THE SEMINOLE IMPROVEMENT DISTRICT

CONSTRUCTION
&
DEVELOPMENT MANUAL

FARNER BARLEY AND ASSOCIATES, INC.
▲ ENGINEERS
▲ SURVEYORS
▲ PLANNERS
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SITEWORK AND SUBDIVISION SPECIFICATIONS

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Acronym List:

AASHTO:	American Association of State Highway and Transportation Officials
ANSI:	American National Standards Institute
ASTM:	American Society for Testing and Materials
AWWA:	American Water Works Association
DIP:	Ductile Iron Pipe
DIPRA:	The Ductile Iron Pipe Research Association
EOR:	Engineer of Record
ESC:	Erosion and Sediment Control
F.D.O.T.:	Florida Department of Transportation
FDEP:	Florida Department of Environmental Protection
H.D.P.E.:	High Density Polyethylene
LBR:	Limerock Bearing Ratio
MOT:	Maintenance of Traffic
MP:	Master Plan
MS:	Minimum Standards
NASSCO:	National Association of Sewer Service Guidelines
NPDES:	National Pollutant Discharge Elimination System
NSF:	The National Sanitation Foundation
OSHA:	Occupational Safety and Health Administration
P.V.C:	Poly Vinyl Chloride
R.C.P.:	Reinforced Concrete Pipe

RPZ: Reduced pressure backflow prevention device

S.I.D.: Seminole Improvement District

S.R.A.S.P.: Spiral Rib Aluminized Steel Pipe

SWFWMD: South Florida Water Management District

SWPPP: Stormwater Pollution Prevention Plan

Section 1

GENERAL GUIDELINES AND GOVERNING SPECIFICATIONS

1. GENERAL

1.1. The Seminole Improvement District Minimum Standards (MS) set forth in this document are intended to provide a basis for design and construction for those utilities that come under the jurisdiction of Seminole Improvement District (SID). SID must approve any variations to these MS. Requests to vary the MS must be submitted to SID in writing and in advance of any work performed. It is the intention of SID that the requirements and criteria set forth in these MS shall be applicable in every case where facilities are being constructed, or are to be constructed, and shall be owned and/or operated and maintained by SID. These MS shall also be applicable to any portions of facilities that exist or may lie within public rights-of-way or easements in areas served by SID. These MS are in full compliance with the SID Master Hydraulic Plan (MP). Applicable Federal, State and local laws and regulations shall be considered concurrently with this text.

1.2. When the word Engineer is used, it means Design Engineer of Record unless specifically denoted as SID District Engineer. The Applicant and/or the Designing Engineer of Record (EOR) is responsible for designing and constructing a complete and cohesive working installation that efficiently interacts with and compliments any existing facilities and does not adversely impact the operation of the existing utility system. SID approval and/or acceptance of plans, specifications, designs, and/or materials does not relieve the Applicant and/or the EOR from this stated responsibility. SID assumes no responsibility for design submittals or for any material specified in those designs. All referenced standards are the latest revisions (such as, but not limited to, the American Water Works Association [AWWA], the American National Standards Institute [ANSI], the American Society for Testing and Materials [ASTM], the National Sanitation Foundation [NSF], the Ductile Iron Pipe Research Association [DIPRA] etc.). SID assumes no responsibility for standards developed by outside agencies. Conflicts arising between these MS and outside agency requirements shall be referred in writing to SID for resolution.

1.3. Subject to SID approval, the EOR is responsible for securing proper existing utility information, sizing the proposed facilities and preparing plans and specifications all in accordance with these MS and others set forth in the SID MP. SID may apply more stringent or different standards where site-specific conditions warrant. Copies of all design criteria and calculations shall be provided to SID for review.

1.4. All construction plans shall be reviewed and approved by SID. No plan changes shall be made without specific SID concurrence. No construction shall start prior to a pre-construction conference held with a SID Representative in attendance. While SID makes every effort to ascertain whether plans and specifications are in conformance with these MS, it reserves the right to enforce these MS regardless. SID shall be the final interpreter of the intent of the requirements set forth in this document.

2. OTHER AGENCIES

2.1. The Applicant is responsible for application and procurement of any and all required permits necessary to perform the work. Separate approvals for storm-water systems, road

repair and replacement, electrical work, building permits, and any other applicable conditions are also required.

3. EXISTING FACILITIES

3.1. Modification of existing facilities or connecting to existing facilities shall be completed only in the presence of an on-site SID Representative. All connections shall conform to SID-approved plans and specifications. The Applicant shall be responsible for locating all existing utilities and making corresponding contact with appropriate agencies.

4. CONTRACT SECURITY

4.1. All SID related projects will be properly bonded (performance and payment bonds) in an amount equal to one hundred per cent (100%) of the contract price. These bonds shall remain in effect through the warranty period. The warranty period begins on the day final contract payment is made by SID and ends after three hundred sixty-five (365) days. SID may require a separate maintenance bond in some cases.

4.2. All bonds shall be written by a surety company licensed to do business in the State of Florida as listed in the Department of Treasury Federal Register and countersigned by a Florida resident agent. The surety shall have a rating of "A+" or "A" by Best's Rating Guide.

5. PRECONSTRUCTION OBLIGATIONS

5.1. After the plans and specifications are approved and prior to construction, the applicant shall contact SID to schedule a preconstruction meeting. The meeting shall include the Applicant, Engineer of Record, SID District Engineer, Contractor and any other utility or agency representatives deemed necessary by SID.

5.2. The Contractor shall call Sunshine 811 for utility locations prior to conducting underground excavations.

6. RESTORATION

6.1. The Applicant is responsible for protecting all existing facilities, assets, properties, and appurtenances and will properly restore any and all such items when damaged during construction. Pavement replacement, including curb, gutters and striping shall occur within ten (10) days of the occurrence of the damage, unless otherwise approved by SID.

GOVERNING SPECIFICATIONS

1. GENERAL PAVING AND DRAINAGE

1.1. The "Florida Department of Transportation Standard Specifications (F.D.O.T. Standard Specifications) for Road and Bridge Construction" Divisions II and III, current edition, copies of which are issued separately as amended and augmented by the Supplemental Specifications, shall govern the paving and drainage construction of this project. The Contractor's attention is specifically directed to the provisions of such Standard Specifications, which are hereby made a part hereof as if fully set forth at length.

1.2. Other Specifications not based on the F.D.O.T. Standard Specifications may be contained herein and shall be the entire Specification for the work described.

2. INTENT OF DRAWINGS AND SPECIFICATIONS

2.1. All construction in the public rights-of-way shall be in accordance with all Local Government Specifications.

2.2. All required site work improvements shall be in accordance with "The F.D.O.T. Standard Specifications for Road and Bridge Construction", Divisions II and III (F.D.O.T. Standard Specifications), the "F.D.O.T. Roadway and Traffic Design Standards", current edition, as amended by the project Drawings, the Specifications contained herein, and the project Drawings.

2.3. In event of conflict between the provisions of the above mentioned documents, the Local Government Specifications shall govern.

3. SUPPLEMENTAL CONSTRUCTION SPECIFICATIONS

3.1. The following specifications represent modifications to the corresponding Sections of the Standard Specifications, hereinabove defined.

3.2. In case of conflicting requirements between the Standard Specifications and these modifications, the modifications shall govern.

3.3. Any applicable provisions in the Standard Specifications not amended by and not in conflict with the Supplementary Specifications shall be understood to be in full effect.

Section 2

SAFETY REGULATIONS

1. GENERAL

1.1. The Contractor's attention is specifically directed to the published regulations of the Florida Department of Commerce on the "Use of Cranes, Drag Lines and similar Equipment near Power Lines", "Excavations and Trenching Operations", and similar regulations of that department.

1.2. The Contractor's attention is further directed to the enactment of the Florida Trench Safety Act which incorporates OSHA Standard 29 CFR 1926.650 Subpart P, as the State's trench excavation safety standard. The Contractor is fully responsible for the design of the trench safety system and for compliance with the applicable standards for the Project.

1.3. The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated in writing by the Contractor to the Seminole Improvement District and the Engineer.

1.4. The Contractor shall comply with all OSHA (Occupational Safety and Health Administration) requirements.

1.5. The Contractor is required to be familiar with all Federal and Local safety rules and regulations. It shall be the sole responsibility of the Contractor to adhere to and enforce all such safety rules and regulations. The Seminole Improvement District shall be held harmless to any citations, fines, or suits of law, that may result as a breach of safety rules and regulations by the Contractor or any and all Subcontractors of the Contractor. No actions of the Engineer's appointed Observer shall be construed to indicate compliance of the Contractor, or of his Subcontractors, with safety rules and regulations.

1.6. Not withstanding the foregoing, neither the Engineer nor Seminole Improvement District shall be required to perform the safety-related functions of Contractor, Subcontractor or others; nor shall Engineer or Seminole Improvement District be required to inspect for OSHA violations or other similar violations of federal or local safety standards; nor shall Engineer or Seminole Improvement District be deemed to be a guarantor or insurer of safety of any person on or near the job site.

2. PUBLIC SAFETY AND CONVENIENCE

2.1. The Contractor shall at all times so conduct the Work as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the Work, and to insure the protection of persons and property, in a manner satisfactory to the Engineer and Seminole Improvement District . No road or street shall be closed to the public, except with the permission of the Engineer and proper governmental authority. Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches.

3. BARRICADES, WARNING AND DETOUR SIGNS

3.1. The Contractor shall (in accordance with the requirements of the Florida Department of Transportation's Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System – Index No. 600) provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and signs, provide a sufficient number of flagmen and watchmen, and take all necessary precautions for the protection of the Work and the safety of the public. Those streets and/or highways closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. The Contractor shall provide and maintain acceptable warning and detour signs at all closures, intersections and along the detour routes, directing the traffic around the closed portion or portions of the Work so that the temporary detour route or routes shall be indicated clearly throughout its or their entire length. All barricades and obstructions shall be illuminated at night and all lights shall be kept burning from sunset until sunrise. Barricades shall be well built and so designed as not to be blown over by the wind.

3.2. Roadways, parkways and other existing Work, including sodded or grassed areas, which are damaged by the Contractor's operations shall be repaired at the Contractor's expense and left in condition as good as existed before the Work was commenced.

Section 3

EROSION AND SEDIMENT CONTROL

1. GENERAL

1.1. Provide Erosion and Sediment Control (hereafter known as "ESC") measures on the project and in areas within road the rights-of-way where work is accomplished in conjunction with the project, so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project or right-of-way and damage to work on the project.

1.2. Construct and maintain temporary ESC features or, where practical, construct and maintain permanent ESC features as shown in the plans or as may be directed by the Engineer.

1.3. Coordinate the installation of temporary ESC features with the construction of the permanent ESC features to the extent necessary to ensure economical, effective, and continuous control of erosion and water pollution throughout the life of the project.

1.4. No clearing and grubbing or rough cutting shall be permitted until ESC systems are in place, other than sitework specifically directed by the Engineer to allow soil testing and surveying.

1.5. Equipment and vehicles shall be prohibited by the Contractor for maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damage caused by construction traffic to ESC systems shall be repaired immediately by the Contractor.

1.6. Contractor shall be responsible for collecting, storing, hauling and disposing of spoil, silt and waste materials as specified in this or other Specifications and in compliance with applicable federal, and local rules and regulations.

1.7. Contractor shall conduct all construction operations in conformance with the ESC practices described in the Drawings and these Specifications.

1.8. Contractor shall install, maintain and inspect ESC measures and practices as specified in the Drawings and these and/or other Specifications.

1.9. Due to unanticipated conditions, the use of control features or methods other than those included in the original plans may be necessary.

1.10. Until all construction is approved, Contractor shall be responsible for the implementation of these ESC plans and the construction, maintenance, replacement and upgrading for these ESC facilities.

1.11. The boundaries of the clearing limits shown on the ESC plan shall be clearly flagged by survey tape or fencing prior to construction. During the construction period, no disturbance beyond the clearing limits shall be permitted. Contractor shall maintain clearing limits for the duration of construction.

1.12. Stabilized construction entrances shall be installed at the beginning of construction and maintained for the duration of construction. Additional measures, such as constructed wheel wash systems or wash pads, may be required to ensure that all

paved areas are kept clean and track out to road right-of-way does not occur for the duration of construction.

1.13. Facilities shown on the ESC plan must be constructed prior to or in conjunction with all clearing and grading so as to ensure that the transport of sediment to surface waters, drainage systems, and adjacent properties is minimized.

1.14. Facilities shown on the ESC plan are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded as needed for unexpected storm events and modified to account for changing site conditions (e.g. additional cover measures, additional sump pumps, relocation of ditches and silt fences, perimeter protection, etc.)

2. CONTROL OF CONTRACTOR 'S OPERATIONS WHICH MAY RESULT IN WATER POLLUTION

2.1. Prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments with fuels, oils, bitumens, calcium chloride, or other harmful materials. Also, conduct and schedule operations to avoid or otherwise minimize pollution or siltation of such water impoundments, and to avoid interference with fish.

2.2. Except as necessary for construction, do not deposit excavated material in rivers, streams, canals, or impoundments, or in a position close enough thereto, to be washed away by high water or runoff.

2.3. Where pumps are used to remove highly turbid waters from enclosed construction areas such as cofferdams or forms, treat the water by one or more of the following methods prior to discharge into State waters: pumping into grassed swales or appropriate vegetated areas or sediment basins, or confined by an appropriate enclosure such as turbidity barriers when other methods are not considered appropriate.

2.4. Do not disturb lands or waters outside the limits of construction as staked, except as authorized by the Engineer.

3. MATERIALS FOR TEMPORARY EROSION CONTROL

3.1. The Contractor may use new or used materials for the construction of temporary silt fence, staked turbidity barriers, and floating turbidity barrier not to be incorporated into the completed project, subject to the approval of the Engineer.

4. EROSION AND SEDIMENT CONTROL PLAN

4.1. A plan to prevent, control and reduce erosion and water pollution, meeting the requirements or special conditions of all permits authorizing project construction shall be prepared.

4.2. When a National Pollutant Discharge Elimination System (NPDES) Permit is issued or approved the plan shall be prepared as a part of the Stormwater Pollution Prevention Plan (SWPPP). The SWPPP will include this ESC plan and all additional measures that will be employed to dispose of, control, or prevent the discharge of solid, hazardous, and sanitary wastes to waters of the State. Include procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for

cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills.

4.3. When the SWPPP is required, prepare the ESC plan in accordance with the sequence of operations and present in the NPDES Stormwater Pollution Prevention Plan required format. The ESC plan shall describe, but not be limited to, the following items or activities:

4.3.1. For each phase of construction operations or activities, supply the following information:

4.3.1.1. Locations of all ESC devices.

4.3.1.2. Types of all ESC devices.

4.3.1.3. Estimated time ESC devices will be in operation.

4.3.1.4. Monitoring schedules for maintenance of ESC devices.

4.3.1.5. Methods of maintaining ESC devices.

4.3.1.6. Containment or removal methods for pollutants or hazardous wastes.

4.3.2. The name and telephone number of the person responsible for monitoring and maintaining the ESC devices.

5. CONSTRUCTION REQUIREMENTS

5.1. <u>ESC Recommended Construction Sequence:</u>

- Pre-Construction Meeting.
- Post sign with name and phone number of ESC supervisor (may be consolidated with the required notice of construction sign).
- Flag or fence clearing limits.
- Install catch basin protection if required.
- Grade and install construction entrance(s).
- Install perimeter protection (silt fence, brush barrier, etc.).
- Construct sediment ponds and traps.
- Grade and stabilize construction roads.
- Construct surface water controls (interceptor dikes, pipe slope drains, etc.) simultaneously with clearing and grading for project development.
- Maintain ESC measures in accordance with manufacturer's recommendations.
- Relocate ESC measures or install new measures so that, as site conditions change, ESCs always remain in accordance with the ESC plan.
- Cover all areas that will be unworked for more than seven (7) days during the dry season or two (2) days during the wet season with straw, wood fiber mulch, compost, plastic sheeting or equivalent.
- Stabilize all areas that reach final grade within seven (7) days.
- Seed or sod any areas to remain unworked for more than thirty (30) days.
- Upon completion of construction, all disturbed areas must be stabilized and BMPs removed, if appropriate.

5.2. Limitation of Exposure of Erodible Earth

5.2.1. Limit the surface areas of unprotected erodible earth exposed by the construction operation and provide erosion or pollution control measures to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal, or other water impoundments or to prevent detrimental effects on property outside the project or damage to the project.

5.2.2. Limit the area in which excavation and filling operations are being performed so that it does not exceed the capacity to keep the finish grading, grassing, sodding, and other such permanent ESC measures current in accordance with the accepted schedule.

5.2.3. Stabilization of Disturbed Areas

5.2.3.1. Following an initial disturbance or redisturbance, complete permanent or temporary stabilization:

5.2.3.1.1. Within seven (7) days for surfaces of dikes, swales, ditches, perimeter controls and slopes greater than 3:1.

5.2.3.1.2. Within fourteen (14) days for other disturbed or graded areas.

5.2.3.2. Stabilization:

5.2.3.2.1. Temporary stabilization shall consist of vegetation, anchored straw mulch, mulch netting, jute, excelsior blankets, wood chips, surge stone or stone mulch.

5.2.3.2.2. Permanent stabilization shall be performed in accordance with the restoration schedule as shown on the Drawings, which may include rip rap or fabriform mat with details.

5.2.3.3. Requirements do not apply to areas currently used for material storage or on which actual construction activities are currently performed.

5.3. Incorporation of ESC Features

5.3.1. Incorporate permanent ESC features into the project at the earliest practical time.

5.3.2. Use approved temporary ESC features to correct conditions that develop during construction which were not foreseen at the time of design, to control erosion prior to the time it is practical to construct permanent control features, or to provide immediate temporary control of erosion that develops during normal construction operations, which are not associated with permanent ESC features on the project.

5.4. Scheduling of Successive Operations

5.4.1. Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for

efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

5.4.2. Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter.

5.4.3. Schedule and perform grading operations so that permanent ESC features can follow immediately thereafter if conditions on the project permit.

5.4.4. Limit the area in which excavation and filling operations are being performed so that it does not exceed the capacity to keep the finish grading, grassing, sodding, and other such permanent ESC measures current in accordance with the accepted schedule.

5.5. Details for Temporary ESC Features

5.5.1. General

5.5.1.1. Use temporary erosion and water pollution control features that consist of, but are not limited to, temporary grassing, temporary sodding, temporary mulching, sandbagging, slope drains, sediment basins, sediment checks, berms, baled hay or straw, inlet protection, floating turbidity barrier, staked turbidity barrier, temporary gravel construction entrance and silt fence.

5.5.1.2. In concentrated flow areas, use ESC measures and devices, excluding silt fence, to prevent overtopping. Silt fence is not meant to be placed in concentrated flow areas.

