aluminum and the dissimilar
38 metal.

1 F. Where aluminum contacts wood, apply 2 coats of aluminum metal and masonry paint to
2 the wood.
3

4 END OF SECTION

- 1 B. Non-submerged Services: Shop primer for ferrous metals, other than those covered by
2 Paragraph 2.01 A, shall be sprayed with 1 coat of Glidden T&S Primer 5205, or an
3 acceptable equal, at a minimum dry film thickness of 2.0-mils.
- 4 C. Non-primed Surfaces: Gears, bearing surfaces and other similar surfaces obviously not to
5 be painted shall be given a heavy shop coat of grease or other suitable rust-resistant
6 coating. This coating shall be maintained as necessary to prevent corrosion during all
7 periods of storage and erection and shall be satisfactory to the County up to the time of
8 the final acceptance test.
- 9 D. Compatibility of Coating System: Shop priming shall be done with primers that are
10 guaranteed by the manufacturer to be compatible with their corresponding primers and
11 finish coats specified in Section 09900 "Painting" for use in the field and which are
12 recommended for use together.

13 **PART 3 - EXECUTION**

14 3.01 APPLICATION

- 15 A. Surface Preparation and Priming
- 16 1. Non-submerged components scheduled for priming, as defined above, shall be
17 sandblasted clean in accordance with SSPC SP 6, Commercial Grade, immediately
18 prior to priming. Submerged components scheduled for priming, as defined above,
19 shall be sandblasted clean in accordance with SSPC SP 10, immediately prior to
20 priming.
- 21 2. Surfaces shall be dry and free of dust, oil, grease, dirt, rust, loose mill scale, and other
22 foreign material before priming.
- 23 3. Shop prime in accordance with acceptable paint manufacturer's recommendations.
- 24 4. Priming shall follow sandblasting before any evidence of corrosion has occurred and
25 within 24-hours.
26

27 **END OF SECTION**

SECTION 09901
COATINGS AND LININGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This specification pertains to the specialty coating and lining of manholes and lift station wet wells and valve vaults. As well as 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.
- B. Precast concrete rehabilitation and new structures: The Work shall include the furnishing and installation of an interior protective lining/coating corrosion protection system including all necessary materials, equipment and tools as required for a complete installation in accordance with the manufacturers recommendations. The completed system shall provide a waterproof, corrosion protection system to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.

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.
- B. Fiberglass liner manufacturers shall certify that the liner has been manufactured, sampled, tested, and inspected in accordance with ASTM D 3753.
- C. Polyethylene liner manufacturers shall certify that the liner has been designed and manufactured in accordance with ASTM F 1759 and these specifications.
- D. Holiday Testing: Each coat 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

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 1.04 COVERAGE

2 A. The protective lining/coating corrosion protection shall cover all concrete surfaces within
3 the wetwell or manhole including the adjustment ring area.

4 B. Coatings and lining surfaces shall be holiday free and all defects shall be repaired in
5 accordance with the manufacturer's recommendations prior to the next coat being
6 applied.

7 1.05 REFERENCE STANDARDS

8 A. American Society for Testing and Materials (ASTM)

9 1. ASTM C1244: Standard Test Method for Concrete Sewer Manholes by the Negative
10 Air Pressure (Vacuum) Test Prior to Backfill

11 2. ASTM D3299: Filament-Wound Glass-Fiber Reinforced Thermoset Resin Corrosion-
12 Resistant Tanks

13 3. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings
14 Materials

15 4. ASTM D3753: Glass-Fiber-Reinforced Polyester Manholes and Wetwells

16 5. ASTM D6365: Nondestructive Testing of Geomembrane Seams using the Spark Test.

17 6. ASTM F1759: Design of High-Density Polyethylene (HDPE) Manholes for Sub-
18 surface Applications

19 7. ASTM F1869: Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using
20 Anhydrous Calcium Chloride

21 8. ASTM G62: Standard Test Methods for Holiday Detection in Pipeline Coatings.

22 B. NACE INTERNATIONAL (Formerly The National Association of Corrosion Engineers)

23 1. NACE SP0188-2006 (formerly RP0188): Discontinuity (Holiday) Testing of New
24 Protective Coatings on Conductive Substrates.

25 2. NACE Standard SP0490-2007 (formerly RP0490): Holiday Detection of Fusion-
26 Bonded Epoxy External Pipeline Coating of 250 to 760 μm (10 to 30-mils).

27 3. NACE Standard SP0178-2007 (formerly RP0178): Design, Fabrication, and Surface
28 Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

29 **PART 2 - PRODUCTS**

30 2.01 GENERAL

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

1 2.02 HDPE LINERS

- 2 A. The Work shall include the furnishing and installation of an interior protective liner
3 system including all necessary labor, materials, equipment and tools as required for a
4 complete installation. Liner shall be high-density polyethylene (HDPE). This liner shall
5 provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete
6 surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater
7 and to prevent infiltration. To ensure total unit responsibility, all materials and
8 installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.
- 9 B. Manhole HDPE Liner shall have a minimum thickness of 2-mm (78-mil) and wetwell
10 HDPE shall have a minimum thickness of 5-mm (195-mil). All HDPE liner sheets shall
11 be extruded with a large number of anchoring studs, a minimum of (420/m², 39/ft²),
12 manufactured during the extrusion process in 1-piece with the sheet so there is no
13 welding and no mechanical finishing work to attach the studs to the sheet. The liner shall
14 have a pull out of 112.5-lbs/anchoring stud. A manufacturer certified fabricator shall
15 custom fit the liner to the formwork in order to protect the concrete surfaces from sewer
16 gases.
- 17 C. All welding shall be performed in accordance with the published directives and
18 procedures of the manufacturer and by welders certified by the manufacturer and
19 documentation shall be provided to the County prior to the Work. Completion of
20 welding will provide a 1-piece monolithic HDPE protective liner system that will provide
21 excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event
22 that infiltration occurs. Flat liner sheet, not anchored, used for overlapping joints, shall
23 have a minimum thickness of 3-mm for manholes or 5-mm for wetwells and shall contain
24 a co-extruded bottom surface layer of conductive polyethylene. Conductive cap strip
25 material shall have a free path from the back side of the sheet to a portion of the concrete
26 surface.
- 27 D. Field welding of the liner at the riser joints shall be completed only after vacuum testing
28 (ASTM C1244) of the new structure has been completed and any concrete joint
29 deficiencies have been rectified. Vacuum testing is not required on rehabilitation of
30 existing structures.
- 31 E. Testing and supervision of the installation and welding shall be performed by qualified
32 staff only and must be checked when completed by visually checking and by Spark
33 Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All
34 high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor
35 model AP/W Holiday Detector or equal.
- 36 F. Penetrations (Forcemain, conduit, etc) shall have an internal boot comprising of
37 minimum of 3/8-inch 316SS band clamp compressing a 2-inch wide neoprene with full
38 circumferential welded boot around each penetration in accordance with the
39 manufacturer's details.

1 2.03 PREFORMED POLYPROPYLENE (PP) LINERS

- 2 A. The Work shall include the furnishing and installation of an interior protective liner
3 system including all necessary labor, materials, equipment and tools as required for a
4 complete installation. This liner shall provide a waterproof, corrosion resistant liner to
5 prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive
6 gases/acids produced by wastewater and to prevent infiltration. To ensure total unit
7 responsibility, all materials and installation thereof shall be furnished by, and coordinated
8 with, 1 supplier/manufacturer.
- 9 B. All joints shall be field welded by hot air extrusion welding with PP welding bead. Field
10 welding of the PP liner at the riser joints shall be completed only after vacuum testing
11 (ASTM C1244) of the new structure has been completed and any concrete joint
12 deficiencies have been rectified. Vacuum testing is not required on rehabilitation of
13 existing structures.
- 14 C. Testing and supervision of the installation and welding shall be performed by qualified
15 staff only and must be checked when completed by visually checking and by Spark
16 Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All
17 high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor
18 model AP/W Holiday Detector or equal.
- 19 D. Penetrations (Forcemain, conduit, etc) shall be gasketed PP pipe bell connectors or PP
20 sleeves for boot type connectors and shall be attached to the PP liner by hot air extrusion
21 welding with PP welding bead in accordance with the manufacturer's details.

22 2.04 FIBERGLASS LINERS

- 23 A. General: Fiberglass reinforced polyester wetwell and manhole liners shall be manufactured
24 from commercial grade polyester resin or other vinyl ester resin with fiberglass reinforcements.
25 The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute
26 sulfuric acid, as well as other gases associated with the wastewater collection systems.
27 Fiberglass products shall be manufactured in accordance with National Bureau of Standards,
28 Voluntary Product Standard PS 1569 and ASTM D-3753. All inserts and sleeves for piping
29 shall be in accordance with the liner manufacturer's recommendations and shall result in
30 complete coverage of all pre-cast sections and be capable of passing a spark test. The
31 manufacturer shall have a minimum of 5-years experience in manufacturing products which
32 meet the specified standards and shall provide 3 references to verify the qualifications of the
33 manufacturer.
- 34 B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing
35 materials shall be commercial grade "E" type glass in the form of mat, chopped roving,
36 continuous roving, roving fabric or a combination of the above, having a coupling agent
37 that will provide a suitable bond between the glass reinforcement and resin. All materials
38 including resins, glass reinforcement, fillers and additives shall be chemically resistant to
39 hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the
40 inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed

1 at the factory with the same glass-resin jointing process.

2 C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and
3 no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior
4 surface shall be resin rich with no exposed fibers and shall be free of crazing, de-
5 laminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-inch or greater in
6 depth, resin runs, dry areas, sharp projections, or surface pits greater than 6 per square
7 foot if they are less than 3/4-inch diameter and less than 1/16-inch deep. The exterior
8 surface shall be free of blisters larger than 1/2-inch in diameter. To provide UV protection,
9 the exterior surface shall have a factory applied gray pigment for a minimum thickness of
10 0.125-inches.

11 D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed
12 for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The
13 fiberglass reinforced wetwell liner and manholes shall meet the following physical
14 requirements:
15

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6 x 10 ⁶ for MH's 0.8 x 10 ⁶ for Wetwell's	0.7 x 10 ⁶
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4 x 10 ⁶	0.7 x 10 ⁶
Compressive MH's(psi)	18,000	12,000

16 E. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of
17 percent retention of each property after immersion testing when plotted against the log of
18 immersion time and extrapolated to 100,000-hours shall assure retention of at least 50%
19 of the initial properties.

20 F. FRP liner shall be 1-piece with no vertical or horizontal seams allowed. The FRP shall
21 be fabricated in accordance with NBS PS 15-69, and shall consist of commercial grade
22 polyester resin, UV inhibitor, chopped strand, woven roving, and continuous
23 reinforcement. Minimum liner thickness shall be 1/2-inch for all diameter wells, and
24 shall not have external ribs. Liner size shall be field verified by liner manufacturer's
25 representative. Tolerance of the inside diameter shall be +/- 1% of the required liner
26 diameter.

27 G. Testing: All tests shall be performed as specified in ASTM D3753 latest edition, Section
28 8, test method D-790 (note 5) and test method D695. Each completed liner shall be
29 examined for dimensional requirements, hardness and workmanship. All required ASTM
30 D3753 testing shall be completed and records of all testing provided to the County. As a
31 basis of acceptance, the manufacturer shall provide an independent certification which
32 shall consist of a copy of the manufacturer's test report, and be accompanied by a copy of
33 the test results that the liner has been sampled, tested and inspected in accordance with
34 the provisions of this specification and meets all its requirements. The independent
35 certification and manufacturer's test report shall be provided to the County prior to
36 delivery of the Liner.

1 H. Fiberglass Reinforced Top: The fiberglass manhole liner top shall be fabricated using
2 fiberglass material as above. Material and installation to meet all physical requirements
3 as above. Top to be attached to wetwell liner pipe with fiberglass layup to comply with
4 ASTM D3299. When reinforcement is necessary for strength, the reinforcement shall be
5 fiberglass channel laminated to the inside of the liner top and shall comply with ASTM
6 D3299. 4,000-psi concrete shall be poured around the entire manhole fiberglass cone
7 section. Lift station top slabs shall be re-poured with HDPE interior liner. Contractor
8 shall ensure an airtight connect between the Pump Station HDPE lined top slab and
9 interior wetwell liner.

10 I. Non-Shrink Grout: Non-shrink grout used in the bench area of manholes and fillet areas
11 of wetwells, or on pipe penetrations shall be 100% calcium aluminate, un-thinned and un-
12 altered, as manufactured by Sewpercoat, Strong-Seal, or an approved equal.

13 J. Miscellaneous Materials: Additional items of construction necessary for the complete
14 installation of the fiberglass liner shall conform to specific details on the Drawings and
15 shall be constructed of first-class materials conforming to the applicable portions of these
16 Specifications.

17 2.05 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, HYDRANTS,
18 FITTINGS AND APPURTENANCES)

19 Cleaning, surface preparation, coating application, and thickness shall be as specified
20 herein and shall meet or exceed the coating manufacturer's recommendations. When the
21 manufacturer's minimum recommendations exceed the specified requirements,
22 Contractor shall comply with the manufacturer's minimum recommendations. All
23 cleaning, surface preparation, coating application, thickness, testing, and coating
24 materials (where available) shall be in accordance with the referenced standards of
25 AWWA, ANSI, NACE, SSPC, NSF, and ASTM. Color-coding shall be Safety Blue,
26 Safety Green and Pantone Purple 522-C for water, wastewater and reclaimed water
27 respectfully. Surfaces shall be holiday detected in accordance with ASTM G 62. Areas
28 found to have holidays shall be marked and repaired in accordance with the paint
29 manufacturer's instructions. The County shall be notified of time of testing so that he
30 might be present to witness testing.

31 A. Procedures for Coating Exterior of DIP, Hydrants, Fittings and Appurtenances

32 1. Surface Preparation: Do not abrasive blast or prepare more surface area than can be
33 coated in the same day; prepare surfaces and apply prime coatings within an 8-hour
34 period.

35 a. Steel: Shall require NACE-1/SSPC-SP5 White Metal Blast Cleaning minimum
36 angular anchor profile of 1.5-mils. White metal blast cleaning removes all of the
37 coating, mill scale, rust, oxides, staining, corrosion products, and other foreign
38 matter from the surface.

39 b. DIP: DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances),
40 Shall require NACE-3/SSPC-SP6 Commercial Blast Cleaning minimum angular
41 anchor profile of 1.5-mils. Commercial blast cleaning removes all visible oil,
42 grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other

1 foreign matter from all surfaces and allows stains to remain on 33% (percent) of
2 each unit area of surface.

- 3 c. Note: Primer Option - Hydrants, FBE (Valves and appurtenances), existing
4 factory coatings: Where specifically called out in the Coating System Table
5 below, NACE-4/SSPC-SP7 may be substituted for the commercial blast for
6 hydrants and factory applied FBE (Valves and appurtenances) where the coating
7 manufacturer has specifically provided compatible coatings with existing coatings
8 including urethane, epoxy, alkyd and water-based coatings. Under no
9 circumstances shall DIP with asphaltic seal coat be over-coated. NACE-4/SSPC-
10 SP7 Brush-Off Blast Cleaning shall be free of all visible oil, grease, dirt, dust,
11 loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust,
12 and coating may remain on the surface. Mill scale, rust, and coating are
13 considered tightly adherent if they cannot be removed by lifting with a dull putty
14 knife after abrasive blast cleaning has been performed.
- 15 2. Contaminants: Remove dirt, dust, oil and all other contaminants that could interfere
16 with adhesion of the coating in accordance with SSPC-SP1 for the substrate and
17 between each coating layer.
 - 18 3. Temperature: Surface temperature of substrate shall be a minimum of 5°F above the
19 dew point and rising and generally between 40°F to 100°F. Temperatures shall not
20 exceed manufacturer's recommendations.
 - 21 4. Stripping: Edges, corners, crevices, welds, and bolts shall be given a brush coat/stripe
22 coat for each material/layer. The stripe coat shall be applied by a brush and worked
23 in both directions.
 - 24 5. Coatings Systems: Two (2) options for coating systems are provided. Each coat shall
25 be a distinctive color or shade to verify each coating in the system.
 - 26 6. Prime coat: DIP, DIP with asphaltic seal coat, Hydrants, FBE (Valves and
27 appurtenances) prime coat shall be zinc-rich. Zinc-rich shall only be used on bare
28 metal. Factory applied FBE/Asphaltic/Mastic coatings on valves and appurtenances
29 shall be completely removed per NACE 3 / SSPC-SP6.
 - 30 7. Note: Where specifically called out in the Coating System Table for factory applied
31 FBE (Valves and appurtenances) surface preparation may be NACE-4/SSPC-SP7 and
32 the prime coat shall be an Inorganic water based epoxy. Asphaltic seal coats and
33 mastics shall not be overcoated with Inorganic water based epoxy.
 - 34 8. Intermediate coat: Varies per coating system.
 - 35 9. Final Coat: Varies per coating system.
 - 36 10. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-
37 125 volts DC per mil in accordance with the latest edition of the following standards:
38 NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the
39 manufacturers recommendations. All low voltage holiday testing shall be performed
40 using a Tinker & Razor model M-1 Holiday Detector or equal.
 - 41 11. Coating Systems: Either System 1 or System 2 shall be used for above ground, non-
42 immersion ferrous metal surfaces (Inclusive of Steel, DIP, Hydrants, Fittings and
43 Appurtenances).
- 44

1

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 2 Safety 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

2

3

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

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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

1 2.06 SPECIALTY COATINGS

2 A. The Specialty Coatings are for rehabilitation of existing precast concrete manholes and
3 existing valve vaults. New precast structures shall be lined only. All specialty coatings
4 applicators shall follow the procedure as outlined below:

- 5 1. Pre-Inspection: Applicator shall take appropriate action to comply with all local, state
6 and federal regulations including those set forth by OSHA, EPA, the County and any
7 other applicable authorities. Prior to conducting any work, perform inspection of
8 structure to determine need for protection against hazardous gases or oxygen-depleted
9 atmosphere and the need for flow control or flow diversion.
- 10 2. Bypass plan: Bypass plan for flow control or bypass shall be submitted to the County
11 for approval prior to conducting the work. Any active flows shall be dammed,
12 plugged, or diverted as required to ensure all liquids are maintained below or away
13 from the surfaces to be coated until final applications are cured as recommended by
14 the corrosion protection system manufacturer.
- 15 3. Surface Preparation: NACE 6/SSPC-SP13 "Surface Preparation of Concrete." Dry
16 abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and
17 centrifugal shot blasting, high pressure water cleaning (5,000 to 10,000-psig), water
18 jetting (10,000 to 30,000-psig) or combination of methods to remove deteriorated
19 concrete, brick or mortar, laitance, hard contaminants, existing coatings, localized
20 micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and
21 other concrete surfaces and shall display a surface profile suitable for application of
22 the system. Minimum surface profile shall be ICRI CSP-5 or greater. Containment
23 shall be provided to capture spent abrasive material and deteriorated concrete for
24 removal by the Contractor.
- 25 4. Substrate Inspection: After completion of surface preparation, the Contractor shall
26 inspect for: Leaks, Cracks, Holes, Exposed Rebar, Ring and Cover Condition, Invert
27 Condition, Inlet and Outlet Pipe Condition. After the defects in the structure have
28 been identified, repair with a manufacturer approved underlayment or material to
29 assure proper rehabilitation of the surface defect and compatibility with the specialty
30 coating system product to be applied. Repairs to exposed rebar, defective pipe
31 penetrations or inverts, shall be recommended by the specialty coating manufacturer
32 and approved by the County prior to proceeding with the repair. Final preparation
33 and cleaning of repaired surfaces is required prior to application of the coating and
34 shall comply with the corrosion protection system manufacturer's recommendations.
- 35 5. Manufacturer's certification: Applicators, installers, welders and application
36 equipment shall be certified by the manufacturer of the corrosion protection system
37 and documentation shall be provided to the County prior to the work.
- 38 6. Area to be coated: All exposed concrete of the entire interior surface of precast
39 structure including but not limited to benching, pipe penetrations, walls, bottom of
40 top slab, chimney, etc. Flow channel inverts are not necessary to coat. Corrosion
41 protection system shall interface with adjoining construction materials/components
42 throughout the manhole structure to effectively seal and protect substrates from attack
43 by corrosive elements and to ensure the effective elimination of infiltration into the
44 sewer system.

- 1 7. Application: Application of specialty coating system shall be in strict accordance with
2 manufacturer's recommendation. Specified surfaces should be shielded to avoid
3 exposure of direct sunlight, other intense heat source or, where cementitious products
4 are employed, excessive ventilation. Where varying surface temperatures do exist,
5 coating installation should be scheduled when the temperature is falling versus rising.
6 Verification of the corrosion protection system thickness shall be verified during
7 application via wet gauge methods or following cure of the system using appropriate
8 non-destructive or destructive methods.
- 9 8. Holiday Testing: Cure time shall be in accordance with the Manufacturers product
10 data sheet. Final concrete structure corrosion protection system shall be completely
11 free of holidays, pinholes or voids. High voltage Holiday testing shall be required
12 and holidays marked and repaired with same material and to same thickness as
13 required of original installation. All high voltage discontinuity (spark) testing shall
14 be performed using a Tinker & Rasor model AP/W Holiday Detector or equal and at
15 100-125 volts DC per mil or per the manufacturers recommendations.
- 16 9. Destructive Testing: Destructive testing may be performed as directed by the County
17 to verify coating adhesion and coating DFT. Repairs to areas tested by destructive
18 means shall be repaired by the certified applicator at the Contractor's expense.
- 19 10. Reporting: Provide final written report to the County detailing the location, date of
20 report, description of repair or original installation and manufacturer data and cut
21 sheets of the corrosion protection system and applicable testing results as per sections
22 7, 8 and 9.
- 23 11. Warranty: The report shall contain a copy of the warranty.

- 24 B. System SC-1: Sauereisen Sewergard 210 (Trowelable), 210FS (Trowelable Fast Set), 210S
25 (Sprayable) or 210RS (Rotary Spray) shall be applied and then shall be finished with a coat
26 of Sauereisen Sewergard Glaze 210G. The lining system to be utilized shall be an epoxy
27 mortar or aggregate filled epoxy. Material furnished under this specification shall be a pre-
28 packaged from the manufacturer. Materials shall be trowel applied or sprayed and shall
29 conform to the Manufactures product data sheet as supplied by the manufacturer.
- 30 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
31 thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to
32 application.
- 33 2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch
34 shall be repaired with Sauereisen Underlayment No F-120, F-121 or F-209 Filler
35 prior to application of protective lining/coating corrosion protection system.
- 36 3. Thickness:
 - 37 a. Sewergard 210 / 210FS / 210RS: The material shall be applied in 1 or more layers
38 for a total thickness of minimum of 125-mils DFT (1/8-inch). After application,
39 the material shall be damp rolled with excess water shaken off prior to back
40 rolling.
 - 41 b. Sprayable 210S: The material shall be applied in 1 or more layers for a total
42 thickness of minimum of 60-mils shall be required for the Spray applied 210S.
- 43 4. Finishing Glaze: After application, and curing of either the 210, 210FS, 210RS or
44 210S, the material shall be coated with a minimum of 20-mils of Sauereisen
45 Sewergard Glaze 210G by roller or spray application in accordance with the
46 manufacturers recommendations.

- 1 5. Holiday Testing: The protective lining/coating protection system shall be cured in
2 accordance with the manufacturer's recommendations prior to holiday testing at a
3 minimum of 14,500 volts.
- 4 C. System SC-2: Tnemec Perma-Shield Coating System.
- 5 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
6 thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to
7 application and surface shall be minimum 5°F above the dew point. Moisture content
8 not to exceed 3-pounds per 1,000 square feet in a 24-hour period verify dryness using
9 a "plastic film tape-down test" ASTM D4263 and perform Anhydrous Calcium
10 Chloride ASTM F1869.
- 11 2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch
12 shall be repaired Series 217 or 218 Filler prior to application of protective
13 lining/coating corrosion protection system. Concrete surface shall be pre-wet or
14 dampened with potable water prior to surfacer application.
- 15 3. Thickness: Lining Series 434: The material shall be applied in 1 or more layers for a
16 total thickness of minimum of 125-mils DFT (1/8-inch).
- 17 4. Finishing Glaze: After application, and curing, the material shall be coated with 15-
18 20-mils of Series 435 in accordance with the manufacturer's recommendations.
- 19 5. Holiday Testing: The protective lining/coating protection system shall be cured in
20 accordance with the manufacturer's recommendations prior to holiday testing at a
21 minimum 14,500 volts.
- 22 D. System SC-3: Sewercoat (PG and 2000 HS) Calcium aluminate mortar: The lining
23 system to be utilized shall be 100% calcium aluminate cement with 100% calcium
24 aluminate aggregate. Materials shall be spray applied by either a wet gunning (low-
25 pressure spray) or dry gunning (shotcrete) method and shall conform to the
26 manufacturer's product data sheet as supplied by the manufacturer. The equipment shall
27 be clean and free of any hydrated or un-hydrated Portland Cement.
- 28 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
29 fully saturated with water prior to application.
- 30 2. Thickness: The material shall be applied in 1 or more layers to such total thickness as
31 required. A minimum of 1-inch shall be applied.
- 32 3. Finishing: After spraying, the material shall be brushed or trowel finished.
- 33 4. Curing: Curing by appropriate methods (curing compound, water mist, etc.) should be
34 implemented as the surface begins to harden and dry (as early as 1-hour after
35 application).
- 36 E. System SC-4: Raven 405: System shall be 100% solids epoxy. Thinning with solvents
37 shall not be permitted. Surface preparation, mixing, pot life, ambient conditions,
38 application, film thickness per coat, cure time, and recoat time shall be in accordance the
39 manufacturer's recommendations.
- 40 1. Applicator/installer shall be certified by the Manufacturer.
- 41 2. Surfacer/Repair: Raven 710, 705CA or Raven 700 shall be spray applied or trowelled
42 to repair/fill minor surface defects or applied as an underlayment.

- 1 3. Primer: Concrete exhibiting a moisture vapor emission rate greater than 3-lbs/1,000
2 square feet/24-hours, when tested according to ASTM F1869, shall be primed with
3 Raven 155. Raven 155 primer (2 component waterborne epoxy) shall be applied at a
4 maximum of 8-mil WFT (3-mil DFT). Recoat window minimum 2-4-hours at 72°F
5 with maximum 72-hours at 72°F.
 - 6 4. Top Coat: Raven 405 shall be applied with an approved plural component airless
7 spray system. Coating thickness shall be in relation to the profile of the surface to be
8 coated as recommended by the coating product manufacturer. In all cases the coating
9 shall be applied with minimum of 2 coats applied at 40-80-mils WFT/DFT each for
10 minimum final film thickness at 125-mils DFT. Subsequent top coating or additional
11 coats of the coating product(s) shall occur within the product's recoat window:
12 minimum cure to a tacky state; maximum cure of 18-hrs at 72°F substrate
13 temperature. Additional surface preparation procedures will be required if this recoat
14 window is exceeded including inspection for and removal of amine blush and/or other
15 potential contaminants.
 - 16 5. Holiday Testing: The protective lining/coating protection system shall be cured in
17 accordance with the manufacturer's recommendations prior to holiday testing at a
18 minimum of 12,500 volts.
- 19 F. SC-5: Spectrashield Multicomponent Liner System. Spectrashield multi-component
20 stress panel liner system composed of moisture barrier (modified polymer), surfaces
21 (polyurethane/polymeric blend foam) and final barrier coat (modified polymer). The
22 system is applied in three-steps and the applicator/installer shall be certified by the
23 Manufacturer.
- 24 1. Application
 - 25 a. Moisture barrier: Silicone Modified Polyurea Minimum 40-mils DFT
 - 26 b. Surfacer: Polyurethane/Polymeric blend foam
 - 27 c. Final corrosion barrier: Silicone Modified Polyurea Minimum 60-mils DFT
 - 28 2. Film Thickness: Final installation shall be a minimum of 500-mils. A permanent
29 identification and date of work performed shall be affixed to the structure in a readily
30 visible location.
 - 31 3. Holiday Testing: The protective lining/coating protection system shall be cured in
32 accordance with the manufacturer's recommendations prior to holiday testing at a
33 minimum of 50,000 volts.

34 **PART 3 - EXECUTION**

35 3.01 QUALITY ASSURANCE

- 36 A. All materials shall be delivered to the job in original sealed and labeled containers of the
37 coating manufacturer, and shall be subject to inspection by the County. Labels shall
38 show name of manufacturer, type of coating, formulation, date, color and manufacturers
39 recommendations. Coatings manufacturer date shall not exceed the manufacturer's
40 recommendations for storage and useful life and Coatings manufactured in excess of 1-
41 year prior to application shall be rejected.

- 1 B. Oil and grease shall be completely removed in accordance with SSPC-SP1 before
2 beginning any other surface preparation method. Surfaces of welds shall be scraped and
3 ground as necessary to remove all slag and weld spatter.
- 4 C. All components of equipment that can be properly prepared and coated after installation
5 shall be installed prior to surface preparation. Components that will be inaccessible after
6 installation shall have the surfaces prepared and coated before installation.
- 7 D. All ferrous metal surfaces shall be free of all defects and have all sharp edges, welds,
8 slag, defects and weld splatter ground smooth in accordance with NACE Standard
9 RPO178.
- 10 E. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) for
11 each coating. The stripe coat shall be applied by a brush and worked in both directions.
12 Special attention shall be given to filling all crevices with coating.
- 13 F. Coating shall be applied in a neat manner that will produce an even film of uniform and
14 proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks.
15 Each coat shall be carefully examined and faulty material, poor workmanship, holidays,
16 damaged areas and other imperfections shall be touched up prior to applying succeeding
17 coats. Each coat shall be thoroughly dry and hard before the next coat is applied in
18 accordance with the coating manufacturer's recommendations for drying time between
19 coats. In no case shall coating be applied at a rate of coverage greater than the maximum
20 rate recommended by the coating manufacturer. Each coat shall be uniform in coverage
21 and color. Successive coats shall perceptibly vary in color.
- 22 G. Coating failures will not be accepted and shall be entirely removed down to the substrate
23 and the surface recoated. Failures include but are not limited to holidays, sags, checking,
24 cracking, teardrops, fat edges, fisheyes, or delamination.
- 25 H. Surfaces not required to be coated: Brass, Bronze, Stainless steel (Not including SS bolts
26 and nuts)

27 3.02 INSPECTION FOR ACCEPTANCE

- 28 A. The quality of materials, the process of manufacture and the finished sections shall be
29 subject to inspection and approval by the County. Such inspection may be made at the
30 place of manufacture, at the site after delivery or at both places and the sections shall be
31 subject to rejection at any time due to failure to meet any of the specification
32 requirements; even though sample sections may have been accepted as satisfactory at the
33 place of manufacture. Sections rejected after delivery to the job shall be marked for
34 identification and shall be removed from the job at once. Sections that have been
35 damaged after delivery will be rejected and if already installed removed and replaced,
36 entirely at the Contractor's expense.

- 1 B. At the time of inspection, the sections will be carefully examined for compliance with the
2 specified ASTM designation and with the approved manufacturer's drawings. Sections
3 shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks,
4 roughness, soundness, etc. The surface shall be dense and close-textured.
- 5 C. Precast concrete structures shall be inspected by the County and defective materials shall
6 replaced by the Contractor at the Contractor's expense.
- 7 D. Any repairs made on surfaces shall be holiday detected. Areas found to have holidays
8 shall be marked and repaired in accordance with the coating manufacturer's instructions.
9 The County shall be notified of time of testing so that he might be present to witness
10 testing.

11 3.03 FIBERGLASS LINER INSTALLATION

- 12 A. Do not drop or impact the fiberglass liner. Use of chains or cables in direct contact with
13 the liner is prohibited.
- 14 B. The Contractor shall sequence the Work so that wastewater service is maintained to
15 existing customers at all times.
- 16 C. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water blast,
17 acid washed with a 20% muratic acid solution, and pressure washed a second time. All
18 loose materials, grease/fats, and hydrogen sulfide contamination shall be removed. The
19 existing bench/fillet areas in the wetwell/manhole shall be removed prior to pressure
20 washing. An inspection of the structures shall be conducted by the County prior to the
21 fiberglass liner installation.
- 22 D. Exterior liner diameter shall be approximately 4-inches smaller than the inside diameter
23 of the barrel section of the structure.
- 24 E. Liner depth shall be from invert to top elevation of manhole and wetwell. The top 12-
25 inches of the manhole liner shall be a fiberglass neck that extends from the liner corbel or
26 cone section to the bottom of the ring and cover. The neck is used to protect the concrete
27 grade rings or brick and mortar adjustments from the sewer environment.
- 28 F. The wetwell top slab and manhole corbel or cone section shall be removed and discarded
29 by the Contractor in accordance with all applicable regulations at the Contractor's
30 expense.
- 31 G. Measure and cut wetwell liner to exact length and invert configuration. Measure and cut
32 all incoming and outgoing line openings.
- 33 H. Lower wetwell liner into wetwell and level.
- 34 I. Extend all incoming and outgoing lines inside the liner with PVC or other approved pipe.
- 35 J. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed

1 completely during initial preparation. Upon installation of the liner, a new bench/fillet
2 shall be constructed with non-shrink grout and shall be field coated with resin and
3 fiberglass in a dry environment after wastewater flows are diverted. The newly constructed
4 bench shall sufficiently overlap the newly installed liner to prevent migration of fluids or
5 gases between the liner and the bench. There shall be no exposed concrete between the
6 factory manufactured fiberglass liner and the field installed fiberglass bench overlay.

7 K. Pipe Penetrations: Piping shall extend past the liner into the fiberglass wetwell or flush
8 with the liner. If the existing piping does not fully penetrate the fiberglass liner, the
9 Contractor must extend similar material piping into the fiberglass wetwell. Any gaps on
10 joints must be sealed with a non-shrink grout specified herein.

11 L. Pour or pump 3,000-psi pump mix into the annular space between the liner and existing
12 wet well.

13 M. Use concrete grade rings on top of the liner cone section to bring ring and cover to finish
14 grade. Manhole liner neck section shall extend from the ring and cover support area up to
15 the ring and cover. The neck section shall be designed to protect the adjustment ring(s),
16 brick and mortar used to bring the ring and cover to final grade

17 N. A non-shrinking grout as specified herein shall be applied to areas that cannot be fiber-
18 glassed due to water.

19 O. Following installation, the Contractor shall determine soundness by applying air or water
20 pressure (3-5-psi) to the wet well or manhole liner. While holding at the established
21 pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured
22 pressure. Any leakage through the laminate is cause for failure of the task. The County
23 shall be present during testing. The Contractor shall be responsible for isolating the work
24 of this Contract from existing work and shall be solely responsible for the method of such
25 isolation. Refer to ASTM D-3753 8.6. Any repairs required shall be repaired in
26 accordance with the manufacturer's recommendations at the Contractor's expense.

27 P. Prior to final acceptance and final inspection of the fiberglass liner installation, flush and
28 clean all parts of the system. Remove all accumulated construction debris, rocks, gravel,
29 sand, silt, and other foreign material from the wetwell or manhole
30

31 END OF SECTION

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1 B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing
2 materials shall be commercial grade "E" type glass in the form of mat, chopped roving,
3 continuous roving, roving fabric or a combination of the above, having a coupling agent
4 that will provide a suitable bond between the glass reinforcement and resin. All materials
5 including resins, glass reinforcement, fillers and additives shall be chemically resistant to
6 hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the
7 inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed
8 at the factory with the same glass-resin jointing process.

9 C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and
10 no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior
11 surface shall be resin rich with no exposed fibers. The interior and exterior surfaces shall
12 be free of crazing, de-laminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-
13 inch or greater in depth, resin runs, dry areas, sharp projections, or surface pits greater
14 than 6 per square foot if they are less than 1/4-inch diameter and less than 1/16-inch deep.
15 To provide UV protection, the exterior surface shall have a factory applied gray pigment
16 for a minimum thickness of 0.125-inches.

17 D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed
18 for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The
19 fiberglass reinforced wetwell liner and manholes shall meet the following physical
20 requirements:
21

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6 x 10 ⁶	0.7 x 10 ⁶
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4 x 10 ⁶	0.7 x 10 ⁶
Compressive (psi)	18,000	12,000

22 E. Soundness: Following installation, the Contractor shall determine soundness by applying
23 air or water pressure (3-5-psi) to the wetwell liner. While holding at the established
24 pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured
25 pressure. Any leakage through the laminate is cause for failure of the task. The
26 Contractor shall be responsible for isolating the work of this Contract from existing work
27 and shall be solely responsible for the method of such isolation. Refer to ASTM D-3253
28 8.6.

29 F. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of
30 percent retention of each property after immersion testing when plotted against the log of
31 immersion time and extrapolated to 100,000-hours shall assure retention of at least 50%
32 of the initial properties.

1 2.02 NON-SHRINK GROUT

2 A. Non-shrink grout used in the bench area of manholes and fillet areas of wetwells, or on
3 pipe penetrations shall be 100% calcium aluminate, un-thinned and un-altered, as
4 manufactured by Sewpercoat, Strong-Seal, or an approved equal.

5 2.03 BENCH

6 A. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed
7 completely during initial preparation. Upon installation of the liner, a new bench/fillet shall
8 be constructed with non-shrink grout and shall be field coated with resin and fiberglass in a
9 dry environment after wastewater flows are diverted. The newly constructed bench shall
10 sufficiently overlap the newly installed liner to prevent migration of fluids or gases
11 between the liner and the bench. There shall be no exposed concrete between the factory
12 manufactured fiberglass liner and the field installed fiberglass bench overlay.

13 2.04 PIPE PENETRATIONS

14 A. Piping shall extend past the liner into the fiberglass wetwell or flush with the liner. If the
15 existing piping does not fully penetrate the fiberglass liner, the Contractor must extend
16 similar material piping into the fiberglass wetwell. Any gaps on joints must be sealed
17 with a non-shrink grout specified herein.

18 2.05 MANWAY NECK OR LIP

19 A. Manhole liner neck section shall extend from the ring and cover support area up to the
20 ring and cover. The neck section shall be designed to protect the adjustment ring(s),
21 brick and mortar used to bring the ring and cover to final grade.

22 2.06 MISCELLANEOUS MATERIALS

23 A. Additional items of construction necessary for the complete installation of the fiberglass
24 liner shall conform to specific details on the Drawings and shall be constructed of first-
25 class materials conforming to the applicable portions of these Specifications.

26 **PART 3 - EXECUTION**

27 3.01 INSTALLATION

28 A. Fiberglass Liner

29 1. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water
30 blast, acid washed with a 20% muratic acid solution, and pressure washed a second
31 time. All loose materials, grease/fats, and hydrogen sulfide contamination shall be
32 removed. The existing bench/fillet areas in the wetwell/manhole shall be removed
33 prior to pressure washing. An inspection of the structures shall be conducted by the
34 County prior to the fiberglass liner installation.

- 1 2. Exterior liner diameter shall be approximately 4-inches smaller than the inside
2 diameter of the barrel section of the structure.
- 3 3. Liner depth shall be from invert to top elevation of manhole and wetwell. The top
4 12-inches of the manhole liner shall be a fiberglass neck that extends from the liner
5 corbel or cone section to the bottom of the ring and cover. The neck is used to protect
6 the concrete grade rings or brick and mortar adjustments from the sewer environment.
- 7 4. The wetwell top slab and manhole corbel or cone section shall be removed and
8 discarded by the Contractor in accordance with all applicable regulations at the
9 Contractor's expense.
- 10 5. Measure and cut wetwell liner to exact length and invert configuration. Measure and
11 cut all incoming and outgoing line openings.
- 12 6. Lower wetwell liner into wetwell and level.
- 13 7. Extend all incoming and outgoing lines inside the liner with PVC or other approved
14 pipe.
- 15 8. Construct new benches/fillets and tie-in and seal bottom of liner with a quick setting
16 non-shrink grout as specified herein.
- 17 9. Tie-in and seal all lines extending into the wetwell liner with non-shrink grout.
- 18 10. Pour or pump 3,000-psi pump mix into the annular space between the liner and
19 existing wetwell.
- 20 11. Use concrete grade rings on top of the liner cone section to bring ring and cover to
21 finish grade.
- 22 12. A non-shrinking grout as specified herein shall be applied to areas that cannot be
23 fiber-glassed due to water.

24 3.02 SHIPPING

- 25 A. Do not drop or impact the fiberglass wet well liner. Use of chains or cables in direct
26 contact with the wet well is prohibited.

27 3.03 MAINTENANCE OF SERVICE

- 28 A. The Contractor shall sequence the Work so that wastewater service is maintained to
29 existing customers at all times.

30 3.04 FIELD QUALITY CONTROL

- 31 A. Workmanship: It is imperative that the wetwell liner and appurtenances be built
32 watertight and that the Contractor adhere rigidly to the specifications for materials and
33 workmanship. Upon completion, the wetwell liner will be tested and if any damage on
34 the liner is observed, the fiberglass liner installation will be rejected.

35 B. Cleaning

- 36 1. Prior to final acceptance and final inspection of the fiberglass liner installation, flush
37 and clean all parts of the system. Remove all accumulated construction debris, rocks,
38 gravel, sand, silt, and other foreign material from the wetwell.

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2. Upon the County's final inspection of the fiberglass liner installation, if any foreign matter is still present in the system, flush and clean the section and portions of the wetwell as required.
 3. Testing: Upon installation, cleaning, and visual inspection, the Contractor shall, in the presence of the County, test the entire lined surface in accordance with subsection 2.01, E of this specification section. Any repairs required shall be repaired in accordance with the manufacturer's recommendations at the Contractor's expense. The cost for the performance of this test shall be borne entirely by the Contractor.

9

END OF SECTION

1 **SECTION 09960**

2 **HIGH PERFORMANCE FERROUS METAL COATINGS**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

5 A. The work of this section includes surface preparation, coating systems and methods of
6 application. All work shall be done in strict accordance with this specification, the
7 Contract Documents, and the manufacturer's printed instructions.

8 B. The Contractor shall furnish all supervision, labor, tools, materials, equipment,
9 maintenance of traffic, containment systems, scaffolding, other structures and incidentals
10 required for transportation, unloading, storage, surface preparation, protection of the
11 public and environment, application of products, and cleanup necessary to complete this
12 Contract in its entirety.

13 C. The scope of Work includes painting all exposed miscellaneous metal, pipe, fittings,
14 valves, hangers, straps, support, hardware, equipment, appurtenances, and all other work
15 obviously required to be painted unless otherwise specified. The Contractor shall also paint
16 all surfaces he affects or damages during his performance of the Work, which may be
17 exposed to view in the finished work including, but not limited to, metals, pipe, fittings,
18 valves, equipment and all other existing items similar to proposed items specified for
19 painting. Miscellaneous metal items to be painted shall be included in the Work of this
20 Section where they come within the general intent of the Specifications or as stated herein.

21 D. In general the following surfaces shall be painted:

- 22 1. Pipe, fittings, flanges, appurtenances and other metal surfaces to 1 ft below grade. Pipe 1
23 ft below grade and within 6-inches above grade shall be considered immersion surface
24 and shall be coated with the immersion surface high performance coating system.
- 25 2. Metal or Galvanized materials including, but not limited to: pipe straps, hangers, pipe
26 support floor stands, nuts, bolts, hardware and tapping saddles. Pipe straps to be
27 removed and coated on both sides.
- 28 3. Pipe Surfaces under pipe straps. Pipe straps shall be removed and pipe coated
29 underneath pipe straps regardless if pipe straps are to be coated. No more than two-
30 thirds of the total number of pipe straps shall be removed at any given time.
- 31 4. Pedestrian access barriers shall be removed and coated on all sides.
- 32 5. Incidentals within the limits of the project including but not limited to bollards,
33 adjacent walkways, walls or supports containing graffiti.
- 34 6. Contractor shall provide new 1/2" neoprene that shall be placed at contact interfaces
35 between materials including, but not limited to, pipe support floor stands, pipe straps, and
36 access barriers. The Contractor shall remove and replace existing neoprene where
37 exposed with new material. In situations where 1/2" neoprene is not sized properly for
38 existing conditions, the County on a case by case basis may require a different thickness.

- 1 E. The following surfaces or items are not generally required to be painted, unless noted
2 otherwise. The Contractor shall properly protect these materials from surface
3 preparation, coating application, or damage.
4 1. Products with polished chrome, aluminum, nickel, Stainless steel, brass, or bronze
5 materials.
6 2. Stainless steel finish hardware.
7 3. Flexible couplings.
8 4. Labels, signs or nameplates including but not limited to: UL, FM, equipment
9 identification, performance rating, name and nomenclature plates.
10 5. Aluminum handrails, walkways, window, louvers, and grating unless otherwise
11 specified herein.

12 1.02 REFERENCES

- 13 A. SSPC – Society for Protective Coatings
14 B. ASTM – American Society of Testing Materials
15 C. NACE – National Association of Corrosion Engineers
16 D. NSF – National Sanitation Foundation (Standard 61)
17 E. AWWA – American Water Works Association

18 1.03 DEFINITIONS

- 19 A. Field Coating is the coating of new or rebuilt items at the job site. Field coating shall be
20 the responsibility of the Contractor.
21 B. Shop Coating is the coating of new or rebuilt items in the shop prior to delivery to the jobsite.
22 C. Exterior – Outside, exposed to weather
23 D. Interior – Inside, not subject to immersion service
24 E. Immersion service – Material submerged or subject to splash or spray
25 F. WFT – Wet Film Thickness
26 G. DFT – Dry Film Thickness
27 H. MDFT – average minimum dry film thickness
28 I. SCARIFY – Roughen the entire existing coating surface by use of brush off blasting,
29 hand tools, sanding, etc to provide an anchor profile for adhesion by new coating
30 systems. Scarified surface shall be approved by the Coatings manufacturer and County
31 prior to over-coating. Existing rust spots, weld slag, sharp edges, defects etc shall be
32 removed by SSPC-SP3 Power tool cleaning.

- 1 J. General: The following referenced surface preparation specifications of the Joint Surface
2 Preparation Standards from NACE International (NACE) and The Society for Protective
3 Coatings (SSPC) shall form a part of this Specification:
- 4 1. SSPC-SP1 Solvent Cleaning. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax,
5 fat, foreign matter, and contaminants, etc. by one of the following methods: steam
6 cleaning, alkaline cleaning, or volatile solvent cleaning. Rags and solvents must be
7 replenished frequently to avoid spreading the contaminant rather than removing it.
8 Low-pressure (1500-4000 psi) high volume (3-5 gal/min) water washing with
9 appropriate cleaning chemicals is a recognized "solvent cleaning" method. All
10 surfaces should be cleaned per this Specification prior to using hand tools or blast
11 equipment and between each coating application.
 - 12 2. SSPC-SP2 Hand Tool Cleaning. Removal of loose rust, loose mill scale, loose paint
13 and loose foreign matter to a clean sound substrate by hand chipping, scraping,
14 sanding, and wire brushing. Tightly adherent rust, mill scale or paint may remain
15 providing that it cannot be removed by lifting with a dull putty knife
 - 16 3. SSPC-SP3 Power Tool Cleaning. Removal of loose rust, loose mill scale, loose paint
17 and loose foreign matter, to a clean sound substrate by power tool chipping,
18 descaling, sanding, abrasive grinding wheels, needle guns, wire brushes, etc. Tightly
19 adherent rust, mill scale or paint may remain providing that it cannot be removed by
20 lifting with a dull putty knife
 - 21 4. SSPC-SP5 White Metal Blasting (NACE-1). Complete removal of all visible oil,
22 grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other
23 foreign matter, leaving the surface a uniform gray-white color.
 - 24 5. SSPC-SP6 Commercial Blast (NACE-3). Complete removal of all visible oil, grease,
25 dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign
26 matter, leaving only light shadows or discolorations from stains of rust, mill scale, or
27 previous coating on 33% of the unit surface area. At least 66% of each unit surface
28 area is to be free of all visible discoloration or staining.
 - 29 6. SSPC-SP 7 Brush-Off Blast (NACE 4). Complete removal of oil, grease, dust, dirt,
30 loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale,
31 rust and previous coating. Tightly adherent rust, mill scale or paint may remain
32 providing that it cannot be removed by lifting with a dull putty knife.
 - 33 7. SSPC-SP10 Near White Blast (NACE 2). Complete removal of all visible oil, grease,
34 dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign
35 matter, leaving only light shadows or discolorations from stains of rust, mill scale, or
36 previous coating on 5% of the unit surface area. At least 95% of each unit surface
37 area is to be free of all visible discoloration or staining.
 - 38 8. SSPC-SP 11 Power Tool Cleaning to Bare Metal. Complete removal of all visible oil,
39 grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign
40 matter and retain or produce a minimum 1.0 mil surface profile. Slight residues of
41 rust and paint may be left in the lower portion of pits if the original surface is pitted.
 - 42 9. SSPC-SP 12 Waterjetting (NACE-5). Surfaces preparation by ultra-high pressure
43 water jetting discharged from a nozzle at pressures of 70 MPa (10,000 psig) or greater
44 to prepare a surface for coating or inspection. The difference in degrees of surface
45 cleanliness is defined by the amount of pressure as follows:
46 a. Low Pressure Water Cleaning (LP WC) Less than 34 MPa (5,000 psi)
47 b. High Pressure Water Cleaning (HP WC) 34 to 70 MPa (5,000-10,000 psi)

- 1 c. High Pressure Water Jetting (HP WJ) 70 to 210 MPa (10,000-30,000 psi)
2 d. Ultra-High Pressure Water Jetting(UHP WJ) Above 210 MPa (30,000 psi)
3 e. WJ-1 Clean to Bare Substrate: Complete removal of all visible rust, dirt, previous
4 coatings, mill scale, and foreign matter. Discoloration of the surface may be present.
5 f. WJ-2 Very Thorough or Substantial Cleaning: Complete removal of all visible oil,
6 grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent
7 thin coatings, and other tightly adherent foreign matter limited to a maximum of
8 5% of the surface.
9 g. WJ-3 Thorough Cleaning: A WJ-3 surface shall be cleaned to a matte (dull,
10 mottled) finish is free of all visible oil, grease, dirt, and rust except for randomly
11 dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent
12 foreign matter limited to a maximum of 33% of the surface.
13 h. WJ-4 Light Cleaning: A WJ-4 surface shall be cleaned to a finish which is free of
14 all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating.
15 Any residual material shall be tightly adherent.
16 10. SSPC-SP13 Surface Preparation of Concrete (NACE-6). Complete removal of
17 contaminants, laitance, form oils, dust, dirt, loosely adhering concrete, and previous
18 coating. Blasting, High-pressure water cleaning or waterjetting methods should be
19 performed sufficiently close to the surface so as to open up surface voids, bug holes, air
20 pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.
21 11. SSPC-SP 14 Industrial Blast Cleaning (NACE-8). Complete removal of oil, grease,
22 dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill
23 scale, rust and previous coating evenly distributed on 10% of the unit surface area.
24 Stains and discolorations may be present on 90% of the unit area. Tightly adherent
25 rust, mill scale or paint cannot be removed by lifting with a dull putty knife.
26 12. SSPC-SP 15 Commercial Grade Power Tool Cleaning. Complete removal of all
27 visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other
28 foreign matter, except random staining shall be limited to no more than 33 percent of
29 each unit area of surface. Staining may consist of light shadows, slight streaks, or
30 minor discolorations caused by stains of rust, stains of mill scale, or stains of
31 previously applied coating. Slight residues of rust and paint may also be left in the
32 bottoms of pits if the original surface is pitted. (Equivalent standard as SSPC-SP6
33 Commercial Grade Blast Cleaning NACE-3).

34 1.04 SUBMITTALS

- 35 A. Submit to the Engineer as provided in the General Conditions and Division 1, shop
36 drawings, manufacturer's specifications and data on the proposed paint systems and
37 detailed surface preparation, application procedures and dry film thickness.

- 1 B. Schedule of Painting Operations: The Contractor shall submit for approval a complete
2 Schedule of Painting Operations within 30 days after the Notice to Proceed. It shall be the
3 Contractor's responsibility to properly notify and coordinate with the County for schedule
4 updates and site activities. This Schedule shall include for each surface to be painted, the
5 brand name, the volume of solids, the coverage and the number of coats the Contractor
6 proposes to use in order to achieve the specified dry film thickness. When the schedule has
7 been approved, the Contractor shall apply all material in strict accordance with the approved
8 Schedule and the manufacturer's instructions. Wet and dry paint film gauges shall be utilized
9 by the County to verify the proper application while Work is in progress.
- 10 C. Protection and Containment Plan: The Contractor shall submit for approval the process,
11 equipment, design, materials, requirements, disposal and methods to provide for
12 protection of the environment, collection of abrasive blasting material, collection of
13 existing coatings, protection of the public and protection for public access.
- 14 D. Maintenance of Traffic Plan (MOT): The Contractor shall prepare and submit a Traffic
15 Control Plan to the Owner, and Orange County Public Works Department or Florida
16 Department of Transportation for review and acceptance prior to commencing any Work
17 on the site. The Traffic Control Plan shall detail procedures and protective measures
18 proposed by the Contractor to provide protection and control of traffic affected by the
19 Work consistent with the following applicable standards:
20 1. Standard Specifications for Road and Bridge Construction, Latest Edition including
21 all subsequent supplements issued by the Florida Department of Transportation
22 (FDOT Spec.).
23 2. Manual of Traffic Control and Safe Practices for Street and Highway construction,
24 Maintenance and Utility Operations, FDOT.
25 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 26 E. Test panels/samples: At the request of the County, samples of the finished work prepared in
27 strict accordance with these Specifications shall be furnished, and all painting shall be equal
28 in quality to the approved samples. Finished areas shall be adequate for the purpose of
29 determining the quality of workmanship. Experimentation with color tints shall be furnished
30 to the satisfaction of the County where standard chart colors are not satisfactory.
- 31 F. Equivalent materials of other manufacturers may be substituted on approval of the Engineer.
32 Substitutions that decrease the film thickness, the number of coats applied, change the
33 generic type of coating, or fail to meet the performance criteria of the specified materials will
34 not be approved. Prime and finish coats of all surfaces shall be furnished by the same
35 manufacturer. Requests for substitution shall include Manufacturer's literature for each
36 product giving the name, generic type, descriptive information, evidence of satisfactory past
37 performance, and an independent laboratory certification that their product meets the
38 performance criteria of the specified materials including but not limited to the following:
39 1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams
40 load
41 2. Adhesion – Elcometer Adhesion Tester
42 3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine
43 Exposure)
44 4. Hardness – ASTM D3363-74

- 1 5. Humidity – ASTM D2247-68
- 2 6. Salt Spray (Fog) – ASTM B117-73

3 1.05 QUALITY ASSURANCE

4 A. Manufacturer's Qualifications

- 5 1. All paints and/or coatings applied in the performance of the Work shall be supplied
- 6 by one paint supplier and be the product of one manufacturer; unless the County
- 7 specifies or accepts a specialty paint not available from that manufacturer.
- 8 2. The paint manufacturer shall have supplied paint for water and wastewater facilities
- 9 for a minimum of ten (10) years, and products supplied shall be contained within the
- 10 manufacturer's standard water and wastewater brochure.
- 11 3. When the manufacturer's minimum recommendations exceed the specified requirements,
- 12 Contractor shall comply with the manufacturer's minimum recommendations.

13 B. Contractor / Applicator Qualifications as listed below shall be submitted at the time of

14 Bidding as part of the Bid Package.

- 15 1. The Contractor's Project Superintendent / Project Manager shall be at minimum
- 16 certified NACE Level 1 and be in good standing with NACE International prior to
- 17 bidding. The Contractor have a Competent Person onsite as defined by OSHA.
- 18 Certification credentials shall be provided to the County and verifiable through the
- 19 NACE.org certification search website.
- 20 2. The Contractor must show proof that all employees associated with this project shall
- 21 have been employed by the Contractor for a period not less than six (6) months.
- 22 3. Painting shall be performed by experienced painters in accordance with the
- 23 recommendations of the paint manufacturer and the Contract Documents. All paint
- 24 shall be uniformly applied without sags, runs, spots, or other blemishes. Work that
- 25 shows carelessness, lack of skill, or is defective in the opinion of the County, shall be
- 26 corrected at the expense of the Contractor.
- 27 4. The applicator shall have practical experience and successful history in the
- 28 application of the specified products to surfaces of water supply and wastewater
- 29 collection and treatment facilities. A written list of references shall be provided to
- 30 show experience and costs with high performance coatings on pipelines and aerial
- 31 crossings as well with all other aspects with the defined Scope of Work.
- 32 5. The Contractor shall provide a list of equipment owned and maintained by the
- 33 Contractor that shall be utilized on the project.
- 34 6. The Contractor shall provide their written QA / QC program.
- 35 7. Contractors shall submit their protection and containment plan to prevent blasting
- 36 debris, paint chips, paint overspray from entering water bodies.

37 C. Safety and Health Requirements.

- 38 1. General: In accordance with the requirements of the OSHA Regulations for
- 39 Construction, the Contractor shall provide and require the use of personal protective
- 40 and lifesaving equipment for all persons working in or about the Project including,
- 41 but not limited to, head and face protection, fall protection, safety harnesses and
- 42 respiratory devices. Applicable health and safety precautions required by appropriate
- 43 regulatory agencies such as OSHA, ANSI, etc., shall be followed.

- 1 2. Ventilation: Ventilation shall be adequate to reduce the concentration of air
2 contaminants to the degree that a hazard to workers does not exist.
- 3 3. Sound Levels: Whenever the occupational noise exposure exceeds the maximum
4 allowable sound levels, the Contractor shall provide and require the use of approved
5 ear protective devices.
- 6 4. Illumination: Adequate illumination shall be provided while work is in progress.
7 Whenever required by the County, the Contractor shall provide additional
8 illumination and necessary support sufficient to cover all areas to be checked. The
9 level of illumination required for observation purposes shall be determined by the
10 County.
- 11 5. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall
12 conform to the applicable requirements of the OSHA Regulations for Construction.
13 The Contractor shall provide access to the County for all areas of work during each
14 phase of construction.
- 15 6. Safety of Public. Provide scaffolding, signage, temporary pedestrian access and
16 barricades as required to protect the public from the work area. Areas to be closed off
17 shall require public notice.