5.5.1.3. After installation of ESC devices, repair portions of any devices damaged.

5.5.2. Temporary Grassing

5.5.2.1. The Engineer may designate certain areas of grassing as temporary ESC features.

5.5.2.2. The Engineer may direct the Contractor to omit permanent type grass seed from grassing and reduce the specified rate of spread for fertilizer used in conjunction with grassing operations when such work is designated as a temporary ESC feature.

5.5.2.3. Hydro seeding is an allowable alternate to conventional seeding.

5.5.3. Temporary Sod

5.5.3.1. Furnish and place sod within areas designated by the Engineer to temporarily control erosion.

5.5.3.2. If the Engineer determines that the sod will be of a temporary nature, he may not require fertilizer and lime. Keep the sod in a moist condition in order to ensure growth.

5.5.3.3. Furnish performance turf, in accordance with FDOT Section 570, to establish turf during the project construction period.

5.5.4. Temporary Mulching

5.5.4.1. Furnish and apply a 2” thick to 4” thick blanket of straw or hay mulch to designated areas, then mix or force the mulch into the top 2” of the soil in order to temporarily control erosion.

5.5.4.2. Use only undecayed straw or hay which can readily be cut into the soil.

5.5.4.3. The Contractor may substitute other measures for temporary ESC, such as hydro-mulching, chemical adhesive soil stabilizers, etc., for mulching with straw or hay, if approved by the Engineer.

5.5.4.4. When beginning permanent grassing operations, plow under temporary mulch materials in conjunction with preparation of the ground.

5.5.5. Sandbagging

5.5.5.1. Furnish and place sandbags in configurations to control erosion and siltation.

5.5.6. Slope Drains

Construct slope drains in accordance with the details shown in the plans, or as may be approved as suitable to adequately perform the intended function.

5.5.7. Sediment Basins

5.5.7.1. Construct sediment basins in accordance with the details shown in the plans, or as may be approved as suitable to adequately perform the intended function.

5.5.7.2. Clean out sediment basins as necessary in accordance with the plans or as directed.

5.5.8. Berms

Construct temporary earth berms to divert the flow of water from an erodible surface.

5.5.9. Baled Hay or Straw

5.5.9.1. Provide bales having minimum dimensions of 14” x 18” x 36”, at the time of placement.

5.5.9.2. Construct baled hay or straw dams to protect against downstream accumulations of silt. Place the dam to effectively control silt dispersion under conditions present on the project.

5.5.9.3. The Contractor may use alternate solutions and usage of materials if approved.

5.5.10. Temporary Silt Fence

5.5.10.1. General:

5.5.10.1.1. Definition-a temporary, continuous barrier constructed of sediment-control geotextile supported by posts used to trap sediment, but allow surface runoff to filter through.

5.5.10.1.2. Furnish, install, maintain, and remove temporary silt fences, in accordance with the manufacturer's directions, these Specifications and the details as shown on the plans.

5.5.10.1.3. Silt fence that is inadequately embedded into the ground will blow out, releasing water and sediment under the fence. Failure to properly install, inspect and maintain are the primary causes of this failure.

5.5.10.1.4. Install all ESC devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, or any wetlands associated therewith and to any adjacent property as required. At sites where exposure to such sensitive areas is prevalent, complete the installation of any ESC device prior to the commencement of any earthwork.

5.5.10.2. Materials and Installation:

5.5.10.2.1. Use a geotextile fabric

5.5.10.2.2. Choose the type and size of posts, wire mesh reinforcement (if required), and method of installation. Do not use products which have a separate layer of plastic mesh or netting. Provide a durable and effective temporary silt fence that controls sediment.

5.5.10.2.3. Construct the silt fence from a continuous roll of geotextile if possible. Cut to the length of the barrier to avoid joints. When joints are necessary, it is preferred that the material be overlapped to the next port or the adjoining fabrics wrapped together around posts.

5.5.10.2.4. Erect temporary silt fence at upland locations across ditch lines and at temporary locations shown on the plans or approved by the Engineer where continuous construction activities change the natural contour and drainage runoff. Silt fence must be tied into the slope so that the base of the fence is above the design storage depth. Do not attach temporary silt fence to existing trees.

5.5.10.2.5. Posts shall be spaced a maximum of 6' apart.

5.5.10.2.6. The bottom edge of the geotextile is to be buried a minimum of 6” in a vertical trench, with the soil pressed firmly against the embedded geotextile.

5.5.11. Floating Turbidity Barriers and Staked Turbidity Barriers

5.5.11.1. Install, maintain, and remove turbidity barriers to contain turbidity that may occur as the result of dredging, filling, or other construction activities which may cause turbidity to occur in the waters of the State.

5.5.11.2. The Contractor may need to deploy turbidity barriers around isolated areas of concern, both within as well as outside the project limits.

5.5.11.3. Place the barriers prior to the commencement of any work that could impact the area of concern. Install the barriers in accordance with the details shown in the plans or as approved by the Engineer.

5.5.11.4. Ensure that the type barrier used and the deployment and maintenance of the barrier will minimize dispersion of turbid waters from the construction site. The Engineer may approve alternate methods or materials.

5.5.11.5. Operate turbidity barriers in such a manner to avoid or minimize the degradation of the water quality of the surrounding waters.

5.5.11.6. Turbidity barriers shall be placed to not interfere with flow of water between stormwater ponds if needed for flood control.

5.5.12. Rock Bags

5.5.12.1. Furnish and place rock bags to control erosion and siltation. Place the bags as shown in the plans, or as directed by the Engineer.

5.5.12.2. Use F.D.O.T. No. 4 or No. 5 coarse aggregate rock.

5.5.12.3. When filled with rocks, the bag size shall be approximately 12” x 12” x 4”.

5.5.12.4. Fabric material shall have openings that are clearly visible to minimize clogging yet small enough to prevent rock loss, and shall be of sufficient strength to allow removing and relocating bags without breakage.

5.5.13. Stabilized Construction Entrance/Exit

5.5.13.1. Stabilized construction entrances/exits provide a stable area for entrance or exit from the construction site and reduce tracking of sediment onto streets or public rights-of-way.

5.5.13.2. All surface water flowing to or diverted toward construction entrances shall be piped under the entrance to maintain positive

drainage. Pipe installed under the construction entrance shall be protected with a mountable berm. Pipe shall be sized according to the drainage, with a minimum diameter being 6". Pipe will not be necessary when the stabilized construction entrance/exit is located at a high spot.

5.5.13.3. A stabilized construction entrance/exit shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance/exit.

5.5.14. Washing Areas

5.5.14.1. Vehicle Wheels:

5.5.14.1.1. When necessary, wheels of vehicles exiting the construction site shall be cleaned or washed to remove sediment prior to entrance onto public rights-of-way.

5.5.14.1.2. When washing of vehicle wheels is required, it may be done on an area adjacent to a stabilized construction entrance/exit which is stabilized with coarse aggregate and which drains into an ESC approved sediment trapping device or into a drainage swell or inlet protected with ESC devices.

5.5.14.2. Vehicles:

5.5.14.2.1. Vehicles such as concrete delivery trucks or dump trucks and other construction equipment shall not be washed at locations where the runoff will flow directly into a watercourse or stormwater conveyance system.

5.5.14.2.2. Designate special areas for washing vehicles. Locate these areas where the washwater will spread out and evaporate or infiltrate directly into the ground, or where the runoff can be collected in a temporary holding or seepage bin.

5.5.14.2.3. Beneath wash areas construct a gravel or rock base to minimize mud production.

5.5.15. Storage of Construction Materials and Chemicals

5.5.15.1. Isolate sites where chemicals, cements, solvents, paints, or other potential water pollutants are stored in areas where they will not cause runoff pollution.

5.5.15.2. Store toxic chemicals and materials, such as pesticides, paints and acids, in accordance with manufacturer's guidelines.

5.5.15.3. Protect groundwater resources from leaching by placing a plastic mat, packed clay, tar paper, or other impervious materials on any areas where toxic liquids are to be opened and stored.

5.5.16. Demolition Areas

5.5.16.1. Water or slurry used to control dust contaminated with heavy metals or toxic pollutants shall be retained on the site and shall not be allowed to run directly into watercourses or stormwater conveyance systems.

5.5.16.2. Methods of ultimate disposal of these materials shall be carried out in accordance with applicable local and federal health and safety regulations.

5.5.17. Sanitary and Waste Material Disposal

5.5.17.1. Provide the construction sites with portable toilet facilities for workers.

5.5.17.2. Contractor shall formulate and implement a plan for the collection and disposal of waste materials on the construction site. In plan, Contractor shall designate locations for trash and establish a collection schedule. Methods for ultimate disposal of waste shall be specified and carried out in accordance with applicable local and federal health and safety regulations and guidelines. Locate trash collection points where they will least likely be affected by concentrated stormwater runoff.

5.5.17.3. Make special provisions for the collection and disposal of liquid wastes and toxic or hazardous materials.

5.5.17.4. All facilities, receptacles and waste collection areas shall be kept as neat and orderly to the extent possible and shall not be allowed to overflow their containers.

5.5.17.5. Debris/trash containers shall not be allowed to accumulate from day to day, unless as otherwise approved by Seminole Improvement District.

5.5.18. Pesticides

5.5.18.1. Use and store pesticides in accordance with manufacturer's guidelines and with local and federal regulations.

5.5.18.2. Avoid overuse of pesticides which could produce contaminated runoff.

5.5.18.3. Take great care to prevent accidental spillage.

5.5.18.4. Never wash pesticide containers in or near flowing streams or stormwater conveyance systems.

5.5.19. Street Cleaning

5.5.19.1. Keep streets clean of construction debris and mud carried by construction vehicles and equipment. Clean streets weekly on Friday at a minimum.

5.5.19.2. All sediment spilled, dropped or tracked onto public rights-of-way must be removed as soon as possible by vacuum sweeping, scraping, or shoveling.

5.5.19.3. Water-hosing or sweeping of debris and mud off of the street into adjacent areas is NOT allowed.

5.6. Inspections and Maintenance of ESC Features

5.6.1. General

5.6.1.1. Provide daily routine inspections and maintenance of permanent and temporary ESC features until the project is complete and accepted.

5.6.1.2. If reconstruction of such ESC features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary ESC features, failure by the Contractor to install permanent ESC features as scheduled, the Contractor shall replace such ESC features.

5.6.1.3. Inspect all ESC features at least once every seven calendar days and within twenty four (24) hours of the end of a 0.25" storm or greater.

5.6.1.4. Maintain all ESC features as required in the SWPPP and as specified in state and/or federal environmental regulatory permits so as to be in compliance at all times.

5.6.2. Silt Fence Inspection and Maintenance

5.6.2.1. Make a daily review of silt fence locations in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fence under direction of the Engineer.

5.6.2.2. Periodically inspect silt fence locations in areas where construction activities have not changed natural contour and drainage runoff. Erosion around the ends of the silt fence is indicative of improperly designed and installed silt fencing. Immediately correct any deficiencies and/or install additional silt fence under direction of the Engineer.

5.6.2.3. Immediately after each rainfall and at least daily during a prolonged rainfall, inspect all temporary silt fences. Immediately correct any deficiencies.

5.6.2.4. Should the fabric of a silt fence collapse, tear, decompose, or otherwise become ineffective, promptly replace it within twenty-four (24) hours of discovery.

5.6.2.5. Remove sediment deposits when the deposit reaches approximately 1/2 of the volume capacity of the temporary silt fence, 30% of the height of the fence, or as directed by the Engineer to provide adequate storage volume for the next rainfall and to reduce pressure on the fence.

5.6.2.6. Take care to avoid undermining the silt fence during cleanout. It may be easier and more effective to remove and replace the silt fence when removing silt deposits or provide a second silt fence.

5.6.2.7. Replace geotextile when silt fence is in place longer than twelve (12) months, unless Engineer directs otherwise.

5.6.3. Stabilized Construction Entrance/Exit Inspection and Maintenance

5.6.3.1. Daily inspection and maintenance are required.

5.6.3.2. Each stabilized construction entrance/exit shall be maintained in a condition which would minimize tracking of sediment onto public rights-of-way. This may require adding stone or other repairs as conditions demand.

5.7. Protection During Suspension of Work

5.7.1. If it is necessary to suspend the construction operations for any appreciable length of time, shape the top of the earthwork in such a manner to permit runoff of rainwater, and construct earth berms along the top edges of embankments to intercept runoff water.

5.7.2. Provide temporary slope drains to carry runoff from cuts and embankments that are in the vicinity of rivers, streams, canals, lakes, and impoundments. Locate slope drains at intervals of approximately 500', and stabilize them by paving or by covering with waterproof materials. Should such preventive measures fail, immediately take such other action as necessary to effectively prevent erosion and siltation.

5.7.3. The Engineer may direct the Contractor to perform, during such suspensions of operations, any other ESC work deemed necessary.

6. REMOVAL OF TEMPORARY ESC FEATURES

6.1. General

6.1.1. Remove or incorporate into the soil any temporary ESC features existing at the time of construction of the permanent ESC features in an area of the project in such a manner that no detrimental effect will result.

6.1.2. The Engineer may direct that temporary features be left in place.

6.2. Silt Fence Removal

6.2.1. Silt fence shall be removed upon stabilization of the contributing drainage area. Accumulated sediment may be spread to form a surface for turf or other vegetation establishment, or disposed of elsewhere.

6.2.2. Dress any sediment deposits remaining in place after the temporary silt fence is no longer required to conform with the finished grade, and prepare and seed them. The area should be reshaped to permit natural drainage.

6.3. Stabilized Construction Entrance/Exit Removal

6.3.1. After construction is complete and the site is stabilized, each stabilized construction entrance/exit will be removed and the area stabilized, unless it is to be used as an underlayment for a driveway.

7. DUST CONTROL

7.1. Implement dust control methods to control dust creation and movement on construction sites and roads and to prevent airborne sediment from reaching receiving streams or stormwater conveyance systems, to reduce on-site and off-site damage, to prevent health hazards, and to improve traffic safety.

7.1.1. Control blowing dust by one or more of the following methods:

7.1.1.1. Install mulches bound with chemical binders.

7.1.1.2. Provide temporary vegetative cover.

7.1.1.3. Apply spray-on adhesive on mineral soils when not used by traffic.

7.1.1.4. Till or roughen surface and bring clods to the surface.

7.1.1.5. Irrigate by water sprinkling.

7.1.1.6. Water sprinkling by mobile method (water truck) can be utilized where necessary to provide additional dust control.

7.1.1.7. Install barriers using solid board fences, burlap fences, crate walls, bales of hay, or similar materials.

7.2. Demolition activities which create large amounts of dust with significant concentrations of heavy metals or other toxic pollutants shall use dust control techniques to limit transport of airborne pollutants.

7.3. Implement dust control methods immediately whenever dust can be observed blowing on the project site.

8. EQUIPMENT MAINTENANCE AND REPAIR

8.1. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose.

8.2. Locate such areas so that oils, gasoline, grease, solvents, and other potential pollutants cannot be washed directly into receiving streams or stormwater conveyance

systems. Provide these areas with adequate waste disposal receptacles for liquid, as well as solid waste.

8.3. Clean and inspect maintenance areas daily.

8.4. On a construction site where designated equipment maintenance areas are not feasible, take precautions during each individual repair of maintenance operation to prevent potential pollutants from washing into streams or conveyance systems.

8.5. Provide temporary waste disposal receptacles.

Section 4

LAND CLEARING AND GRUBBING

1. RELATED WORK

1.1. All clearing and grubbing shall be performed by the Contractor.

1.2. All clearing and grubbing shall be completed expeditiously and without interruption after starting.

1.3. Burning of debris.

1.3.1. It is preferred that Contractors burn on site where possible

1.3.2. A daily permit from the Local Forestry Office is required for any burning.

1.3.3. If an air curtain incinerator is deemed necessary, the permit from the Forestry Office will state such. In the rural areas, it may not be necessary/required. Burning is to be performed in accordance with the Florida Forest Service standards and must be performed by a certified pile burner. All piled debris should be clear of dirt as much as possible and stacked neatly and in such a manner as to allow for air flow.

1.4. If historical or archeological artifacts or possible culturally important items or areas are discovered at any time on the site, the Contractor shall cease work in the area and immediately notify the Seminole Improvement District.

1.5. Existing ornamental trees may be relocated to other property owned by Seminole Improvement District. The Contractor shall contact S.I.D. for coordination.

2. PRELIMINARY SOILS INVESTIGATIONS

2.1. When the Drawings contain the results of a soil survey, such data is not to be construed as a guarantee of the depth, extent or character of material present.

2.2. When soil borings are provided by the Engineer or Owner, they shall be considered as supplemental information and not considered as definitive of the subsoil conditions.

2.3. The Contractor is fully responsible for assessing subsoil conditions for the entire project before clearing for proctor or archeologist.

Section 5

DEMOLITION AND SITE CLEARING

1. DESCRIPTION

1.1. The work to be performed consists of removing existing features that encumber the proposed construction area.

1.2. Existing concrete slabs, asphalt, base, curbing, walls, pumps, pump stations, signage, light poles, piping, and catch basins to be removed within the shaded limits of demolition unless otherwise noted if applicable. Contractor shall obtain all necessary federal and local permits.

1.3. Some incidental items may have been inadvertently omitted from the plan. The contractor is encouraged to thoroughly inspect the site as well as review the plans and specifications prior to submitting pricing. Contractor will not receive additional compensation for incidental items not shown on the demolition plan.

1.4. The demolition plan is based on available utility information and may or may not be all inclusive for this site. Any utilities encountered during demolition that are not depicted/addressed on this drawing should be brought to the attention of the Engineer of Record immediately.

1.5. Contractor is required to obtain all demolition permits.

1.6. All features identified on the plan which are listed to be demolished are to be removed from the site. After demolition is complete the site shall be delivered in a condition suitable for development.

1.7. Contractor shall limit all demolition activities to those areas delineated on the construction drawings unless otherwise directed by the owner or as required for construction of improvements.

1.8. A fire extinguisher shall be provided within 250 feet of all demolition.

1.9. All gas cans shall be DOT - approved.

2. PROTECTION OF PROPERTY REMAINING IN PLACE

2.1. Existing site features located within the area of demolition identified to remain shall be protected during the course of construction; features affected by grading shall be adjusted to meet design grades.

2.2. All asphalt to be removed shall be saw cut adjacent to remaining improvements.

2.3. Contractor to coordinate with all utility owners prior to removal and/or relocation of existing utilities. All existing utility connections to be disconnected and removed to service point or meter unless noted to remain. Contractor is responsible in maintaining and protecting utilities located within the limits of

construction and shall be responsible for all damages caused during construction and shall repair said damages at his/her expense.

2.4. Existing survey monumentation shall not be disturbed; any disturbed or removed monumentation shall be replaced by a Florida registered surveyor at the expense of the Contractor.

2.5. If historical or archeological artifacts or possible culturally important items or areas are discovered at any time on the project site, the Contractor shall cease work in the area and immediately notify the Seminole Improvement District.

3. REMOVAL OF EXISTING STRUCTURES

3.1. Contractor is responsible for controlling airborne dust and pollutants by using water sprinkling or other suitable means of control. Dust blinds may be needed for direct impacts.