18 D. Pre-Job Conference

- 19 1. A pre-job meeting shall be held prior to the commencement of the Work, prior to
20 significant phases or per specific site location if the Work is not contiguous.
21 Attendance shall include the County, Engineer, Contractor, and Painters Site
22 Supervisor. The meeting will address site specific issues including but not limited to:
23 schedule, access to the site, safety requirements, surface preparation, application,
24 coating systems, inspection, quality control, MOT, protection of the public
25 and protection of the environment as covered in the specifications.
- 26 2. Copies of all manufacturer's instructions and recommendations shall be furnished to
27 the County and Engineer by the Contractor prior to the meeting.
- 28 3. It shall be the responsibility of the Coating Manufacturer to have their factory
29 representative meet in person with the Contractor and Engineer a minimum of three times
30 during the job as a consultant on surface preparation, mil thickness of coating and proper
31 application of coating unless meeting is determined to be unnecessary by the Engineer.

32 E. Surface Preparation

- 33 1. Visual Standard SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation
34 Standards for Painting Steel Surfaces" and The National Association of Corrosion
35 Engineers, "Blasting Cleaning Visual Standards" (TM-01-70 and TM-01-75) shall be
36 the standards used to evaluate proper surface preparation.
- 37 2. To facilitate inspection, the Contractor shall on the first day of blasting operations, blast
38 metal panels (12" x 12" x 1/4") to the degree called for in the Specifications and as noted
39 above. Once a sample panel has been approved, it shall establish the quality of all
40 subsequent Work by reference. The sample shall then be stored in a dry, sealed plastic
41 container on the job site. Sample panels shall be prepared and approved for each type of
42 sandblasting specified and shall be maintained and utilized by the County throughout the
43 duration of sandblasting operations as reference standards of quality. Coatings shall be
44 applied only at temperatures and conditions recommended by the paint manufacturer.

1 F. Inspection Devices:

- 2 1. The Contractor shall utilize, until final acceptance of the Work, inspection devices in
3 good working condition for the detection of holidays, environmental conditions, and
4 measurements of wet and dry-film thicknesses of protective coatings. Inspection
5 devices shall be operated in strict accordance with the manufacturer's printed
6 instructions and applicable SSPC and NACE standards and guidelines.
- 7 2. Thickness and Holiday Checking: Thickness of coatings shall be checked with a
8 nondestructive, magnetic type thickness gauge. Coating integrity of coated surfaces shall
9 be tested with an approved holiday detection unit per the paint manufacturer's
10 recommendation. All pinholes shall be marked, repaired in accordance with the paint
11 manufacturer's printed recommendations and re-tested. No pinholes or other
12 irregularities will be permitted in the final coating. In cases of dispute concerning film
13 thickness or holidays, the Contractor shall abide by the County's determination unless
14 independent tests are performed by a certified lab at the Contractor's expense. Field
15 measurements of film thickness shall not exceed the requirements of SSPC-PA 2
16 Measurement of Dry Coating Thickness with Magnetic Gages. Discrepancies shall be
17 measured and verified with a micrometer or Tooke gauge if no other option is available.

18 1.06 PRODUCT DELIVERY STORAGE AND HANDLING

- 19 A. Delivery: All materials shall be delivered to the job in undamaged, original packages with
20 seals unbroken and in legible, labeled containers. Packages shall not be opened until the
21 County inspects them and they are required for use. Labels shall show name of
22 manufacturer, type of coating, formulation, date, color and manufacturers'
23 recommendations and instructions for use.
- 24 B. Storage: All painting materials shall be stored in a clean, dry, well-ventilated place,
25 protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint
26 susceptible to damage from low temperatures shall be kept in a heated storage space
27 when necessary. The Contractor shall be solely responsible for the protection of the
28 materials he stores at the job site. Empty coating cans shall be neatly stacked in areas the
29 Owner designates, and shall be removed from the job site on a schedule the Owner
30 determines.
- 31 C. Mixing: Mechanical mixers, capable of thoroughly mixing the pigment and vehicle
32 together, shall mix the paint prior to use where required by manufacturer's instructions,
33 however, thorough hand mixing will be allowed for small amounts up to one gallon.
34 Pressure pots shall be equipped with mechanical mixers to keep the pigment in
35 suspension, when required by manufacturer's instructions. Otherwise, intermittent hand
36 mixing shall be done to assure that no separation occurs. Materials shall be in full
37 compliance with the requirements of pertinent codes and fire regulations.
- 38 D. Thinning: Catalysts or thinners shall only be utilized as recommended by the
39 manufacturer, and shall be added or discarded strictly in accordance with the
40 manufacturer's instruction.

1 1.07 PROJECT SITE CONDITIONS

2 A. Application: Paint shall be applied only on thoroughly dry surfaces and during periods of
3 favorable weather, unless specifically allowed by the paint manufacturer. Except as provided
4 below, painting shall not be permitted when the atmospheric temperature is below 50° F, or
5 when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or
6 when it can be anticipated that these conditions will prevail during the drying period.

7 B. No coatings shall be applied unless the relative humidity is below 85%.

8 C. No coatings shall be applied unless surface temperature is a minimum of 5° above dew
9 point; temperature must be maintained during curing.

10 1.08 WARRANTY

11 A. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month
12 of the one (1) year warranty period following completion of all painting Work. All
13 defective Work shall be repaired in strict accordance with this Specification, and to the
14 satisfaction of the paint manufacturer and the County.

15 B. Fluoropolymer / Fluorourethane. The Contractor shall warrant through the Manufacturer
16 that the coating system shall not: check, crack, blister or delaminate from the substrate;
17 change color more than 12 MacAdam units as determined in accordance with ASTM
18 D2244; exhibit loss of gloss in excess of 24 units as measured by a gloss meter in
19 accordance with ASTM D523-8; or chalk in excess of a rating of 8 as measured in
20 accordance with ASTM D4214, Method A. Warranty coverage shall be effective for a
21 period of 15 years from Final Completion depending on color. The Contractor shall
22 notify the Manufacturer prior to ordering materials and begin the warranty process.
23 Sample panels shall be obtained from the Manufacturer, and at least 2 sample panels shall
24 be provided to the County in addition to the Manufacturers minimum requirements
25 regarding the warranty process. The Contractor shall not be permitted to install the
26 coating system until the Manufacturer has provided assurance that the color, substrate,
27 surface preparation or existing conditions are in conformance with the Manufacturer's
28 requirements for warranty.

29 **PART 2 - PRODUCTS**

30 2.01 GENERAL

31 A. The painting schedule has been prepared on the basis of Tnemec and Carboline products,
32 and their recommendations for application.

33 B. No paint containing lead shall be allowed.

34 2.02 COATING SYSTEMS

35 A. The following summarizes the painting systems for various types of applications.

1 B. The Contractor shall have the coating color matched or tinted by the coating supplier to
 2 exactly match Tnemec Color Codes as shown below. Manufacturers other than Tnemec shall
 3 submit a color matched swatch to the County for approval prior to ordering materials.
 4

Color Table

Fluid Conveyed by Pipe	Tnemec Color Codes
Potable Water (WM)	True Blue 11SF
Wastewater (FM)	Hunter Green 08SF
Reclaimed Water (RWM)	Purple Rain 14SF

5 C. Minimum film thickness shall be per manufacturer's recommendations unless a greater
 6 thickness is specified. The Contractor shall measure minimum film thickness in the field
 7 by utilizing a wet film gauge, which the County shall verify. Regardless of anchor
 8 profile, the Contractor shall utilize a wet film gauge to verify that the County-specified
 9 average minimum dry film thickness (MDFT) is being applied. The calculated value for
 10 wet film thickness (WFT) shall be derived from County's average MDFT unless the
 11 manufacturer's minimum range is greater. Following the manufacturer's recommended
 12 drying time, the Contractor shall measure and provide results to the County verifying that
 13 the average minimum dry film thickness meets the MDFT for each coat and final system,
 14 utilizing a dry film gauge. The County may conduct side-by-side verification.

15 D. Coating systems shall incorporate the paints specified below, applied at the average dry
 16 film thickness (DFT) in mils per coat noted, and have the specified minimum average dry
 17 film thickness (MDFT) for each individual coat and total system.

18 HP – High Performance Coatings of FERROUS METALS
 19

System HP-1
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Complete removal of existing coating system

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	8 MDFT	9.5 MDFT

20

System HP-2
EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings and galvanized metal

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	9.5 MDFT

1

System HP-3
EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing solvent based coating system exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	7.5 MDFT	6.0 MDFT

2

System HP-4
INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing coating, or manufacturer epoxy-primed surface not exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	9.5 MDFT	8.0 MDFT

3

System HP-5
 EXTERIOR EXPOSURE, (IMMERSION)
 Complete removal of existing coating system for immersion surfaces

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	12.0 MDFT	12.5 MDFT

1

System HP-6
 INTERIOR/EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing water based or unknown coating surface exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	7.0 MDFT	NA

2

System HP-7
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	8.0 MDFT

3

4

System HP-8
 INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coating

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Finish	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	5.0 MDFT	NA

1
 2 DFT = Dry Film Thickness
 3 MDFT = Minimum Dry Film Thickness

4 2.03 EQUIPMENT

- 5 A. The Contractor's surface preparation, coating and painting equipment shall be designed and
 6 suitable for the application of the specific materials herein specified. The Contractor shall
 7 submit a list of all applicable equipment owned by the Contractor. The Contractor's
 8 equipment shall be subject to the approval of the County based on the manufacturer's data.
- 9 B. Effective oil and water separators shall be used in all compressed air lines serving spray
 10 painting and sandblasting operations to remove oil or moisture from the air before it is
 11 used. Separators shall be placed as far as practical from the compressor.
- 12 C. The Contractor shall furnish all equipment for application of the paint and the completion
 13 of the Work in first-class condition and shall comply with recommendations of the paint
 14 manufacturer.

15 **PART 3 - EXECUTION**

16 3.01 GENERAL

- 17 A. All coating and painting shall conform to the applicable requirements of the Society for
 18 Protective Coatings (SSPC) Manual (most recent edition). Any material applied upon
 19 improperly prepared surfaces shall be removed and redone to the satisfaction of the
 20 Owner at the sole expense of the Contractor.
- 21 B. All Work shall be done by skilled craftsmen who are qualified to perform the required
 22 work and shall be done in a manner comparable to the best standards of practice found in
 23 that trade.

- 1 C. The Contractor shall provide a supervisor to be at the work site during surface preparation,
2 cleaning and coating operations. The supervisor shall have the authority to coordinate the
3 work and make other decisions pertaining to the fulfillment of their contract.
- 4 D. Prior to assembly, all surfaces that will be made inaccessible after assembly, shall be
5 prepared as specified herein, and shall receive the paint or coating system as specified herein.
- 6 E. Coating shall not be applied to wet or damp surfaces and shall not be applied in inclement
7 weather. Do not apply when the surface temperature is less than 5° F above the dew point, or
8 if relative humidity is greater than 85%. Dew or moisture condensation should be anticipated
9 and if such conditions are prevalent, coating should be delayed until the surfaces are dry.
10 Further, the day's coating should be completed well in advance of when condensation will
11 occur, in order to permit the film a sufficient drying time prior to the formation of moisture.
- 12 F. Any surfaces not specifically named in the Scope of Work, and not specifically
13 exempted, shall be prepared, primed and painted in the manner and with materials
14 consistent with these Specifications. The Owner shall select which of the manufacturer's
15 products, whether the type is indicated herein or not, shall be used for such unnamed
16 surfaces. No extra payment shall be made for this painting.
- 17 G. Contractor shall inspect each pipe joint, pipe strap, personal barriers and appurtenances after
18 providing access to the location but prior to commencing surface preparation activities. The
19 Contractor shall immediately report leaks, damage, stripped bolts or nuts to the County.

20 3.02 SURFACE PREPARATION

- 21 A. Solvent Cleaning: All dust, dirt, oil, or any contaminants that would affect the adhesion or
22 durability of the finish coating must be removed before hand tool cleaning, abrasive blasting
23 and prior to each coating layer application by cleaning per SSPC-SP1 "Solvent Cleaning."
- 24 B. Defects: All ferrous metal surfaces shall be free of all defects. The Contractor shall
25 remove by chipping or grinding all sharp edges; other defects shall be ground smooth in
26 accordance with NACE Standard RPO178, Appendix C. Weld flux, weld spatter, slag
27 and excessive rust scale shall be removed by SSPC-SP 11 Power Tool Cleaning to Bare
28 Metal. All weld seams, sharp protrusions, and edges shall be ground smooth prior to
29 surface preparation or application of any coatings.
- 30 C. Gaskets: Existing gaskets in between flanged joints shall be cut or ground flush with the
31 existing flanged joint prior to surface preparation or field blasting operations. The Contractor
32 shall not field blast into bell and spigot joints or under tapping saddles. Contractor shall blast
33 perpendicular to the pipe surface. SSPC-SP3 Power Tool Cleaning shall be used inside bells
34 and against tapping saddles to avoid damage to gaskets and locking mechanisms.
- 35 D. Field blasting cleaning for all surfaces shall be accomplished by dry sandblasting method
36 unless otherwise directed, or the County provides written approval
- 37 1. The abrasive used in blast cleaning shall produce an anchor profile in accordance
38 with the recommendations of the manufacturer of the protective coating, which is to
39 be applied to the surface being cleaned.

- 1 2. At all times during the blast cleaning operations, adequate means shall be employed
- 2 to absolutely insure that existing protective coatings shall not be exposed to abrasion
- 3 from blast cleaning operations.
- 4 3. All blast cleaned surfaces shall be carefully dried and cleaned prior to application of
- 5 specified coatings. No coatings or paint shall be applied over damp or moist surfaces.
- 6 4. Field blasting and priming shall be completed on any particular area during the same
- 7 workday, and the application of the primer shall follow immediately after surface
- 8 preparation and cleaning prior to formation of any form of corrosion. If the surface is
- 9 not primed within 8 hours, complete surface preparation shall be repeated.
- 10 5. The Contractor shall at all times keep the area of his work in reasonably clean condition
- 11 shall not permit blasting materials to accumulate in an uncontrolled manner such as to
- 12 constitute a nuisance or hazard to the satisfactory prosecution or the Work, operation of
- 13 the existing facilities, public safety, environmental nuisances or public access.
- 14 6. "Touch-up systems will be same as original specification except that approved
- 15 manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this
- 16 system was originally used. Also, strict adherence to manufacturer's complete touch-
- 17 up recommendations shall be followed. Any questions relative to compatibility of
- 18 products shall be brought to the attention of the COUNTY and Coating Manufacturer;
- 19 otherwise, Contractor assumes full responsibility.
- 20 7. Areas that are inaccessible to abrasive blasting, including adjacent to concrete
- 21 pedestals, tapping saddles, pressure gauges or other appurtenances shall be cleaned in
- 22 accordance with SSPC-SP 11 "Power Tool Cleaning to Bare Metal" immediately
- 23 adjacent to the area as approved by the County.

24 E. Specified Surface Preparation: All surfaces shall be cleaned per SSPC-SP1 "Solvent
 25 Cleaning". In addition to the surface preparation for the specific Service Condition,
 26 surface preparation shall be as follows:
 27

Substrate	Condition	Surface Preparation
All Surfaces	All – Prior to Surface Preparation	SSPC-SP1 Solvent Cleaning
Steel	Exterior / Non-Immersion	SSPC-SP10 Near White Blast (NACE 2)
Steel	Exterior / Immersion	SSPC-SP5 White Metal Blasting (NACE-1)
Ductile Iron Pipe	Exterior / Non-Immersion	SSPC-SP6 Commercial Blast (NACE-3)
Ductile Iron Pipe	Exterior / Immersion	SSPC-SP10 Near White Blast (NACE 2)
Ferrous Metal	Exterior / Non-Immersion / Inaccessible to abrasive blasting	SSPC-SP 11 Power Tool Cleaning to Bare Metal
Galvanized Metals	Exterior / Non-Immersion	SSPC-SP 7 Brush-Off Blast (NACE 4)
PVC	Exterior / Non-Immersion	SSPC-SP1 Solvent Cleaning & Scarify by brush blast, power tools or hand sanding
Existing Coating System to be Over-Coated	Exterior / Non-Immersion	Scarify by brush blast, power tools or Hand Sanding with fine abrasive

- 1 1. Exposed Pipe: Bituminous coated pipe shall not be used in above ground or exposed
2 locations and shall be factory primed for all new pipe installations. After installation
3 all exterior, exposed flanged joints shall have the gap between adjoining flanges
4 sealed with a flexible caulking shall meeting ASTM C-920 and shall be Sika Flex 1A
5 or equal to prevent rust stains.
- 6 2. The Contractor shall not abrasive-blast or prepare more surface area than can be coated in
7 the same day; prepare surfaces and apply prime coatings within an 8-hour period.
- 8 3. Contractor shall coordinate with the County prior to surface preparation. County
9 approval shall be required prior to application of the prime coat.

10 3.03 APPLICATION EQUIPMENT

11 A. Brush and / or Rollers

- 12 1. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked
13 phenolic resin core shall be utilized.
- 14 2. The brushing or rolling shall be done so that a smooth coat, as nearly uniform in
15 thickness as possible, is obtained. Brush or roller strokes shall be made to smooth the
16 film without leaving deep or detrimental marks.
- 17 3. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or
18 sheepskins, and paint mitt.
- 19 4. It may require 2 coats to achieve the specified dry film thickness if application is by
20 brush and roller.

21 B. Air, Airless or Hot Spray

- 22 1. The equipment used shall be suitable for the intended purpose, shall be capable of
23 properly atomizing the paint to be applied, and shall be equipped with suitable
24 pressure regulators and gauges.
- 25 2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and
26 sags should be brushed out immediately or the paint shall be removed and the surface
27 resprayed.
- 28 3. High build coatings should be applied by a crosshatch method of spray application to
29 ensure proper film thickness of the coating.
- 30 4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or
31 sheepskins shall be used, as the manufacturer authorizes.
- 32 5. Special care shall be taken with thinners and paint temperatures so that paint of the
33 correct formula reaches the receiving surface.
- 34 6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer
35 of the paint being sprayed.
- 36 7. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of
37 each coating. The stripe coat shall be applied by a brush and worked in both
38 directions prior to spray application. Special attention shall be given to filling all
39 crevices with coating.

40 3.04 WORKMANSHIP

41 A. General

- 42 1. Under no circumstances shall Asphaltic seal coats and mastics be overcoated.

- 1 2. Paints shall be mixed in proper containers of adequate capacity. All paints shall be
2 thoroughly stirred before use and shall be kept stirred while using. No unauthorized
3 thinners or other materials shall be added to any paint.
- 4 3. Only skilled painters shall be used on the Work, and specialists shall be employed
5 where required.
- 6 4. Extreme care shall be exercised in the painting of all operable equipment, such as valves,
7 electric motors, etc., so that the proper functioning of the equipment will not be affected.
- 8 5. The Contractor's scaffolding shall be erected, maintained, and dismantled without
9 damage to structures, machinery, equipment or pipe. Drop cloths shall be used where
10 required to protect the environment, the public, buildings, equipment, and areas
11 surrounding the Work. All surfaces required to be clear for visual observations shall
12 be cleaned immediately after paint application.
- 13 6. The prime coat shall be applied immediately following surface preparation within 8
14 hours of the same working day. All paint shall be applied by brushing, paint mitt and
15 roller, conventional spraying, or airless spraying, using equipment approved by the
16 paint manufacturer.
- 17 7. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be
18 considered recoatable when an additional coat can be applied without any detrimental
19 film irregularities such as lifting or loss of adhesion.
- 20 8. Surfaces that will be inaccessible after assembly shall receive either the full specified
21 paint system or three shop coats of the specified primer before assembly.
- 22 9. Finish colors shall be as specified per the color table in section 2.02 of this
23 specification, and shall be factory mixed (i.e., the Contractor shall not tint the paint,
24 unless the COUNTY and the Coating Manufacturer so authorizes.)
- 25 10. All shop-coated surfaces shall be protected from damage and corrosion before and
26 after installation by treating damaged area immediately upon detection. Abraded or
27 corroded spots on shop-coated surfaces shall be cleaned per SSPC-SP1 Solvent
28 Cleaning" and then touched up with the same materials as the shop coat in accordance
29 with the manufacturers instruction. At the discretion of the Owner, all shop coated
30 surfaces that are faded, discolored, or that require more than minor touch up shall be
31 field blast cleaned and repainted.

- 32 B. Field Coating: All painting at the site shall be designated "Field Coating".
- 33 1. All paint shall be at ambient temperature before applying, and no painting shall be
34 done when the temperature is below 50 degrees F, in dust-laden air, when rain is
35 falling, mist is present, when relative humidity exceeds manufacturer's
36 recommendation when temperature is less than 5° F above the dew point, or until all
37 traces of moisture have completely disappeared from the surface to be painted.
 - 38 2. Protective coverings or drop cloths shall be used to protect existing appurtenances,
39 concrete walkways, concrete structures, existing surfaces, the public, the environment
40 and equipment. Care shall be exercised to prevent paint or coating overspray and
41 spatter onto surfaces that are not to be painted. Surfaces from which such materials
42 cannot be removed satisfactorily shall be painted or repainted, as required to produce,
43 a finish satisfactory to the County.
 - 44 3. All edges, corners, crevices, welds, hardware and irregular surfaces shall receive a
45 brush coat (stripe coat) of the specified product for each coat prior to application of
46 each complete coat.

- 1 4. Coating shall be applied in a neat manner that will produce an even film of uniform
2 and proper thickness, with finished surfaces free from brush marks or other
3 irregularities. Each coat shall be carefully examined and faulty material, poor
4 workmanship, holidays, damaged areas and other imperfections shall be touched up
5 prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before
6 the next coat is applied in accordance with the coating manufacturer's
7 recommendations for drying time between coats. Coating shall be cleaned in
8 accordance with SSPC-SP1 prior to the application of next coating. In no case shall
9 coating be applied at a rate of coverage greater than the maximum rate recommended
10 by the coating manufacturer.
- 11 5. Coating failures shall not be accepted and shall be entirely removed down to the
12 substrate and the surface recoated. Failures include, but are not limited to, holidays,
13 sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination. Any repairs
14 made on surfaces shall be repaired in accordance with the coating manufacturer's
15 instructions.
- 16 6. Each coat shall be uniform in coverage and color. Successive coats of paint shall be
17 tinted so as to make each coat easily distinguishable from each other with the final
18 undercoat tinted to the approximate shade of the finished coat.
- 19 7. Painting shall be continuous and shall be accomplished in an orderly manner so as to
20 facilitate inspection. Surfaces of exposed members that will be inaccessible after
21 erection shall be cleaned and painted before erection.
- 22 8. All materials shall be applied in accordance with the manufacturer's instructions. If
23 spray painting is required, Contractor shall accept all responsibility for any damage
24 caused by overspray and/or drifting paint mist.
- 25 9. Caulking: The Contractor shall caulk all voids or interfaces including but not limited
26 to: flanges, threads, nuts, saddles, gaps, voids or spaces between appurtenances and
27 pipe to be coated immediately after the prime coat to prevent rust formation where
28 ferrous metal is not accessible to surface preparation or blasting. Flexible caulking
29 shall meet or exceed ASTM C-920 and shall be Sika Flex 1A or equal.

30 3.05 FIELD QUALITY CONTROL

31 At a minimum, the Contractor shall provide field quality control and verification of the
32 coating film thickness utilizing the below methods.

- 33 A. Wet Film Gauge. Both the Contractor and the County shall use a wet film gauge to
34 verify the applied coating desired wet film thickness (WFT) to produce the required
35 minimum DFT.

36
$$\text{Target WFT} = \text{County specified average MDFT} / \text{Volume Solids} \times 100\%$$

37 If thinner is applied per the manufacturer's recommendations, the volume of solids shall
38 be reduced accordingly. Regardless of anchor profile, surface pattern or base metal
39 calculation of the substrate, the gauge reported WFT shall meet the target WFT value for
40 the substrate or previously coated surface to ensure the required average MDFT will be
41 achieved.

- 1 B. DFT Magnetic Gauge. Dry Film Magnetic Pull-Off Gauge (Type I) shall be utilized to
2 determine DFT in accordance with SSPC-PA 2 "Measurement of Dry Coating Thickness
3 with Magnetic Gages." The average of the readings shall meet the County-specified
4 MDFT for each coating application. Electromagnetic Gauge (Type II) shall not
5 considered acceptable for use on this project.
- 6 C. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125
7 volts DC per mil in accordance with the latest edition of the following standards: NACE
8 SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturers
9 recommendations. All low voltage holiday testing shall be performed using a Tinker &
10 Razor Model M-1 Holiday Detector, or equal. Areas found to have holidays shall be
11 marked and repaired in accordance with the paint manufacturer's instructions.
- 12 D. Destructive Testing: Destructive testing using a Tooke gauge shall only be utilized in
13 cases of dispute regarding DFT. The County shall be permitted up to three (3) cuts using
14 the Tooke Gauge and the Contractor shall be responsible for repairing the areas examined
15 at no additional cost.
- 16 E. Environmental Testing: humidity, dew point and temperature shall be constantly
17 measured and logged. Any electronic gauges shall be first calibrated against a sling
18 psychrometer each day.

19 3.06 INSPECTION OF SURFACES

- 20 A. Before application of the prime coat and each succeeding coat, all surfaces to be coated
21 shall be subject to inspection and approval by the County. The Contractor shall correct
22 any defects or deficiencies before application of any subsequent coating. Coatings
23 applied without County approval shall be removed and reapplied at no cost to the County.
- 24 B. The Contractor shall provide the County access to all areas of the Work. All scaffolding
25 or lifts shall be in compliance with OSHA requirements.
- 26 C. The Contractor shall furnish samples of surface preparation and of painting systems to be
27 used as a standard throughout the job, unless omitted by the County.
- 28 D. When any appreciable time has elapsed or has exceeded the manufactures
29 recommendations between coatings, the County shall carefully inspect previously coated
30 areas and surfaces that are damaged or contaminated, in the opinion of the County shall
31 be cleaned and recoated at the Contractor's expense. Re-coating times of manufacturer's
32 printed instructions shall be adhered to.
- 33 E. Coating thickness shall be determined by the use of a properly calibrated "DeFelsko
34 Positest FM" Type 1 Coating Thickness Gauge (or equal) for ferrous metal or a "Tooke"
35 Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note
36 that use of the "Tooke" gauge is classified as a destructive test.

1 3.07 PROTECTION, CONTAINMENT AND CLEAN-UP

- 2 A. The premises shall at all times be kept free from accumulation of waste material and
3 rubbish caused by employees or work. At the completion of the painting remove all
4 tools, scaffolding, surplus materials, and all rubbish from and about the site and leave the
5 area "broom clean" unless more exactly specified.
- 6 B. It shall be the responsibility of the Contractor to protect at all times, in areas where
7 painting is being done, floors, sidewalks, walls, bridges, environment, public property,
8 equipment, vehicles, appurtenances, and finished surfaces adjacent to paint work. Cover
9 all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of
10 painting work.
- 11 C. The Contractor shall contain all spent abrasives, old paint chips, paint overspray and
12 debris by means suitable to the County, including but not limited to, full shrouding of the
13 area. The Contractor shall provide a complete design and plan of the intended shroud or
14 cover. Care must be taken not to modify or damage the structure during the use of the
15 shroud. If damage should occur, the Contractor is held responsible for all repairs. The
16 Contractor's containment must be adequate enough to stop blasting residue from being
17 released into the environment. There should be no visible emissions of particulate matter
18 or visible deposits on the ground outside the containment area. Water jetting or wet
19 abrasive blast cleaning for the purpose of removing paint and surface debris shall be
20 conducted within a containment designed, installed, and maintained in order to capture
21 paint chips and debris. Collection of the water is not required. Mesh containment
22 materials that capture paint chips and debris while allowing the water to pass through
23 shall have openings a maximum of 25 mils (625 microns) in greatest dimension. Low
24 Pressure Water Cleaning for the purpose of removing chalk, dirt, grease, oil and other
25 surface debris can be performed without additional containment provided paint chips are
26 removed and collected prior to Low Pressure Water Cleaning (LP WC).
- 27 D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed
28 or smeared on all surfaces, hardware, equipment, painted, and unpainted surfaces.
- 29 E. After completion of all painting, the Contractor shall remove from job site all painting
30 equipment, surplus materials, and debris resulting from this work.
- 31 F. The Contractor is responsible for the removal and proper disposal of all hazardous
32 materials from the jobsite in accordance with Local, State, and Federal requirements as
33 outlined by the Environmental Protection Agency.

34 END OF SECTION

1 1.03 SUBMITTALS

2 A. Materials and Shop Drawings

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

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

11 C. Manufacturer's Certification

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

13 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

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

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

24 B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage
25 to the pipe and fittings and their respective coatings. Pipe or fittings shall not be rolled
26 off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All
27 pipe or fittings shall be examined before installation and no piece shall be installed which
28 is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating.
29 Accidental damage to pipe or coating shall be repaired to the satisfaction of the County or
30 be removed from the job. When not being handled, the pipe shall be supported on timber
31 cradles or on level ground, graded to eliminate all rock points and to provide uniform
32 support along the full pipe length. When being transported, the pipe shall be supported at
33 all times in a manner which will not permit distortion or damage to the lining or coating.
34 Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the
35 Contractor shall be removed from the site.

1 **PART 2 - PRODUCTS**

2 2.01 MATERIALS

3 A. Ductile Iron Pipe

4 1. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151

5 2. Thickness/Pressure Class:

6 a. Below ground piping: Class 350 (4-inch to 12-inch), Class 250 (16-inch to 24-

7 inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.