4. DISPOSAL OF MATERIALS

4.1. Contractor to use care in handling debris from site to ensure the safety of the public. Haul route to be closely monitored for debris or material tracked onto adjoining roadways, sidewalks, etc.. Roadways and walkways to be cleared daily or as necessary to maintain public safety.

4.2. At the end of each work period, any drop-off in the area adjacent to the travel way of abutting roads shall be back filled in accordance with FDOT Standard Index 600 or shall be otherwise protected with temporary barrier wall at the contractors expense.

4.3. The contractor shall insure that the Maintenance of Traffic (MOT) for the project conforms with FDOT Standard Index Series 600, applicable index for work being performed.

4.4. Contractor shall coordinate demolition with construction of improvements within the road right-of-way to minimize traffic disruption.

Section 6

EARTHWORK

1. GENERAL

1.1. Excavation, fill and/or rough grading will be performed by the Contractor.

1.2. Any suitable excess material shall be stockpiled in an unused area off-site, as provided by the Owner.

1.3. In the event additional fill material is needed to bring the site to final grade, the Contractor will supply the material, load and haul to the site. The Contractor shall be responsible for spreading the material to final grade. A sample of the fill material must be determined to be suitable by the Geotechnical Engineer before installation.

1.4. Any unsuitable soil material shall be removed from the site and disposed of by the Contractor.

1.5. If historical or archeological artifacts or possible culturally important items or areas are discovered at any time on the project site, the Contractor shall cease work in the area and immediately notify the Seminole Improvement District.

1.6. Lake banks or other similar sloped areas shall be compacted to prevent erosion. All sodded areas shall be graded smooth to allow for mowing.

2. SUBSOIL EXCAVATION

2.1. Prior to excavation, the Contractor shall contact the Owner to determine if a Geotechnical recommendation report has been prepared for the project.

2.2. Where muck, rock, clay or other material is unsuitable in its original position within the limits of the pavement, the Contractor shall excavate such material to a depth of 2’ below the bottom of the pavement subgrade, or as indicated by the Engineer or Geotechnical Report, backfill with suitable material to be shaped to conform to the required cross-sections.

2.3. If removal of plastic soils below the finished earthwork grade is required, a construction tolerance of plus/ minus 0.2’ in depth and plus/minus 6” (each side) in width will be allowed.

2.4. Removal of organic and plastic material shall also conform to FDOT Standard Index #500.

Section 7

DEWATERING

1. GENERAL

1.1. Description

1.1.1. Design, furnish, install, maintain, operate and remove complete temporary dewatering system(s) as required to lower and control water levels and hydrostatic pressures during construction and dispose of pumped water.

1.1.2. Obtain necessary permits from governing agencies for the discharge or disposal of the dewatering water.

Prior to construction, the Contractor shall obtain a permit from the South Florida Water Management District (SFWMD) for dewatering activities. The permit may be conditioned to protect the water quality in the project vicinity. These conditions may include treatment, discharge sampling, monitoring and reporting.

1.1.3. Projects having current permits from the SFWMD will be authorized to conduct dewatering activities.

1.2. Site Conditions

If a project Geotechnical Report is provided, the Contractor shall assume that the water table is located as described in the report.

The Contractor shall satisfy himself/herself that this data is representative, and shall perform any additional testing he/she deems necessary to evaluate engineering properties for design of the dewatering system.

1.3. Definitions

Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the faces or bottom of the excavation.

1.4. Quality Assurance

Before dewatering is commenced, the Contractor shall obtain the acceptance of the District Engineer for the method, installation and details of the dewatering system that is proposed to be used. To that end, the Contractor shall submit to the Seminole Improvement District plans setting forth the details of the proposed dewatering systems. The dewatering system plans shall be in sufficient detail to indicate sizes of pumps, piping, appurtenances, the ultimate disposal point for water and to permit the District Engineer to judge the overall completeness and effectiveness of the proposed system.

The control of groundwater shall be such that softening of the bottom of excavations

or formation of “quick” conditions or “boils”, do not occur. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.

The Contractor shall select the particular method of dewatering to be employed.

1.5. Dewatering Submittals

1.5.1. Prior to installation of the dewatering system, submit working informational and scheduling drawings and the following design data:

1.5.1.1. The proposed type of dewatering system, including relief of hydrostatic head and maintenance of the excavations in the dewatering and in a hydrostatically relieved condition.

1.5.1.2. Arrangement, location and depths of the components of the system.

1.5.1.3. A complete description of equipment to be used with installation, operation, and maintenance procedures.

1.5.1.4. Standby equipment and emergency power supply.

1.5.1.5. Location and size of sumps and discharge lines, including their relation to water disposal sites.

1.5.1.6. Types and sizes of filters.

1.5.1.7. Location, types and depths of wells and/or well points and observation wells.

1.5.1.8. Proposed locations of observations wells.

1.5.1.9. Design calculations demonstrating adequacy of the selected system and equipment.

1.5.1.10. Coordination with earth support system design and excavation operations.

1.5.1.11. Equipment to be used with Bio Products for unforeseen causes

1.5.2. Review of dewatering and recharge system by the District Engineer shall not relieve the Contractor from the responsibility for the adequacy of these systems to achieve the specified results.

2. PRODUCTS

2.1. General

The Contractor shall furnish, install, operate and maintain all machinery, appliances, and equipment to maintain all excavations free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property, or to cause a nuisance or menace to the public.

The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent which would cause damage or endanger adjacent structures.

The static water level shall be drawn down a minimum of three feet (3') below the bottom of the excavation in order to maintain the undisturbed state of the foundation soils and to facilitate the placement of fill or backfill compacted to the required density.

2.2. Sump Pumping

Sumps shall be no deeper than four feet (4') and shall be at the low point of excavation. Excavation shall be graded to drain to the sumps.

2.3. Well Points

The annular space between the pipe and the borehole of the well point shall be sealed near the top of the well point to prevent vacuum leaks. Installation shall be carried out in such a way so as not to excessively disturb in situ material.

2.4. Deep Wells

Deep wells shall be cased with PVC, steel, or other suitable casing material. The casing shall have a perforated section at the water producing zone. The annular zone between the casing and the borehole may be gravel packed. Installation shall be carried out by an acceptable method.

2.5. Vertical Sand Drains

Vertical sand drains shall be installed with minimum disturbance to in situ material.

3. EXECUTION

3.1. General

One hundred percent (100%) standby pumping capacity shall be available on site at all times and shall be connected to the dewatering system piping to permit immediate use. In addition, standby ancillary equipment and appliances for all ordinary emergencies, and competent workmen for operation and maintenance of all dewatering equipment shall be on site at all times. Standby equipment shall include emergency power generation and automatic switchover to the emergency generator when normal power fails.

Dewatering systems shall not be shut down between shifts, on holidays, on weekends, or during work stoppages.

The Contractor shall control surface water to prevent entry into excavations.

At each excavation, a minimum of four (4) temporary observation wells (piezometers) shall be provided to continuously monitor the groundwater level, if required by the Engineer or SID.

3.2. Drainage of Excavated Areas

3.2.1. Collect surface water and seepage which may enter the excavation, and divert the water into a sump so that it can be drained or pumped.

3.2.2. Install settling basins or other approved apparatus as required to reduce the amount of fine particles which may be carried by water diverted into the discharge line.

3.2.3. Backfill sumps and settling basins when no longer required with granular material, concrete or other material as approved by the Engineer.

3.3. Disposal

3.3.1. Dispose of all water in accordance with applicable provisions of all Federal, and local regulatory boards having jurisdiction over water discharges. Water containing soil, silt or chemical contaminants shall not be discharged into natural watercourses, municipal drains or sewers.

3.3.2. The Contractor shall obtain the necessary discharge permits from the SFWMD for proposed groundwater dewatering discharges.

3.3.3. The Contractor shall submit to the S.I.D. copies of all permits obtained for the discharge or disposal of dewatering water. Copies of the permits shall be maintained on the Site at all times.

Section 8

ROADWAY AND PARKING LOT CONSTRUCTION

1. GOVERNING SPECIFICATIONS

1.1. "The Florida Department of Transportation Standard Specifications for Road and Bridge Construction", Divisions II and III, current edition as amended and augmented by the supplemental specifications, and Sections 120, 334 and 344 of the FDOT Local Agency Specifications, current edition, shall govern the construction of this project.

1.2. The attention of the Contractor is specifically directed to the provisions of such Standard Specifications, which are hereby made a part hereof, as if fully set forth at length.

2. INTENT OF PLANS AND SPECIFICATIONS

2.1. All construction in the public rights-of-way shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, current edition, and the project plans.

3. SUPPLEMENTAL CONSTRUCTION SPECIFICATIONS

3.1. The following clauses represent modifications to the corresponding Articles of the Standard Specifications, herein above defined and related exclusively to the above contract. In case of conflicting requirements between the Standard Specifications and these modifications, the modifications shall govern. Any applicable provisions in the Standard Specifications not amended by and not in conflict with the Supplemental Specifications shall be understood to be in full effect. These modifications are compatible with non-federally funded projects.

4. DIVISION I - GENERAL REQUIREMENTS AND COVENANTS

NOT INCLUDED

5. DIVISION II - CONSTRUCTION DETAILS

5.1. Section 110 - Clearing and Grubbing

5.1.1. Article 110-1 Description - the work specified in this Section consists of clearing and grubbing of all items within the construction limits of the roadways, water retention sites, and required for the installation of the storm and sanitary sewer. The construction limits of the roadway shall be as shown on the typical section. All work shall be performed in accordance with the applicable Dept. of Transportation requirements with the following amendments:

5.1.2. Section 110-2.1 Work Included - all areas where excavation is to be done within the construction limits of the roadways and areas lying outside of the construction limits which shall be designated on the plans, and all water retention areas and drainage right-of-ways.

5.1.3. Section 110-2.4 Boulders - any boulders encountered shall be removed and disposed of by the Contractor in areas designated by Owner.

5.2. Section 120 - Excavation and Embankment

5.2.1. Article 120-1 Description - the work specified in this Section consists of the excavation and embankment required for the roadway and water retention areas and includes the preparation of the subgrade, the construction of embankments, and the compaction and dressing of excavated areas and embankments with the following amendments:

5.2.2. Article 120-2.2 Regular Excavation - regular excavation shall include roadway excavation and water retention area excavation.

5.2.3. Article 120-4.1 Subsoil Excavation - when the Contractor has completed the normal excavation to the point of being ready to begin the subgrade stabilization the testing laboratory shall be notified and determine in the field the length of the necessary subsoil excavation. All unsuitable soil shall be removed from the site and disposed of by the Contractor.

5.2.3.1. Where muck, rock, clay or other material is unsuitable in its original position within the limits of the pavement, the Contractor shall excavate such material to a depth of 2' below the bottom of the pavement subgrade, or as indicated by the Engineer, and backfill with suitable material to be shaped to conform to the required cross-sections. If removal of plastic soils below the finished earthwork grade is required, a construction tolerance of plus/minus 0.2' in depth and plus/minus 6" (each side) in width will be allowed.

5.2.4. Article 120-13 Method of Measurement

5.2.4.1. When the item of Grading by the lump sum and Water Retention Area Excavation - cubic yard is included in the contract proposal, the price and payment for this item shall include the hauling, depositing and grading of any excess excavated material to the locations on the project site as selected by the Owner or Engineer. Rough grading will be measured and paid for by lump sum.

5.2.4.2. When the item of Grading (stockpile) by the square yard and Water Retention Area Excavation (stockpile) per cubic yard is included in the contract proposal the price and payment for this item shall include the hauling and

depositing in a stockpile of any excess excavated material to a single location as selected by the Owner or Engineer.

5.2.4.3. When the item of Grading (removal) by the square yard and Water Retention Area Excavation (removal) per cubic yard is included in the contract proposal, the price and payment for this item shall include the hauling and disposal of any excess excavated material to a location provided by the Contractor, off of the project site.

5.2.5. Article 120-13.1.6 Subsoil excavation shall be deleted.

5.2.6. Article 120-14.2.3 Additional depth of subsoil excavation shall be deleted.

5.2.7. Grading - Square Yard - when the item of grading by square yard is included in contract, the price and payment for this item shall include all work described in this Section, including all subsoil excavation with the exception of any work which is specified to be paid for under other earthwork items which may be included in this contract.

5.3. Section 125 - Excavation for Structures

5.3.1. Article 125-1 Description - the work specified in this Section consists of excavation for pipe culverts, storm sewer, and all other pipe lines, manholes, inlets, headwalls and similar structures with the following amendments.

5.3.2. Article 125-8.3.1 General

In the second stage the Contractor shall obtain a well-compacted bed and fill along the sides of the pipe and to a point which is two feet below finish grade or at lease one foot above the top of the pipe. The width of backfill and compaction to be done under this second stage shall be the width of the portion of the trench having vertical sides; or, when no portion of the trench has vertical sides it shall be to a width at least equal to twice the outside diameter of the pipe.

5.3.3. Article 125-8.3.2 Density Requirements - the backfill for the first and second stages shall be placed in twelve inch layers (compacted thickness) and shall be compacted to 95 per cent of maximum density as determined by AASHTO T-180. Where pavement is to be constructed over the pipe or within four feet thereof, the backfill for the third stage (min. four feet below finish grade) shall be placed in the manner required for the first and second stages and compacted to 98 percent of maximum density as determined by AASHTO T-180. Where construction is outside the above stated limits, the backfill for the third stage shall be placed in the manner and compacted to the degree required for the first and second stages.

5.3.4. Density tests shall be taken on each twelve-inch layer at intervals not to exceed 300 lineal feet and at each transverse section of pipeline.

5.4. Section 160 - Stabilizing

5.4.1. Article 160-2 Stabilized Subgrade - all work shall be performed in accordance with Type B requirements. The contractor shall have the discretion to utilize either limerock or clay for the stabilizing agent in accordance with Section 914 of Standard Specifications.

5.4.2. Section 160.5.1 General - all pipes, conduits, sleeves, etc shall be installed compacted and tested prior to the beginning of stabilizing operations. In the event that a pipe, conduit, sleeve, etc. must be installed after completion of subgrade, the trench width shall be sufficient to allow compaction equipment to thoroughly compact the backfill and the stabilized subgrade remixed and recompacted for a distance of 25' each side of the trench. If curbing has been installed, a section of curb for a minimum distance of 5' each side of the trench shall be removed and replaced after proper compaction. As an alternative to the above, the pipe, conduit, sleeve, etc. may be installed by jack and boring under the stabilized subgrade.

5.4.3. Article 160-5.2 Application of Stabilizing Material - the mandatory requirement of mechanical material spreaders shall not be strictly adhered to. The Contractor shall be responsible to provide a subgrade of uniform mix to the required depth and meeting the bearing value and density requirements stated on the drawings and these specifications.

5.4.4. Article 160.7.1 General - bearing value samples shall be obtained and tested at completion of satisfactory mixing of the stabilized area. Florida bearing value shall not be less than 75 psi where a limerock base course is to be constructed and 50 where a stabilized roadway is to be constructed. For any area where the bearing value obtained is deficient from the above stated values, additional stabilizing material shall be spread and mixed in accordance with Article 160-5.3. This reprocessing shall be done for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

5.4.5. Article 160-7.2 Tolerances in Bearing Value Requirements - there shall be no under tolerances from the specified bearing value.

5.4.6. Article 160-8.1 General - a minimum of two lime rock bearing ratio (LBR) tests per mile or at least one test for each section of road between intersections shall be taken. Field density tests shall be taken between intersections and at intervals not to exceed 500'. The completed stabilized subgrade shall be checked for width and depth at intervals not to exceed 200 feet. No less than the required width and depth shall be acceptable.

5.5. Section 200 - Limerock Base

5.5.1. Article 200-3 Equipment - the requirement for the mechanical spreader shall not be strictly adhered to.

5.5.2. Article 200-5.2 Base - When the specified compacted thickness of the base is greater than eight (8) inches, the base shall be constructed on two (2) courses.

5.5.3. Article 200-6.4 Density Tests - field density tests shall be at intervals not to exceed 500 feet with no less than two tests taken for each section of road between intersections. The base course shall be checked for width and depth at intervals not to exceed 200 feet. No less than the required width and depth shall be acceptable.

5.6. Section 300 - Prime and Tack Coats for Base Courses

5.6.1. Article 300-1 - Description - the work specified in this Section consists of the application of bituminous prime coats on previously prepared bases and the application of bituminous tack coats on previously prepared bases and on existing pavement surfaces. All such work shall be accomplished in accordance with these specifications and in conformity with the lines, dimensions and notes shown in the drawings.

5.6.2. Article 300-8.1 General - the quantity to be paid for under this Section shall be the area in square yards of bituminous material as calculated from the area of the limerock base.

5.6.3. Article 300-9 Basis of Payment - payment for this work shall be made under Bituminous Material - per square yard.

5.7. Section 330 - Hot Bituminous Mixtures - General Construction Requirements.

5.7.1. Extraction, Marshall stability and density tests shall be taken on the material placed on each 1/4 mile of road and at least one test for each shall be taken for material that is placed in any one day. The asphaltic concrete surface course shall be checked for width and depth at intervals not to exceed 200 feet.

5.7.2. Section 330-9.1.3 Rain and Surface Conditions - delete and substitute the following: Transport of asphalt mixtures from the plant shall immediately cease when rain begins at the roadway. Asphalt mixtures shall not be placed while rain is falling or when water is on the surface to be covered.

5.7.3. Section 330-9.2.2 Thickness of Layers - When the final asphalt thickness is to be 1-1/2" or greater, the asphalt shall be placed in a minimum of 2 lifts with each lift being at least 3/4" thick.

5.7.4. Section 330-12.4 Correcting Unacceptable Pavement - the Contractor shall correct unacceptable pavement by removing and replacing only.

The removal must be for the full depth of the course and extend at least 50' on either side of the defective area for the full width of the paving lane.

5.8. Section 346 - Portland Cement Concrete

5.8.1. Article 346-1 The intent of this specification is to secure, for every part of the work, concrete of a homogeneous structure, which, when hardened, will have the required strength, durability and appearance.

5.8.1.1. Any exposed concrete which is not formed as shown on the plans or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job, unless the Engineer and Owner grant permission to patch the defective area.

5.8.1.2. Permission to repair any surface defect shall not be considered a waiver of the defective work if the repair does not, in the opinion of the Engineer and Owner, satisfactorily restore the quality and appearance of the surface.

Codes and Standards - All work, except as modified herein, shall conform to the requirements of:

ACI-301	"Specifications for Structural Concrete for Buildings"
ACI-302	"Recommended Practice for Concrete Floor and Slab Construction"
ACI-304	"Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete"
ACI-305	"Recommended Practice for Hot Weather Concreting"
ACI-306	"Recommended Practice for Cold Weather Concrete"
ACI-318	"Building Code Requirements for Reinforced Concrete"
ACI-318.1	"Building Code Requirements for Structural Plain Concrete"

5.8.2. Article 346-2.2 Types of Cement to be Used - unless the particular type of cement is designated in the plans or special provisions, Type I, Portland Cement shall be used for concrete.