8 b. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or

9 specified.

10 3. Joints

11 a. Push-on or Mechanical Joints (below ground piping)

12 (1) Standards: ANSI A21.11, AWWA C111

13 (2) Class: 350-psi working pressure rating

14 (3) Gaskets

15 (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR)

16 ring type.

17 (b) Wastewater Service: Neoprene rubber ring type.

18 b. Flanged (above ground or inside below ground vaults)

19 (1) Standards: ANSI A21.15, ANSI B16.1

20 (2) Class: 125-pound factory applied screwed long hub flanges, plain faced

21 without projection.

22 (3) Gaskets

23 (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber

24 (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American

25 Cast Iron Pipe or acceptable equal.

26 c. Restrained Joints

27 (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems

28 (for 16-inch diameter and smaller) as manufactured by American Ductile Iron

29 Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable

30 equal.

31 (2) Class: 250-psi minimum design pressure rating.

32 (3) Standard mechanical joint retainer glands shall not be acceptable.

33 d. Joint Accessories

34 (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.

35 (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts

36 conforming to ASTM A193 Grade B8M.

37 e. Pipe Length (below ground installation): 20-foot maximum nominal length.

38 4. Pipe Identification

39 a. Each length of pipe shall bear the name or trademark of the manufacturer, the

40 location of the manufacturing plant, and the class or strength classification of the

41 pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not

42 clearly marked is subject to rejection. The Contractor shall remove all rejected

43 pipe from the project site within five NORMAL WORKING DAYS.

1 B. Fittings

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

21 2.02 COATINGS, LININGS AND IDENTIFICATION MARKINGS

22 A. Exterior Coatings

- 23 1. Below ground/buried or in a casing pipe:
- 24 a. Type: Asphaltic coating, 1.0-mil DFT in accordance with ANSI/AWWA
25 A21.51/C151.
- 26 b. Markings: (continuous 3-inch wide strip within top 90 degrees of pipe - min.
27 drying time 30-minutes before backfill).
- 28 c. Color:
- 29 (1) Raw Wastewater: Safety Green
- 30 (2) Reclaimed Water: Purple (Pantone 522C)
- 31 (3) Potable Water: Safety Blue
- 32 2. Above ground/Exposed/In vaults
- 33 a. Coatings and coating testing for ductile iron pipe and fittings for above
34 ground/exposed applications shall be accordance with Division 9. Primer,
35 intermediate and final coats whether shop or field applied shall be compatible and
36 applied in accordance with the coating system manufacturer's recommendations.
37 Refer to Appendix D "List of Approved Products" for approved coating system
38 suppliers. Asphaltic seal coat applied to the exterior of above ground piping and
39 fittings shall be blasted and completely removed prior to coating per NACE-
40 3/SSPC-SP6 commercial blast cleaning minimum angular anchor profile of 1.5-
41 mils.

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

1 2.03 LOCATION MARKERS AND LOCATION WIRE

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

3 1. Markers: Markers shall consist of a passive device capable of reflecting a specifically
4 designated repulse frequency tuned to the utility (service) being installed. Markers
5 shall be color coded in accordance with American Public Works Association's
6 "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater
7 and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be
8 installed directly above the centerline of the respective pipeline at intervals not to
9 exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends)
10 or change in horizontal direction and at each valve along the pipeline. Markers shall
11 be hand backfilled to 1-foot above the pad and have a finished depth of burial of not
12 less than 2-feet or more than 6-feet. No separate payment shall be made for
13 furnishing and installing the respective frequency and color-coded electronic pad type
14 marker.

15 2. Locator System: Marker locator set shall be the Scotch Mark EM II Electronic
16 Marker Locator Path Tracing Receiver, or acceptable equal. The Contractor shall
17 furnish 1-locator set for each type of service piping installed on the project (i.e.:
18 reclaimed water, wastewater) to the County. Each unit shall incorporate the
19 following features and accessories:

- 20 a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
- 21 b. Field strength meter that provides visual indication of the return signal.
- 22 c. Function switch for selection of operation mode.
- 23 d. Sensitivity control to adjust the receiver gain.
- 24 e. Audio speaker for signal response.
- 25 f. Battery access panel containing condensed operating instructions.
- 26 g. Auxiliary headset and heads set jack.
- 27 h. Permanently attached shoulder straps.
- 28 i. Rugged shockproof and weatherproof storage/carrying case.

29 3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

30 B. Location Detection Wire

31 1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe
32 identification).

33 2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of
34 each valve box collar and be capable of extending 12-inches above top of box (stored
35 inside the 2-inch brass pipe through the valve box collar) in a manner so as not to
36 interfere with valve operation. For direction drilling installations, a minimum of 2
37 (two) 10-gauge wires shall be pulled along with the pipe.

38 3. Continuity: Continuity of wire to be tested using Metrotech 810/9860 or acceptable
39 equal.

1 **PART 3 - EXECUTION**

2 3.01 **INSTALLATION**

3 A. Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA
4 Manual M-42. When a restraining type gasket is used, the bell shall be painted red.

5 B. Underground Ductile Iron Pipe and Fittings.

6 1. Bedding firm, dry and even bearing of suitable material. Blocking under the pipe will
7 not be permitted.

8 2. Placement

9 a. Alignment: In accordance with lines and grades shown on the Drawings.
10 Deflection of joints shall not exceed 75% of the values recommended by the pipe
11 manufacturer.

12 b. The Contractor shall provide line and grade stakes at a 100-foot maximum
13 spacing and at all line and/or grade change locations. The Contractor shall
14 provide temporary benchmarks at a maximum of 1,000-foot intervals. The
15 minimum pipe cover shall be 30-inches below the finished grade surface or 30-
16 inches below the elevation of the edge of pavement of the road surface whichever
17 is greater.

18 c. All pipe and fittings shall be inspected prior to lowering into trench to insure no
19 cracked, broken or otherwise defective materials are being used. All homing
20 marks shall be checked for the proper length so as to not allow a separation or
21 over homing of connected pipe. Homing marks incorrectly marked greater than
22 1-inch shall result in rejection of pipe and removal from site. The Contractor
23 shall clean ends of pipe thoroughly and remove foreign matter and dirt from
24 inside of pipe and keep clean during and after installation.

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

29 e. Trench Dewatering and Drainage Control: Contractor shall prevent water from
30 entering trench during excavation and pipe-laying operations to the extent
31 required to properly grade the bottom of the trench and allow for proper
32 compaction of the backfill. Pipe shall not be laid in water.

33 f. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from
34 entering the pipe or pipe joint during handling or laying operations and any pipe
35 or fitting that has been installed with dirt or foreign material in it shall be
36 removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign
37 materials in lieu of flushing. At times when pipe installation is not in progress,
38 the open ends of the pipe shall be closed by a watertight plug or by other means
39 approved by the County to ensure absolute cleanliness inside the pipe. The pipe
40 shall be installed with the color stripe and pipe text on the top of pipe.

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

7 4. Joints

8 a. Joint Placement

9 (1) Push on joints: Pipe shall be laid with the bell facing upstream. The gasket
10 shall be inserted and the joint surfaces cleaned and lubricated prior to
11 placement of the pipe. After joining the pipe, a metal feeler shall be used to
12 verify that the gasket is correctly located.

13 (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the
14 "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The
15 gasket shall be inserted and the joint surfaces cleaned and lubricated with
16 soapy water before tightening the bolts to the specified torque.

17 C. Thrust Restraint

18 1. General: Thrust restraint shall be accomplished by the use of mechanical restraining
19 devices unless specifically identified otherwise on the Drawings or herein.

20 2. Length of Restrained Joints: In accordance with the lengths listed in the table as
21 shown on the Drawings.

22 D. Installation of Pipes on Curves

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

25 3.02 CLEANING AND FIELD TESTING

26 A. General: At the conclusion of the Work, the Contractor shall provide all associated
27 cleaning and field testing as specified in other related sections of these specifications.
28

29 END OF SECTION

1 **SECTION 15064**

2 **POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and
6 install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown
7 on the Drawings and specified herein.

8 B. General Design: The equipment and materials specified herein are intended to be
9 standard types of PVC pipe and ductile iron fittings for use in transporting wastewater,
10 reclaimed water, and water.

11 1.02 QUALITY ASSURANCE

12 A. Qualifications: All of the PVC pipe and ductile iron fittings shall be furnished by
13 manufacturers who are fully experienced, reputable, and qualified in the manufacture of
14 the materials to be furnished. The pipe and fittings shall be designed, constructed,
15 installed in accordance with the best practices and methods and shall comply with these
16 specifications as applicable.

17 B. Standards:

- 18 1. AWWA C900/C905
19 2. ASTM D1784 / D1785 / D2241 / D2466 / D2564 / D2729 / D2774 / D3034 / D3139 /
20 D3212
21 3. NSF 14
22 4. UNI-B-1 through 5

23 C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 -
24 AWWA C900/C905.

25 D. Quality Control:

- 26 1. The manufacturer shall establish the necessary quality control and inspection practice
27 to ensure compliance with the referenced standards.
28 2. In addition to the manufacturer's quality control procedures, the County may select an
29 independent testing laboratory to inspect the material at the production facility for
30 compliance with these specifications. The County will pay for the cost of facility
31 inspection requested by the County.

1 1.03 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
3 to construction in accordance with the General Conditions and specifications Section
4 01300 "Submittals."

5 B. Materials and Shop Drawings

6 C. Manufacturer's Certification

7 1. Submit sworn certification of factory tests and their results.

8 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

9 A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with
10 the manufacturer's recommendations. PVC pipe shall be covered with black plastic with
11 a minimum thickness of 15-mil. Joint gaskets shall be stored in a clean, dark and dry
12 location until use.

13 B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage
14 to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off
15 the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe
16 or fittings shall be examined before installation and no piece shall be installed which is
17 found to be defective. Pipe shall be handled to prevent damage to the pipe or coating.
18 Accidental damage to pipe or coating shall be repaired to the satisfaction of County or it
19 shall be removed from the job. When not being handled, the pipe shall be supported on
20 timber cradles or on level ground, graded to eliminate all rock points and to provide
21 uniform support along the full pipe length. When being transported, the pipe shall be
22 supported at all times in a manner to prevent distortion or damage to the lining or coating.
23 Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the
24 Contractor shall be removed from the site.

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

31 **PART 2 - PRODUCTS**

32 2.01 GENERAL

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

1 2.02 MATERIALS

2 A. Polyvinyl Chloride (PVC) Pipe

- 3 1. Standards: AWWA C900/C905 and ASTM D1784/D3034/F679 (Gravity Sewer)
- 4 2. Compounds: Class 12454-A or Class 12454-B
- 5 3. PVC Gravity Pipe and Fittings: PVC gravity pipe (6-inch to 15-inch), shall conform
- 6 to ASTM D3034, maximum SDR 35. PVC gravity pipe (18-inch to 36-inch), shall
- 7 conform to ASTM F679 and uniform minimum "pipe stiffness" at 5% (percent)
- 8 deflection shall be 46-psi. The joints shall be integral bell elastomeric gasket joints
- 9 manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI
- 10 Bell Plastic Pipe Association standard is UNI B.
- 11 4. PVC Pressure Pipe and Fittings: All PVC pipe of nominal diameter 4 to 12-inches
- 12 shall be manufactured in accordance with AWWA Standard C900 and greater than
- 13 12-inches shall be manufactured in accordance with AWWA Standard C905. The
- 14 PVC pipe shall have a minimum working pressure rating of 100-psi and shall have a
- 15 maximum dimension ratio of 18. Pipe shall be the same outside diameter as ductile
- 16 iron pipe.
- 17 5. Dimension Ratio/Thickness: (unless otherwise shown on the Drawings)
- 18 a. Raw Wastewater:
- 19 (1) Pressure Systems: DR 18
- 20 (2) Gravity Systems: DR 35 (ASTM D3034) or PS 46 (ASTM F679)
- 21 b. Treated Wastewater: DR 18
- 22 c. Reclaimed Water: DR 18
- 23 d. Raw Water: DR 18
- 24 e. Potable Water: DR 18
- 25 f. Irrigation Piping: Schedule 40 or SDR 21
- 26 6. Joints:
- 27 a. Push-on integral bell elastomeric gasket joints:
- 28 (1) Standards: ASTM D3212/D3139/F477 and UNI-B-1
- 29 (2) Gaskets:
- 30 (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR)
- 31 rieber type.
- 32 Wastewater Service: Styrene Butadiene Rubber (SBR) rieber type for C900 / C905
- 33 pipe. Styrene Butadiene Rubber (SBR) ring type for gravity systems.
- 34 (b)
- 35 (3) Pipe Markings: Pipes shall have a manufacturer's home-mark on the spigot.
- 36 On field cut pipe, the Contractor shall provide home-mark on the spigot in
- 37 accordance with manufacturer's recommendations.
- 38 b. Solvent weld (nominal diameter less than 4-inches):
- 39 (1) Standards: ASTM D2466/D2564
- 40 (2) Type: Slip Fitting Socket (tapered)
- 41 (3) Exclusions: Plastic saddle and flange joints will not be used.

- 1 c. Restrained Joints:
2 (1) Restrained joint devices shall be made specifically for PVC pipe and meet or
3 exceed the requirements in ASTM F-1674.
4 (2) Manufacturers: Uni-flange mechanical joint restraints and bell restraints (for
5 all sizes); Meg-a-lug system as manufactured by EBBA Iron (sizes 12-inches
6 or less), or acceptable equal.
7 (3) Design pressure rating equal to or above test pressure as specified herein.
8 d. Pipe Length:
9 (1) Pressure systems: 20-foot maximum nominal length
10 (2) Gravity systems: 13-foot minimum nominal length

11 B. Fittings - Pressure Systems (nominal diameter 4-inches and greater):

- 12 1. Materials: Ductile iron
13 2. Joints: Mechanical Joint, Minimum 350-psi pressure rating
14 3. Gaskets:
15 a. Water and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type
16 b. Wastewater Service: Neoprene rubber ring type
17 4. Exclusions: Standard double bell couplings will not be acceptable where the pipe will
18 slip completely through the coupling.
19 5. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53,
20 latest revision, and shall be ductile iron.
21 6. All fittings shall have a date code cast (not printed or labeled), with identification of
22 the date, factory and unit at which it was cast and machined. Fittings shall have
23 distinctly cast on them the pressure rating, nominal diameter of openings,
24 manufacturer's name, the country where cast, and deflection angle. Ductile iron
25 fittings shall have the letters "DI" or "Ductile" cast on them.
26 7. All potable water main fittings shall have NSF certification and ISO 9001
27 certification for both the foundry and manufacturer. The NSF 61 certification shall be
28 issued on all coatings and linings, from the said manufacturers that are used for
29 potable water applications.
30 8. All ductile iron fittings shall have exterior coatings, including markings and colors, and
31 interior linings in conformance with Section 15062 "Ductile Iron Pipe and Fittings."

32 C. Fittings - Pressure Systems (nominal diameter less than 4-inches)

- 33 1. Material: Polyvinyl Chloride (PVC)
34 2. Joints: Slip fitting tapered socket with solvent weld
35 3. Solvent: Sure Guard 12 or acceptable equal
36 4. Exclusions: Plastic saddle and flange joint fittings shall not be used

1 2.03 LOCATION MARKERS, LOCATION WIRE AND IDENTIFICATION MARKINGS

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

3 1. Markers: Markers shall consist of a passive device capable of reflecting a specifically
4 designated repulse frequency tuned to the utility (service) being installed. Markers
5 shall be color coded in accordance with the American Public Works Association's
6 "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater
7 and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be
8 installed directly above the centerline of the respective pipeline at intervals not to
9 exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends)
10 or change in horizontal direction and at each valve along the pipeline. Markers shall
11 be hand backfilled to 1-foot above the pad and have a finished depth of burial of not
12 less than 2-feet or more than 6-feet. No separate payment shall be made for
13 furnishing and installing the respective frequency and color-coded electronic pad type
14 marker.

15 2. Locator System: Marker locator set shall be the 3M Dynatel 1420 or 3M Dynatel
16 1420E Electronic Marker System Marker Locator, or acceptable equal. The
17 Contractor shall furnish 1 locator set for each type of service piping installed on the
18 Project (i.e.: reclaimed water, wastewater.) to the County. Each unit shall incorporate
19 the following features and accessories:

- 20 a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
- 21 b. Field strength meter that provides visual indication of the return signal
- 22 c. Function switch for selection of operation mode
- 23 d. Sensitivity control to adjust the receiver gain
- 24 e. Audio speaker for signal response
- 25 f. Battery access panel containing condensed operating instructions
- 26 g. Auxiliary headset and heads set jack
- 27 h. Permanently attached shoulder straps
- 28 i. Rugged shockproof and weatherproof storage/carrying case

29 3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

30 B. Location Detection Wire

31 1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe
32 identification).

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

38 C. Identification Markings:

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

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

4 **PART 3 - EXECUTION**

5 3.01 INSTALLATION

6 A. Standards: AWWA C900/C905/UNI-B 3 and 4

7 B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings

8 1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe
9 will not be permitted.

10 2. Placement/Alignment:

11 a. Installation shall be in accordance with lines and grades shown on the Drawings.
12 For pressure systems, deflection of joints shall not exceed 75% of that
13 recommended by the manufacturer.

14 b. All pipe and fittings shall be inspected prior to lowering into trench to insure no
15 cracked, broken or otherwise defective materials are being used. All homing
16 marks shall be checked for the proper length so as to not allow a separation or
17 over homing of connected pipe. Homing marks incorrectly marked on pipe shall
18 result in rejection of pipe and removal from site. The Contractor shall clean ends
19 of pipe thoroughly and remove foreign matter and dirt from inside of pipe and
20 keep clean during and after installation.

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

25 d. Trench Dewatering and Drainage Control: Contractor shall prevent water from
26 entering trench during excavation and pipe laying operations to the extent
27 required to properly grade the bottom of the trench and allow for proper
28 compaction of the backfill. Pipe shall not be laid in water.

29 e. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from
30 entering the pipe or pipe joint during handling or laying operations and any pipe
31 or fitting that has been installed with dirt or foreign material in it shall be
32 removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign
33 materials in lieu of flushing. At times when pipe installation is not in progress,
34 the open ends of the pipe shall be closed by a watertight plug or by other means
35 approved by the County to ensure absolute cleanliness inside the pipe. The color
36 stripe and pipe text shall be viewed from the top of pipe when installed. When
37 installing PVC pipe, no additional joints will be installed until the preceding pipe
38 joint has been completed and the pipe carefully embedded and secured in place.

- 1 f. Locating Wire: Locating wire, for electronically locating pipe after it is buried, or
2 installed by trenchless technology shall be attached along the length of and
3 installed with the pipe. This is applicable to all sizes and types of pressure mains.
4 At a minimum, the tracing wire is to be attached to the pipe with nylon wire ties.
5 The wire itself shall be 10-gauge single strand solid core copper wire with non-
6 metallic insulation. The insulation shall be color coded for the type of pipe being
7 installed. Continuous continuity must be maintained in the wire along the entire
8 length of the pipe run. Permanent splices must be made in the length of the wire
9 using wire connectors approved for underground applications as listed in the
10 uniform electric code handbook. The coiled wire shall extend to a minimum of
11 12-inches above the surface and be connected to a test station box at valve
12 locations.
- 13 g. PVC Pressure Pipe Installation and Training: PVC pipe shall be installed in
14 accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe",
15 AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the
16 spigot end into the bell flush with the insertion line or as recommended by the
17 manufacturer. At no time shall the bell spigot end be allowed to go past the
18 "insertion line" or "homing mark" for pressure pipe applications and homing mark
19 shall be visible.
- 20 h. Field Cutting: PVC pipe can be cut with a handsaw or power driven abrasive disc
21 making a square cut. The end shall be beveled with a beveling tool, wood rasp or
22 power sander to the same angle as provided on the factory-finished pipe. The
23 insertion line on the spigot shall be remarked to the same dimensions as the
24 factory-marked spigot.
- 25 i. All Contractor pipe crews utilizing PVC pressure pipe shall be trained on an
26 annual basis by Uni-Bell in coordination with the County and attended by the
27 manufacturer's representative of the respective approved Manufacturers in
28 Appendix D "List of Approved Products." The Uni-Bell PVC training session
29 will consist of proper handling, storage, installation, and compaction as well as
30 County requirements regarding PVC pipe and deflection. Every person handling,
31 installing or backfilling PVC pipe shall not be permitted to install County owned
32 and / or maintained pipe without training.
- 33 j. Approved manufacturers representatives (Appendix D "List of Approved
34 Products"), not present at the hosted Uni-Bell training session or individuals of
35 pipe crews not in attendance shall be trained on every project site. On-site project
36 training shall be for each manufacturer of pipe utilized on-site, per crew and per
37 project. Specifically each crewmember shall be trained on every project by every
38 pipe manufactures representative regardless of previous on-site training. Every
39 person handling, installing or backfilling PVC pipe shall not be permitted to
40 install County owned and / or maintained pipe without training.
- 41 k. PVC Gravity Pipe Installation: Gravity sewer pipe shall be installed to the homing
42 mark, no tolerance. Any noticeable separation shall be removed and reinstalled.
43 The homing mark may be disregarded to meet the maximum of 1-inch separation
44 between bell and spigot requirement. Joints:

- 1 2. Water and Reclaimed Water Combination Air Release Valves: The valve body shall
- 2 be 316 stainless steel, 316 stainless steel float, bronze water diffuser Buna-N or Viton
- 3 seat and stainless steel trim.
- 4 3. Fittings from the main to the air release valve shall be threaded and made of brass.

- 5 B. For Wastewater Service
- 6 1. General: Wastewater force mains shall be equipped with combination air release
- 7 valves located as shown on the Drawings. Valves shall be made to remove air at high
- 8 points where elevation change is 2-feet or greater, located in an enclosure as detailed
- 9 on the Drawings.
- 10 2. Wastewater Combination Air Release Valves: The valve body shall be conical in
- 11 shape and shall be 316 stainless steel with a funnel shape lower body to automatically
- 12 drain sewage back into the system. All internal parts shall be corrosion resistant 316
- 13 stainless steel or non-metallic plastic materials.
- 14 3. On flanged connections 316 stainless steel bolts, nuts and washers are to be used
- 15 along with the proper sized gasket.

- 16 C. Air release valves shall be installed in an enclosure.

17 2.03 TAPPING SLEEVES AND VALVES

- 18 A. General: Tapping sleeves shall be mechanical joint sleeves.

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

- 25 C. Fabricated Mechanical Joint Tapping Sleeves: Sleeves shall be of split mechanical joint
- 26 design with separate end and side gaskets. Sleeves shall be fabricated of high strength
- 27 steel, meeting ASTM A283 Grade C or ASTM A-36. Outlet flange shall meet AWWA
- 28 C-207, Class "D" ANSI 150-pound drilling and be properly recessed for the tapping
- 29 valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI
- 30 A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have
- 31 manufacturer applied fusion-bonded epoxy coating, minimum 12-mil thickness.

- 32 D. Tapping Valves: Tapping valves shall be resilient seated gate valves flange by
- 33 mechanical joint ends. Valves shall be compatible with tapping sleeves as specified
- 34 above and specifically designed for pressure connection operations.
- 35 1. Tapping valves with alignment lip shall be placed vertical where possible for Water
- 36 and Reclaimed Water.

- 1 2. Tapping Valves 16-inch and larger shall be AWWA C515 resilient seated only (16-
2 inch and 24-inch no gearing required) above 24-inch shall be installed vertically with
3 a spur gear actuator. When tapping existing mains, valves 24-inch and above shall be
4 furnished with NPT pipe plugs for flushing the tracks.

5 2.04 VALVE BOXES FOR BURIED VALVES

- 6 A. Standard 2-piece Cast Iron Valve Box: Required for mains less than 6-feet below finished
7 grade and less than or equal to 12-inches in diameter.
8 1. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such
9 elevation at or slightly above the finished grade surface as directed by the County's
10 Representative.
11 2. The barrel shall be 2-piece, screw type only, having 5-1/4-inch shaft. The upper
12 section shall have a flange at the bottom having sufficient bearing area to prevent
13 settling and shall be complete with locking cast iron covers. Coat buried cast iron
14 pieces with coal tar epoxy.
- 15 B. Valve Box Assembly: Valve box assemblies with operating nut extension is required for
16 any size main that is 6-feet or greater below finished grade or if mains are greater than
17 12-inches in diameter.
18 1. Valve boxes shall be 1 complete assembled unit composed of the valve box and
19 extension stem that attaches and locks to the 2-inch wrench nut. The extension shall
20 be high strength, corrosion resistant steel construction, and permanently attached to
21 the operating nut.
22 2. The operating nut extension insert shall be 1 complete assembled unit with a self-
23 adjusting extension stem system that fits inside a standard valve box that will
24 accommodate variable trench depths 6-feet and greater as shown in the Drawings.
25 All moving parts of the extension stem shall be enclosed in a housing to prevent
26 contact with the soil.
27 3. A valve box-centering device designed to eliminate the shifting of the valve box
28 against the operating nut of the valve shall be used. Valve box assembly shall be
29 adjustable to accommodate variable trench depths 6-foot and greater as shown in the
30 Drawings.
- 31 C. The stem assembly shall be of a telescoping design that allows for variable adjustment
32 length. The material shall be at minimum galvanized square steel tubing. The stem
33 assembly shall have a built-in device that prevents the stem assembly from disengaging at
34 its fully extended length. The extension stem must be capable of surviving a torque test
35 to 1,000-foot-pounds without failure.
- 36 D. Valve boxes shall have locking cast iron covers utilizing a 5-sided nut with a special
37 wrench needed to open. Covers shall have "WATER", "SEWER", or "RECLAIMED
38 WATER" cast into the top, as applicable
- 39 E. Concrete Collar: Each valve installed in an unimproved area (outside of pavement,
40 driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or
41 collar as shown in the Drawings.

- 1 F. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the
2 Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in the
3 concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch by 18-
4 inch long concrete post set flush with the pavement surface in improved areas. The disc
5 shall be stamped with the following information as shown on the Drawings:
6 1. Size of the valve
7 2. Type of valve
8 3. Service
9 4. Direction and number of turns to open
- 10 G. Valve markers are to be made of schedule 80 PVC and have decal applied containing
11 information as shown on the Drawings. The marker shall be the same color as the pipe
12 being marked.

13 2.05 LINE STOPPING ASSEMBLIES

- 14 A. Sleeves used to line-stop existing mains shall be provided and installed at locations as
15 shown on the Drawings. Line-stopping sleeve shall be steel fusion epoxy coated body
16 with stainless steel straps, bolts, nuts, and washers. Contractor shall determine the
17 outside diameter of the existing main prior to ordering sleeve.
- 18 B. The line-stopping equipment shall consist of a resilient sealing element, which shall be
19 attached to and transported by a plug inserter perpendicularly into the pipe. The linear
20 actuator shall extend and retract the Line-Stopper into and out of the pipe. When
21 retracted from the pipe, the element and inserter shall be contained within the stopper
22 housing.
- 23 C. The hollow cylindrical sealing element shall be molded of natural rubber. The lower
24 interior chamber of the element shall be enlarged into a hemispherical cavity to allow
25 symmetrical deformation into sealing conformity with the bore of the pipe.
- 26 D. The linear actuator shall be hydraulic and shall have a self-contained hand operated
27 pump. The actuator shall exert a force sufficient to perpendicularly deform the
28 cylindrical element into axially symmetrical sealing contact with the bore of the pipe.
29 Design of actuator shall provide adequate stroke and means to continually align the line-
30 stop bullet stopping assemblies in sizes 14-inch through 20-inch with pressure rating to
31 250-psig.
- 32 E. Equalization of pressure across the sealed element shall not be required to retract the
33 element from the pipe. No equalization fittings shall be required downstream of the line-
34 stopper.
- 35 F. The line-stopping equipment shall be accurately aligned on the 4-inch through 8-inch
36 fittings by locating in the external threads of the fitting nozzle. With sizes 10-inch and
37 12-inch the location shall be made on the centering groove of the fitting flange.
- 38 G. Line-stopping equipment must be capable of function and acceptance of multiple stopper
39 heads and shall be compatible with existing system fittings.

1 2.06 FIRE HYDRANTS AND VALVE ASSEMBLIES

- 2 A. Fire hydrants shall be 5-1/4-inch minimum valve opening and shall comply with the
3 current AWWA Standard Specifications C502-54 for 150-psi working pressure. Fire
4 hydrants shall be of ample length for 3-1/2-foot depth of bury with necessary extensions
5 to place safety flange the required 3-inches above finished grade. Each hydrant shall be
6 made in at least 2 sections bolted together. All interior working parts of the hydrant shall
7 be removable from the top of the hydrant to allow repairs without removing the hydrant
8 barrel after it has been installed. It shall be provided with 2 (two) 2-1/2-inch hose
9 nozzles and 1 (one) 4-1/2-inch pumper nozzle, all having its specific Fire District
10 Standard hose threads. All nozzles shall have caps attached by chains. Operating nuts
11 shall be AWWA Standard. Drain or weep holes shall be permanently plugged by the
12 manufacturer.
- 13 B. Fire hydrant painting and coating shall meet the requirements of Section 09900
14 "Painting." Fire hydrants shall be painted silver in accordance with the present Orange
15 County standards. Three (3) operating wrenches shall be furnished for every 10 hydrants
16 installed or relocated.
- 17 C. All hydrant assemblies shall incorporate anchoring hydrant fittings, including M.J.
18 Locked Hydrant Tee with split gland to provide the locking together of the entire
19 assembly. Gate valve shall be as specified in Specification Section 15111 "Plug Valves."
- 20 D. All hydrants shall have a 24-inch to 48-inch square by 6-inch thick reinforced concrete
21 shear pad as shown in the Drawings.
- 22 E. Fire hydrants shall be located in the general location as shown on the Drawings. Final
23 field location of all hydrants shall be as approved by the County. All hydrants shall be
24 located no less than 5 and no more than 10-feet from the edge of pavement of the
25 adjacent roadway and no less than 5-feet from any physical feature which may obstruct
26 access or view of any hydrant unless otherwise approved by the County.

27 2.07 SERVICE SADDLES

- 28 A. Stainless Steel Service Saddles: Shall be epoxy or nylon coated ductile iron body with
29 stainless steel, 18-8 type 304 straps, AWWA tapered threads for 1-inch and 2-inch to be
30 iron pipe threads. Controlled OD saddles to be used on C905 PVC pipe, double straps to
31 be 2-inch minimum width each, single strap to be minimum of 3-inches wide.
- 32 B. PVC Pipe Service Saddle
- 33 1. One-inch and 2-inch services utilize brass body saddle with controlled OD for 12-
34 inches and smaller pipe.
- 35 2. One-inch and 2-inch taps on existing pipes larger than 12-inches shall use controlled
36 OD epoxy or nylon coated ductile iron body with stainless steel 18-8 type 304 straps.
- 37 3. Four-inch or larger services shall be mechanical tapping sleeves.
- 38 C. Ductile Iron Pipe Service Saddle
- 39 1. One-inch services shall be direct tapped.

- 1 2. Two-inch service shall use a controlled OD service tapping saddle with stainless steel
- 2 straps and a ductile iron body that is either nylon or epoxy coated
- 3 3. Four-inch or larger services shall be mechanical tapping sleeves.

4 D. HDPE Pipe Service Saddle

- 5 1. One-inch and 2-inch shall utilize controlled O.D. tapping saddle with epoxy or nylon
- 6 coated stainless steel 18-8 type 304 double straps.
- 7 2. Four-inch or larger, shall use wide body tapping sleeves with a broad cross section
- 8 gasket set in a retaining groove that increases sealing capability as pressure increases.

9 E. Concrete Pressure Pipe Service Saddle

- 10 1. Tapped concrete pressure pipe shall be in accordance with AWWA M-9, using a
- 11 strap-type saddle made specifically for concrete cylinder pressure pipe.

12 F. Steel Pipe Service Saddle

- 13 1. Welded-on steel sleeves shall be used for all sizes and applications.

14 2.08 CORPORATION STOPS AND CURB STOPS

15 A. Corporation Stops: Shall be brass body reduced port type compatible with the

16 polyethylene tubing and threaded in accordance with AWWA C800, AWWA C901, and

17 shall comply with NSF-61.

18 B. Curb Stops: Shall be brass body reduced port type compatible with the polyethylene

19 tubing and threaded in accordance with AWWA C800, AWWA C901, and shall comply

20 with NSF-61.

21 2.09 WATER MAIN AND RECLAIMED WATER MAIN SERVICE PIPE

22 A. Polyethylene Service Pipe: One-inch and 2-inch service lines shall be polyethylene

23 tubing conforming to AWWA C901 and AWWA C800. Tubing shall be approved for

24 potable water use and bear the seal of the National Sanitation Foundation (NSF). The

25 product shall be rated for a minimum working pressure of 150-psi and a (Dimension

26 Ratio) DR-9 size. The tubing shall be designated copper tube size and the material PE-

27 2406 cell classification minimum PE213323C in accordance with ASTM 3350.

28 B. Ductile Iron Service Pipe: Services 4-inch and larger shall be DIP. If the existing main is

29 on the same side of the street as the property to be serviced, the service pipe shall be DIP

30 from the point of connection to the existing main to the meter assembly. If the existing

31 main is on the opposite side of the street as the property to be serviced, at a minimum, the

32 segment of pipe immediately upstream from the meter assembly shall be DIP.

33 C. No service pipe shall terminate under a driveway.

1 2.10 PRESSURE GAUGES

2 A. Pressure gauges shall be installed on each pump station discharge pipe as indicated on the
3 Drawings.

4 B. Pressure gauge shall be direct mounted, diaphragm (type) gauge, stainless steel case,
5 stainless steel sensing element, liquid filled, with a 4-1/2-inch diameter dial and furnished
6 with a clear glass crystal window and 1/4-inch shut-off (isolation) valve. Gauges shall be
7 weatherproof.

8 C. The pressure gauge face dial shall be white finished aluminum with jet-black graduations
9 and figures and shall indicate the units of pressure measured in psi. Gauges shall be
10 provided with pressure at normal operation at the mid range of the gauge.

11 D. As wastewater flows through the housing, the cylinder shall transmit pressure through the
12 sensing liquid. Gauge outlet in the spool or ring shall be threaded, 1/4-inch, per ANSI
13 B2.1.

14 E. Nipples for connecting gauges to piping shall be Schedule 80S, Grade TP 316 seamless
15 stainless steel, conforming to ASTM A 312. Fittings shall conform to ASTM A 403,
16 Class WP316. Threads shall conform to ANSI B2.1. Size of pipe nipple shall match the
17 gauge connection size.

18 2.11 TIE RODS

19 A. Steel for tie rods and tie bolts shall conform to the requirements of ASTM Designation A
20 242, and rods shall be galvanized in conformance with requirements of ASTM
21 Designation A 123.

22 2.12 BACK FLOW PREVENTION

23 A. Reduced Pressure Backflow Preventer shall conform to the requirements of ASSE 1013,
24 rated to 180°F and supplied with full port ball valves. The main body and access covers
25 shall be bronze and meet ASTM B 584, the seat ring and all internal polymers shall be
26 NSF Noryl and the seat disc elastomers shall be silicone.

27 B. Dual check valves shall be required and shall be accessible for maintenance without
28 removing the relief valve or the entire device from the line.

29 C. The bottom of the preventer shall be installed a minimum of 12-inches above grade and
30 not more than 30-inches above grade.

31 2.13 FLANGED COUPLING ADAPTERS

32 A. All adapters shall be harnessed with the bolts across the joint (flange to flange or flange
33 to lug) designed for the pipe test pressure.

- 1 B. Adapter Size: Conform in size and bolt hole placement to ANSI standards for steel and/or
2 cast iron flanges 125 or 150-pound standard unless otherwise required for connections.
- 3 C. Exposed Sleeve Type
4 1. Material: Steel
5 2. Coating: Enamel
6 3. Bolting: Carbon steel
7 4. Acceptable Manufacturers: Dresser Manufacturing Co. - Style 128 for cast iron
8 ductile iron and steel pipes with diameters of 2-inches through 96-inches, or equal.
- 9 D. Buried Sleeve Type
10 1. Material: Cast iron
11 2. Bolting: Type 304 stainless steel conforming to ASTM A 193, Grade B8 for bolts,
12 and ATM A 194, Grade 8 for nuts and washers. Bolts and nuts greater than 1-1/8-
13 inches shall be carbon steel, ASTM A 307, Grade B, with cadmium plating, ASTM A
14 165, Type NS.
15 3. Acceptable manufacturers: Dresser Manufacturing Co. - Style 127 locking type for
16 cast iron, ductile, iron, asbestos cement and steel pipes with diameters of 3-inches
17 through 12-inches, or equal.
- 18 E. Split Type
19 1. Material: Malleable or ductile iron.
20 2. Design: For use with grooved or shouldered end pipe.
21 3. Coating: Enamel
22 4. Acceptable Manufacturers: Victaulic Company of America - Style 741 for pipe
23 diameters of 2-inches through 12-inches, Victaulic Company of America - Style 742
24 for pipe diameters of 14-inches through 16-inches, or equal.

25 **PART 3 - EXECUTION**

26 3.01 INSTALLATION

- 27 A. All ancillary equipment shall be installed in the locations shown, true to alignment and
28 rigidly supported. Any damage to the above items shall be repaired to the satisfaction of
29 the County before installation.
- 30 B. After installation, all ancillary equipment shall be tested as specified for adjacent piping.
31 If any joint or equipment proves to be defective, it shall be repaired and retested to the
32 satisfaction of the County.
- 33 C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and
34 appurtenances as shown on the Drawings that are in masonry floors or walls, and install
35 concrete inserts for hangers and supports as soon as forms are erected and before concrete
36 is poured. Before setting these items, the Contractor shall check all plans and figures,
37 which have a direct bearing on the location and shall be responsible for the proper
38 location of these valves and appurtenances during the Construction of the structures.

1 D. Notification and Connections to Existing Mains

- 2 1. The Contractor shall submit a completed "System Connection" form to the County to
3 schedule the connection. The request shall be made a minimum of 5-working days
4 prior to the proposed tie-in to the existing main for pressure connections and 10-
5 working days prior to the proposed tie-in to the existing main for non-pressure
6 connections. In this request, the Contractor shall provide the following information:
7 a. Points of connection, fittings to be used and method of flushing and disinfection if
8 applicable
9 b. Estimated construction time for said connections
10 c. Identify pressure and non-pressure connections
11 2. Connections shall only be made on the agreed upon date and time. If the Contractor
12 does not perform the Work in the agreed upon manner or schedule, the Contractor
13 shall be required to reschedule the connection by following the procedure outlined
14 above.

15 E. Pressure Connections: Sufficient length of main shall be exposed to allow for installation
16 of the tapping sleeve and valve and the operation of the tapping machinery. The main
17 shall be supported on concrete pedestals or bedding rock at sufficient intervals to
18 properly carry its own weight, plus the weight of the tapping sleeve, valve and
19 machinery. Any damage to the main due to improper or insufficient supports will be
20 repaired at the Contractor's expense.

- 21 1. Prior to the tap, the Contractor shall assemble all materials, tools, equipment, labor,
22 and supervision necessary to make the connection.
23 2. The Contractor shall excavate a dry and safe working area pit of sufficient size to
24 enable the necessary Work.
25 3. The inside of the tapping sleeve and valve, the outside of the main and the tapping
26 machine shall be cleaned and swabbed or sprayed with 1% liquid chlorine solution
27 prior to beginning installation for water system pressure connections and must
28 comply with AWWA C-651-99 or most current version.
29 4. After the tapping sleeve has been mounted on the main, the tapping valve shall be
30 bolted to the outlet flange, making a pressure tight connection. Prior to beginning the
31 tapping operation, the sleeve and valve shall be pressure tested under the observation
32 of County personnel to 150-psi for 30-minute duration to ensure that no leakage will
33 occur.
34 5. For pressure connections 4-inch through 20-inch installation, the minimum diameter
35 cut shall be 1/2-inch less than the nominal diameter of the pipe to be attached. For
36 larger taps, the allowable minimum diameter shall be 2 to 3-inches less than the
37 nominal diameter of the pipe being attached. After the tapping procedure is
38 complete, the Contractor shall submit the coupon to the County.
39 6. The tapping valve shall be placed horizontally for pressure connections to wastewater
40 force mains. A plug valve shall be attached to the tapping valve after the tapping
41 procedure is complete. The tapping valve shall be left in the open position prior to
42 backfilling.
43 7. Adequate restrained joint fittings shall be provided to prevent movement of the
44 installation when test pressure is applied.
45 8. The Contractor shall be responsible for properly backfilling the work area pit after the
46 Work is completed.

- 1 F. Non-Pressure Dry Connections
2 1. For water service connections, no customer shall be without service for more than 6-
3 hours. For wastewater connections, provide bypass operations per Section 01516
4 "Collection System Bypass." This accommodation to customers may include
5 scheduling after Normal Working Hours.
6 2. The Contractor shall be ready to proceed by pre-assembling as much material as
7 possible at the site to minimize the length of service interruption.
8 3. Needed pipe restraints must be installed prior to the initiation of the shutdown.
9 4. The excavation shall be opened and needed site preparations must be completed
10 before the initiation of the connection work.
11 5. County shall postpone a service cut-off if the Contractor is not ready to proceed at the
12 scheduled time.
13 6. Only County personnel shall operate the valves needed to perform the shutdown on
14 the existing system.

15 3.02 PAINTING

- 16 A. All exterior surfaces of iron body valves shall be clean, dry, and free from rust and grease
17 before coating.
18 B. For valves installed underground or in valve vaults, all exterior ferrous parts of valve and
19 actuator shall be coated at the factory with a thermally bonded epoxy coating in
20 accordance with AWWA C550, latest revision.
21 C. For aboveground service, the exterior ferrous parts of all valves shall be coated in
22 weatherproof paint. The color of the finish coats shall be in accordance with the Orange
23 County Utilities Standards.

24 END OF SECTION

1 **SECTION 15110**

2 **PLUG VALVES**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

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

7 1.02 QUALITY ASSURANCE

8 A. References

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

10 B. Proof-of-Design Tests

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

23 1.03 SHOP DRAWINGS AND SUBMITTALS

24 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
25 to construction in accordance with the General Conditions and specifications Section
26 01300 "Submittals."

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

5 **PART 2 - PRODUCTS**

6 2.01 GENERAL

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

9 2.02 MANUFACTURERS

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

12 2.03 MATERIALS

13 Materials of construction shall be as follows:
14

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

15 2.04 MANUFACTURE

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

- 1 4. Valves shall have the name of the manufacturer and the size of the valve cast or molded
2 onto the valve body. A permanent plate shall be attached to the valve or operator
3 indicating serial number, order number, accessories, operator model and manufacturer.
- 4 5. Ball centric/eccentric plug valves shall be of the non-lubricated type. The port area
5 for valves 4-inches to 20-inches shall have a minimum 80% nominal pipe diameter
6 and valves 24-inches and larger shall have a minimum port area of 70% of nominal
7 pipe diameter unless noted on the Drawings as "full port". Plug valves denoted as full
8 port shall have a port area equal to the full area of the nominal pipe diameter.
- 9 6. Minimum pressure rating of valves 4-inches to 12-inches shall be 175-psi; valves 14-
10 inches to 72-inches shall be 150-psi. Valve bodies shall be cast iron ASTM A126,
11 Class B and fusion-bonded epoxy coated.
- 12 7. Valve ends shall be mechanical joint (buried) or flanged (exposed) as indicated on the
13 Drawings. Valve flange drilling for valves 3-inches and larger shall be per ANSI
14 B16.1, Class 125. Plugs shall be cast iron or ductile iron with neoprene facing and shall
15 be of the single piece design. The plug shall be of the same configuration for all valves
16 and shall require no stiffening member opposite the plug for balance or support. Valve
17 body seats shall have a welded-in overlay of not less than 90% nickel. Packing shall be
18 adjustable and safely replaceable without disassembling the valve. Bushing shall be
19 316 stainless steel in both upper and lower journals and shall be protected from foreign
20 matter with the use of a grit seal or similar. The valve should be capable of drip tight
21 shut off with flow in either direction at the full pressure of the valve. All exposed nuts,
22 bolts, springs and washers on buried service valves shall be 304 stainless steel. All
23 above- grade valves shall have 316 stainless steel hardware.
- 24 8. Actuators: Manual valves shall have lever or gear actuators and tee wrenches,
25 extension stems, and floor stands as indicated on the Drawings. Valves 6-inch and
26 larger shall be equipped with buried service rated gear actuators. Buried valves shall
27 have a 2-inch square operating nut. All gearing shall be enclosed in a steel housing
28 and be suitable for running in a lubricant with seals provided on all shafts to prevent
29 entry of dirt and water into the actuator. Actuator shafts shall be supported on
30 permanently lubricated bronze bearings. Actuators shall clearly indicate valve
31 position and an adjustable stop shall be provided to set closing torque. Exposed nuts,
32 bolts and washers shall be 316 stainless steel. Valve packing adjustment shall be
33 accessible without disassembly of the actuator.
- 34 9. Valve Testing: Plug valves shall be tested in accordance with AWWA C504. Each
35 valve shall meet the performance, leakage, and hydrostatic tests described in AWWA
36 C504. The leakage test shall be applied to the face of the plug tending to unseat the
37 valve. The manufacturer shall furnish certified copies of reports covering proof-of-
38 design testing as described in AWWA C504.

39 B. Valve Boxes

- 40 1. All valves installed underground shall have cast iron 2-piece valve boxes. Valve boxes
41 shall be provided with suitable heavy bonnets and shall extend to such elevation at or
42 slightly above the finished grade surface as directed by the County. The barrel shall be
43 screw type only, with a 5-1/4-inch shaft. The upper section shall have a flange at the
44 bottom having sufficient bearing area to prevent settling and shall be complete with
45 locking cast iron covers. Covers shall have "SEWER" cast into the top for all
46 wastewater mains which shall be so constructed as to prevent tipping or rattling.

- 1 2. A valve box with an operating nut extension is required for any size main that is 6-feet
2 or greater below finished grade. The extension shall be high strength, corrosion
3 resistant steel construction and permanently attached to the operating nut. The
4 operating nut extension insert shall be one complete assembled unit with a self-
5 adjusting extension stem system that fits inside a standard valve box. All moving parts
6 of the extension stem shall be enclosed in a housing to prevent contact with the soil. A
7 valve box-centering device designed to eliminate the shifting of the valve box against
8 the operating nut of the valve shall be used. The valve box assembly shall be adjustable
9 to accommodate variable trench depths 6-foot and greater as shown in the Drawings.
- 10 3. The stem assembly shall be of a telescoping design that allows for variable
11 adjustment length. The material shall be galvanized square steel tubing. The stem
12 assembly shall have a built-in device that prevents the stem assembly from
13 disengaging at its fully extended length. The extension stem must be capable of
14 surviving a torque test to 1,000 foot-pounds without failure.
- 15 4. The valve boxes shall have locking lids.
- 16 5. Extension sections shall be cast or ductile iron only.
- 17 6. Valve boxes in non-paved areas shall be installed with a valve collar as shown in the
18 Drawings. The protective concrete collar with a bronze identification disc shall be
19 constructed of Class B concrete as shown on the Drawings.

20 **PART 3 - EXECUTION**

21 3.01 INSTALLING VALVES AND BOXES

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

38 **END OF SECTION**

1

APPENDIX C

2

ORANGE COUNTY UTILITIES

3

PERMITS OBTAINED BY COUNTY

4



Florida Department of Environmental Protection

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Noah Valenstein
Secretary

NOTIFICATION OF ACCEPTANCE OF USE OF A GENERAL PERMIT

PERMITTEE:

Orange County Utilities
9150 Curry Ford Road
Orlando, FL 32825
Jose Hernandez, Chief Engineer

Email: jose.hernandez2@ocfl.net

PERMIT NUMBER:

ISSUE DATE:

EXPIRATION DATE:

COUNTY:

PROJECT NAME:

CONNECTED TO:

FACILITY ID:

0359153-001-DWC/CG

November 29, 2017

November 28, 2022

Orange

Holden Avenue Sewer Phase 1

OCUD South WRF

FLA107972

Dear Mr. Hernandez:

This letter acknowledges receipt of your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System for the subject project. Our office received the Notice on November 28, 2017.

This is to advise you that the Department does not object to your use of such General Permit.

Please note the attached requirements apply to your use of this General Permit for constructing the proposed domestic wastewater collection/transmission system.

You are further advised that the construction activity must conform to the description contained in your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System and that any deviation will subject the permittee to enforcement action and possible penalties.

Sincerely,

A handwritten signature in cursive script that reads "Wanda Parker-Garvin".

Wanda Parker-Garvin
Environmental Manager
Permitting and Waste Cleanup Program - Wastewater

WPG/ohm

cc: Thomas Lochrane, PE, Lochrane Engineering, tom.lochrane@lochrane.com
Charles LeGros, DEP, Charles.LeGros@dep.state.fl.us
Osama Mahmoud, DEP, osama.mahmoud@dep.state.fl.us

REQUIREMENTS FOR USE OF THE GENERAL PERMIT FOR DOMESTIC WASTEWATER COLLECTION/TRANSMISSION SYSTEMS:

1. This general permit is subject to the general permit conditions of Rule 62-4.540, F.A.C., as applicable. This rule is available at the Department's Internet site at:
<http://www.dep.state.fl.us/legal/Rules/shared/62-4/62-4.pdf> [62-4.540]
2. This general permit does not relieve the permittee of the responsibility for obtaining a dredge and fill permit where it is required. [62-604.600(6)(b)1]
3. This general permit cannot be revised, except to transfer the permit. [62-604.600(6)(b)2]
4. This general permit will expire five years from the date of issuance. If the project has been started and not completed by that time, a new permit must be obtained before the expiration date in order to continue work on the project. [62-4.030]
5. Upon completion of construction of the collection/transmission system project, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the Department's Central District Office Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation. This form is available at the Department's Internet site at: <http://www.dep.state.fl.us/water/wastewater/dom/dw-forms.htm>. [62-604.700(2)]

Please submit the entire clearance document package in electronic format to DEP_CD@dep.state.fl.us, with a copy to osama.mahmoud@dep.state.fl.us, and Charles.LeGros@dep.state.fl.us. If the file is very large, you may post it to the Wastewater Electronic Applications folder on the following ftp site at:

<ftp://ftp.dep.state.fl.us/pub/wastewater/>

After posting the document, send an e-mail to DEP_CD@dep.state.fl.us, with a copy to osama.mahmoud@dep.state.fl.us, and Charles.LeGros@dep.state.fl.us, alerting us that it has been posted. Any submitted drawings (should be sized 11" x 17") and the engineer of record's signed seal and dates on the required document must be legible for acceptance.

For further clarification contact:
(Osama Mahmoud), (407) 897-4125
3319 Maguire Blvd, Suite 232
Orlando, Florida 32803-3767

6. The new or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. [62-604.700(3)]
7. Abnormal events shall be reported to the Department's Central District Office in accordance with Rule 62-604.550, F.A.C. For unauthorized spills of wastewater in excess of 1000 gallons per incident, or where information indicates that public health or the environment may be endangered, oral reports shall be provided to the STATE WATCH OFFICE TOLL FREE NUMBER (800)320-0519 as soon as practical, but no later than 24 hours from the time the permittee or other designee becomes aware of the circumstances. Unauthorized releases or spills less than 1000 gallons per incident are to be reported orally to the Department's Central District Office within 24 hours from the time the permittee, or other designee becomes aware of the circumstances. [62-604.550]

UTILITY PERMIT

PERMIT NO: 2018-H-594-390

STATE ROAD INFORMATION

County: Orange	Section: 75010000	State Road No: SR 600	Beginning Mile Post: 10.190	Ending Mile Post: 10.190
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APPLICANT INFORMATION

The Utility Agency Owner (UAO) shall be identified in this Applicant Information Box. When the UAO is a City or County and desires to have the Utility Builder make a joint permit applicant, as prescribed in Section 2.1(4) of the 2017 Utility Accommodation Manual (UAM), the Utility Builder shall also be identified in this Applicant Information Box. A Utility Builder alone cannot apply for a utility permit without the City or County adding them as a joint applicant.

Utility Agency/Owner (UAO)		Utility Builder (only applicable when the UAO is a City or County)	
Name:	<u>Orange County Utilities (Hernandez)</u>	Name:	_____
Contact Person:	<u>Orange County Utilities (Hernandez)</u>	Contact Person:	_____
Address:	<u>9150 Curry Ford Rd</u>	Address:	_____
City:	<u>Orlando</u>	City:	_____
State:	<u>Florida</u>	State:	_____
Zip:	<u>32825</u>	Zip:	_____
Telephone:	<u>4072549718</u>	Telephone:	_____
Email:	<u>Jose.Hernandez2@ocfl.net</u>	Email:	_____

WORK DESCRIPTION

The Applicant(s) requests permission from the Florida Department of Transportation (FDOT) to construct, operate, and maintain the utilities as described below and as depicted in the incorporated documentation.
Construction of force main and gravity sewer in conjunction with Orange County Public Works roadway widening project (Permit 2018-A-510-037). work within the Department's right of way consists of wet tapping an existing OCU 12" force main to connect the new facility.

Utility Work No: _____

Additional sheets are attached and are incorporated into this permit Yes No

For FDEP certification, the FDOT agency report is attached in accordance with UAM Section 2.4.1 (13) Yes No

TRAFFIC CONTROL (TCP)

The TCP will comply with the following 600 series index(es) 616

A TCP has been attached and incorporated into this permit application in compliance with UAM Section 2.4.2.

MOT Technician's contact information (may be supplied at the two (2) business day notification to FDOT):

Name: _____ Telephone: _____ Email: _____

COMMENCEMENT OF WORK

The UAO and/or Utility Builder shall commence actual construction in good faith within sixty (60) calendar days after approval of the permit application. If the beginning date is more than sixty (60) calendar days from the date of approval, the UAO and/or Utility Builder must review the permit with the FDOT Approving Engineer listed to make sure no changes have occurred to the transportation facility that would affect the permit's continued approval. The UAO and/or Utility Builder shall make good faith efforts to expedite the work and complete the work within the calendar days indicated.

Anticipated Start Date: 12/3/2018

Calendar days needed to completed: 5

Approved
2018-H-594-390
Scott Kirts
10/3/2018

Florida Department of Transportation
UTILITY PERMIT

PERMIT NO: 2018-H-594-390

APPLICANT SIGNATURE

By the below signature(s) the UAO and/or Utility Builder agree(s) to construct, operate, and maintain the work as noted in the above Work Description, shown in plans and incorporated documents, in compliance with the UAM, all instructions noted in the FDOT Special Instructions Box, and special instructions incorporated into this permit. The UAO and/or Utility Builder declares, the location of all existing utilities that it owns or has an interest in, both aerial and underground, are accurately shown on the plans of the work areas. In accordance with UAM Section 2.8, the UAO and/or Utility Builder further declares that a letter of notification was delivered to the owners of other facilities within the work areas and that those listed below are the only facility owners known to be involved or potentially impacted by the proposed work.

Date Notified:	Name of other facility owners (attach additional sheets if necessary).
<u>7/26/2016</u>	<u>AT&T Corp</u>
<u>7/26/2016</u>	<u>AT&T FL</u>
<u>7/26/2016</u>	<u>Charter a/k/a Bright House</u>
<u>7/26/2016</u>	<u>Crown Castle</u>
<u>7/26/2016</u>	<u>Duke Energy - Distribution</u>

Utility Agency/Owner

Utility Builder (when applicable)

Signature: JOSE HERNANDEZ (digital signature) Date: 8/7/2018
 Name (printed): JOSE HERNANDEZ
 Title: _____

Signature: _____ Date: _____
 Name (printed): _____
 Title: _____

FDOT PROJECT INFORMATION

Pursuant to UAM Section 2.1(10), the utility work is within FDOT projects listed below and must have a Utility Work Schedule for each project approved prior to commencement of work within the FDOT project limits:

FDOT construction is proposed or underway. Refer to Financial Project Id: 43967915201, 43967915901
This work is NOT related to an approved utility work schedule.

FDOT SPECIAL INSTRUCTIONS

In accordance with UAM Section 2.7, FDOT incorporates the below and attached special instructions into this permit.

- (1) COMPLY WITH THE FOLLOWING LANE CLOSURE RESTRICTIONS: NO LANE CLOSURES ALLOWED NORTHBOUND FROM: 7 AM TO 9 AM AND 12 PM TO 7 PM SOUTHBOUND FROM: 6 AM TO 7 PM.
- (2) PERMITTEE SHALL CONTACT JOSE ORTIZ AT (321) 319-8100 TO PROVIDE START NOTICE AT LEAST 48 HOURS PRIOR TO STARTING WORK.

PRIOR TO ANY WORK REQUIRING LANE CLOSURES, MOBILE OPERATIONS OR TRAFFIC PACING OPERATIONS, THE CONTRACTOR OR PERMITTEE SHALL SUBMIT A REQUEST ... (see special

Additional FDOT Special Instructions are attached and incorporated into this permit. Yes No

PERMIT APPROVAL

By signature below, FDOT gives permission to the UAO and /or Utility Builder to construct, operate, and maintain the utilities indicated in this Utility Permit in compliance with the UAM, all incorporated documents, and special instructions. Any changes to the approved work must be approved by the FDOT's Approving Engineer and attached and incorporated into this permit in accordance with UAM Section 2.11.

Approving Engineer: Scott Kirts (digital signature) Date: 10/3/2018
 Name: Scott Kirts
 Title: OPERATIONS PROGRAM ENGINEER

Notification of Utility Work to be provided to: Telephone 32131981008103 or Email: jose.ortiz@dot.state.fl.us

An FDOT Representative is required to be present on the worksite prior to commencement of work. Yes No

Rep. Name: _____ Telephone _____ Email: _____

Approved
2018-H-594-390
Scott Kirts
10/3/2018

PERMIT NO.: 2018-H-594-390

STATE ROAD INFORMATION:

NAME OF OTHER FACILITY OWNERS / DATE NOTIFIED:

Facility Name: Duke Energy - Transmission, Date Notified: 7/26/2016, Facility Name: Orange County Utilities, Date Notified: 7/26/2016, Facility Name: OUC Chilled Water, Date Notified: 7/26/2016, Facility Name: OUC Communications, Date Notified: 7/26/2016, Facility Name: OUC Electric - Distribution, Date Notified: 7/26/2016, Facility Name: OUC Electric - Transmission, Date Notified: 7/26/2016, Facility Name: OUC Lighting, Date Notified: 7/26/2016, Facility Name: OUC Water, Date Notified: 7/26/2016, Facility Name: TECO Peoples Gas, Date Notified: 7/26/2016, Facility Name: Tower Cloud/Uniti Fiber, Date Notified: 7/26/2016

FDOT PROJECT INFORMATION:

FDOT construction is proposed or underway. Refer to Financial Project Id: 43967915201, 43967915901
This work is NOT related to an approved Utility Work Schedule.