5.8.3. Article 346-3 Classification of Concrete - the separate classifications of concrete prepared under these specifications are herein designated as Classes I and II, in accordance with the intended use and the proportions, strength and other requirements.

5.8.4. Article 346-4.3 Certification (For Ready-Mixed Concrete) - no certification shall be required from the manufacturer of ready-mixed concrete.

5.8.5. Article 346-5 Admixtures

5.8.5.1. Air-entraining agents shall conform to ASTM C-260 and shall maintain an air content of 4% to 8% for normal weight concrete.

5.8.5.2. Water-reducing admixtures shall conform to ASTM C-494 and shall be of normal set - Type A, retarded set - Type D, or accelerated set - Type E, as specified for various locations and temperatures.

5.8.5.3. Fly ash conforming to the requirements of ASTM C-618, Class F, including the optional requirements of Supplementary Tables 2 & 4 may be used as long as the required strength is obtained at 28 days. All required tests and design mixes shall conform to the requirements of these specifications. Water-reducing and air-entraining admixtures are to remain as specified and compatibility of the fly ash with these admixtures is the Contractor's responsibility. Fly ash must be obtained from a source acceptable to the Engineer and Owner with a successful history of use in concrete and quality assurance test results that assure uniformity and consistent performance. Verify that any stack additives at the producing plant do not contaminate the fly ash in any manner that could be deleterious to the concrete quality. The producer of the fly ash shall be responsible to maintain adequate quality control to prevent deleterious contaminants in their product, such as some compounds of sodium, ammonium or sulphur.

5.8.6. Article 346-6 Required Strength of Concrete

5.8.6.1. Concrete shall be ready-mixed in accordance with ASTM C-94, "Specifications for Ready-Mixed Concrete". Maximum slump shall be 4 inches. Minimum design strength shall be as specified in the plans or other portions of the specifications for each type of concrete construction.

5.8.6.2. Flowable concrete shall conform to all other conditions of these specifications. The concrete shall be made flowable by using water-reducing admixtures that conform to ASTM C-494 Types A, B, C, D or E used as a singular admixture or in an admixture system. Type F admixture usage in high slump concrete may also be used with the acceptance by the Engineer prior to installation.

5.8.6.3. No water shall be added to the mix at the site without the expressed written authorization of the Engineer and when water is so added, the delivery slip shall note the amount and be initialed by the Job Superintendent. The supplier of

ready-mixed concrete shall inform his drivers of this procedure and any violation shall be sufficient reason for the Engineer to order the Contractor to place further concrete deliveries with another plant.

5.8.7. Article 346-8 Test Requirements

5.8.7.1. Submit the proposed design mix for each class of concrete for review prior to the pouring of any concrete. This shall be done in accordance with ACI 211.1 and shall show the quantities of cement, fine and coarse aggregates, water and admixtures. The proposed slump laboratory cylinder tests and material test data shall be submitted to establish their conformance to these specifications. A water-reducing admixture shall be added to all concrete; this will be included in the design mix. Review of this design mix does not relieve the Contractor of responsibility for its performance.

5.8.7.2. Concrete test cylinders shall be made by the testing agency in accordance with ASTM C-31 and C-172 and tested in accordance with ASTM C-39. Each set specified shall consist of 5 cylinders with 1 tested at 7 days, 1 tested at 14 days, 2 tested at 28 days, and 1 spare, unless otherwise directed by the Engineer. Concrete cylinder tests shall be the only tests used to determine concrete strength. Concrete which fails to meet the specified design strength at 28 days shall be rejected and removed and replaced by the Contractor. As an alternative, the Contractor may request the Owner to accept the non-conforming concrete in place, in which case, the value of the entire installation including materials, labor, formwork, excavation, reinforcement, etc. plus a penalty of 50% shall be deducted from compensation due the Contractor. Concrete test cylinders shall be made on concrete poured each day on the basis of 1 set per 50 c.y. of concrete poured. If the total amount of concrete poured in any one day is less than 10 c.y., no tests are required.

5.8.7.3. Slump test will be made in accordance with ASTM C-143 each day concrete is poured for every truckload of concrete delivered. All values shall be recorded.

5.8.7.4. Testing for compressive strength shall be made in accordance with the ASTM Standard Method C-39. If 28-day cylinder tests are low or if 7-day tests indicate the probability that 28-day results will be sub-standard, the mix proportions shall be adjusted. If the strengths fail to meet the above specifications, the Owner or Engineer may require at the Contractor's expense:

5.8.7.4.1. Tests in accordance with the "Standard Method of Securing, Preparing, and Testing Specimens from Hardened Concrete for Compressive and Flexural Strength" ASTM C-42.

5.8.7.4.2. In the event that the concrete does not test satisfactorily, the Owner or Engineer will order the work removed or strengthened properly at the Contractor's expense.

5.8.7.5. An Inspector from a testing agency shall be present during the placing of all concrete to check for unit weight, slump and air content in accordance with ASTM C-138, C-143 and C-173, as well as all other provisions of this specification.

5.8.7.6. An Inspection and Testing Agency may also be engaged by the Contractor to perform field testing and inspections during concrete placement. The Owner shall cooperate with their personnel and shall provide such material samples as are needed for testing, as well as access and working space so they can properly perform their function.

5.8.7.7. Deficient Thickness:

No payment will be made for any finished concrete, such as curb, sidewalk or pavement, which is more than 1/4 inch less than the specified thickness. Areas of finished concrete found deficient in thickness by more than 1/4 inch shall be evaluated by the Engineer; and if, in his judgment, the deficient area is sufficient to seriously impair the anticipated service life of the pavement, such areas shall be removed and replaced with concrete of the thickness shown in the plans. The Contractor shall remove the affected area of the pavement within the limits specified and replace it with concrete of the specified quality and thickness. The Contractor will receive no compensation for the area of pavement removed nor for the materials or labor involved in its removal. Any section of pavement removed shall be the full length between transverse joints. If, in the opinion of the Engineer, the deficiency will not seriously impair the anticipated service life of the pavement, the Contractor may elect to leave the pavement in place, but will receive no compensation for the area of pavement determined to be in non-compliance.

5.8.8. Method of Measurement - the quantities to be paid for under this Section shall be the volume, in cubic yards, of each of the various classes of

concrete shown on the plans, complete in place and accepted. Any item of work constructed under this Section and for which measurement for payment is not to be made by the volume of concrete, i.e., curb and gutter, sidewalk, etc., measurement and payment for such work shall be as specified in the Section under which the work is specified in detail.

5.8.9. Calculation of Volume of Concrete - in computing the pay quantity of concrete, the dimensions used shall be the plan dimensions of the concrete, within the neat lines shown in the plans. The quantity to be paid for shall be the original plan quantity, measured as provided above, except where the plans call for an estimated quantity of miscellaneous concrete for contingent use, the concrete shall be measured as the actual quantity in place and accepted.

5.8.10. Basis of Payment - the quantities, determined as provided above shall be paid for at the contract unit price per cubic yard, for each of the various classes of concrete shown in the proposal. Reinforcing steel used in incidental concrete work will not be paid for separately but the cost of such reinforcement shall be included in the contract unit price for the concrete. The above prices and payment shall be full compensation for all the work specified in this Section and shall include all forms, false work, joints, weep holes, drains, pipes, conduits, setting anchor bolts, and dowels, surface finish, expansion joint material, reinforcement and clean-up. Unless payment is provided under a separate item in the proposal, the above prices and payments shall also include all clearing and grubbing, removal of existing structures, excavation and compaction of the subgrade. Payment shall be made under Class I Concrete-per cubic yard; Class II Concrete-per cubic yard.

5.9. Section 425 - Inlets, Manholes and Junction Boxes

5.9.1. Article 425-3.2 Gratings - unless shown otherwise frames, grates and covers shall be of cast iron. Cast iron covers for manholes shall be designated for traffic bearing and shall weigh not less than 130 pounds. Cast iron grates for inlets shall be designed for traffic bearing and shall have sufficient open area to pass the calculated maximum storm water surface flow. No opening shall be greater than one inch in least dimension with lesser openings used where pedestrian safety is a consideration.

5.9.2. Section 425-5 Precast Inlets, Manholes and Junction Boxes - the Contractor shall use precast inlets, including inlet tops, risers, manholes and junction boxes.

5.9.2.1. Precast inlet tops and manholes shall be set to conform accurately to the finished pavement surface. Pavement shall be finished minimum of 1/4" above the front edge of the inlet top or manhole.

5.9.2.2. If necessary, built-up bricks may be used to raise the precast inlets to the proper elevation as shown on the drawings.

5.9.2.3. All brick seams shall be grouted. Grout shall be one part cement and two parts sand; lime shall not be used. Each layer of bricks shall be laid in a full bed and joint of mortar, without requiring subsequent grouting, flushing, or filling and shall be thoroughly bonded.

5.9.2.4. The inner face of the build-up bricks and the weep hole in precast inlet tops shall be grouted with non-shrink grout. Grout shall be finished flush and smooth, and shall be water tight. Weep holes shall be grouted prior to placement of limerock in the roadway.

5.9.2.5. The area excavated in the limerock base course to allow for adjustment of the manhole ring and cover to grade shall be backfilled with limerock and compacted to the same density as the limerock base course.

5.9.2.6. All manhole covers shall be cleaned to remove asphalt and debris, then painted with black rust-inhibiting paint. If the manhole is located in a paved area, the cleaning and painting shall occur after the final asphalt surface is placed.

5.9.2.7. Manholes and inlets in non- paved areas shall be surrounded by sod or suitable ground cover.

5.10. Section 430 - Pipe Culverts and Storm Sewers

5.10.1. Article 430-12.1 New Pipe - the quantities to be paid for under this Section shall be determined by the measurement of pipe from the centerline of the structure to the centerline of the next structure, of storm sewer or pipe arch culvert completed, in place and accepted.

5.10.2. Article 430-13.9 General - payment for this work shall also be made under Reinforced Oval Concrete Pipe (R.O.C.P.) per linear foot, Reinforced Concrete Pipe (R.C.P.) per linear foot, and High Density Polyethylene Pipe (H.D.P.E.P) per linear foot.

5.11. Section 520 - Concrete Gutter, Curb Elements and Traffic Separator

5.11.1. The Work specified in this Section consists of the construction of Portland cement concrete curb and gutter, valley gutter, and any other types of concrete curb not specified in other Sections. The various items shall be constructed in accordance with these Specifications and in conformity with the lines, grade, dimensions and notes shown in the drawings.

5.11.2. Materials

5.11.2.1. Section 520-2.1 Concrete - all Work under this Section shall be 3,000 psi concrete

5.11.2.2. Section 520-2.2 Reinforcement - any steel reinforcement required by the drawings shall conform to the requirements of Section 415.

5.11.2.3. Section 520-2.3 Joint Materials - joint materials for various items shall be in accordance with Section 932.

5.11.3. Finished grades at the back of any concrete curb or gutter shall be constructed to within a tolerance of +/- 0.10' of the grades shown on the drawings.

5.12. Section 521 - Concrete Barriers, Traffic Railing Barricades and Parapets

5.12.1. Temporary barrier walls shall be concrete precast sections only. Cast in place walls are not allowed.

Section 9

PORTLAND CEMENT PERVIOUS PAVEMENT

1. GENERAL PROVISIONS

1.1. Scope of Work: The Work to be completed under this contract includes the furnishing of all labor, materials and equipment necessary for construction of the proposed improvements in conformance with the plans and specifications.

1.2. References:

1.2.1. American Society of Testing and Materials.

1.2.1.1. ASTM C 29 “Test for Unit Weight and Voids in Aggregate.”

1.2.1.2. ASTM C 33 “Specification for Concrete Aggregates.”

1.2.1.3. ASTM C 42 “Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.”

1.2.1.4. ASTM C 117 “Test Method for Material Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing.”

1.2.1.5. ASTM C 138 “Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.”

1.2.1.6. ASTM C 150 “Specifications for Portland Cement” (Types 1 or II only).

1.2.1.7. ASTM C 1157 “Performance Specification for Hydraulic Cement.”

1.2.1.8. ASTM C 172 “Practice for Sampling Fresh Concrete.”

1.2.1.9. ASTM C 260 “Specification for Air-Entraining Admixtures for Concrete.”

1.2.1.10. ASTM C 494 “Specification for Chemical Admixtures for Concrete.”

1.2.1.11. ASTM C 595 “Specifications for Blended Hydraulic Cements” (Type IP or IS only).

1.2.1.12. ASTM C 618 “Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.2.1.13. ASTM C 989 “Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.”

1.2.1.14. ASTM C 1077 “Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.”

1.2.1.15. ASTM D 448 “Specification for Standard Sizes of Coarse Aggregate for Highway Construction.”

1.2.1.16. ASTM D 1557 “Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop.”

1.2.1.17. ASTM E 329 “Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction.”

1.2.2. American Association of State Highway and Transportation Officials (AASHTO)

1.2.2.1. AASHTO T-180 “Moisture-Density Relations of Soils Using a 101 pound (454 kg) Rammer and an 18 in. (457 mm) Drop.”

1.3. Contractor Qualifications: The use of a Finishing Contractor who has successfully completed the NRMCA Pervious Concrete Installers Course is strongly recommended. Prior to award of the contract, the placing contractor shall furnish Owner/Engineer/Architect a statement attesting to qualifications and experience and the following:

1.3.1. A minimum of 2 completed Pervious Concrete projects with addresses.

1.3.2. Unit weight acceptance data.

1.3.3. In-situ pavement test results including void content and unit weight.

1.3.4. Sample of product (i.e. core or test panel).

1.3.5. Proposed equipment to be used for placement and compaction.

1.4. Concrete Producer Qualification: The use of a concrete producer who has successfully completed the NRMCA Pervious Concrete Installer/Technician Course is strongly recommended.

If the placing contractor and/or concrete producer have insufficient experience with Portland cement pervious concrete pavement as outlined in sections 1.3 and 1.4, the placing contractor shall retain an experienced consultant who meets the requirements in sections 1.3 and 1.4 to monitor production, handling, and placement operations at the contractor’s expense.

1.5. Test Panels:

Regardless of qualifications, the contractor is to place, joint and cure two test panels, each to be a minimum of 225 sq. ft. at the required project thickness to demonstrate to the Engineer’s satisfaction that in-place unit weights can be achieved and a satisfactory pavement can be installed at the site location.

1.5.1. Test panels may be placed at any of the specified Portland cement pervious locations. Test panels shall be tested for thickness in accordance with ASTM C 42; void structure in accordance with ASTM C 138; and for core unit weight in accordance with ASTM C 140,

paragraph 6.3.

1.5.2. Satisfactory performance of the test panels will be determined by:
- Compacted thickness no less than ¼ "of specified thickness.
- Void Structure: 20% ± 5% for low porosity, high strength
  30% ± 5% for high porosity, low strength
- Unit weight plus or minus 5 pcf of the design unit weight.

1.5.3. If the requirements in item 2 above are not met, the test panel shall be removed at the contractor's expense and disposed of in an approved landfill.

1.5.4. If the test panel meets the above-mentioned requirements, it can be left in-place and included in the completed work.

1.6. Concrete Mix Design: Contractor shall furnish a proposed mix design with proportions of materials to Owner or Agent prior to commencement of work. The data shall include unit weights determined in accordance with ASTM C 29 paragraph 11, jigging procedure.

2. MATERIALS

2.1. General: Locally available material having a record of satisfactory performance shall be used.

2.2. Cement: Portland Cement Type I or II conforming to ASTMC C 150 or Portland Cement Type IP or IS conforming to ASTMC C 595, or ASTM C 1157.

2.2.1. Fly ash and Ground Iron Blast-Furnace Slag: Fly ash conforming to ASTM C 618 may be used in amounts not to exceed 30 percent of total cementitious material. Ground Iron Blast-Furnace Slag conforming to ASTM C 989 may be used in amounts not to exceed 50 percent by weight of total cementitious material.

2.2.2. Note: When Class "F" Fly ash is used as part of the minimum cementitious content specified in Section 3.1, bond strength development may be delayed and additional curing time is required. See Section 5.5.

2.3. Aggregate: Use coarse aggregate (3/8 to No. 16) per ASTM C 33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448. If other gradation of aggregate is to be used, submit data on proposed material to owner for approval.

2.4. Air Entraining Agent: Shall comply with ASTM C 260.

2.5. Admixtures:

Type A Water Reducing Admixtures – ASTM C 494.
Type B Retarding – ASTM C 494.
Type D Water Reducing/Retarding – ASTM C 494.

2.5.1. Also, a hydration stabilizer can be utilized and is recommended in the design and production of pervious concrete. This stabilizer suspends cement hydration by forming a protective barrier around the cementitious particles, which delays the particles from achieving initial set. The admixture's primary

function should be as a hydration stabilizer; however it must also meet the requirements of ASTM C 494 Type B Retarding or Type D Water Reducing/Retarding admixtures.

2.6. Water: Comply with ASTM C 94.

3. PROPORTIONS

3.1. Cement Content: For pavements subjected to vehicular traffic loading, the total cementitious material content shall not be less than 600 lbs. per cu. yd.

3.2. Aggregate Content: The volume of aggregate per cu. yd. shall be a minimum 18 ft. when calculated as a function of the unit weight determined in accordance with ASTM C 29 jigging procedure. Fine aggregate, is used, should not exceed 3 cu. ft. and shall be included in the total aggregate volume.

3.3. Admixtures: Shall be used in accordance with the manufacturer's instructions and recommendations.

3.4. Mix Water: Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration.)

3.5. Mix Design: Using concrete materials acceptable to the Engineer, a tentative concrete mix shall be designed and tested for the consistency intended for use on the work and specified.

3.5.1. High Porosity, Low Strength Modulus of Rupture shall be as follows:

3.5.1.1. Average strength such that at least 90% of tests are equal to or greater than 150 psi.

3.5.1.2. Any individual test (minimum of 2 beams) shall be greater than 130 psi.

3.5.1.3. Low Porosity, High Strength Modulus of Rupture shall be as follows:

3.5.1.3.1. Average strength such that at least 90% of tests are equal to or greater than 350 psi.

3.5.1.3.2. Any individual test (minimum of 2 beams) shall be greater than 400 psi.

3.5.2. Modulus of Rupture tests shall be IAW with AASHTO T 23, and T97, except beams shall be filled in one lift (1 layer), compacted lightly during filling, and finished by rolling a hardened 6"x12" concrete sample across it's surface and tested at 14 days. Unit weight (density) and % voids (porosity) shall be tested and reported.

4. SUB-GRADE PREPARATION AND FORM-WORK

4.1. Subgrade Material: The top 6 inches shall be composed of granular or gravely soil that is predominantly sandy with no more than a moderate amount of silt or clay.

4.2. Subgrade Permeability: Prior to placement of Portland Cement Pervious Pavement, the subgrade shall be tested for rate of permeability by double ring infiltrometer, or other suitable test of subgrade soil permeability. The tested permeability must reasonably compare to the design permeability.