THE WORK WAS INSPECTED AND FOUND TO BE IN NON-COMPLIANCE AS NOTED BELOW:

Approved
2018-H-594-390
Scott Kirts
10/3/2018

PERMIT NO.: 2018-H-594-390

The complete special instructions could not fit in the space allotted on Page 2 of the Utility Permit so they are displayed below.

Special FDOT Instructions

(1) COMPLY WITH THE FOLLOWING LANE CLOSURE RESTRICTIONS: NO LANE CLOSURES ALLOWED NORTHBOUND FROM: 7 AM TO 9 AM AND 12 PM TO 7 PM SOUTHBOUND FROM: 6 AM TO 7 PM. (2) PERMITTEE SHALL CONTACT JOSE ORTIZ AT (321) 319-8100 TO PROVIDE START NOTICE AT LEAST 48 HOURS PRIOR TO STARTING WORK.

PRIOR TO ANY WORK REQUIRING LANE CLOSURES, MOBILE OPERATIONS OR TRAFFIC PACING OPERATIONS, THE CONTRACTOR OR PERMITTEE SHALL SUBMIT A REQUEST TO THE DEPARTMENT THAT INCLUDES THE TIME, LOCATION, AND DESCRIPTION OF WORK BEING PERFORMED. THE LANE CLOSURE REQUEST SHALL BE SUBMITTED TO THE DEPARTMENT A MINIMUM OF 2 WEEKS PRIOR TO THE PROPOSED CLOSURE DATE AND MUST BE APPROVED BY THE DEPARTMENT BEFORE WORK REQUIRING THE CLOSURE MAY BEGIN WITHIN THE FDOT RIGHT OF WAY. SUBMIT LANE CLOSURE REQUESTS THROUGH THE LANE CLOSURE INFORMATION SYSTEM (LCIS), FOUND AT THE FOLLOWING WEBSITE: [HTTPS://LCIS.DOT.STATE.FL.US/](https://lcis.dot.state.fl.us/)

Approved
2018-H-594-390
Scott Kirts
10/3/2018

CONSTRUCTION PLANS FOR HOLDEN AVENUE PHASE 1 UTILITY IMPROVEMENTS

FROM JOHN YOUNG PARKWAY TO
ORANGE BLOSSOM TRAIL (U.S. 441)

PROJECT SEQ. #36906 UNIT 1432 - SUBUNIT 96

DISTRICT NO. 6
ORANGE COUNTY, FLORIDA

BID SET

BOARD OF COUNTY COMMISSIONERS

TERESA JACOBS	COUNTY MAYOR
BETSY VANDERLEY	DISTRICT 1
ROD A. LOVE	DISTRICT 2
PETE CLARKE	DISTRICT 3
JENNIFER THOMPSON	DISTRICT 4
EMILY BONILLA	DISTRICT 5
VICTORIA P. SIPLIN	DISTRICT 6

AJIT LALCHANDANI
COUNTY ADMINISTRATOR

RAYMOND HANSON, P.E.
DIRECTOR ORANGE COUNTY UTILITIES DEPARTMENT



LIST OF DRAWINGS	
U1	COVER SHEET
U2	LOCATION & VICINITY MAPS
U3 - U4	UTILITY NOTES
U5	SUMMARY OF QUANTITIES
U12 - U13	U6 - U10 PLAN AND PROFILES
	U19 - U21 STANDARD DETAILS
	U22 - U23 WASTEWATER ASSET TABLES
	U24 CROSS SECTION
M-1	MAINTENANCE OF TRAFFIC GENERAL NOTES
M-10, M-13 - M-14	M-2 - M-15 MAINTENANCE OF TRAFFIC PLANS

PREPARED BY:

LOCHRANE
ENGINEERS • SURVEYORS

201 SOUTH BUNNY AVENUE, ORLANDO, FLORIDA 32803
PH: (407) 896-5317 FAX: (407) 896-2667 EMAIL: WWW.LOCHRANE.COM

REVISIONS	DATE	BY

DESIGNED BY:	FWA	DATE:	
CHECKED BY:	RB	DATE:	
DRAWN BY:	TA	DATE:	
APPROVED BY:	TGL	DATE:	
PROJECT NO.:	04012.40		

Approved
2018
SHEET U1
OF U24
Scott Harris
10/3/2018

UTILITIES ENCOUNTERED

TELEPHONE, FIBER OPTIC CABLE	
BELL SOUTH	(407) 273-5084
AT&T (PEA)	(407) 578-8000
NATURAL GAS	
TECO/PEOPLES GAS	(407) 420-2679
WATER	
ORLANDO UTILITIES COMMISSION (DISPATCH)	(407) 236-9651
OVERHEAD AND UNDERGROUND ELECTRIC	
ORLANDO UTILITIES COMMISSION	(407) 649-4449
CABLE TV	
BRIGHT HOUSE NETWORKS	(407) 532-8509
ORANGE COUNTY UTILITIES	
DISPATCH	(407) 836-2777
FIELD SERVICES	(407) 836-6818 OR
	UD-FSC@OCFL.NET
RAY RICE (INSPECTOR/ CONSTRUCTION DIVISION)	(407) 947-9800

NOTE: THIS LISTING IS PROVIDED AS AN AID TO THE CONTRACTOR. UTILITIES LISTED ARE THOSE WHICH ARE KNOWN TO HAVE FACILITIES WITHIN THE GENERAL LOCATION OF THE PROJECT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY AND ARRANGE FOR FIELD LOCATION OF ALL FACILITIES THAT ARE ENCOUNTERED DURING CONSTRUCTION.

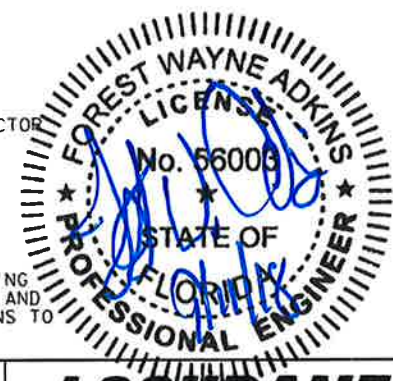
GENERAL CONSTRUCTION NOTES

ALL WORK AND REQUIREMENTS FROM THE NOTES IN THIS PAGE SHALL BE A REQUIREMENT OF THE CONTRACT AND EXECUTED BY THE CONTRACTOR AT NO ADDITIONAL COST TO ORANGE COUNTY.

- THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHILE EXCAVATING IN PROXIMITY OF WATER MAINS, WASTEWATER FORCE MAINS, GRAVITY MAINS AND RECLAIMED WATER MAINS. MAIN LOCATIONS SHOWN ON THE PLANS MAY NOT BE EXACT. THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING UTILITY LOCATIONS.
- SHOULD A PIPE EMERGENCY OCCUR, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OCU DISPATCH OPERATOR (407-836-2777) AND THE OCU INSPECTOR.
- THE CONTRACTOR SHALL NOTIFY THE OCU CONSTRUCTION DIVISION AT LEAST SEVEN (7) DAYS PRIOR TO COMMENCEMENT OF THE CONSTRUCTION PROJECT BY CALLING (407) 254-9798.
- THE CONTRACTOR SHALL NOTIFY THE OCU CONSTRUCTION DIVISION AT LEAST 48 HOURS PRIOR TO ANY UTILITIES CONSTRUCTION BY CALLING (407) 254-9798.
- THE MATERIALS, PRODUCTS, AND CONSTRUCTION OF ALL UTILITIES CONNECTING TO THE OCU SYSTEM SHALL BE IN CONFORMANCE WITH THE ORANGE COUNTY UTILITIES STANDARDS AND CONSTRUCTION SPECIFICATIONS MANUAL.
- ALL OCU MAINS AND FACILITIES WITHIN THE LIMITS OF THE PROJECT SHALL BE SUPPORTED AND PROTECTED AGAINST DAMAGE DURING CONSTRUCTION.
- THE CONTRACTOR SHALL ADJUST ALL EXISTING OCU MAINS AND FACILITIES IN CONFLICT WITH NEW GRADE, NEW OR ALTERED ROADWAYS, SIDEWALKS, DRIVEWAYS, OR STORM WATER IMPROVEMENTS. OCU FACILITIES TO BE ADJUSTED INCLUDE, BUT ARE NOT LIMITED TO PIPELINES, PUMP STATIONS, VALVE BOXES, AIR RELEASE VALVES, FIRE HYDRANTS, MANHOLE COVERS AND METERS. ALL EXISTING AND NEW OCU WATER AND SEWER VALVES, VALVE BOXES, AND MANHOLES SHALL BE PROTECTED AND ADJUSTED TO FINISH GRADE AS SHOWN ON THE DRAWINGS. VALVE AND VALVE BOXES SHALL REMAIN ACCESSIBLE AT ALL TIMES. ANY VALVES THAT MIGHT BE COVERED DURING CONSTRUCTION SHALL BE MARKED WITH A MARKER (GREEN FOR SEWER, BLUE FOR WATER, AND PURPLE FOR RECLAIMED WATER MAIN). A MINIMUM OF FOUR (4) FEET ABOVE GRADE. ALL VALVES UNDER CONSTRUCTION ARE TO REMAIN CLOSED DURING CONSTRUCTION.
- ONLY OCU SHALL OPERATE OCU WATER, WASTEWATER, AND RECLAIMED WATER VALVES. THE CONTRACTOR SHALL COORDINATE VALVE OPERATION WITH THE OCU INSPECTOR. FOR OPERATION OF MAINS NOT OWNED BY OCU, IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE APPROPRIATE UTILITY REPRESENTATIVE.
- CONSTRUCTION ACTIVITIES SHALL NOT CAUSE INTERRUPTIONS IN WATER, WASTEWATER, OR RECLAIMED WATER SERVICE. THE CONTRACTOR SHALL COORDINATE PRE-APPROVED INTERRUPTIONS OF SERVICE WITH THE OCU INSPECTOR 7 WORKING DAYS IN ADVANCE.
- THE CONTRACTOR SHALL PROVIDE FOR BYPASSING AND/OR HAULING WASTEWATER. THE CONTRACTOR SHALL SUBMIT A BYPASS PLAN SIGNED AND SEALED BY A PROFESSIONAL ENGINEER TO OCU DEVELOPMENT ENGINEERING FOR APPROVAL PRIOR TO IMPLEMENTATION BY CONTRACTOR.
- ALL VALVES INSTALLED AS PART OF THIS CONSTRUCTION PROJECT SHALL REMAIN CLOSED DURING CONSTRUCTION. KEEP VALVES ON ALL WET TAPS CLOSED UNTIL CLEARED BY FDEP. DO NOT CONNECT NEWLY CONSTRUCTED WATER MAINS TO ANY EXISTING WATER MAINS UNLESS CLEARED BY FDEP AND OCU.
- THE CONTRACTOR SHALL PROVIDE A JUMPER ASSEMBLY WITH A BACKFLOW PREVENTER FOR MAKING TEMPORARY CONNECTIONS TO AN EXISTING POTABLE WATER SOURCE IN ORDER TO CHLORINATE AND FLUSH NEW WATER MAINS WITH POTABLE WATER. ANY TEMPORARY POTABLE WATER CONNECTIONS TO RECLAIMED WATER OR FORCEMAIN SHALL ALSO BE EQUIPPED WITH A BACKFLOW PREVENTER.

- FOR PVC PIPE THAT WILL BE OWNED AND MAINTAINED BY OCU, NO PIPE BENDING IS ALLOWED. THE MAXIMUM ALLOWABLE TOLERANCE FOR JOINT DEFLECTION IS 0.75 DEGREES (3-INCHES PER JOINT PER 20 FT STICK OF PIPE). ALIGNMENT CHANGE SHALL BE MADE ONLY WITH SLEEVES AND FITTINGS.
- FOR NON-PVC PIPE THAT WILL BE OWNED AND MAINTAINED BY OCU, LONG RADIUS CURVES, EITHER HORIZONTAL OR VERTICAL MAY BE INSTALLED WITH STANDARD PIPE BY DEFLECTIONS AT THE JOINTS. MAXIMUM DEFLECTIONS AT PIPE JOINTS, FITTINGS AND LAYING RADIUS FOR THE VARIOUS PIPE LENGTHS SHALL NOT EXCEED 75 PERCENT OF THE PIPE MANUFACTURER'S RECOMMENDATION.
- CONTRACTOR SHALL COORDINATE WITH ALL OTHER UTILITY OWNERS FOR RESOLUTION OF CONFLICTS. CONTRACTOR SHALL HAVE 48 HOURS TO DETERMINE THE RESOLUTION OF ANY UNKNOWN OR UNFORESEEN CONFLICTS. COSTS INCURRED SHALL BE BORNE BY THE UTILITY OWNER AND/OR CONTRACTOR AND NO CLAIMS MAY BE MADE AGAINST ORANGE COUNTY OR THE ENGINEER FOR THESE CONFLICTS. NO ADDITIONAL COMPENSATION SHALL BE MADE FOR THE PERIOD OF TIME TO RESOLVE ANY CONFLICTS.
- SUPPORT & PROTECT ALL EXISTING UTILITIES. CONTRACTOR SHALL CONTACT UTILITY OWNERS FOR LOCATION OF ALL EXISTING FACILITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH UTILITY OWNERS AND BE RESPONSIBLE FOR PROVIDING TEMPORARY SUPPORT FOR UTILITY POLES AND ALL OTHER UTILITIES DURING CONSTRUCTION.
- THE UTILITIES IMPROVEMENTS AND ADJUSTMENT SHOWN ON THESE DRAWINGS ARE INTENDED TO MAINTAIN THE INTEGRITY OF THE ORANGE COUNTY WATER, WASTEWATER, AND RECLAIMED WATER SYSTEMS. THE DRAWINGS DO NOT INCLUDE WORK PERFORMED ON, OR FOR UTILITY SYSTEMS OWNED BY OTHERS, UNLESS STATED OTHERWISE ON THE DRAWINGS.
- NOTIFY FIBER OPTICS COMPANIES SEVEN (7) DAYS PRIOR TO ANY CONSTRUCTION. EXTREME CAUTION SHALL BE EXERCISED IN THE AREAS OF FIBER OPTICS.
- SEE DETAIL SHEET FOR SEPARATION REQUIREMENTS BETWEEN WATER MAINS, SEWER MAINS AND OTHER PIPELINES AND MAINS. NO CONCRETE ENCASEMENT OF PIPES WILL BE PERMITTED.
- ALL PVC WATER MAIN, SEWER AND RECLAIMED MAIN PIPE SHALL CONFORM TO AWWA C900, C909, DR 16, OR C905, DR 18. ALL DUCTILE IRON WATER MAIN AND RECLAIM WATER SHALL CONFORM TO ANSI/AWWA A21.51/C151. ALL PVC PRESSURE PIPES SHALL USE DUCTILE IRON FITTINGS. FITTINGS FOR ALL SERVICES SHALL BE BRASS. GRAVITY MAIN SHALL MEET ASTM 03034, MAX SDR 35.
- ALL PIPE, PIPE FITTINGS AND APPURTENANCES INSTALLED UNDER THIS PROJECT WILL BE COLOR CODED OR MARKED IN ACCORDANCE WITH SUBPARAGRAPH 62-555.320 (21) (b) 3, FAC, USING BLUE AS A PREDOMINANT COLOR FOR WATER; GREEN FOR WASTEWATER; PURPLE FOR RECLAIMED WATER.
- ALL BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 95% OF MAXIMUM DRY DENSITY AS MEASURED BY AASHTO T-180 METHOD 'D' TEST (MODIFIED PROCTOR) IN OPEN AREAS AND TO NOT LESS THAN 98% MAXIMUM DRY DENSITY AS MEASURED BY AASHTO T-180 METHOD 'D' TEST (MODIFIED PROCTOR) UNDER ASPHALT OR CONCRETE PAVEMENT AND WITHIN 3-FT OF PAVEMENT. ALL SOIL TESTING TO BE CONDUCTED BY THE COUNTY. THE CONTRACTOR SHALL PROVIDE ALL REASONABLE ASSISTANCE DURING SOIL TESTING.
- PIPE LENGTHS SHOWN ON PLANS ARE APPROXIMATE. ACTUAL LENGTHS ARE TO BE DETERMINED DURING CONSTRUCTION.
- ALL STATIONS AND OFFSETS REFER TO CENTERLINE OF CONSTRUCTION.
- MAINTAIN EMERGENCY VEHICLE ACCESS TO ALL BUSINESSES AND RESIDENCES AT ALL TIMES.
- LOCAL RESIDENTIAL AND BUSINESS ACCESS SHALL BE MAINTAINED AT ALL TIMES. PROVIDE WRITTEN NOTIFICATION TO RESIDENTS SEVEN (7) DAYS PRIOR TO IMPLEMENTING ANY ROADWAY OR DRIVEWAY CLOSURE.
- ALL MAINS SHALL BE CONSTRUCTED AS SHOWN ON THE PLANS. A MINIMUM COVER OF 36 INCHES SHALL BE MAINTAINED ON ALL MAINS, WHERE IT IS NOT OTHERWISE SPECIFIED ON PLANS OR DIRECTED BY THE ENGINEER. A MINIMUM COVER OF 48" SHALL BE MAINTAINED FOR MAINS 16 INCHES OR HIGHER IN DIAMETER OR GREATER (SEE TABLE 2210-1 OCU STANDARDS AND CONSTRUCTION SPECIFICATION MANUAL). ALL DIRECTION CHANGES IN THE PIPE BOTH HORIZONTAL AND VERTICAL SHALL BE BY JOINT DEFLECTION UNLESS OTHERWISE NOTED OR DIRECTED BY THE ENGINEER. JOINT DEFLECTION SHALL NOT EXCEED 50% OF THE MANUFACTURER'S RECOMMENDED DEFLECTION FOR DUCTILE IRON PIPE. NO JOINT DEFLECTIONS OR BENDING IS ALLOWED IN PVC PIPE. ALIGNMENT CHANGE FOR PVC PIPE SHALL BE MADE ONLY WITH FITTINGS.
- ALL PIPES SHALL BE RESTRAINED IN ACCORDANCE WITH THE RESTRAINT TABLES SHOWN ON THE DETAIL SHEETS. IN ADDITION, ALL FITTINGS SHALL BE MECHANICAL JOINT RESTRAINED. NO THRUST BLOCKS SHALL BE PERMITTED. RESTRAIN EXISTING PIPE WHERE REQUIRED IN ACCORDANCE WITH THE RESTRAINT TABLES.
- COMPLETE ALL CONSTRUCTION WITHIN RIGHT-OF-WAY LIMITS AND EASEMENT LIMITS, UNLESS OTHERWISE NOTED.
- PIPE SIZES SHOWN ON PLANS ARE MINIMUM INSIDE DIAMETER.
- ALL CONNECTIONS TO EXISTING MAINS SHALL BE MADE BY THE CONTRACTOR ONLY AFTER THE PROPOSED CONNECTION PROCEDURE AND WORK SCHEDULE HAVE BEEN REVIEWED AND ACCEPTED BY THE OWNER. THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST TO THE OWNER A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO SCHEDULING ANY CONNECTIONS. THE REQUEST SHALL REFERENCE THE PROFESSIONAL LAND SURVEYOR CERTIFIED COMPLETED AS-BUILT RECORD DRAWINGS PREVIOUSLY SUBMITTED AND SHALL OUTLINE THE FOLLOWING:
 - POINTS OF CONNECTION, FITTINGS TO BE USED, METHODS OF FLUSHING AND DISINFECTION AND VERIFICATION OF RESTRAINT ON EXISTING PIPE.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION



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FOREST W. ADKINS, P.E. P.E. NUMBER 56003

ORANGE COUNTY
GOVERNMENT
FLORIDA

HOLDEN AVENUE
UTILITY NOTES

Approved
SHEET NO. 2018-H-094-390
Scott Kirks
U-3
10/3/2018

- b. ESTIMATED CONSTRUCTION TIME FOR THE CONNECTIONS. THE OWNER SHALL REVIEW THE SUBMITTAL WITHIN FIVE (5) WORKING DAYS AFTER RECEIVING IT AND INFORM THE CONTRACTOR REGARDING APPROVAL OR DENIAL OF THE REQUEST. IF THE OWNER REJECTS THE REQUEST, THE CONTRACTOR SHALL RESUBMIT THE REQUEST MODIFYING IT IN A MANNER ACCEPTABLE TO THE OWNER. ALL CONNECTIONS SHALL ONLY BE MADE ON THE AGREED UPON DATE AND TIME. SHOULD THE CONTRACTOR NOT INITIATE AND COMPLETE THE CONNECTION WORK IN THE AGREED UPON MANNER, HE SHALL BE REQUIRED TO RESCHEDULE THE CONNECTION BY FOLLOWING THE PROCEDURE OUTLINED ABOVE. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES IN THE SYSTEM. MAINS SHALL NOT BE PLACED IN SERVICE UNTIL CLEARANCE IS RECEIVED FROM FDP. AS-BUILT DRAWINGS MUST BE COMPLETED AND SUBMITTED PRIOR TO WATER MAIN CHLORINATION.
32. PROTECT EXISTING IMPROVEMENTS TO THE MAXIMUM EXTENT POSSIBLE. RESTORE ALL EXISTING IMPROVEMENTS AND DISTURBED AREAS TO ORIGINAL CONDITION. PAVEMENT TO BE RESTORED IN ACCORDANCE WITH THE PAVEMENT RESTORATION DETAILS SHOWN ON THE CONSTRUCTION DETAIL SHEETS. ALL DAMAGED SIDEWALK, ROADWAY PAVEMENT AND OTHER IMPROVEMENTS SHALL BE RESTORED TO ORIGINAL CONDITION.
 33. ALL COUNTY ROADS TO BE OPEN CUT SHALL BE APPROVED BY ORANGE COUNTY PUBLIC WORKS PRIOR TO OPEN-CUTS. SUBMIT A MAINTENANCE OF TRAFFIC (MOT) PLAN CONFORMING TO ORANGE COUNTY RIGHT-OF-WAY UTILIZATION REGULATIONS TO ORANGE COUNTY PUBLIC WORKS A MINIMUM OF FOURTEEN (14) DAYS PRIOR TO ANY WORK WITHIN COUNTY RIGHT-OF-WAY. A COPY OF THIS PLAN SHALL ALSO BE SUBMITTED TO THE ENGINEER AND UTILITY COUNTY INSPECTOR. NOTIFY THE COUNTY ENGINEER 48 HOURS PRIOR TO ANY OPEN CUT OF ROADWAYS OR JACK AND BORE OPERATIONS WITHIN THE COUNTY RIGHT-OF-WAY. TWO WAY TRAFFIC MUST BE MAINTAINED AT ALL TIMES DURING THE COURSE OF CONSTRUCTION. MAINTAIN A SET OF COUNTY APPROVED CONSTRUCTION PLANS AND MOT PLANS AT THE CONSTRUCTION SITE AT ALL TIMES WHEN WORKING WITHIN THE COUNTY RIGHT-OF-WAY.
 34. INSTALL AIR RELEASE VALVES (ARV) AT ALL HIGH POINTS IN THE SYSTEM WHERE AIR CAN ACCUMULATE. AIR RELEASE VALVES AND APPURTENANCES SHALL BE COLOR CODED BLUE FOR WATER, GREEN FOR SEWER, AND PURPLE FOR RECLAIMED. STATIONING FOR AIR RELEASE VALVES IS APPROXIMATE. CONTRACTOR TO INSTALL AIR RELEASE VALVES AT HIGH POINTS IN MAIN.
 35. WATER, SEWER, AND RECLAIMED WATER LINE MARKERS SHALL BE PLACED EVERY 1,000 FT AND AT ALL VALVE AND DIRECTIONAL CHANGES. SEE VALVE AND PIPING MARKING DETAILS. NO MARKERS ARE REQUIRED AT VALVES ADJACENT TO FIRE HYDRANTS, OR IN RESIDENTIAL SUBDIVISIONS.
 36. BENCHMARK LOCATIONS AND ELEVATION ARE SHOWN IN THE PLANS AS REPRESENTED BY SURVEYOR AT THE TIME OF SURVEY. CONTRACTOR SHALL VERIFY ITS CORRECTNESS AT THE TIME OF CONSTRUCTION AND INSTALL HIS OWN TEMPORARY BENCHMARKS. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OCU UTILITIES INSPECTOR.
 37. NO VALVE BOXES, METERS, PORTIONS OF MANHOLES, OR OTHER APPURTENANCES OF ANY KIND RELATING TO ANY UNDERGROUND UTILITIES SHALL BE LOCATED IN ANY PORTION OF A CURB-AND-GUTTER SECTION. CONTRACTOR SHALL ADVISE ENGINEER IMMEDIATELY UPON DISCOVERY OF A POTENTIAL CONFLICT.
 38. WHERE REQUIRED, AT NO ADDITIONAL COST TO THE COUNTY, THE CONTRACTOR SHALL USE TEMPORARY SHEETING OR TRENCH BOXES TO MINIMIZE THE SIZE OF EXCAVATIONS AND PROTECT EXISTING ROADWAYS, UTILITIES AND OTHER FACILITIES. OR AS NEEDED TO REMAIN WITHIN THE LIMITS OF CONSTRUCTION. CONTRACTOR TO COMPLY WITH OSHA TRENCH SAFETY REQUIREMENTS AT ALL TIMES.
 39. CONTRACTOR TO PROVIDE DETAILED AS-BUILT DRAWINGS OF ALL UTILITIES UNCOVERED IN TRENCHES. THE AS-BUILT SHALL RECORD LOCATION, SIZE, TYPE, ELEVATION AND OWNER OF ALL UTILITY FACILITIES UNCOVERED.
 40. ALL EXISTING MAINS SHALL REMAIN IN SERVICE UNTIL THE PROPOSED MAIN(S) ARE ACCEPTED FOR SERVICE AND ALL SERVICE ARE TRANSFERRED TO THE MAIN(S).
 41. CONTRACTOR IS RESPONSIBLE FOR ALL BY-PASS PUMPING, TANKERS AND PUMPING OUT LINES. BY-PASS PUMPING MUST BE MONITORED AT ALL TIMES.
 42. WHERE MINIMUM SEPARATION BETWEEN UTILITIES OR STORM SEWERS IS REQUIRED, THE DISTANCE IS MEASURED FROM THE OUTSIDE EDGE OF PIPE TO OUTSIDE EDGE OF PIPE.
 43. COORDINATION AND COMMUNICATIONS WITH ORANGE COUNTY STAFF SHALL BE MADE THROUGH THE ORANGE COUNTY UTILITIES CONSTRUCTION DIVISION INSPECTOR.
 44. ALL NEW INSTALLED DUCTILE IRON PIPE FOR WATER AND RECLAIMED WATER SHALL HAVE POLYETHYLENE ENCASUREMENT (POLYWRAP) IN ACCORDANCE WITH ANSI/AWWA A21.51/C105 AND AWWA C105 WRAPPING COLORS TO BE BLUE FOR WATER AND PANTONE PURPLE FOR RECLAIMED. POLY WRAP TAPE ONLY. ALL PROPOSED IRON PIPES SHALL BE WRAPPED IN 8 MIL POLYETHYLENE. POLYETHYLENE BAGGING SHALL HAVE "ORANGE COUNTY UTILITIES" STAMPED ON THE BAGGING.
 45. THE CONTRACTOR SHALL SUBMIT TO THE COUNTY A COMPREHENSIVE WRITTEN PLAN FOR APPROVAL AND ACCEPTANCE BY THE COUNTY THAT DESCRIBES THE METHODS AND EQUIPMENT FOR INSTALLING UTILITY LINES PROPOSED WITHIN A THREE (3) FOOT PROXIMITY TO THE OUTSIDE DIAMETER OF AN EXISTING UTILITY MAIN GREATER THAN 6" DIAMETER IS SIZE. THE PLAN SHALL BE CONSISTENT WITH THE SUBMITTED BYPASS PLAN AND SHALL DETAIL THE METHODS FOR AVOIDING UNNECESSARY DELAY, INJURY, DAMAGE OR DESTRUCTION OF EXISTING PUBLIC UTILITY SERVICES.
 46. CONTRACTOR TO PERFORM PRELIMINARY LOCATOR WIRE CHECK PRIOR TO OCU INSPECTION.
 47. CONTRACTOR IS RESPONSIBLE TO PERFORM FINAL WALK THROUGH INSPECTION WITH OCU INSPECTORS.
 48. JOINTS FOR DISSIMILAR PIPE TO MEET ORANGE COUNTY UTILITIES STANDARDS AND CONSTRUCTION SPECIFICATION MANUAL CHAPTER 3, SECTION 3310 PART 2, 2.01-C.