4.3. Subgrade Support: The subgrade shall be compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D 1157 or AASHTO T 180. Subgrade stabilization shall not be permitted.

4.3.1. If fill material (embankment) is required to bring the subgrade to final elevation, it shall be clean and free of deleterious materials. It shall be placed in 8 inch maximum layers, and compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180.

4.4. Subgrade Moisture: The subgrade shall be in a moist condition (within +/- 3% of the optimum moisture content as determined by the modified compaction test ASTM D 1557 or AASHTO T 180).

4.5. Forms: Forms shall be of wood or steel and shall be the depth of the pavement. Forms shall be of sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations.

5. MIXING, HAULING AND PLACING

5.1. Mix Time: Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolutions of the drum.

5.2. Transportation: The Portland cement aggregate mixture may be transported or mixed on site and should be used within one (1) hour of the introduction of mix water, unless otherwise approved by the Engineer. This time can be increased to 90 minutes when utilizing the hydration stabilizer specified in Section 2.5.

5.3. Discharge: Each mixer truck will be inspected for appearance of concrete uniformity according to Section 3.4. Water may only be added by the concrete producer to obtain the required mix consistency. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following any addition of water to the mix. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete. The practice of discharging onto subgrade and pulling or shoveling to final placement is not allowed.

5.4. Placing and Finishing Equipment: Unless otherwise approved by the Owner or Engineer in writing, the Contractor shall provide mechanical equipment of either slip form or form riding with a following compactive unit that will provide a minimum of 10 psi vertical force. The pervious concrete pavement will be placed to the required cross section and shall not deviate more than +/- 3/8 inch in 10 feet from profile grade. If placing equipment does not provide the minimum specified vertical force, a full width roller or other full width compaction device that provides sufficient compactive effort shall be used immediately following the strike-off operation. After mechanical or other approved strike-off and compaction operation, no other finishing operation will

be allowed. If vibration, internal or surface applied, is used, it shall be shut off immediately when forward progress is halted for any reason. The Contractor will be restricted to pavement placement widths of a maximum of fifteen (15') feet unless the Contractor can demonstrate competence to provide pavement placement widths greater than the maximum specified to the satisfaction of the Engineer.

5.5. Curing: Curing procedures shall begin within 20 minutes after the final placement operations. The pavement surface shall be covered with a minimum six- (6) mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions.

5.5.1. Cure Time:

5.5.1.1. Portland Cement Type I, II or IS – 7 days minimum.

5.5.1.2. Portland Cement Type I or II with Class F Fly ash (as part of the 600 lbs/cy minimum cementitious) of Type Ip – 10 days minimum.

5.5.1.3. No truck traffic shall be allowed for 10 days (no passenger car/light trucks for 7 days).

5.6. Jointing: Control (contraction) joints shall be installed at 40-foot intervals for pavements designed for vehicular traffic. They shall be installed at a depth of ¼ the thickness of the pavement. These joints can be installed in the plastic concrete or saw cut. If saw cut, the procedure should begin as soon as the pavement has hardened sufficiently to prevent raveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed whenever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a bonding agent suitable for bonding fresh concrete to existing concrete shall be brushed, rolled or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.

6. TESTING, INSPECTION AND ACCEPTANCE

6.1. Laboratory Testing: The owner will retain an independent testing laboratory. The testing laboratory shall conform to the applicable requirements of ASTM E 329 "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM C 1077 "Standard Practice for Testing Concrete and Concrete Aggregates for use in Construction, and Criteria for Laboratory Evaluation" and shall be inspected and accredited by the Construction Materials Engineering Council, Inc. or by an equivalent recognized national authority.

6.1.1. The Agent of the testing laboratory performing field sampling and testing of concrete shall be certified by the American Concrete Institute as Concrete Field Testing Technician Grade I, or by a recognized state or national authority for an equivalent level or competence. The Concrete Producer shall endorse technicians testing proficiency of Portland Cement Pervious Concrete.

6.2. Testing and Acceptance: A minimum of 1 gradation test of the subgrade is required every 5000 square feet to determine percent passing the No. 200 sieve per ASTM C 117.

6.2.1. A minimum of one test for each day's placement of pervious concrete in accordance with ASTM C 172 and ASTM C 29 to verify unit weight shall be conducted. Delivered unit weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, jigging procedure. The unit weight of the delivered concrete shall be ± 5 pcf of the design unit weight.

6.2.2. Test panels shall have two cores taken from each panel in accordance with ASTM C 42 at a minimum of seven (7) days after placement of the pervious concrete. The cores shall be measured for thickness, void structure and unit weight. Untrimmed, hardened core samples shall be used to determine placement thickness. The average of all production cores shall not be less than the specified thickness with no individual core being more than ½ inch less than the specified thickness. After thickness determination, the cores shall be trimmed and measured for unit weight in the saturated condition as described in paragraph 6.3.1 'Saturation' of ASTM C 140 "Standard Methods of Sampling and Testing Concrete Masonry Units". The trimmed cores shall be immersed in water for 24 hours, allowed to drain for one (1) minute, surface water removed with a damp cloth, then weighted immediately. Range of satisfactory unit weight values is ± 5 pcf of the design unit weight.

6.2.3. After a minimum of 7 days following each placement, three cores shall be taken in accordance with ASTM C 42. The cores shall be measured for thickness and unit weight determined as described above for test panels. Core holes shall be filled with concrete meeting the pervious mix design.

6.2.4. In lieu of cores, a Pave Quality Indicator (PQI), manufactured by Trans Tech Systems, Inc. can be used to determine the density and porosity (quality) of in place Pervious Concrete Pavement.

Section 11

PIPE CULVERTS AND STORM SEWERS

1. MATERIALS

1.1. The type of pipe to be used will be designated in the Drawings and each type of pipe will be in accordance with the applicable provisions of Section 430 of the F.D.O.T. Standard Specifications.

1.2. New Pipe – FDOT Section 430-11.1

1.2.1. The plan quantities for this item are measured from center line of structure to the center line of the next structure, in place and accepted.

1.2.2. Where Spiral Rib Aluminized Steel Pipe (S.R.A.S.P.) is used, the pipe shall be in accordance with the F.D.O.T. "Roadway and Traffic Design Standards", Index 205.

1.2.2.1. The coils from which the pipe is fabricated shall be hot dip coated in a bath of commercially pure aluminum referred to as Type 1. Aluminum – coated sheet for this product shall be CSP grade and coating weight, 1.00 oz/s.f. Aluminized Steel Type 2 coils shall conform to the applicable requirements of AASHTO M-274 or ASTM A-929.

1.2.2.2. Spiral rib shall be manufactured with ¾" x ¾" x 7-½" external ribs in accordance with the applicable requirements of AASHTO M-36 or ASTM A 760.

1.2.2.3. Pipe connections shall be bell and spigot type joint with fluted gaskets for all pipe connections located above normal water level.

1.2.2.4. All pipe connections below normal water level shall be constructed with a 12" flat sleeve and gasket utilizing the manufacturer's H-12 hugger band with bolt, bar and strap.

1.2.3. Where P.V.C. storm pipe is used, the pipe shall be in accordance with F.D.O.T. Standard Specifications, Section 948-3 (up to 48" diameter) and shall be A-2000, as manufactured by Contech Construction Products, Inc.

2. CONSTRUCTION

2.1. Excavation for Structures FDOT Section 125

Work specified in this Section consists of excavation for pipe culverts, storm sewer, and all other pipelines, manholes, inlets, headwalls and similar structures with the following amendments:

2.2. General – FDOT Section 125-8.3.1

In the bedding zone the Contractor shall obtain a well-compacted bed and fill along the sides of the pipe and to a point which is 2' below finish grade or at least 1' above the top of the pipe. The width of backfill and compaction to be done under this zone shall be the width of the portion of the trench having vertical sides; or, when no portion of the trench has vertical sides it shall be to a width at least equal to twice the outside diameter of the pipe.

2.3. Density Requirements

2.3.1. The backfill for the lowest and bedding zones shall be placed in 12" layers (compacted thickness) and shall be compacted to 95% maximum density as determined by AASHTO T-180.

2.3.2. Where pavement is to be constructed over the pipe or within 4' thereof, the backfill for the cover zone (min. 4' below finish grade) shall be placed in the manner required for the lowest and bedding zones and compacted to 98% maximum density as determined by AASHTO T-180.

Where construction is outside the above stated limits, the backfill or the cover zone shall be placed in the manner and compacted to the degree required for the lowest and bedding zones.

2.3.3. Density tests shall be taken on each 12" layer at intervals not to exceed 300 l.f. and at each transverse section of pipeline.

2.4. Stabilization - General

2.4.1. All pipes, conduits, sleeves, etc. shall be installed, compacted and tested prior to the beginning of stabilizing operations.

2.4.2. In the event that a pipe, conduit, sleeve, etc. must be installed after completion of subgrade, the trench width shall be sufficient to allow compaction equipment to thoroughly compact the backfill and the stabilized subgrade remixed and recompacted for a distance of 25' each side of the trench.

2.4.3. If curbing has been installed, a section of curb for a minimum distance of 5' each side of the trench shall be removed and replaced after proper compaction.

2.4.4. As an alternative to the above, the pipe, conduit, sleeve, etc. may be installed by jack and boring under the stabilized subgrade.

2.5. Record Drawings

2.5.1. Contractor shall maintain during the progress of the Project accurate

records of the location, length and elevation of all pipelines and piping installed.

2.5.2. Promptly after completion of any portion of the work provided, the Contractor shall, in accordance with the requirements of this Section, deliver to the Engineer or Owner as-built information for the stormwater conveyance system including manhole rims and inverts, inlet rims and inverts, pipe sizes and pipe slopes.

2.6. Final Inspection

2.6.1. Contractor shall clean and dewater all pipe sections for final inspection after backfill to final grade and placement of pavement.

2.6.2. Initial inspection shall be by eye using lamp and mirror. Equipment to be provided by Contractor.

2.6.3. If defects in pipe or blockages are suspected or observed, the Engineer may require a video recording and report as specified in FDOT Section 430-4.8.

Section 12

INLETS, MANHOLES AND JUNCTION BOXES

1. DESCRIPTION

1.1. Installation of grates, inlets, manholes and junction boxes shall be in accordance with F.D.O.T. Standard Specifications, Section 425.

1.2. The furnishing of drainage pipe shall conform to F.D.O.T. Standard Specifications, Section 430, and to the particular types, sizes and dimensions as shown in the Drawings.

2. GRATINGS

2.1. Frames, grates and covers shall be of cast iron and shall be furnished by Contractor.

2.2. Contractor shall install the frames, grates and covers on the existing and new structures installed by the Contractor to the lines, grades and dimensions shown in the Drawings.

2.3. Cast iron covers for manholes shall be designated for traffic bearing and shall weigh not less than 130 lbs.

2.4. Cast iron grates for inlets shall be designed for traffic bearing and shall have sufficient open area to pass the calculated maximum storm water surface flow.

2.5. No opening shall be greater than 1” in least dimension, with lesser openings used where pedestrian safety is a consideration.

3. **PRECAST INLETS, MANHOLES, AND JUNCTION** BOXES

3.1. Contractor shall use precast inlets, including inlet tops, risers, manholes and junction boxes.

3.2. Precast inlet tops and manholes shall be set to conform accurately to the finished pavement surface. Pavement shall be finished a minimum of 1/4” above the front edge of the inlet top or manhole.

3.3. If necessary, build-up bricks may be used to raise precast inlets to the proper elevations as shown on the drawings.

3.4. Grouting of Build-Up Bricks:

3.4.1. All brick seams shall be grouted. Grout shall be one part cement and two parts sand; lime shall not be used.

3.4.2. Each layer of bricks shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling and shall be thoroughly

bonded.

3.4.3. The inner face of the build-up bricks and the weep hole in precast inlet tops shall be grouted with non-shrink grout. The grout shall be finished flush and smooth and shall be water-tight.

3.4.4. Weep holes shall be grouted prior to placement of limerock in the roadway.

3.5. The area excavated in the limerock base course to allow for adjustment of the manhole ring and cover to grade shall be backfilled with limerock and compacted to the same density as the limerock base course.

3.6. Manhole Cleaning and Removal

3.6.1. All manhole covers shall be cleaned to remove asphalt and debris, then painted with black rust-inhibiting paint.

3.6.2. If the manhole is located in a paved area, cleaning and painting shall occur after the final asphalt surface is placed.

3.7. Manholes and inlets located in non-paved areas shall be surrounded by sod or other suitable ground cover.

Section 13

ROOF DRAINS AND YARD DRAINS

1. DESCRIPTION

1.1. The work under this Section includes the furnishing, installing and/or laying, jointing, and testing of all roof drain/yard drain lines, manholes, fittings and appurtenances required for a complete roof drain/yard drain system as shown on the Drawings and specified herein.

1.2. The work shall also include such connections, reconnections, temporary service, and all other provisions in regard to existing roof drainage/yard drainage operations and modifications as is required to perform the new work.

2. MATERIALS

2.1. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.

2.2. All material shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

2.3. Polyvinyl chloride (PVC) pipe & fittings (4" – 10") shall be manufactured from virgin material and shall meet the requirements of ASTM D3034 (latest).

2.3.1. Pipe shall be SDR-35 or greater for depths less than 15'.

2.3.2. Pipe shall be SDR-26 for depths greater than 15'.

2.3.3. All joints shall be compression type joints meeting the requirements of ASTM D 3212 (latest).

2.3.4. When rubber gaskets are to be installed in the pipe joint, the gasket shall be the sole element relied on to maintain a tight joint.

2.3.4.1. Pipe joints shall be tested hydrostatically at the plant, using test methods ASTM D 3212.

2.3.4.2. Soil-tight joints must be watertight to 2 psi.

2.3.4.3. Watertight joints must be watertight to 5 psi, unless a higher pressure rating is required in the plans.

2.4. PVC Pipe and fittings (12" – 48") shall conform to: AASHTO M 278 for smooth wall PVC pipe; or AASHTO M 304 or ASTM F 949 for PVC ribbed pipe.

2.5. Corrugated polyethylene tubing and fittings for the underdrain shall meet the requirements of AASHTO M 252 or AASHTO M 294.

2.5.1. The tubing or pipe shall not be left exposed to sunlight for periods exceeding the manufacturer's recommendation.

2.5.2. Corrugations may only be annular.

2.5.3. Pipe conforming to Minimum Cell Classification 335420E may be used if the combination of color and UV stabilizer provides the same or better UV protection as 335420C.

2.6. Yard Drains

2.6.1. Yard drains shall be 12" x 12" pre-molded, high impact, plastic catch basin adapters manufactured by NDS, Inc., or approved equal.

2.6.2. Yard drains shall be Model 1221 or 1222 low profile adapters, depending on the type of collection system pipe used.

2.6.3. Grates shall be Model 1290, 12" structural foam polyolefin dome, Atrium style grates with UV inhibitor. In landscape areas, grates shall be flat style in grass areas.

2.6.4. Grates shall have an open surface area of 50.60 sq. in. and a capacity of 66.29 gpm.

2.7. Manholes

2.7.1. Manholes shall be the size and depth shown on the Drawings and shall be precast, reinforced, concrete barrels and cones coated as specified.

2.7.2. Precast concrete sections shall conform to the ASTM Specifications for Precast Reinforced Concrete Manhole Sections Designation C478 (latest), with the following additional requirements:

2.7.2.1. Cement shall meet the requirements of ASTM C150 (latest), Specifications for Portland Cement, Type II.

2.7.2.2. Concrete shall have a minimum compressive strength of 4000 psi.

2.7.2.3. Minimum wall thickness shall be 5", or 1/12 the inside diameter as shown, whichever is greater.

2.7.2.4. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations.

2.7.2.5. Joint contact surfaces shall be formed with machine casting. Joint contact surfaces shall be exactly parallel with a 2:1 slope and nominal 1/16" clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket, conforming to ASTM C443 (latest), Joints for Circular Concrete Sewer, and Culvert Pipe Using Rubber Gasket or RAMNEK premolded Plastic Joint Sealer with joints pre-primed.

2.7.3. Manhole Frames and Covers

2.7.3.1. Manhole frames and covers shall be cast iron of the type and size shown on the Drawings.

2.7.3.2. Castings shall be made of good quality, strong, tough, even grained cast iron, and shall be smooth, free from scale, lumps, blisters, sandholes and defects of any nature which should render them unfit for the service for which they are intended.

2.7.3.3. Castings shall be thoroughly cleaned and subjected to a careful hammer inspection.

2.7.3.4. Castings shall meet the requirements of ASTM A48 (latest), Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12, Ductile Iron meeting the requirements of ASTM A536 (latest), Standard Specification for Ductile Iron Castings. In either case, manhole frame and cover shall be designed to withstand an HS20-44 loading defined in the AASHTO Specifications.

2.7.3.5. Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking.

3. CONSTRUCTION

3.1. Excavation And Backfill

3.1.1. Excavation and backfill consists of excavating for roof drains/yard drains, and all other pipelines, manholes, and similar structures with the following amendments to Section 125 of the F.D.O.T. Standard Specifications.

3.1.2. When soil borings are provided by the Engineer or Owner, they shall be considered as supplemental information and shall not be considered as definitive of the subsoil conditions. Contractor is fully responsible for assessing subsoil conditions for the entire project.

3.1.3. F.D.O.T. Section 125.8 Backfilling - The requirements specified shall also include the roof drains/yard drains, manholes, and related facilities.

3.1.4. F.D.O.T. Section 125.8.3.2 Compaction - The backfill for the first and second stages shall be placed in 12” layers (compacted thickness) and shall be compacted to 95% of maximum density as determined by AASHTO T-99.

3.1.5. Where pavement is to be constructed over the pipe or within 4’ thereof, the backfill for the third stage (min. 4’ below finish grade) shall be placed in the manner required for the first and second stages and compacted to 98% of maximum density as determined by AASHTO T-

180. Where the construction is outside these limits, the third stage shall be compacted to a firmness approximately equal to that of the adjacent soil and no testing will be required.

3.1.6. Contractor shall be responsible for the testing of the backfill compaction.

3.1.6.1. The testing shall be performed by an independent testing laboratory.

3.1.6.2. Density tests shall be taken on pipe located under or within 4' of pavement, on each 12" layer at intervals not to exceed 300 l.f., and at each transverse section of pipeline.

3.2. Pipe Laying

3.2.1. Pipe laying shall be done only after a careful inspection of each piece has been conducted and defective pipe discarded and replaced immediately.

3.2.2. The pipe grade may be established by use of Laser Beam equipment, or by use of batter boards placed at not greater than 25' intervals.

3.2.3. The laying of pipe shall commence at the lowest point, with the spigot ends pointed toward the direction of flow, and proceed upward in gradient with the ends abutting and true to line and grade.

3.2.4. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when the trench conditions or weather is unsuitable for working in dry conditions.

3.2.5. Any trench dewatering (well point, etc.) required for proper alignment of pipe shall be done by Contractor at his own expense, and no pipe shall be laid in the dewatered trench until approval is made by the Engineer.