49. LOCATIONS OF EXISTING UTILITIES AS SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY THE EXISTENCE AND LOCATION OF ALL ABOVEGROUND AND UNDERGROUND UTILITIES AND DETERMINE THE STATUS OF SAID UTILITY, PRIOR TO ANY DEMOLITION OR CONNECTION OF PROPOSED UTILITIES. CONTRACTOR SHALL CONTACT UTILITY OWNERS, INCLUDING FIBER OPTICS COMPANIES, AT LEAST SEVEN (7) DAYS PRIOR TO CONSTRUCTION AND A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION. EXTREME CAUTION SHALL BE EXERCISED IN AREAS OF FIBER OPTICS AND GAS MAINS.
50. IMMEDIATELY AT ONSET OF CONSTRUCTION, CONTRACTOR SHALL FIELD VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL EXISTING UTILITIES CRITICAL TO COMPLETING THE PROJECT (INCLUDING WATER, SEWER, RECLAIMED WATER, POWER, TELEPHONE, GAS AND CABLE TV) AND SHALL EVALUATE POTENTIAL CONFLICTS IN A WRITTEN REPORT TO OWNER AND ENGINEER. ANY CONFLICTS SHALL BE REPORTED TO ENGINEER/OWNER IMMEDIATELY UPON DISCOVERY AND DETAILED IN THE REPORT.
51. REPLACE ALL EXISTING VALVE BOXES WITH NEW BOXES.
52. LOCATIONS AND DIMENSIONS OF EXISTING RIGHT-OF-WAYS AND EASEMENTS ARE BASED ON BEST AVAILABLE INFORMATION. VERIFY AND STAKE THE LIMITS OF THE RIGHT-OF-WAYS AND EASEMENTS IN ORDER TO AVOID ENCROACHMENTS BEFORE ANY CONSTRUCTION.
53. WHEN USING SCALED DATA CONSIDER THAT THESE PLANS MAY HAVE ALTERED IN SIZE DURING REPRODUCTION.
54. WHEN OBTAINING DATA AND INFORMATION FROM THE PLANS, FIGURES SHALL BE USED IN REFERENCE TO SCALED DIMENSIONS.
55. RESTORE ALL EXISTING IMPROVEMENTS AND DISTURBED AREAS TO ORIGINAL OR BETTER CONDITIONS.
56. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SATISFYING ALL REQUIREMENTS OF REGULATORY AGENCY PERMITS FOR CONSTRUCTION ACTIVITIES AND RELATED ACTIVITIES.
57. SALVAGE AND/OR DISPOSAL OF ALL EXISTING EQUIPMENT SHALL BE AT THE DIRECTION OF THE ORANGE COUNTY RESIDENT PROJECT REPRESENTATIVE.
58. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER DISPOSAL OF ALL STRUCTURES, PIPE, CONDUIT, WIRE, FITTINGS, PANELS, ETC. THAT ARE DEMOLISHED, DISASSEMBLED, OR REMOVED, PER SECTION 02080 OF THE SPECIFICATION MANUAL OF THIS PROJECT.
59. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DE-WATERING REQUIRED DURING CONSTRUCTION AND TO OBTAIN AND PAY FOR ALL PERMITS REQUIRED FOR THE TEMPORARY DEWATERING OF DRAINAGE STRUCTURES.
60. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TEMPORARY PLUGS, BLOCKING, TAPS, AND TESTING EQUIPMENT REQUIRED TO COMPLETE PRESSURE TESTING, AS SPECIFIED.
61. CONTRACTOR TO PROVIDE SIGNED AND SEALED SURVEYED AS-BUILTS BY A STATE OF FLORIDA LICENSED SURVEYOR. SURVEY TO INCLUDE AS-BUILTS ON ALL INSTALLED WATER LINES, VALVES, AND FITTINGS ON THE NEW WATER MAIN. ALL TABLES TO BE UPDATED WITH THE CORRECT DATA TO CORRESPOND WITH THE WATER LINE AND APPURTENANCES BEING AS-BUILT. SURVEY ALSO TO INCLUDE BOTH HORIZONTAL AND VERTICAL SEPARATION FROM ALL EXISTING WATER LINES, SANITARY SEWER LINES AND STORM LINES. SURVEY TO INCLUDE LOCATION AND SIZE OF ALL CASING PIPES INSTALLED (DIAMETER, END POINT, INVERT ELEVATION). AS-BUILTS TO BE PROVIDED WITH REQUEST FOR CLEARANCE OF WATER LINES. CONTRACTOR TO PROVIDE BACTERIOLOGICAL TEST RESULTS AS PER THE FPD WATER PERMIT FOR EACH PORTION OF WATER LINE BEING CLEARED FOR USE.

FDOT NOTES

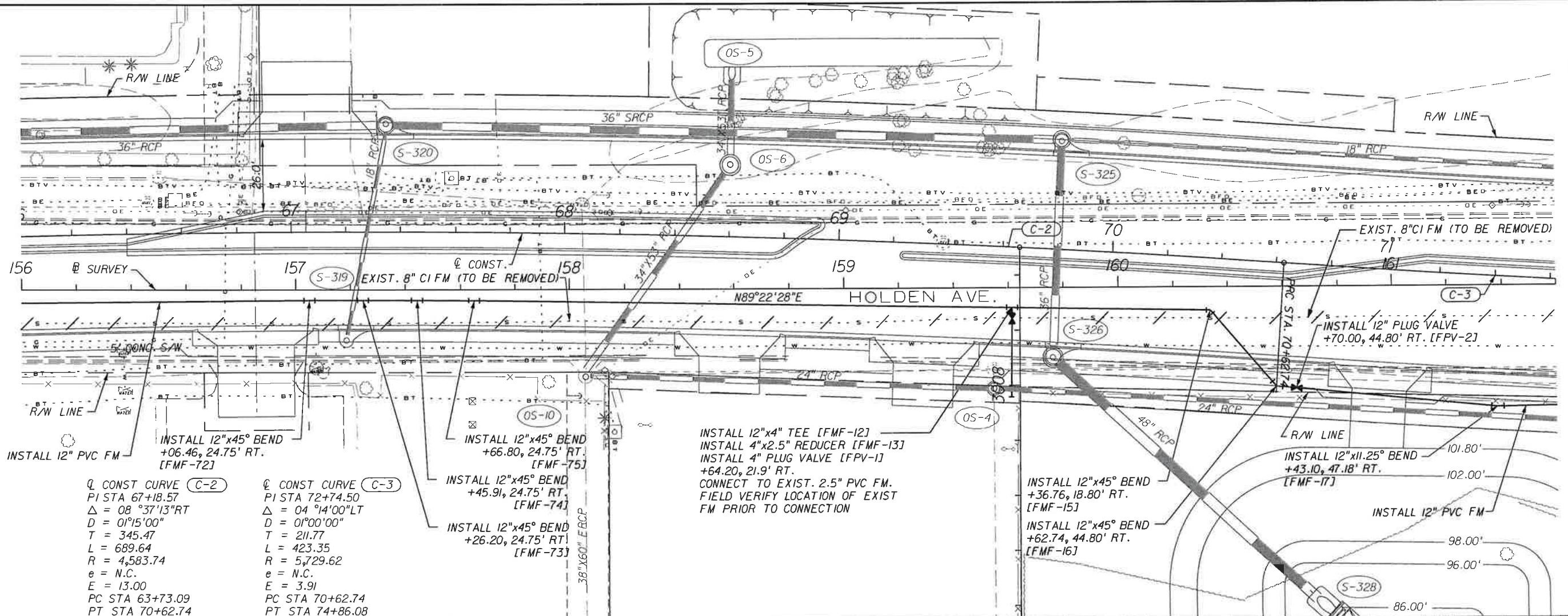
62. ALL WORK PERFORMED WITHIN THE FDOT RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE 2018 EDITIONS OF THE FDOT DESIGN STANDARDS, SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, AND THE 2017 UTILITY ACCOMMODATION MANUAL.
63. FDOT 48 HOURS START NOTICE CONTACT PHONE NUMBER (321) 319-8100.
64. PERMITTEE SHALL NOT BEGIN ANY WORKS ALONG FDOT RIGHT-OF-WAY UNTIL AN INSPECTOR IS PRESENT AT THE JOB SITE AND AGREES THAT PROPER PREPARATIONS HAVE BEEN MADE.
65. FOURTEEN (14) DAYS PRIOR TO CLOSING A LANE, THE PERMITTEE SHALL NOTIFY THE LCIS SYSTEM THE TIME, LOCATION OF THE NEEDED LANE CLOSURE AND A DESCRIPTION OF WORK BEING DONE. THE UAO SHALL NOT CLOSE ANY LANES UNTIL RECEIVING APPROVAL FROM FDOT. THE UAO IS NOT REQUIRED TO REPORT LANE CLOSURES FOR EMERGENCIES AS DESCRIBED IN 2017 UAM SECTION 2.2. [HTTPS://LCIS.DOT.STATE.FL.US](https://lcis.dot.state.fl.us)
66. SPECIAL CONCRETE MIX SPECIFICATIONS FOR SIDEWALK:
 - a. MIX NUMBER: 1219360 COLOR NAME: Y35-OBT
 - b. CONCRETE STRENGTH: CLASS I (3000 PSI)
 - c. SUPPLIER COMPANY: CRS RINKER (407-599-4899)
 - d. COLOR: OBT TERRA COTTA (UTILIZING LM SCHOFIELD COLOR)

EMERGENCY WASTEWATER SPILL, WATER MAIN, RECLAIMED WATER MAIN BREAK PROCEDURES

1. THE ORANGE COUNTY UTILITY DISPATCH OPERATOR SHALL BE NOTIFIED IMMEDIATELY IN THE EVENT OF A FORCE MAIN, GRAVITY SEWER, WATER MAIN OR RECLAIMED WATER MAIN BREAK OR DAMAGE.
 2. ALL DAMAGE TO ORANGE COUNTY'S MAINS SHALL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE. IF THE REPAIR IS NOT MADE IN A TIMELY AND APPROVED MANNER, AS DETERMINED BY THE ORANGE COUNTY UTILITIES INSPECTOR, ORANGE COUNTY MAY PERFORM THE REPAIRS AND THE CONTRACTOR WILL BE CHARGED FOR THE REPAIRS.
- THE CONTRACTOR, AT THE CONTRACTOR'S EXPENSE, SHALL IMMEDIATELY REPAIR ALL DAMAGES TO OCU MAINS AND FACILITIES TO EQUAL OR BETTER CONDITIONS. IF REPAIR IS NOT MADE IN A TIMELY MANNER, AS DETERMINED BY OCU, OCU MAY PERFORM REQUIRED REPAIR AND CLEANUP. THE CONTRACTOR WILL BE CHARGED FOR ALL EXPENSES ASSOCIATED WITH THE REPAIR. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL COSTS FOR RESTORATION OF ALL ESCAPED AND SODDED AREAS DISTURBED AS PART OF HIS WORK.



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION



INSTALL 12" PVC FM
 INSTALL 12"x45° BEND
 +06.46, 24.75' RT.
 [FMF-72]

Q CONST CURVE (C-2)
 PI STA 67+18.57
 $\Delta = 08^\circ 37'13''$ RT
 $D = 01^\circ 15' 00''$
 $T = 345.47$
 $L = 689.64$
 $R = 4,583.74$
 $e = N.C.$
 $E = 13.00$
 PC STA 63+73.09
 PT STA 70+62.74

Q CONST CURVE (C-3)
 PI STA 72+74.50
 $\Delta = 04^\circ 14' 00''$ LT
 $D = 01^\circ 00' 00''$
 $T = 211.77$
 $L = 423.35$
 $R = 5,729.62$
 $e = N.C.$
 $E = 3.91$
 PC STA 70+62.74
 PT STA 74+86.08

INSTALL 12"x45° BEND
 +66.80, 24.75' RT.
 [FMF-75]

INSTALL 12"x45° BEND
 +45.91, 24.75' RT.
 [FMF-74]

INSTALL 12"x45° BEND
 +26.20, 24.75' RT.
 [FMF-73]

INSTALL 12"x4" TEE [FMF-12]
 INSTALL 4"x2.5" REDUCER [FMF-13]
 INSTALL 4" PLUG VALVE [FPV-1]
 +64.20, 21.9' RT.
 CONNECT TO EXIST. 2.5" PVC FM.
 FIELD VERIFY LOCATION OF EXIST
 FM PRIOR TO CONNECTION

INSTALL 12"x45° BEND
 +36.76, 18.80' RT.
 [FMF-15]

INSTALL 12"x45° BEND
 +62.74, 44.80' RT.
 [FMF-16]

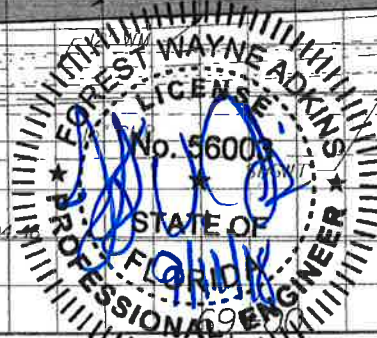
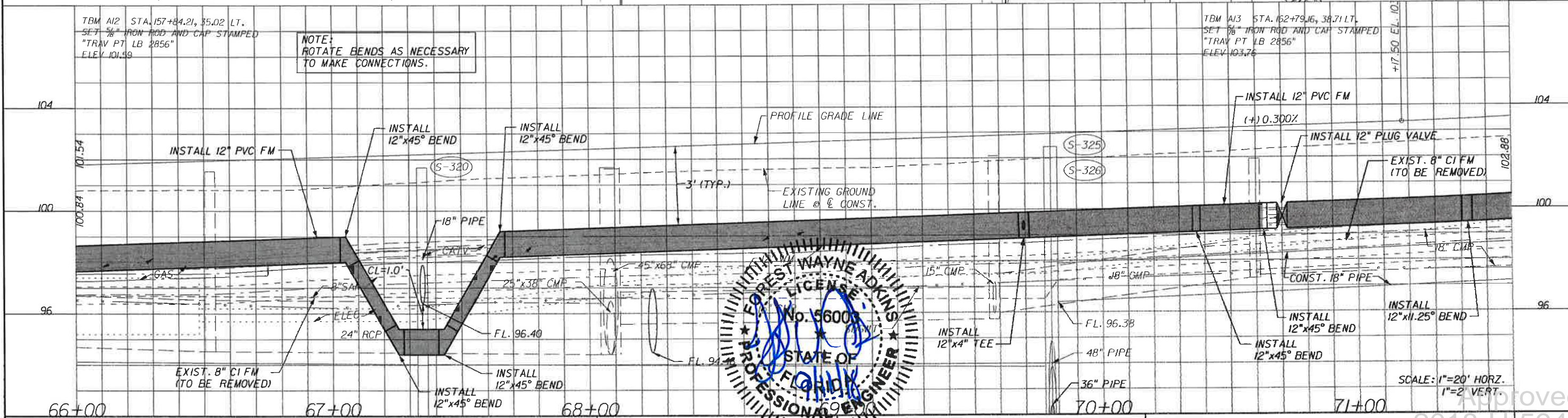
INSTALL 12"x11.25° BEND
 +43.10, 47.18' RT.
 [FMF-17]

INSTALL 12" PVC FM

TBM A12 STA. 157+84.21, 35.02 LT.
 SET 3/8" IRON ROD AND CAP STAMPED
 "TRAV PT LB 2856"
 ELEV 101.59

NOTE:
 ROTATE BENDS AS NECESSARY
 TO MAKE CONNECTIONS.

TBM A13 STA. 162+79.16, 38.71 LT.
 SET 3/8" IRON ROD AND CAP STAMPED
 "TRAV PT LB 2856"
 ELEV 103.76



REVISIONS					
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ORANGE COUNTY
GOVERNMENT
 FLORIDA

UTILITY IMPROVEMENTS
PLAN AND PROFILE
HOLDEN AVENUE

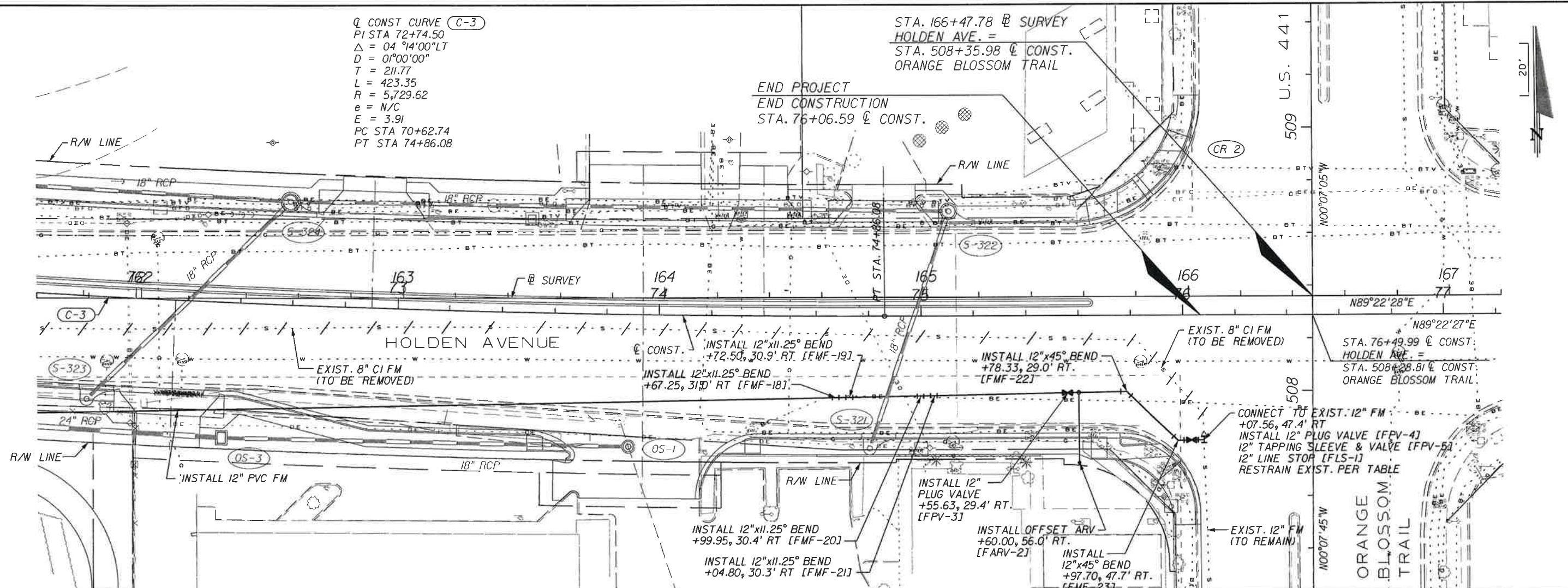
Approved
 2018-H-504-390
 Scott Kirts
 10/3/2018
 U-12

Q CONST CURVE (C-3)
 PI STA 72+74.50
 $\Delta = 04^{\circ}14'00''$ LT
 $D = 01^{\circ}00'00''$
 $T = 211.77$
 $L = 423.35$
 $R = 5,729.62$
 $e = N/C$
 $E = 3.91$
 PC STA 70+62.74
 PT STA 74+86.08

STA. 166+47.78 @ SURVEY
 HOLDEN AVE. =
 STA. 508+35.98 @ CONST.
 ORANGE BLOSSOM TRAIL

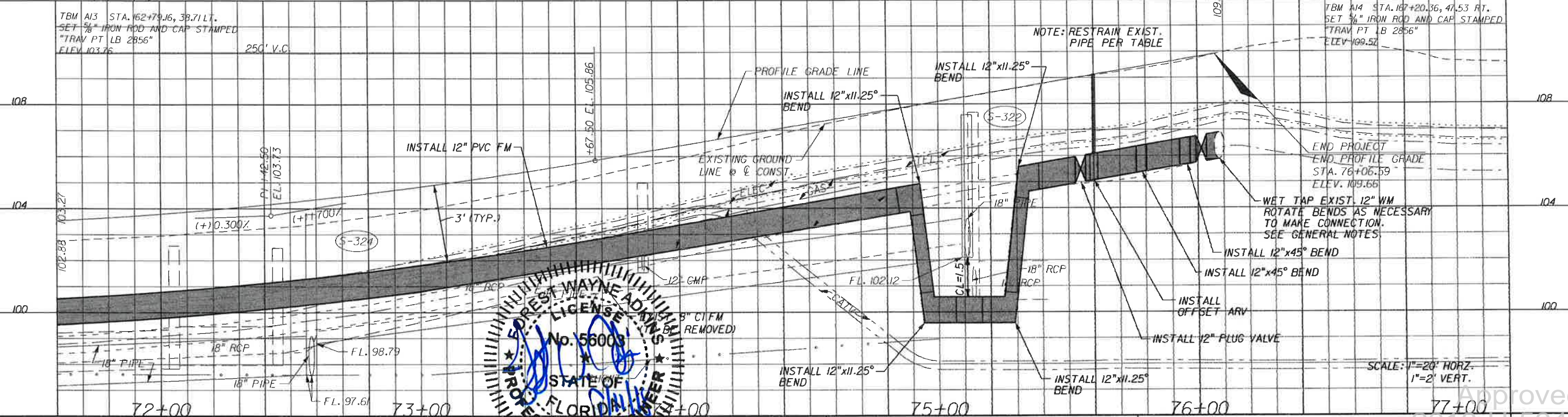
END PROJECT
 END CONSTRUCTION
 STA. 76+06.59 @ CONST.

U.S. 441
 509



TBM A13 STA. 162+79.16, 38.71 LT.
 SET 3/8\"/>

TBM A14 STA. 167+20.36, 47.53 RT.
 SET 3/8\"/>



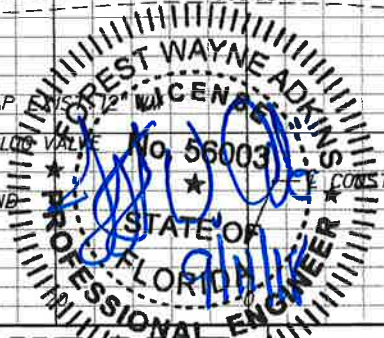
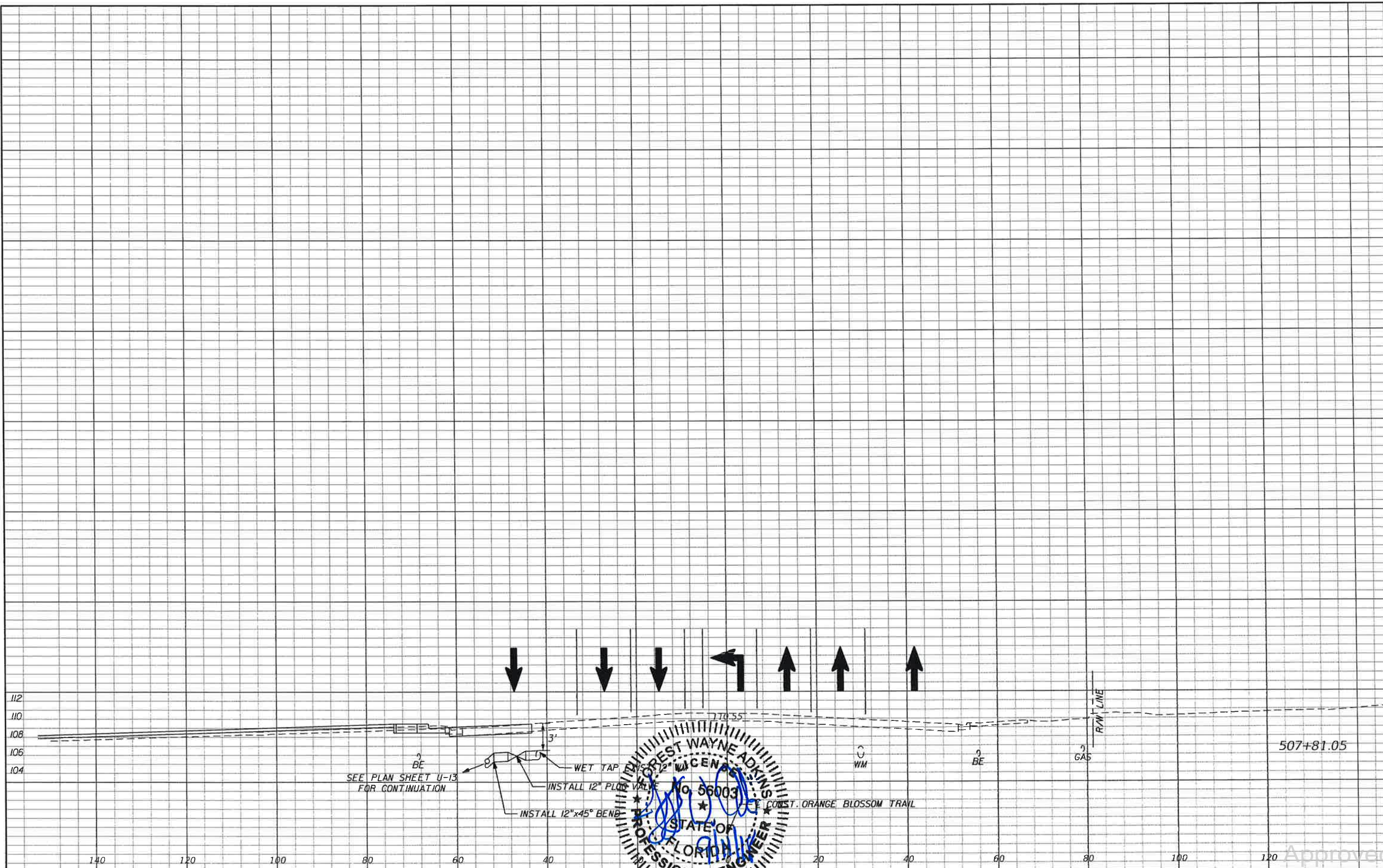
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ORANGE COUNTY
GOVERNMENT
 FLORIDA

UTILITY IMPROVEMENTS
PLAN AND PROFILE
HOLDEN AVENUE

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Approved
 2/18/11
 Scott Kirks
 10/3/2018
 SHEET NO. U-13



REVISIONS	
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Approved: 2018-H-594-390
 Scott Kirts
 03/2018
 SHEET NO. U-24
 UTILITY IMPROVEMENTS
 CROSS SECTION
 ORANGE BLOSSOM TRAIL

MAINTENANCE OF TRAFFIC NOTES:

1. COST OF ALL ITEMS FOR MAINTENANCE OF TRAFFIC TO BE INCLUDED IN PAY ITEM U-4, MAINTENANCE OF TRAFFIC (LS).
2. FOR MAINTENANCE OF TRAFFIC DETAILS, REFER TO THE FDOT ROADWAY AND TRAFFIC DESIGN STANDARDS, LATEST EDITION, INDEX 600 SERIES AND THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION.
3. THE SPEED LIMIT THROUGH THE WORK ZONE DURING ALL PHASES OF CONSTRUCTION SHALL BE 35 MPH.
4. ADVANCE SIGNING TO BE SHOWN AS PER THE APPROPRIATE FDOT INDEX. PHASE SIGNING SHALL BE ERECTED BY THE CONTRACTOR PRIOR TO THE BEGINNING OF THAT PHASE. CONTRACTOR TO COVER ALL CONFLICTING SIGNS WHEN NOT IN USE.
5. ADVANCE SIGN LOCATIONS AND SPACING SHALL BE FIELD ADJUSTED TO AVOID CONFLICTS WITH EXISTING ABOVE GROUND OBJECTS. SIGNS TO BE LOCATED WHERE THEY ARE CLEARLY VISIBLE TO ONCOMING TRAFFIC AND SHALL BE KEPT IN GOOD CONDITION THROUGHOUT THE DURATION OF CONSTRUCTION.
6. ARROWS SHOWN ON THE M.O.T. PLANS ARE INTENDED TO REPRESENT THE DIRECTION OF TRAFFIC ONLY AND DO NOT INDICATE PAVEMENT MARKINGS.
7. CONTRACTOR SHALL NOTIFY LYNX AT (407)841-2279 A MINIMUM OF ONE (1) WEEK PRIOR TO IMPLEMENTATING ANY STREET CLOSURE OR DETOUR PLAN TO COORDINATE BUS RE-ROUTING.
8. ANY CHANGE IN SPEED LIMITS MUST BE APPROVED BY THE ORANGE COUNTY TRAFFIC ENGINEER. CONTACT JOHN KLIMOVITCH AT (407)836-7803.
9. PEDESTRIAN TRAFFIC IS TO BE MAINTAINED PER FDOT INDEX 660.
10. THE CONTRACTOR SHALL CONTACT ORANGE COUNTY ONE (1) WEEK PRIOR TO THE START OF ANY PHASE OF WORK TO REQUEST STREET, LANE OR SIDEWALK CLOSURE AUTHORIZATION.
11. LOCAL RESIDENTIAL/BUSINESS ACCESS SHALL BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL PROVIDE WRITTEN NOTIFICATION TO THE RESIDENTS/BUSINESSES AFFECTED BY CONSTRUCTION ACTIVITIES, ONE (1) WEEK IN ADVANCE OF THE START OF ANY PHASE CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE COPIES OF THE NOTIFICATION TO THE TRAFFIC CONTROL MANAGER PRIOR TO DISTRIBUTION.
12. THE CONTRACTOR SHALL NOTIFY THE ORANGE COUNTY SCHOOL BOARD, SAFETY MANAGER WILLIAM WEN (407-317-3816), ONE (1) WEEK IN ADVANCE OF THE START OF ANY PHASE OF CONSTRUCTION TO COORDINATE SCHOOL BUS RE-ROUTING.
13. ORANGE COUNTY RESERVES THE RIGHT TO REQUIRE ADDITIONAL DEVICES AND/OR CHANGES TO THE TRAFFIC CONTROL PLAN BASED UPON CHANGING TRAFFIC CONDITIONS.
14. ANY CHANGES MADE TO THE TRAFFIC CONTROL PLAN BY THE CONTRACTOR SHALL BE SIGNED/SEALED BY A REGISTERED PROFESSIONAL ENGINEER AND APPROVED BY THE TRAFFIC CONTROL MANAGER PRIOR TO IMPLEMENTATION.
15. THE NUMBER OF DEVICES SHOWN ON THESE PLANS ARE FOR ILLUSTRATION PURPOSES. ADDITIONAL DEVICES MAY BE REQUIRED TO PROPERLY PROTECT THE WORKERS AND WORK ZONE FROM VEHICULAR TRAFFIC.
16. IF TEMPORARY MARKINGS ARE REQUIRED ON FRICTION COURSE SURFACES, ALL MARKINGS SHALL BE INSTALLED USING 3M BRAND STAMARK REMOVABLE TAPE, SERIES 750, WET REFLECTIVE TEMPORARY TAPE. THE USE OF "FOILBACK" TYPES OF TEMPORARY TAPE IS NOT PERMITTED.
17. 3M BRAND REMOVABLE BLACK MASK TAPE, SERIES 145, IS THE ONLY APPROVED MATERIAL FOR "BLACKING OUT" OF EXIST. PAVEMENT MARKINGS ON FINAL ROADWAY SURFACES. UNDER NO CIRCUMSTANCES WILL BLACK PAINT OR GRINDING BE PERMITTED.
18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT EACH EMPLOYEE SUPERVISING THE SELECTION AND PLACEMENT OF MAINTENANCE OF TRAFFIC (MOT) CONTROL DEVICES IS PROPERLY TRAINED, BY ATTENDING AND SUCCESSFULLY COMPLETING AN FDOT APPROVED MOT COURSE. THE TRAINING SHALL BE AT A LEVEL APPLICABLE TO THE EMPLOYEE'S LEVEL OF INVOLVEMENT. COPIES OF CERTIFICATIONS SHALL BE PROVIDED TO ORANGE COUNTY PRIOR TO IMPLEMENTING ANY PHASE OF MOT.
19. THE CONTRACTOR SHALL KEEP ALL SIGNALS AFFECTED BY CONSTRUCTION ACTIVITIES OPERATIONAL THROUGHOUT ALL PHASES OF CONSTRUCTION. VEHICLE DETECTION MUST BE MAINTAINED FOR ALL LANES AT ALL TIMES.
20. THE CONTRACTOR SHALL PROVIDE A TRAFFIC CONTROL SUPERVISOR (TCS) WHO IS RESPONSIBLE FOR INITIATING, INSTALLING AND MAINTAINING ALL TRAFFIC CONTROL DEVICES. THE TCS SHALL BE AVAILABLE ON A 24-HOUR PER DAY BASIS, PARTICIPATE IN ALL CHANGES TO TRAFFIC CONTROL AND REVIEW THE PROJECT ON A DAY TO DAY BASIS. THE TCS SHALL BE PRESENT DURING THE INITIAL SETUP OF THE TRAFFIC CONTROL PLAN AND ALL SUBSEQUENT PHASES OR CHANGES TO THE TRAFFIC CONTROL. THE TCS SHALL IMMEDIATELY CORRECT ALL DEFICIENCIES. THE CONTRACTOR SHALL ENSURE THE TCS BE AVAILABLE ON SITE WITHIN 45 MINUTES OF NOTIFICATION OF AN EMERGENCY SITUATION AND IS PREPARED TO RESPOND TO AND CORRECT THE TRAFFIC CONTROL OR PROVIDE ALTERNATE ARRANGEMENTS FOR CORRECTIVE ACTIONS. THE TCS SHALL BE RESPONSIBLE FOR PERFORMING WEEKLY, DAYTIME AND NIGHTTIME INSPECTIONS OF ALL TRAFFIC CONTROL DEVICES, TRAFFIC FLOW, PEDESTRIAN/BICYCLIST MOVEMENT THROUGH THE WORK AREA, AND BUSINESS ACCOMODATIONS. ORANGE COUNTY MAY DISQUALIFY AND REMOVE FROM THE PROJECT A TCS THAT FAILS TO COMPLY WITH THESE PROVISIONS. ORANGE COUNTY MAY ALSO SUSPEND ALL WORK ACTIVITIES UNTIL CORRECTIVE ACTIONS HAVE BEEN COMPLETED.
21. AN OFF DUTY OFFICER WILL BE REQUIRED FOR NIGHTTIME LANE CLOSURES.
22. ONLY CHANNELIZING DRUMS SHALL BE USED FOR NIGHTTIME LANE CLOSURES.
23. CONTRACTOR TO PROVIDE VARIABLE MESSAGE SIGNS INFORMING THE PUBLIC 10 DAYS PRIOR TO ANY ROAD CLOSURE, AND NOTIFY ORANGE COUNTY EMERGENCY SERVICES 7 DAYS PRIOR TO THE ROAD CLOSURE.
24. EXIST. PAVEMENT MARKINGS WHICH ARE TO BE OBLITERATED, SHALL BE RESTORED TO ORIGINAL CONDITION UPON COMPLETION OF CONSTRUCTION AND PRIOR TO REINSTATING VEHICULAR TRAFFIC.
25. ALL SIGNS AND TRAFFIC CONTROL DEVICES SHALL BE NEW OR LIKE NEW CONDITION. ALL SIGNS SHALL BE POST MOUNTED UNLESS OTHERWISE NOTED.
26. CHANNELIZING DRUMS SHALL BE USED ON NEWLY PAVED ROADWAYS.
27. DURING NON-WORKING HOURS, NO EQUIPMENT, VEHICLES OR MATERIAL SHALL BE PARKED OR STORED WITHIN THE CLEAR ZONE OF A ROADWAY OPEN TO VEHICULAR TRAFFIC.
28. EXISTING REGULATORY SIGNS ARE TO BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE NOTED. ALL EXISTING SIGNS WHICH CONFLICT WITH THE TRAFFIC CONTROL PLAN DURING A CONSTRUCTION PHASE SHALL BE REMOVED OR COVERED AS NECESSARY. THE CONTRACTOR SHALL MAINTAIN AND RELOCATE THE EXISTING ROADWAY SIGNS AS CONDITIONS WARRANT IN EACH PHASE, THROUGHOUT THE DURATION OF CONSTRUCTION. THE COST OF THESE SIGNING OPERATIONS IS TO BE INCLUDED IN THE LUMP SUM MAINTENANCE OF TRAFFIC (ITEM U-4).
29. THE CONTRACTOR SHALL EITHER BACKFILL OR COVER BY AN APPROVED METHOD ALL OPEN TRENCHES AT THE END OF EACH WORK PERIOD. REFER TO FDOT INDEX 600, SHEET 9 OF 12.
30. TRAFFIC SHALL BE MAINTAINED ON PAVED SURFACES AT ALL TIMES.
31. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL TIMES.
32. ALL TEMPORARY PAVEMENT SHALL UTILIZE A FIRM AND UNYIELDING BASE WITH ASPHALT PAVEMENT. TEMPORARY PAVEMENT SHALL BE REPAIRED AS NEEDED OR AS DIRECTED BY THE ENGINEER AND PAYMENT SHALL BE INCLUDED IN THE LUMP SUM MAINTENANCE OF TRAFFIC (ITEM U-4).
33. RELOCATION OF UTILITIES WILL GO ON CONCURRENTLY WITH THE ROADWAY CONSTRUCTION. ROADWAY CONTRACTOR TO COORDINATE CLOSELY WITH UTILITY CONTRACTOR(S) TO AVOID CONFLICTS.
34. THE CONTRACTOR IS TO PROVIDE TRAFFIC DATA AND LANE CLOSURE ANALYSIS TO THE COUNTY FOR APPROVAL PRIOR TO ANY LANE CLOSURES. NO LANE CLOSURES WITHOUT PRIOR APPROVAL OF ORANGE COUNTY TRAFFIC ENGINEERING. LANE CLOSURES WITHIN FDOT R/W SHALL BE LIMITED TO THE FOLLOWING HOURS: 7:30 PM TO 7:00 AM.
35. THESE MAINTENANCE OF TRAFFIC PLANS ARE FOR INFORMATION ONLY. FINAL PLANS TO BE SUBMITTED TO AND APPROVED BY THE COUNTY. MAINTENANCE OF TRAFFIC PLANS FOR ALL WORK WITHIN THE FDOT R/W SHALL BE SUBMITTED TO AND APPROVED BY FDOT. THE MAINTENANCE OF TRAFFIC PLAN DONE BY THE CONTRACTOR SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF FLORIDA.
36. LYNX WILL MAINTAIN BUS SERVICE IN THE AREA DURING CONSTRUCTION. LINK 8 RUNS NORTH-SOUTH ON TEXAS AVE. AND EAST-WEST ON HOLDEN AVE. FROM TEXAS AVE. TO ORANGE BLOSSOM TRAIL. LINK 57 RUNS NORTH-SOUTH ON JOHN YOUNG PARKWAY. THE CONTRACTOR MUST MAINTAIN LYNX SERVICE, INCLUDING PEDESTRIAN ACCESS TO AND FROM THE BUS AT EACH BUS STOP.
37. AT LEAST 60 FEET FROM THE BACK OF THE STOPPED BUS TO THE TANGENT OF THE CURVE OF THE NEAREST DRIVEWAY OR 100 FEET FROM THE LOCATION OF THE BUS ARE REQUIRED TO ACCOMMODATE A TYPICAL 40 FOOT LONG LYNX BUS. THE FRONT DOORS ARE LOCATED AT THE FRONT CORNER OF THE TRANSIT BUS. THE REAR DOORS ARE LOCATED 27 FEET FROM THE FRONT CORNER. NEITHER CAN EMPTY TO DRAINAGE AS CUSTOMERS CAN TRIP AND BE INJURED.



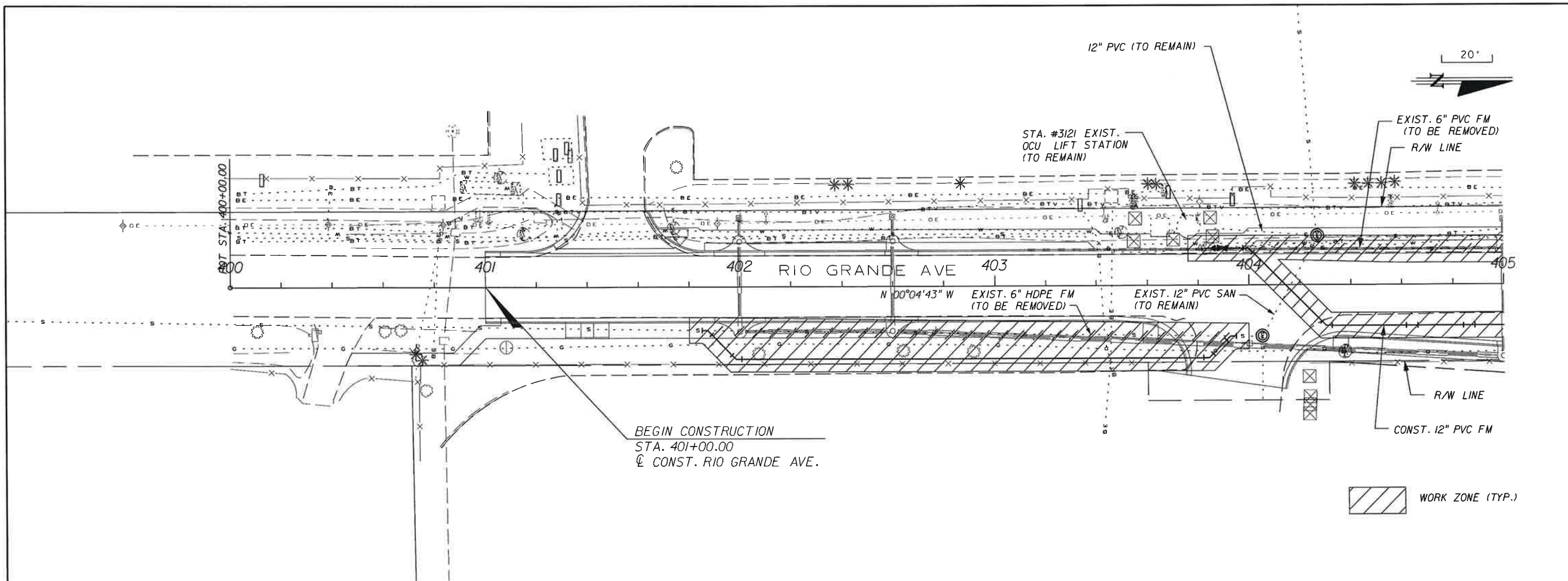
LOCHRANE
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PH: (407) 896-3317 FAX: (407) 896-9167 EMAIL: WWW.LOCHRANE.COM
CERTIFICATE OF AUTHORIZATION NO. 2856
FOREST W. ADKINS, P.E. P.E. NUMBER 56003

ORANGE COUNTY
GOVERNMENT
FLORIDA

MAINTENANCE OF TRAFFIC
HOLDEN AVENUE
GENERAL NOTES

Approved
2018-H-594-390
Scott Kirks
10/3/2018
M-1

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION



PHASE 3 NOTES

THIS PHASE IS TO ADDRESS THE 12" PVC FM ALONG RIO GRANDE AVE AND HOLDEN AVENUE, AND TO ADDRESS THE GRAVITY SANITARY SEWER RE-ROUTING ON THE NORTH LEG OF RIO GRANDE AVENUE.

PHASE 3A

1. CONSTRUCT THE PROPOSED 6" HDPE FM ALONG THE EAST SIDE OF RIO GRANDE AVENUE STA. 401+87.25 RT TO STA. 403+92.56 RT, MAINTAIN TRAFFIC USING FDOT INDEXES 602 AND 603.
2. CONSTRUCT THE PROPOSED 12" PVC FM ALONG THE EAST SIDE OF RIO GRANDE AVENUE AND THE SOUTH SIDE OF HOLDEN AVENUE FROM RIO GRANDE AVENUE STA. 404+30 RT TO HOLDEN AVE STA. 64+25 RT, AND FROM HOLDEN AVENUE STA. 70+63 RT TO STA. 76+08 RT, INCLUDING THE WET TAP OF THE EXISTING 12" FM AT US 441. MAINTAIN TRAFFIC USING FDOT INDEXES 602 AND 603
3. CLOSE THE EASTBOUND TWO LANES OF HOLDEN AVENUE AND MAINTAIN TWO-WAY TRAFFIC ON THE WESTBOUND LANES USING FDOT INDEX 623 FOR DOUBLE LANE CLOSURES. CONSTRUCT THE PROPOSED 12" PVC FM BETWEEN STATIONS 64+25 RT AND 70+63 RT.
4. CONSTRUCT THE CROSSING OF RIO GRANDE AVENUE AT STA. 404+10 AND CONNECT TO THE VALVES AT THE LIFT STATION, PLACING THE EXIST. 8" CI FM OUT OF SERVICE. MAINTAIN TRAFFIC USING FDOT INDEX 603
5. REMOVE THE EXIST. 8" CI FM WHERE ACCESSIBLE ALONG RIO GRANDE AVENUE AND HOLDEN AVENUE, MAINTAIN TRAFFIC USING FDOT INDEXES 602, 603 AND THE WESTBOUND LANES OF HOLDEN AVENUE.
6. SEE GENERAL NOTES FOR LANE CLOSURE INFORMATION.



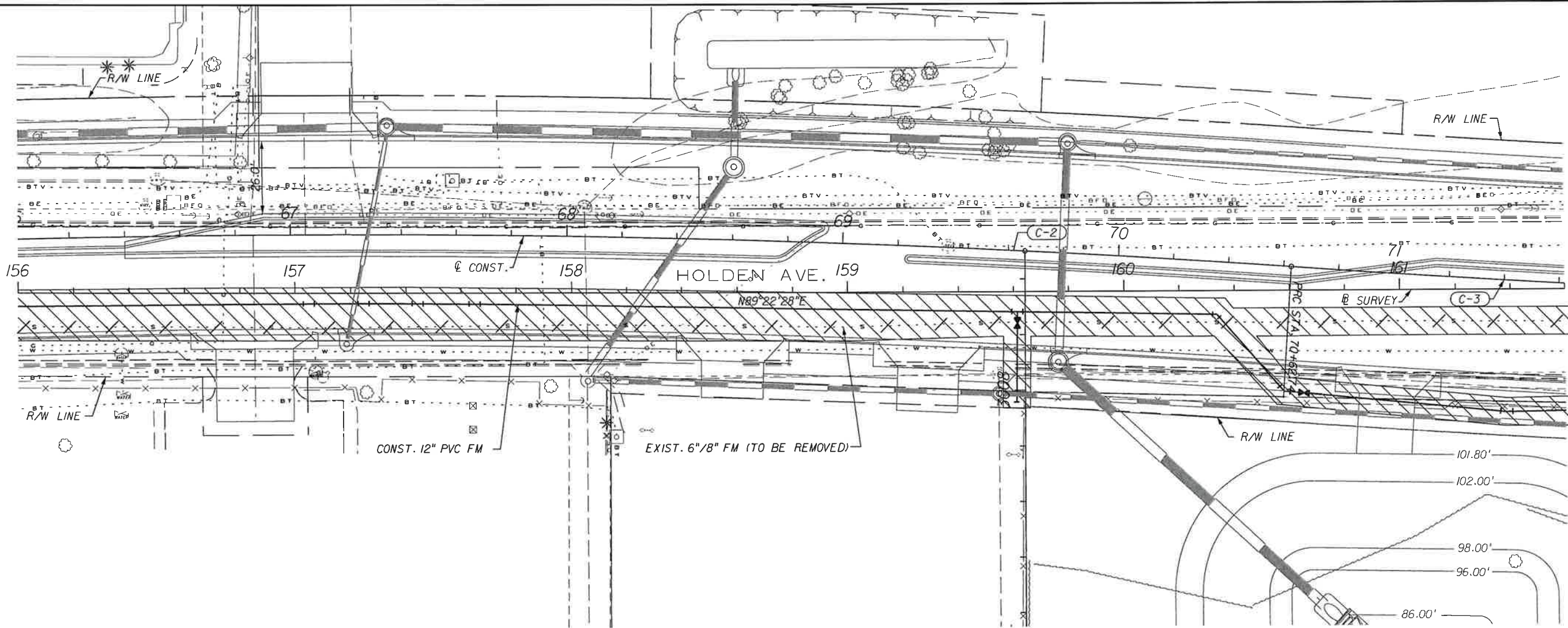
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ORANGE COUNTY
GOVERNMENT
FLORIDA

MAINTENANCE OF TRAFFIC
RIO GRANDE AVE.
PHASE 3A

Approved
2018-H-597-390
Scott Kirks
10/3/2018
M-10

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION



Q CONST CURVE (C-2)
 PI STA 67+18.57
 $\Delta = 08^\circ 37' 13'' \text{RT}$
 $D = 01^\circ 15' 00''$
 $T = 345.47$
 $L = 689.64$
 $R = 4,583.74$
 $e = \text{N.C.}$
 $E = 13.00$
 PC STA 63+73.09
 PT STA 70+62.74

Q CONST CURVE (C-3)
 PI STA 72+74.50
 $\Delta = 04^\circ 14' 00'' \text{LT}$
 $D = 01^\circ 00' 00''$
 $T = 211.77$
 $L = 423.35$
 $R = 5,729.62$
 $e = \text{N.C.}$
 $E = 3.91$
 PC STA 70+62.74
 PT STA 74+86.08

WORK ZONE (TYP.)



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ORANGE COUNTY
GOVERNMENT
 FLORIDA

MAINTENANCE OF TRAFFIC
HOLDEN AVENUE
PHASE 3A

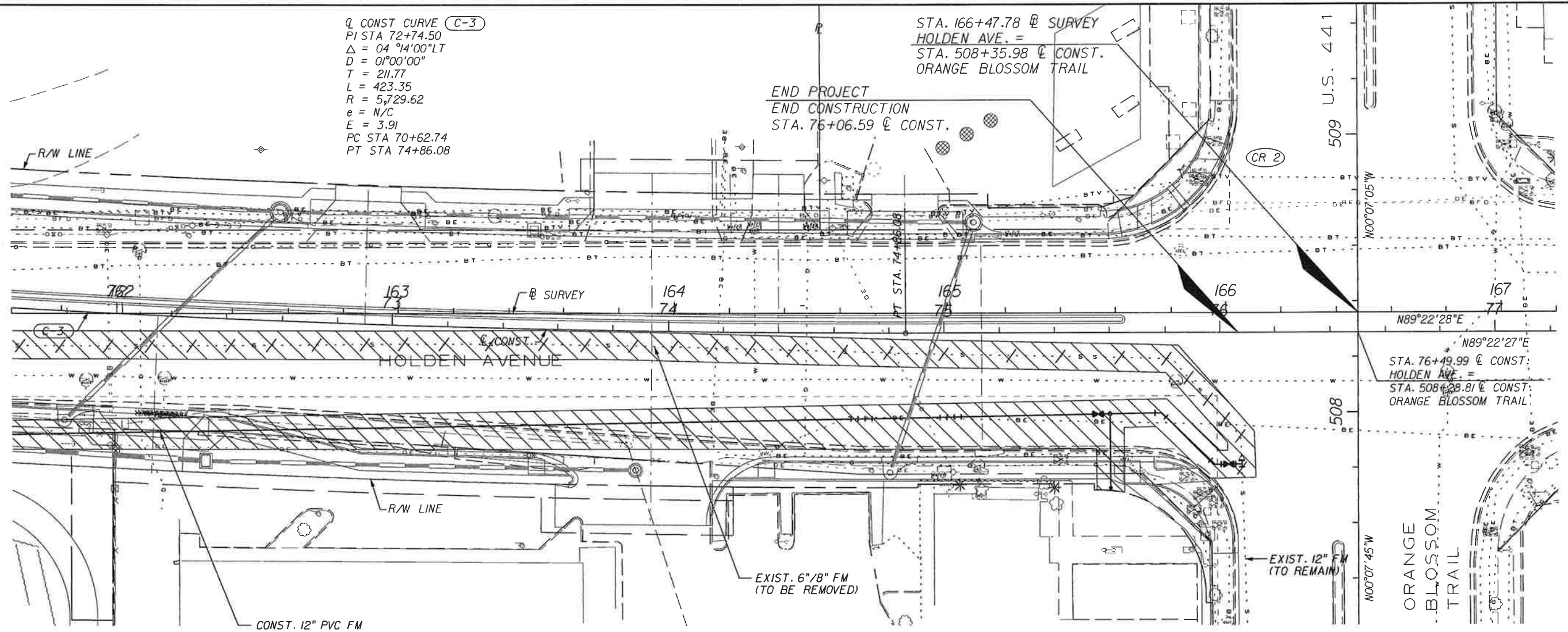
Approved
 2018-H-594-390
 Scott Kirts
 10/3/2018
 SHEET NO. **M-13**

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Q CONST CURVE (C-3)
 PI STA 72+74.50
 $\Delta = 04^\circ 14' 00" \text{LT}$
 $D = 01^\circ 00' 00"$
 $T = 211.77$
 $L = 423.35$
 $R = 5,729.62$
 $e = \text{N/C}$
 $E = 3.91$
 PC STA 70+62.74
 PT STA 74+86.08

STA. 166+47.78 @ SURVEY
 HOLDEN AVE. =
 STA. 508+35.98 @ CONST.
 ORANGE BLOSSOM TRAIL

END PROJECT
 END CONSTRUCTION
 STA. 76+06.59 @ CONST.



 WORK ZONE (TYP.)



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 **ORANGE COUNTY**
GOVERNMENT
 FLORIDA

MAINTENANCE OF TRAFFIC
HOLDEN AVENUE
PHASE 3A

Approved
 2018-H-594-390
 Scott Kirts
 10/3/2018

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

SHEET NO.
M-14

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APPENDIX D

2

3

ORANGE COUNTY UTILITIES Standards and Construction Specification Manual

4

5

LIST OF APPROVED PRODUCTS

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APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Air Release	ARV Enclosure	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	Blue 36" Tall	AVG2036 Encl	Pantone 36" Tall	AVG2036 Encl	Green 36" Tall
			GP3232 Base		GP3232 Base		GP3232 Base	
			AVG2041 Encl	Blue 41" Tall	AVG2041 Encl	Pantone 41" Tall	AVG2041 Encl	Green 41" Tall
		GP3232 Base		GP3232 Base		GP3232 Base		
	Safety-Guard/Hydro Guard	15100 Encl	Blue 34" Tall	15100 Encl	Pantone 34" Tall	15100 Encl	Green 34" Tall	
	Air Release Valves	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	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	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			4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	
Series N69			Series N69		Series N69			
PPG / Ameron	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils		
	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils		
	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils		
	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils		

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Fittings	Fittings	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 Meter	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	
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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	Ductile iron pipe Bell Joint Restraint Gaskets and Locking Bell (4" & Above)	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
		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	

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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	PVC Bell Joint Restraints (16" & Greater)	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.						
		Certaanteed 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.						
		Certaanteed 16"	NA	NA	NA	NA	Certa-Lok C905/RJ	NA
		Diamond Plastics Corp	NA	NA	NA	NA	Trans-21 DR18	Green
		Ipex Inc	NA	NA	NA	NA	IPEX Centurion	Green
		JM Eagle	NA	NA	NA	NA	C905 Big Blue	Green
National Pipe & Plastics Inc		NA	NA	NA	NA	C905	Green	
HDPE C906 DR11	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	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	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	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	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
Line Stops	Line Stops							
	JCM							
	Romac							
	Smith Blair							
Tapping Sleeves and Valves	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	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	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	
	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	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater			
			Model #	Comments	Model #	Comments	Model #	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 minimum 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		
			NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up		
Val-Matic	NA	NA	NA	NA	5700 or 5900 (MJ)	4" & up				
Valve Boxes	Valve Boxes with Locking Lids (Cast Iron)	Two piece standard screw type Heavy Duty Valve Boxes with Locking Lids (Cast Iron) and type of service cast in heavy duty traffic lid (H2O loading) ASTM A48								
		Bingham/Taylor	Series 4905	Box	NA	NA	Series 4905	Box		
			4905-X	Extension	NA	NA	4905-X	Extension		
			4904-L	Blue Water Locking Lid	NA	NA	4904-L	Green Sewer locking Lid		
		Sigma	Series VB 261X-267X	Box	VB-25031LK-VB-2612	Box	Series VB 261X-267X	Box		
			VB 6302	Extension	VB-6302	Extension	VB 6302	Extension		
			VB 4650W	Blue Water Locking Lid	VB2503LK	Purple Square Locking Lid	VB 4650S	Green Sewer locking Lid		
		Star	Series VB-0002	Box	NA	NA	Series VB-0002	Box		
			VBEX 12-24S	Extension	NA	NA	VBEX 12-24S	Extension		
			VBLIDLOCK	Blue Water Locking Lid	NA	NA	VBLIDLOCK	Green Sewer locking Lid		
		Tyler Union	Series 6850	Box	NA	NA	Series 6850	Box		
			58, 59, 60	Extension	NA	NA	58, 59, 60	Extension		
			Locking Lid	Blue Water Locking Lid	NA	NA	Locking Lid	Green Sewer locking Lid		
		Valve Box	Valve Box	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	Blue Water Locking Lid	MVB050CR thru MVB130CR with Extension Stem	Purple Square Locking Reclaim Lid	MVB050C thru MVB130C with Extension Stem	Green Sewer locking Lid
				MVB875 Guide Plate		MVB875 Guide Plate		MVB875 Guide Plate		

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LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	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-Graffiti (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		

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	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	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	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		
	Joining Material	Joining 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		

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LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Generator	Gen	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 shall have Diaphragm Seals. Oil filled.						
Ashcroft		NA	NA	NA	NA	10 1008SL 02L 60#	Gauge Diaphragm Seal	
		25 200SS 02T XYTSE						
Terice		NA	NA	NA	NA	D83LFSS4002LA100 - Gauge		
						M51001SSSS - Diaphragm Seal		
Winter Gauges	NA	NA	NA	NA	D99100 Fill and Mount Charge			
Pumps	Submersible Pumps							
	ABS	NA	NA	NA	NA			
	Flygt	NA	NA	NA	NA	PFQ770 0-60 PSI D70950 top D70954 Bottom		

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pumps	Floats	Float Regulator (FR) - Duplex and Triplex Pump Stations						
		Atlantic Scientific	NA	NA	NA	NA	Roto-Float	
Pumps	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 Disconnect	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 IEEE C62, 41/45 tested with NEMA 4X enclosure, internal fusing, voltage and phase to match service. Rated 80,000 amps per mode for Duplex & 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	
		Joslyn AKA (Total Protection Solutions)	NA	NA	NA	NA	TSS-ST 160 Series, ST 300 Series or JSP-300 Series	
		Surge Suppressors, Inc	NA	NA	NA	NA	LSE Series or SHL Series	
Sub Panel	Sub Panel	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	

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Pump Station Control Panel	AL	Alarm Light / With Base and Globe (AL)							
	American Electric	NA	NA	NA	NA	F32552			
	Red Dot Globe	NA	NA	NA	NA	VGLR-01			
	Red Dot Base					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				

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LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Panel	PM	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		

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Pane	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 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	Variable Frequency Drives							
	Square D	NA	NA	NA	NA			