3.2.6. All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipelines.

3.2.6.1. As the work progresses, the interior of the pipe shall be cleaned of all dirt, jointing material, and superfluous materials of every description.

3.2.6.2. Contractor shall flush all lines constructed under this Contract with clean water, prior to final inspection to assure complete removal of all debris and foreign material, and to the satisfaction of the Engineer. Washwater shall not be allowed to flow into any completed storm sewer system or into water retention basins.

3.2.6.3. At the close of each day's work, and at other times when pipe is not being laid, the end of the pipe shall be temporarily closed with a close-fitting stopper approved by the Engineer. At times when work is not in progress, all open ends of pipe and fittings shall be securely closed so

that no trench water, earth, or other substance can enter the pipe.

3.2.6.4. Openings such as stubs, wyes, tees or other services along the lines shall be securely closed by means of an approved stopper that fits into the bell of the pipe and is recommended by the pipe manufacturer. Stopper shall be jointed in such a manner that it may be removed at some future time without injury to the pipe itself.

3.3. Connections

3.3.1. Types of connections shall be shown on the Drawings.

3.3.1.1. Although the general location of connections may be shown on the Drawings, the actual location shall be determined by Contractor, subject to approval by the Engineer.

3.3.1.2. Each service connection shall be accurately recorded on the as-built Drawings and shall be furnished to the Engineer.

3.3.2. Service lines shall be connected to the main lines by means of a wye fitting with a branch as shown on the standard Drawings.

In the absence of an existing wye, connections of new services to existing mains shall be made by installing a saddle type fitting of the same manufacturer as the pipe.

3.3.3. Installation of plugged wyes where indicated on the Drawings will be made as directed.

Plugs shall be of the type and size required to match the pipe and shall be water-tight and removable without breaking the pipe.

3.4. Field Testing

3.4.1. Contractor is advised that Owner reserves the right to use whatever additional inspection and testing methods it deems appropriate to verify the condition and acceptability of the work.

3.4.2. Contractor shall repair all defects in the work made apparent by any and all inspections and tests even if the work or parts of the work may have passed other tests and inspections.

3.4.2.1. Said repairs shall be made by Contractor at no additional cost to Owner.

3.4.2.2. Owner shall withhold from payment due Contractor an amount equal to the cost of providing such additional tests or inspections.

3.4.2.3. If payment due Contractor is insufficient to cover said cost, Contractor shall pay the difference to Owner prior to final acceptance of the work.

3.5. Manhole Installation

3.5.1. Precast concrete manholes shall have each section set so as to be vertical and in true alignment.

3.5.2. Joint surfaces of the sections shall be sealed with premolded plastic joint sealer equal to "Ramnek", or have an O-ring gasket installed in the preformed recess.

3.5.3. All holes in the sections required for handling and the annular space between the walls of the manhole and the entering pipes shall be thoroughly plugged with non-shrinking grout and shall be finished smooth, and shall be watertight.

3.5.4. Manhole frames and covers shall be set to conform accurately to the finished pavement surface.

3.5.4.1. All adjustments required for grade shall be done with precast grade adjustment rings.

3.5.4.2. Precast adjustment rings shall be constructed of concrete with a minimum compressive strength of 4000 psi.

3.5.4.3. Mortar for joints shall be one part cement and two parts sand; lime shall not be used.

3.5.4.4. Reinforcement shall be provided as necessary to prevent breakage during handling.

3.5.4.5. To assure a sufficient bond between the manhole covers and the surrounding asphalt surface, the manhole cover shall not be set until all base construction has been completed.

3.5.4.6. Manholes shall be protected during construction by covering with sufficient material to prevent debris from entering the manhole and to support the construction machinery required.

3.5.4.7. Immediately before the placement of the final asphalt surface course, the manhole shall be uncovered and the ring and cover so placed to accurately meet the finish pavement grade.

3.5.4.8. The manhole frame shall be set on this concrete section in a ring of mortar at least 1” thick and shaped to shed water away from the frame. Additional mortar shall be added to extend to the outer edge of the adjustment rings and shall be finished smooth.

3.5.4.9. The area excavated in the limerock base course to allow for adjustment of the manhole ring and cover to grade shall be backfilled with limerock and compacted to the same density as the limerock base course.

3.5.5. All manhole covers shall be cleaned to remove asphalt and debris, then painted with black rust-inhibiting paint.

If the manhole is located in a paved area, cleaning and painting shall occur after the final asphalt surface is placed.

3.5.6. Flow channels in manhole base shall be formed of 2500 psi concrete and/or brick rubble and mortar while the manholes are under construction.

3.5.6.1. Cut off pipes at inside face of the manhole and construct the invert to the shape and sizes of pipe indicated.

3.5.6.2. All inverts shall follow the grades of the pipe entering the manholes.

3.5.6.3. Changes in direction of the pipes and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines.

3.5.7. Where shown on the Drawings, stub lines shall be provided for the connection of future lines to manholes.

3.5.7.1. The end of each stub line shall be provided with a bell end which shall be closed by an approved stopper as specified hereinbefore.

3.5.7.2. Each stub line shall be accurately referenced to the center of the manhole, and the actual invert elevation of each of the stub line shall be accurately recorded on the as-built Drawings.

3.6. Yard Drain Installation

Yard drain shall be installed in accordance with manufacturer's recommendations at locations shown on the Drawings.

3.6.1. Attention should be given to each location as it relates to the surrounding finish grade. Install yard drains level and to proper elevations.

3.6.2. Adjust location as necessary to provide a gentle slope from all directions.

3.7. Connections To Existing Structures

3.7.1. Where shown on the Drawings new lines shall be connected into existing manholes or structures.

3.7.1.1. Unless stubs of correct size are found to exist, Contractor shall cut suitable openings into the existing structure (wall and floor slab as required) or remove the existing pipe to accommodate the pipelines as indicated on the Drawings and as herein specified.

3.7.1.2. The portion of each existing structure removed for new installation shall be confined to the smallest opening possible, consistent with the work to be done.

3.7.2. After the pipe is installed, Contractor shall carefully close up the openings around the pipe to make a water-tight joint using "Construction Grout" or "Set Grout" as manufactured by Master Builders, Inc., "NS Grout" as manufactured by the Euclid Chemical Company, or approved equals, and repair the existing manhole invert in a manner satisfactory to the Engineer.

3.7.2.1. The floor shall be reformed and finished to provide flow channels as specified for new manholes.

3.7.2.2. All such work shall be done with the proper tools, and by careful workmen competent to do such work.

3.7.3. Adjusting Existing Structures

3.7.3.1. Existing manholes, within the limits of the proposed work, that do not conform to the finished grade designated on the Drawings for such structures, shall be cut down or extended, and made to conform to the grade of the new pavement, or to the designated grade of the structure if outside of the proposed pavement area.

3.7.3.2. The materials and construction methods for this work shall conform to the requirements specified above.

3.8. Pavement Replacement

3.8.1. Where existing pavement, curb, curb and gutter, sidewalk or driveway paving is removed only for the purpose of constructing, replacing, or removing sewer pipe, service laterals, manholes, etc., such pavement, etc., shall be replaced and restored to as good condition, as determined by the Engineer as before removal.

3.8.2. The replaced pavement shall be of the same or similar type as that removed, except where permission is given by the Engineer for the use of another type.

3.8.3. Rough cuts for pavement curb and gutter, sidewalk, driveways, etc.

shall be trimmed back with a straight saw cut in a manner so as to produce as near as practical a cut of uniform width having parallel sides.

3.8.4. Specific requirements for the replacement of pavement on public roadways shall be in accordance with the requirements of the local governmental entity having jurisdiction and in accordance with the details as shown on the construction Drawings.

Section 14

UNDERDRAINS

1. GENERAL

1.1. Scope

Work in this section includes furnishing all labor, materials, equipment, and services required to construct underdrains to the required lines, grades, and cross sections as specified herein and on the plans.

2. PRODUCTS

2.1. Underdrain Pipe

Pipe and fittings shall be flexible, corrugated tubing manufactured of high-density polyethylene resins and conforming to ASTM Product Specifications F-405 and F-667. Drainage tubing shall be manufactured by Advanced Drainage Systems (ADS), Inc., or approved equal.

2.1.1. Perforated Pipe: Perforations shall be linear slots cut radially into the tubing wall between corrugations. Perforated pipe will be furnished complete with the nylon screen. The screen will completely surround the pipe and will have a lapped, welded longitudinal joint.

2.1.2. Non-Perforated Pipe: Non-perforated pipe shall be used for collector lines which convey the water from perforated pipe to the concrete inlet or outfall.

2.1.3. Fittings: All couplings, reducers, tees, ells, plugs, caps, and other fittings shall be non-perforated and shall be of the same manufacturer as the drainage tubing. A fitting shall be used at each pipe junction/termination, as appropriate.

2.2. Filter Material

Filter material for use in backfilling trenches over and around underdrains shall consist of 1 ½" to 2" gravel washed free of organic or other deleterious matter.

2.3. Filter Fabric

Filter fabric to line and lap over gravel filled subdrain trench shall be Mirafi 140N drainage fabric, or approved equal.

Vertical sand drains shall be installed with minimum disturbance to in situ material.

3. EXECUTION

3.1. Vertical And Horizontal Controls

3.1.1. The Contractor shall establish or shall employ a licensed surveyor to establish all lines and grades necessary for each stage of the work described herein.

3.1.2. Provide blue tops for reference in dressing trench bottoms at intervals not to exceed 30 feet along the centerline of each trench.

3.2. Underdrains

3.2.1. Trenches for underdrains shall be dug after the subgrade is prepared. The excavation of each trench shall begin at its outlet and proceed toward its upper end. The trench must not be excavated below the proposed grade line. Trenches will be cleaned of all loose material and their bottoms will be dressed and fine graded to blue tops set as previously described. Trenches shall be lined with filter fabric and underdrain pipe shall be set on the trench bottom. All fittings shall be securely coupled and all open ends will be capped. The pipe shall be carefully covered with gravel filter material and the filter fabric shall be lapped over the trench.

3.2.2. Care shall be taken not to damage the pipe or its fabric filter screen. Underdrain pipe shall be connected to solid pipe joints and to outfall at the concrete structure/collar as indicated in the plans. Care shall be taken not to loosen or cave-in the trench walls. Any such damage will be excavated and will be backfilled in mechanically tamped lifts not to exceed eight inches and will be re-constructed.

3.3. Settlement

After the trench has been backfilled it shall be thoroughly soaked. This process shall be repeated two times allowing the backfill material to dry twenty-four (24) hours before wetting again.

Section 15

POTABLE WATER SYSTEM

WATER SYSTEMS - DESIGN

1. There shall be no physical connection made between a potable water supply and a questionable or unknown water supply allowing unsafe (contaminated) water to enter the potable water system by direct pressure, vacuum, gravity or any other means. All potable water services around sewage pumping facilities shall be provided with an approved reduced pressure backflow prevention (RPZ) device.

2. System designs shall be based upon pressure data and defined by SID to be applicable to that portion of the service area that serves the proposed facility/development. Air release valves in vaults/manholes shall be provided at all high points in the water main as required by SID. Water main design standards are listed below.

3. **COVER**

   3.1. Minimum cover over water mains shall be thirty (30) inches to finished grade except under roadways where the minimum cover shall be thirty-six (36) inches. Minimum cover in State and/or County roads shall be thirty-six (36) inches. Minimum cover under ditches and/or canal bottoms shall be twenty-five (25) inches, not including the protective concrete cap installed over the pipe (See Detail Drawing)

   3.2. Maximum cover shall be forty-eight (48) inches unless approved by SID.

4. **HORIZONTAL SEPARATION**

   4.1. Horizontal separation shall be a minimum fifteen (15) feet to buildings, top of lake banks, canals, and other structures unless otherwise approved by SID District Engineer.

   4.2. Horizontal separation shall be a minimum ten (10) feet to gas mains, underground electric, telephone, cable TV or other communication cable, unless otherwise directed by the S.I.D District Engineer.

   4.3. Horizontal separation design shall meet all Federal, State, and local regulatory requirements.

5. VERTICAL SEPARATION

   5.1. Water mains shall cross over other pipes when possible.

   5.2. Vertical separation design shall meet all Federal, State, and local regulatory requirements.

6. LAYOUT

   6.1. Permanent dead ends are not acceptable without prior approval by SID and then must be equipped with a SID-approved terminal end and blow-off.

6.2. All water mains shall be placed in right-of-way areas or dedicated easements.

6.3. Water main size and location shall comply with the MP.

7. WATER MAIN MATERIAL

7.1. See section 15.1 for fire-line piping specifications for water mains connected to fire suppression systems.

7.2. Water mains shall be either ductile iron pipe (DIP) or polyvinyl chloride (PVC) manufacture and conform to the criteria listed below. High-density polyethylene pipe (HDPE) may be used in special circumstances with SID prior approval. When HDPE use is approved, only butt-fused joints utilizing the manufacturer's fusion guidelines and procedures are acceptable.

7.3. Pipe class determination shall be based on the installation and the use intended. Pipe classes shall be appropriately labeled on all drawings. DIP and ductile iron fittings shall be cement lined in accordance with AWWA C104. Mechanical joint glands shall be ductile iron. Tee bolts and nuts shall be Cor-Ten steel.

7.4. All above-grade DIP water mains shall be color-coded "Safety Blue". Above-grade fire-lines shall be color-coded "Safety Red". All PVC and HDPE potable water pipe shall bear the National Sanitation Foundation approved stamp and shall be color-coded "Safety Blue". All DIP, PVC, and HDPE water pipe shall be installed with metallic blue colored identification tape aligned directly over the pipe, one (1) foot below grade.

7.5. DIP shall be centrifugally cast and shall conform to AWWA C151/ANSI A21.51. Four (4) inches to twelve (12) inches diameter PVC pipe shall conform to AWWA C900. Fourteen (14) inches to thirty-six (36) inches diameter PVC pipe shall conform to AWWA C905. Four (4) inches to twelve (12) inches diameter HDPE pipe shall conform to AWWA C906. Pipe smaller than (4) four inches shall be ASTM D2241, SR21, 200 PSI pressure rating.

7.6. Twelve (12) inches diameter or smaller pipe must be Pressure Class 350, or PVC C900 DR 18 or thicker, or HDPE C906 DR17. Pipe larger than twelve (12) inches diameter shall be Pressure Class 250 for DIP, or PVC C905 DR25 for fourteen (14) inches and sixteen (16) inches diameter and DR21 for eighteen (18) inches diameter and larger.

7.7. Flanged pipe shall be DIP Special Class 53 or higher. Flanged DIP shall have threaded ductile iron fittings and shall conform to the requirements of AWWA C115. All flanges shall be Ductile Iron Class 125, ANSI B16.1. Flanges shall be flat-faced and each one joined with a one eighth (1/8) inch thick black neoprene, full-faced gasket.

7.8. Rubber ring gaskets shall be suitable for the specified pipe sizes. Rubber gasket joints shall conform to AWWA C111, and shall be furnished by the pipe manufacturer with the pipe. A non-toxic vegetable soap lubricant shall be supplied with the pipe in sufficient quantities for installing the pipe. Lubricants used for potable water lines shall be approved by the NSF.

7.8.1. DIP shall be required in the following circumstances:

7.8.1.1. Within ten (10) feet of sanitary and five (5) feet of storm drainage pipes.
7.8.1.2. Within fifteen (15) feet of buildings, canals and lakes, or other structures.
7.8.1.3. When crossing over or under sewers, canals, gas and storm pipes with less than eighteen (18) inches separation. No joints are allowed within ten (10) feet of these listed crossings.

7.8.1.4. In all other areas as required by jurisdictional agencies or within dedicated easements.

7.9. SID District Engineer may mandate DIP use in any on-site or off-site construction where future or possible disruption to the pipeline is possible.

7.10. Twelve (12) inches and smaller restrained joints shall be U.S. Pipe Field Lok, American Ductile Iron Pipe Lok-Fast, or EBAA Iron Mega-Lug. Fourteen (14) inches and larger restrained joints shall be U.S. Pipe TR Flex, American Ductile Iron Pipe or Lok-Ring.

The restraint method shall be suitable for the pipe size, thickness and test pressure as required for the specific design case following the standards set forth by DIPRA. The plans shall indicate the restrained length of pipe on each side of the fittings. When computing fitting weight, retainer glands/Mega-Lugs shall not be considered a fitting.

7.11. Jack and bore casing pipe shall conform to the criteria set forth by the applicable jurisdictional agency. All carrier pipes shall be restrained in accordance with the MS.

7.12. The EOR is responsible for acquiring approvals from other entities for directional bores under non-SID facilities. Directional bore construction materials shall be either PVC Certa-Lok C900/RJ type, as manufactured by Certain Teed, or HDPE pipe, SDR11. All HDPE pipe joints shall be butt-fused utilizing the pipe manufacturers fusion guidelines and procedures. All directional bore pipe shall have a ten (10) gauge continuous copper wire placed in the pipe that can be used to locate the pipeline from above ground.

7.13. Tapping water mains requires prior SID approval. The tapping pipeline diameter must be smaller than the tapped pipeline diameter. Tees or crosses will be required at locations dictated by SID. Pipe installations and fittings at tapped connections shall be made watertight and constructed to prevent “pull-out”.

Tapping sleeves and valves shall be manufactured ductile iron and have mechanical joints. Tapping sleeves and valves are required for all taps greater than three (3) inches. Taps sized three (3) inches or less must be constructed with a service saddle. All taps shall be constructed with valves. Tapping sleeves shall be installed a minimum of six (6) feet from pipe joints.

7.14. Service line tubing installation sleeves that travel under pavement areas can be constructed with Schedule 80 PVC.

7.15. All construction material shall be first quality, new, and not previously used. Repair clamps are not acceptable on newly installed systems. All gaskets shall be new. Use new, not re-used, gaskets when connecting to existing valves or fittings.

7.16. Polyethylene wrap shall be used in all locations subject to corrosive conditions as defined by SID. Locations shall be indicated on all drawings. SID must approve materials and wrapping procedures. Wrap shall be eight (8) mil polyethylene and shall be installed in accordance with ANSI/AWWA C105/A 21.5, Method "A". Material shall meet the latest revision requirements of ASTM D-1248.

8. WATER MAIN SIZE

8.1. The minimum water main size shall be six (6) inches unless otherwise approved by SID. The Applicant shall be required to demonstrate the adequacy of any proposed pipe size and be in compliance the MP.

8.2. New water mains shall meet maximum daily demands plus fire flow, maximum day tank filling, or peak hour flow requirements, whichever is the most demanding. Residual design pressures under all conditions shall not be less than thirty (30) PSI.

9. WATER SYSTEM VALVES, FITTINGS & APPURTENANCES

9.1. Unless a specific application dictates a higher working pressure requirement, all materials, valves, fittings and appurtenances intended for use in pressure pipe systems shall be designed and constructed to operate under minimum working pressures equal to one hundred fifty (150) PSI. All water system distribution valving shall be designed to facilitate the isolation of each section of pipeline between intersections of the pipe network and other locations as determined by SID.

9.2. Gate valves, four (4) inches to twelve (12) inches, shall be the resilient seat type conforming to AWWA C509. Valves larger than twelve (12) inches shall be gear operated butterfly valves, conforming to AWWA C504. Wafer valves will not be accepted unless specifically approved by SID. Valves shall generally be installed at intervals of not more than twelve hundred (1,200) LF on transmission mains, at intervals of not more than seven (700) LF on main distribution loops and feeders, and on all primary branches connected to these mains. Design valve placement for high-density areas that will minimize the number of services affected by a break or system shut down. Valves will not be placed under curbs, sidewalks or driveways. If placement in sidewalk is unavoidable, the valve box lid and marker shall be recessed to be flush with the surface.

9.3. Valves shall open in a counterclockwise direction. When the distance between pipe centerline to ground surface grade is greater than four (4) feet, valves shall have valve stem extensions standing within six (6) inches of ground surface grade.

9.4. All valves, bends, tees, crosses and dead ends shall be restrained by a mechanical restraint system. The EOR shall provide calculations for retrained joints. Use concrete gravity blocks when instances warrant such installations. Gravity blocks shall be "poured-in-place" concrete having a minimum compressive strength of three thousand (3,000) PSI after twenty-eight (28) days of cure time. Thrust blocks will not be allowed unless specifically approved by SID.

9.5. Standard pressure pipe fittings for ductile iron, PVC or HDPE pipe sizes three (3) inches diameter and larger shall be ductile iron conforming to AWWA C110, or AWWA C153 (short body) with mechanical joints unless flanged or restrained joints are required. Gray cast-iron fittings are not allowed.

9.6. Ductile iron fittings shall be cement lined in accordance with AWWA C104. All fittings thirty (30) inches and larger shall be rated for two hundred fifty (250) PSI working pressure. Mechanical joint fittings, twenty-four (24) inches and smaller shall be rated for three hundred fifty (350) PSI working pressure. Flanged joint fittings twenty-four (24) inches and smaller shall be rated for two hundred fifty (250) PSI working pressure.

For sizes less than three (3) inches diameter, fittings shall be suitable for the pipe material and application. Glands for mechanical joint fittings shall be ductile iron, and tee bolts and nuts shall be Cor-Ten steel. Only bolt systems furnished by the manufacturer for mechanical joints are acceptable; nuts and bolts shall be new, not reused. Pipe gaskets shall be new as supplied by the pipe manufacturer. All flanges shall be ductile iron Class 125, ANSI B16.1. One eighth (1/8) inch thick black neoprene gaskets shall be used on all flanged joints. Only full-faced gaskets shall be used on full-faced flanges. All joints shall conform to AWWA C111. Bolts, nuts and washers for flanges shall be hot dip galvanized, except T-bolts which shall be Cor-Ten steel.

10. FIRE HYDRANTS

10.1. Fire hydrants shall be provided on all transmission and distribution water main systems. Fire hydrants shall be spaced so that the maximum distance for protection will be less than five hundred (500) feet as the fire hose lays. The Fire Marshall may require different intervals.

10.2. Each hydrant shall open in a counterclockwise direction and flow at least five hundred (500) gallons per minute with a residual design pressure of not less than twenty (20) PSI. Fire hydrants shall be of the dry barrel break-away type conforming to AWWA C502 containing five (5), one quarter (1/4) inch interior valve openings. Each hydrant shall have two (2), two and one half (2½) inches threaded hose nozzles and one (1), four and one half (41/2) inches threaded pumper nozzle.

10.3. Fire hydrant branches (from main to hydrant) shall be a minimum six (6) inches diameter. Each branch shall be provided with a resilient seat gate valve located as close as possible to the main. Fire hydrants further than fifty (50) feet from the main will require a second valve at the hydrant. Fire hydrants will be restrained from the hydrant to the tee at the main. Restraint by use of "all-thread" rods is not allowed. Additional protection for fire hydrants shall be provided including, but not limited to, concrete-filled ductile iron traffic posts or other systems approved by SID District Engineer.

10.4. Hydrants shall be located to facilitate roadway access, and be constructed to minimize traffic vulnerability. Hydrants shall not be placed in sidewalks. Fire hydrants shall be installed true and plumb with the center of the pumper nozzle approximately eighteen (18) inches above finished grade. The Fire Marshall may determine the facing direction for the hydrant pumper discharge nozzle, but that nozzle will usually face the best access road available causing the four and one half (41/2) inch nozzles to be oriented in a direction that is parallel to the road.

10.5. Hydrants shall be constructed within a five (5) feet radius “clear zone” with seven (7) “clear” feet above the hydrant top left intact. Landscaping, fencing and any other constructs shall be outside this clear zone. Except in residential pods, Hydrant protection shall include, but not limited to, no fewer than three (3) concrete-filled ductile iron traffic posts or bollards set properly on the site. SID may require hydrant protection that differs from this written standard. Fire hydrants will be painted “Safety Red” unless otherwise indicated by SID District Engineer.

11. WATER SERVICE LINES AND TAPS

11.1. Proper service line sizing is the responsibility of the EOR. No direct service taps shall be allowed on water transmission pipes, mains or lines unless approved by SID District Engineer. Only double strap brass saddles with counterclockwise thread patterns shall be used when tapping water main service lines. Sid District Engineer must approve other kinds of saddles manufactured with other kinds of materials.

11.2. All water main service lines will be installed according to the Construction Details of this MS. The minimum space between water main service taps shall be eighteen (18) inches and no tap will be closer than eighteen (18) inches from a bell or fitting. Consecutive taps shall be offset forty-five (45) degrees. Corporation stops will be installed on all water main service taps.

11.3. The minimum diameter size for single and double services to the “U-branch” shall be one (1) inch. Service lines extending more than seventy-five (75) feet and less than one hundred (100) feet shall be one and one half (11/2) inches minimum diameter. Service lines exceeding one hundred (100) feet from the water main to the meter will not be constructed without prior approval from SID District Engineer.

11.4. Service line tubing shall be polyethylene PE 3408 material conforming to AWWA C901, SDR 9.Tubing shall be installed in a continuous length with no in-line fittings except for “U-branching” at multi-meters. Tubing shall be routed through a two (2) inch PVC Schedule 80 sleeve under roadway installations.

12. SERVICE METER INSTALLATION

12.1. All meters shall be provided and installed according to these MS and under SID supervision. SID will establish the minimum meter size according to information supplied by the Applicant and recommendations from the most recent revision of AWWA Manual M-22. Meter construction plans shall include a typical meter installation for each size meter to be installed. Each separate living unit within a residential building and each separate commercial or industrial space or facility shall have an individual and separate meter, unless otherwise approved by SID District Engineer.

12.2. The side of the meter box closest to the utility easement right-of-way line shall be eight (8) inches inside of the utility easement right-of-way line. In locations where the property line is not clearly defined, the meter shall be placed for ready access as approved by SID. Meters shall not be placed in areas that are or can be fenced by customers. The meter box shall be kept out of pedestrian walkways and out of driveway areas.

12.3. The Applicant will install SID-provided meters under the direction of SID. Service meters will be available from SID in the following sizes only: five eights (5/8), one (1), and one and one half (11/2) inches. Larger meters shall be provided and installed according to the MS under the supervision of SID. Meter boxes for two (2) inches and smaller meters are required. Meter boxes are installed by the Contractor and provided by S.I.D. The Contractor shall wrap the bottom and sides of the meter box with filter fabric.

12.4. SID assumes no responsibility for undersized meters and problems associated with undersized meters. All meters shall be or become the property of the SID.

13. BACKFLOW PREVENTION DEVICES

13.1. Backflow prevention devices shall be installed in all systems required by SID. Such examples include, but are not limited to, irrigation systems, water services for industrial spaces, offices, commercial areas, schools, mobile home parks, multi-family residences, and/or any other locations that SID determines will have backflow prevention devices installed. Single-family residences, at a minimum protection level, shall have double check valve devices installed. SID may require a RPZ device where a greater degree of protection is warranted.

13.2. All fire lines and water service to lift stations shall be designed with RPZ devices.

13.3. Backflow prevention device assemblies shall be provided with all necessary parts and accessories for a complete operable installation. Assemblies shall be the latest approved product of a manufacturer regularly engaged in the production of this equipment type. All assemblies shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California. All assemblies shall be permanently labeled with the following information:

A. Type of Assembly (Reduced Pressure, Double Check Valve, etc.)
B. Name or Trademark
C. Size
D. Model Number
E. Direction of Flow (shown by an arrow)
F. Unit Serial Number
G. Rated Working Water Pressure (RWWP)
H. Rated Working Water Temperature (RWWT)

13.4. The backflow prevention device shall be owned and monitored by the property owner. The property owner shall document that a qualified backflow prevention technician acceptable to the SID has tested the backflow prevention device annually. A copy of the technician's certification must be attached to the test results. The annual report shall be on a form provided by the SID.

14. SYSTEM PRESSURES

14.1. The Applicant shall not assume available meter water pressure greater than thirty-five (35) PSI without confirmation from SID. Lower available pressures shall be used as

directed by SID. SID does not guarantee or warrant the availability of any particular pressure or flow.

15. FIRE LINES

15.1. All fire lines shall have a RPZ device with five eighths (5/8) inch low-flow by-pass meter located within the right-of-way or dedicated easement. All piping from the main to and through the backflow assembly must be DIP, Special Class 53. No exceptions will be made to this requirement. Above-grade fire-lines shall be color-coded “Safety Red”.

16. AIR RELEASE VALVES

16.1. Shall meet AWWA C512, latest revision. Body, cover and baffle material shall be cast iron or ductile iron conforming to ASTM A126 OR A536. Float and trim material shall be stainless steel. Resilient seat material shall be chloramines resistant. Air release valves shall have a minimum 3/32” orifice for a minimum working pressure of 150 psi. Valve inlet and outlet shall be threaded. Combination Air/Vacuum Valves are typically used. Except where otherwise specified, interior ferrous surfaces, exclusive stainless steel surfaces, of all valves shall be coated with two-part thermosetting epoxy coating or fusion bonded epoxy coating. Flange faces of valves shall not be epoxy coated. Exterior surfaces shall be coated with a primer. The epoxy shall be suitable for use in potable and reclaimed water.

WATER SYSTEMS - CONSTRUCTION

1. INSTALLATION

1.1. Installation of water mains and associated appurtenances shall be in accordance with current AWWA specifications and manufacturer's requirements for their particular products. Material loading, unloading, and storage shall be done in a manner that avoids damage. Interior parts and portions will be kept clean and free of foreign materials at all times.

1.2. All piping shall be laid in trenches having dry and stable bottoms. Wet trench installation shall be allowed only in special circumstances and requires SID District Engineer approval. Pipe shall be fully supported along its entire length. Sharp or rocky material encountered in the trench base shall be replaced with proper bedding. Pipe shall be laid on line and to the designed grade. Backfill shall be free of rock and debris larger than one and one half (1/12) inches in diameter. All mains shall have a minimum thirty (30) inches cover, thirty-six (36) inches under roads, and a maximum of forty-eight (48) inches cover to finished grade except where otherwise approved by SID District Engineer.

1.3. Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the surface of the ground. Backfill in open trenches across roadways or other areas which are to be repaved shall be made as specified above except that the entire fill above pipe shall be deposited in layers not to exceed 12” in thickness, moistened and compacted to 98% of maximum density as determined by AASHTO T-180 so that when backfilling is completed, the roadway paving may be placed immediately.

1.4. Concrete thrust blocks are not permitted. Mechanical restraint systems shall be required at each fitting where a change of direction occurs and/or as specified on the plan details. Mechanical restraint systems shall extend a suitable distance from pipeline direction changes; enough to satisfy the restraint requirements computed and set forth in the DIPRA standards. Concrete gravity blocks will be allowed where required. Gravity blocks shall be “poured-in-place” concrete having a minimum compressive strength of three thousand (3,000) PSI after twenty-eight (28) days of cure time. Visqueen protection for bolts shall be provided at all gravity blocks. The EOR shall provide necessary calculations for restrained joints.

1.5. Pipe joints, gravity blocks, conflicts and service connections shall be left exposed until visually inspected and approved by SID or its designated Representative.

1.6. Metallic backed indicator tape shall be installed over all PVC and HDPE mains at twelve (12) inches below grade. The tape color shall be blue.

1.7. All valves shall be placed according to approved plans. All valve stems shall be installed plumb. Valve stem extensions are required as described in Section 9.3. SID shall approve air relief valve installations. Record drawings shall reflect the proper location of all mains, hydrants, services, valves and appurtenances. All taps shall be at least eighteen (18) inches from fittings or pipe bells.

1.8. All road and pavement and construction shall comply with the requirements set forth by the authority that governs that facility.

2. CONNECTION TO EXISTING SYSTEM

2.1. All connections to existing mains shall be made under the direct supervision of SID or its designated Representative. Valves on existing mains shall be operated by or under the direct supervision of SID District Engineer or its personnel. Tapping sleeves and valves shall be pressure tested prior to tapping. If existing customer service must be interrupted, SID shall have seven (7) days advance written notice. The Applicant shall disinfect, secure samples, and acquire the appropriate Health Department clearances to restore service interruptions.

2.2. Bacteriological clearances required shall be expedited and fully cleared within seventy-two (72) hours. The Applicant shall minimize service interruptions by pre-assembling materials and preparing the work site ahead of scheduled work time. SID may postpone a service interruption if the Applicant is not ready to proceed on schedule and/or has failed to make suitable preparations. Service interruptions may be scheduled during night hours to minimize effects. No customer shall be without water service for more than four (4) hours. The Applicant shall provide temporary services to customers who may be without permanent service for more than four (4) hours.

2.3. Disinfection is required for all pipe and fittings used to complete connections with the potable water system. Tapping sleeves and valves shall be disinfected in accordance with the requirements of AWWA. SID District Engineer or its designated Representative shall be present for all wet taps made. Pipe coupons shall be preserved and submitted to SID.

3. CLEANING & FLUSHING

3.1. Foreign material shall be removed from all pipe prior to installation and kept clean during the construction process. The SID-preferred method for cleaning water mains, transmission lines, services lines and other kinds of pressure pipe is “pigging”. Although cannon-flushing mains is not considered a preferred cleaning method, it may be permitted, but must be approved by SID District Engineer or its designated Representative.

3.2. All installed pipe will be thoroughly cleaned and properly “pigged”. Pigging water shall be disposed efficiently without creating a nuisance. All pigs shall be one size larger than the pipe diameter being pigged. The Applicant shall provide piping, “pig Y’s”, temporary fittings and any other materials necessary to complete the pigging job. SID District Engineer or its designated Representative must be present for all pipe pigging or flushing.

3.3. Existing mains must be flushed when new mains are connected. Existing main flushing operations shall be done under the supervision of SID when service is restored. The Applicant shall pay for all water used during cleaning and for other costs that may accrue during cleaning and/or flushing operations.

4. TESTING

4.1. The Applicant shall provide all equipment (including a SID-approved pressure gauge), materials, and labor necessary to pressure and leak test installed piping. All mains and services shall be leak tested. The Applicant will pay for water used during leak testing.

The main tested shall either be isolated from active potable lines or protected from leakage by a double valve arrangement. All water utilized for pressure and leakage testing shall be potable water and have adequate chlorine residual.

4.2. Water mains shall be tested by valve sections based upon the maximum valve spacing required in Section 9.2. The maximum pipeline test length is two thousand (2,000) feet. The test length time is two (2) hours and the test pressure is one hundred fifty (150) PSI. The maximum allowable leakage during the test interval shall comply with current AWWA leakage specifications. Testing procedures shall meet or exceed AWWA C600 criteria. The Applicant shall successfully complete a pretest prior to scheduling the actual pressure and leakage test. SID District Engineer or its designated Representative must observe the actual pressure and leakage test. The Applicant shall replace or adjust components of the pipeline that fail the test. The pipeline shall then be re-tested as described above until it passes the test criteria. The pressure and leakage test shall be done concurrently.

4.3. Bacteriological testing shall not begin until pigging and/or flushing is successful, pressure and leakage tests are complete, and SID has accepted record drawings.

5. DISINFECTION

5.1. The Applicant shall provide all equipment and materials necessary for pipeline disinfection. All mains shall be disinfected in accordance with AWWA/FDEP/Health Department regulations. Bacteriological samples shall be taken from all sections of the main via standard sampling tap assemblies, and sent to a HRS-approved laboratory for analysis. Clearance is required from the FDEP/Health Department before the SID will allow the main to be put into service. The Applicant shall provide sampling taps and test water at no cost to SID. Sampling taps and test water used for disinfection shall be flushed to a location that will not damage any adjacent persons, properties, or things.

Section 16

WASTEWATER SYSTEM

WASTEWATER SYSTEMS - DESIGN

1. There shall be no physical connection made between a sanitary sewer and storm water sewer system. All gravity sewers, pumping stations/lift stations and force mains shall be designed to deliver peak flows using the criteria listed below.

2. FLOW

2.1. Wastewater systems shall be designed on the basis of an average "equivalent residential per capita daily flow" not less than one hundred (100) gallons. Lateral sewer services shall be designed with capacities when running full of not less than four (4) times the average flow. Trunk sewers shall have capacities under the same conditions of not less than two point five (2.5) times the average flow. SID may make special allowances for sewage from industrial facilities upon approval.

3. PRE-TREATMENT

3.1. Waste from non-residential operations shall not be connected to the sanitary sewer system without pretreatment specifically approved by SID District Engineer. The Applicant shall submit a pre-treatment design for approval by SID District Engineer. The owner of the pre-treatment system shall be responsible for operating the system in accordance with the criteria set forth in the approval plan.

3.2. All installations where foods are prepared, processed or served shall have an adequate capacity grease trap system. The Applicant's Engineer will determine the trap design and trap count to be approved by SID District Engineer. Grease trap owners/users connected to the SID collection system give SID the right to inspect any grease traps at any time. Grease trap owners/users will inspect and clean their grease traps. The owner/user-cleaning program shall be based on a schedule that insures necessary and appropriate operation of the wastewater collection system and treatment facility. If necessary SID will correct owner/user grease trap cleaning failures and the cost associated with such corrections will be paid by the owner/user. Those costs shall be invoiced to the customer for payment according to the procedures used for normal water and wastewater utility bill payment and may include such additional administrative and other charges associated with the SID conducting this work on behalf of the customers.

4. GRAVITY SEWER MAIN SIZES

4.1. The minimum allowable size for any gravity sewer main other than sewer service lateral connections shall be eight (8) inches in diameter. Upsizing sewer lines to reduce slopes will not be permitted unless approved by SID. Main size changes must occur in a manhole.

4.2. Lateral sewer services will not be less than four inches in diameter.

5. GRAVITY SEWER MAIN SLOPES

5.1. All gravity sewer mains shall be designed with hydraulic slopes sufficient to result in mean velocities, when flowing full or half full, of not less than two (2) feet per second, based on an acceptable formula. Slopes shall be steep enough to prevent solid and/or fluid separation. The following minimum slopes shall be used for design:

Diameter of Sewer	Minimum Slope
8 inches	0.40%
10 inches	0.28%
12 inches	0.22%

5.2. There shall be no minimum slope variance unless otherwise approved by the SID. The minimum cover for gravity sewers, measured to the invert is four (4) feet unless otherwise approved by the SID.

6. ALIGNMENT

6.1. Gravity sewers of all sizes will be designed with uniform slope and alignment between manholes and shall be laid straight between manholes.

7. SEPARATION

7.1. Maintain horizontal and vertical separation for force mains and gravity sewers by following the criteria listed below.

7.1.1. Design separation distances to comply with jurisdictional permitting agencies.

7.1.2. Design separation distances to comply with these MS.

7.1.3. Keep force mains and gravity sewers at least ten (10) feet from gas mains, underground electric, telephone, cable TV and other communication cable.

7.2. All force mains and gravity sewers shall be placed within rights-of-way or easements satisfactory to SID.

8. PIPE MATERIAL

8.1. PVC and DIP are acceptable pipe material for gravity sewer lines.

8.2. PVC gravity sewer pipe and fittings four (4) inches through fifteen (15) inches shall comply with ASTM D 3034, SDR 26 and minimum stiffness of 40 PSI. PVC gravity sewer pipe eighteen (18) inches and larger shall comply with ASTM F 679, with T-1 wall thickness and minimum pipe stiffness of 46 PSI. Joints and gaskets shall comply with ASTM F 477. PVC gravity sewer pipe shall be green. All PVC sewers shall be installed accompanied by a metallic, green colored identification tape laid one (1) foot below grade, directly above the pipe.

8.3. DIP pipe shall conform to latest ANSI Specification A21.51 and shall be suitable for a minimum one hundred fifty (150) PSI working pressure. Pipe thickness shall be as required for a minimum of five (5) feet of cover with laying condition B (minimum) and computed in accordance with latest ANSI Specification A21.50. The ductile iron shall have a minimum tensile strength of 60,000 PSI and a minimum yield strength of 48,000 PSI. The outside of DIP shall be coated with a bituminous coating and the inside shall be coated with Protecto 401, at a minimum dry film thickness 40 mils.

8.4. DIP shall be used in the following circumstances:

8.4.1. As required on the basis of pipe separation criteria set forth by agencies with jurisdiction.

8.4.2. When there is less than four (4) feet of cover to the invert of a gravity sewer.

8.4.3. When the sewer is placed within fifteen (15) feet of buildings, top of bank of lakes and canals and other structures unless otherwise approved by the SID.

8.4.4. The last run of pipe into a wet well.

8.4.5. Within a core drilled opening.

9. MANHOLES

9.1. Manholes shall be pre-cast in accordance with ASTM C478. All openings and piping entering or exiting manholes shall be sealed with waterproof non-shrinking grout. Manholes shall be coated inside and outside with two (2) coats of coal tar epoxy. Exterior coatings shall include seams and masonry work around tops and all piping entering or exiting manhole. Each coat shall be a different color, the final coat black, and each with a minimum dry film thickness of eight (8) mils per coat. Pipe connections to the manhole shall be cut flush with the inside wall of the manhole. Manhole covers shall be cast iron and suitable for H2O wheel loading. Covers shall be fabricated with the word “sewer” in the casting and the Westlake/S.I.D. logo.

9.1.1. Location

Manholes shall be installed at the terminal end of each gravity sewer; at every grade or direction change, when pipe size or alignments change; at all sewer intersections, and at four hundred (400) feet intervals not otherwise encumbered. Manholes shall be placed in accessible locations, preferably in pavement, always flush to the surface, except as approved by SID. A concrete collar and rain guard shall be placed around manholes outside of pavement areas. Manholes shall have pre-cast, monolithic pour bases. All manholes shall have pre-cast cones. Flat slabs shall not be accepted. Ram-nek or equivalent shall be placed at joints.

9.1.2. Drop Manholes

An exterior drop pipe shall be provided for a sewer entering a manhole at an invert elevation of two point five (2.5) feet or more above the outgoing manhole channel invert. In cases where the elevation difference between the invert is less

than one point eight (1.8) feet, a drop pipe is not required, but a channel shall be constructed to guide the waste stream into the outgoing flow. There is no restriction on the length of a drop pipe. No design should be submitted showing an incoming invert between one point eight (1.8) and two point five (2.5) feet above the outgoing invert.

9.1.3. Flow Channel

The manhole floor shall have a flow channel made to conform in shape and carrying capacity to that of the sewers. Flow channels within the manholes involving changes of direction or drops shall smoothly direct the flow in accordance with standard construction practices. Manholes shall be designed with a minimum zero point one (0.1) foot drop from inlet to outlet

9.1.4. Service Connections

All sanitary connections to SID laterals shall be made with a clean out. SID will not allow service connections into manholes without prior approval. Services greater than seventy-five (75) feet will require a clean-out connection.

9.1.5. Force Main Tie-Ins

In those instances where a force main ties into an existing or proposed manhole, an inside drop will be allowed. The drop shall be DIP with stainless steel straps.

SANITARY SEWERS -- CONSTRUCTION

1. INSTALLATION

1.1. Sewers shall be laid accurately in line and to grade. There shall be no variance in the specified minimum slope. Visible leakage, deflections, horizontal misalignment, significant bowing, non-constant slopes between manholes, sagging joints, or other non-industry standard construction as defined by SID shall each be grounds for rejection of the installed system.

1.2. The minimum cover on a PVC sanitary sewer shall be four (4) feet to the invert. Pipe lengths with less than four (4) feet of cover, will require SID approval prior to installation.

1.3. Trenches and excavations shall be kept dry while work is in progress. Muck, rock, boulders, logs and other material determined by SID to be unsuitable backfill will be removed from the site. Proper bedding material shall be supplied if the existing material includes rock, organic material or other sharp or unstable material. The pipe barrel shall be uniformly supported along its entire length on undisturbed soil or bedding material.

1.4. Excavation and backfill consists of excavating for sanitary sewer, and all other pipelines, manholes, and similar structures with the following amendments to Section 125 of F.D.O.T. Standard Specifications.

1.5. When soil borings are provided by the Engineer or Owner, they shall be considered as supplemental information and shall not be considered as definitive of the subsoil conditions. The Contractor is fully responsible for assessing subsoil conditions for the entire project.

1.6. Sect. 125.8 Backfilling the requirements specified shall also include the sanitary sewer, manholes, force mains and related facilities.

1.7. Sect. 125.8.3.2 Compaction The backfill for the first and second stages shall be placed in 12” layers (compacted thickness) and shall be compacted to 95% of maximum density as determined by AASHTO T180.

1.8. Where pavement is to be constructed over the pipe or within 4’ thereof, the backfill for the third stage (min. 4’ below finish grade) shall be placed in the manner required for the first and second stages and compacted to 98% of maximum density as determined by AASHTO T-180. Where the construction is outside these limits, the third stage shall be compacted to firmness approximately equal to that of the adjacent soil and no testing will be required.

1.9. The Contractor shall be responsible for the testing of the backfill compaction. The testing shall be performed by an independent testing laboratory. Density tests shall be taken on each 12” layer at intervals not to exceed 300 l.f. and at each transverse section of pipeline.

2. MANHOLES

2.1. Manholes shall be set according to the approved construction plans and shall be pre-cast in accordance with the ASTM C478. All openings and piping entering or exiting manholes shall be sealed with waterproof non-shrinking grout. Manholes shall be coated inside and outside with two (2) coats of coal tar epoxy. Exterior coating includes seams and all masonry work around tops and all piping entering or exiting manholes. Each coat shall be a different color, the final coat black, and each with a minimum dry film thickness of eight (8) mils per coat. Pipe connections to the manhole shall be cut flush with the inside wall of the manhole. The manhole invert shall be carefully shaped to conform to the pipe flow channel. Flow channels within the manhole involving changes of direction or drops shall smoothly direct the flow in accordance with standard construction practices and provide for a minimum of zero point one (0.1)-foot drop from inlet to outlet. Manhole floors will not "pond" under "no-flow" conditions.

2.2. Manholes shall be core-drilled to provide pipe opening when pre-cast holes are not available. Ram-nek or an equivalent product shall be used at all riser joints. All PVC sewer pipe connections to manholes shall be made with a pre-cast rubber boot. Core drilled openings shall utilize a Link Seal connection. Core drilled openings require one (1) full length of DIP.

3. INSPECTION & TESTING

3.1. All gravity sewer lines shall be inspected and tested in accordance with these MS. SID shall be notified in writing a minimum of forty-eight (48) hours in advance of testing, so that a SID Representative may be present. Testing shall be performed after the road base is in place. Equipment for performing tests and personnel required for supervision and assistance with items such as removing manhole covers, moving ladders and equipment, holding lights, cleaning, etc., shall be funded and provided by the Applicant. Line sections that fail the tests listed below will be identified, repaired or replaced and re-tested by the Applicant.

3.1.1. Sewer lines shall be cleaned and inspected prior to testing.

3.1.2. Test Requirements

3.1.3. Video Test

All sewer mains and laterals shall be inspected with CCTV video cameras and audio equipment. The purpose is to provide an audio and visual record of the system for SID and to identify problem areas.

a. Prior to starting the video testing, a minimum of ten (10) gallons of water must be introduced into the upstream manhole of the line to be tested and given time to stop flowing prior to the start of the video. Moving water viewed in the videotape warrants a test failure.

b. The television camera used for the inspection shall be one specifically

designed and constructed for such inspections. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in one hundred per cent (100%) humidity conditions. The camera, television monitor, and other components for the video test shall be capable of producing picture quality to the satisfaction of SID. If the quality is unacceptable, the equipment shall be replaced.

c. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition and lateral tie-ins. In no case shall the television camera move at a speed greater than thirty (30) feet per minute.

d. A final report certified using the NASSCO 1-5 index or the NASSCO PACP-pipe defects code will be provided to SID for review and comment. The Applicant is responsible for correcting and/or repairing any deficiencies and will again test the corrected or repaired section.

3.1.4. Visual Test

All sewer main lines shall be inspected visually to verify accuracy of alignment and free of debris and obstructions. The full diameter of the pipe for straight alignments shall be visible when viewed between consecutive manholes. The method of test shall be by visually lamping with mirrors and lights unless SID specifically requests an alternate method. The Applicant shall provide all required equipment and personnel to do the visual test.

3.1.5. Leakage Test

The locations for performing leakage tests and the method used will be selected by SID. Testing methods that may be suitable for various conditions include low-pressure air exfiltration, water infiltration, and water exfiltration. Plugs, caps and branch connections used during testing must be secured against blow-off during leakage tests.

3.1.6. Air Testing

The duration permitted for a prescribed low-pressure exfiltration pressure drop between two (2) consecutive manholes shall be not less than that shown in the following table. The prescribed drop shall not exceed zero point five (0.5) PSI from three point five (3.5) to three point zero (3.0) PSI in excess of the groundwater pressure above the top of the sewer.

Minimum Duration for Pipe Size, Inches	Air Test Pressure Drop Time, Minutes
4	2 1/2
6	4
8	5
10	6 1/2
12	7 1/2
30	18 3/4
36	22 1/2

3.1.7. Infiltration Testing

Infiltration testing shall be an acceptable method of leakage tests only when the groundwater level is above the top of the pipe throughout the length being tested. Tests shall be conducted for a minimum of four (4) hours. The allowable infiltration for any portion of sewer system shall be measured by a weir placed in the appropriate manhole and shall not exceed fifty (50) gallons per inch of internal pipe diameter per one (1) mile of pipe per day. Laterals are not included in the infiltration calculation.

3.1.8. Exfiltration Testing:

Exfiltration testing is an acceptable method of test only in dry areas or when the groundwater level at the time of testing is below the top of the pipe. Tests shall be conducted for a minimum of four (4) hours. The allowable water exfiltration for any length of sewer pipe between manholes shall be measured and shall not exceed fifty (50) gallons per inch of pipe diameter per one (1) mile of pipe per day. During exfiltration testing, the maximum internal pipe pressure at the end shall not exceed twenty-five 25 feet of water or ten point eight(10.8) PSI and the internal water head at the upstream end shall be two (2) feet higher than the top of the pipe. The Applicant shall provide and install service plugs as needed to perform the test.

WASTEWATER FORCE MAINS & REUSE MAINS - DESIGN

1. DESIGN STANDARDS

1.1. The design standards for force mains and reuse mains shall follow the same criteria as outlined for water mains in terms of cover, horizontal and vertical separation and layout. Other criteria for force mains and reuse mains are listed below.

1.2. Air release valves in vaults and manholes shall be provided at all high points in the force main and reuse mains as required by SID.

2. FORCE MAIN/REUSE MAIN MATERIAL

2.1. Force mains shall be either DIP, PVC, or HDPE and conform to the criteria listed below. All reuse mains shall be only PVC unless otherwise noted by requirement or rule.

2.2. Pipe classes shall be based on the installation and the use intended. Pipe classes shall be appropriately labeled on all drawings.

2.3. DIP shall conform to AWWA C151/ANSI A21.51. Four (4) inches to twelve (12) inches diameter PVC pipe shall conform to AWWA C900. Fourteen (14) inches to thirty-six (36) inches diameter PVC shall conform to AWWA C905. Pipes smaller than four (4) inches shall be ASTM D2241 SDR-21, with pressure rating of 200 psi.

2.4. Twelve (12) inches diameter or smaller force mains shall be minimum DIP Pressure Class 350 or PVC C900 DR 18. Fourteen (14) inches or sixteen (16) inches diameter force mains shall be minimum Pressure Class 250 or PVC C905, DR 25. Force mains larger than sixteen (16) inches diameter shall be minimum DIP Special Class 52 or minimum PVC C905, DR21 including Protecto 401 with a minimum dry film thickness of 40 mils.

2.5. Flanged pipe shall be DIP minimum Special Class 53. Flanged DIP shall have threaded ductile iron fittings and shall conform to the requirements of AWWA C115. All flanges shall be ductile iron Class 125, ANSI B16.1. Flanges shall be flat faced and all joints shall be installed with one-eighth (1/8) inch thick black neoprene full-faced gaskets.

2.6. All force main PVC pipe shall bear the approved NSF stamp and shall be either color-coded “green” for sewer or spiral wrapped (less than eighteen [18] inches on center) with green marker tape. All reuse application PVC pipe shall be color-coded “Pantone Purple 522C”. All PVC pipe shall be installed with a color-coded identification tape laid one foot below grade directly above the pipe.

2.7. DIP and ductile iron fittings shall be coated outside with a bituminous coating and inside and shall be coated with Protecto 401, at a minimum dry film thickness of 40 mils. All exposed (above grade) ductile iron force main shall be color-coded “Tnemec Safety Green”. All exposed (above grade) ductile iron reuse piping shall be color-coded “Pantone Purple, 522C”.

2.8. Rubber ring gaskets shall be suitable for the specified pipe sizes. Rubber gasket joints shall conform to AWWA C111, and gaskets shall be furnished by the pipe manufacturer with the pipe. A non-toxic vegetable soap lubricant shall be supplied with the pipe in sufficient quantities for installing the pipe.

2.8.1. DIP shall be required at locations set forth in Section 8.4.

2.8.2. Restrained joints shall be DIP and meet the criteria listed below:

Twelve (12) inches diameter and smaller restrained joints shall be U.S. Pipe Field Lok, American Ductile Iron Pipe Lok-Fast, or EBAA Iron Mega-Lug.

Fourteen (14) inches diameter and larger restrained joints shall be U.S. Pipe TR Flex or American Ductile Iron Pipe Lok-Ring.

The restraint method shall be suitable for the pipe size, thickness, laying condition and test pressure required for the specific design case. The restrained pipe length on each side of a restrained joint or fitting shall be indicated on the plans. The restrained pipe length shall satisfy DIPRA criteria for buried applications.

2.8.3. Jack and Bore Installations:

Casing pipe used with jack and bores shall be in accordance with the applicable agency having jurisdiction over the facility being crossed. All carrier pipes shall be restrained joint DIP.

2.8.4. Directional boring will be considered a viable alternative to jack and bore installations under roadways, canals or ditches. The SID will review each case. Material used for directional bores shall be either PVC Certa-Lok C900/RJ type (as manufactured by Certain Teed) or HDPE pipe, SDR11. All HDPE pipe joints shall be butt-fused utilizing the pipe manufacturer's fusion guidelines and procedure.

2.8.5. All directional bore pipe shall have a continuous ten (10) gauge copper wire pulled through with the pipe to be used in locating the pipe from above ground.

2.8.6. No mains may be tapped without prior SID approval. The tapping line diameter must be smaller than the tapped line diameters unless otherwise approved by SID. SID may require tees at certain locations. Pipe and fitting tapped connections shall be watertight and constructed to prevent pullout.

Tapping sleeves and valves shall be ductile iron with mechanical joints. Valves shall be provided on all taps. Taps less than four (4) inches shall be constructed with a double strap service saddle unless otherwise stated. Tapping sleeves and valves are required for all taps four (4) inches and greater. Tapping sleeves shall be a minimum of six (6) feet from pipe joints.

2.8.7. PVC to DIP transition material shall be fabricated from non-corroding substances and approved by SID.

2.8.8. All construction material shall be first quality and new and not previously used. Repair clamps are not acceptable on newly installed systems. Damaged or faulty pipe, fittings and/or other materials must be properly replaced. All gaskets shall be new. When connecting to existing valves or fittings, gaskets shall be replaced and not reused.

2.8.9. Polyethylene wrap shall be used in all locations subject to corrosive conditions. SID must approve materials and wrapping procedures. Locations shall be indicated on the approved drawings. Wrap shall be eight (8) mil polyethylenes and shall be installed in accordance with ANSI/AWWA C105/A 21.5, Method "A". Material shall meet the latest revision requirements of ASTM D-1248.

2.8.10. The Applicant shall submit a complete set of shop drawings, indicating SID-specified material requirements. Material requirements will be guided by the latest revisions of the specifications from the AWWA, ANSI, ASTM, NSF, and any other SID-approved organizations.

3. FORCE MAIN/REUSE MAIN SIZES

3.1. All force mains and reuse mains shall be sized in accordance with the SID MP. SID must approve all force main sizes. All force mains shall be sized to deliver peak flow requirements as mandated by jurisdictional regulatory agencies. Otherwise, force main diameters shall not be less than four (4) inches and with a flow velocity of not less than two (2) feet per second and not greater than four point five (4.5) feet per second. Force mains shall not enter a manhole from a direction contrary to the direction of flow out of the manhole.

3.2. Two (2) inch force mains may be allowed on privately owned grinder pump stations. Approval from SID requires the Applicant demonstrate the adequacy of the force main sizing.

3.3. All reuse mains shall be sized as required for the specific application and will require approval from SID prior to installation.

4. VALVES, FITTINGS & APPURTENANCES

4.1. Valving for all force main and reuse systems shall be designed to facilitate the isolation of each pipeline section between intersections of the pipe network. All force main valves shall be eccentric plug type with gear operators. Valves on mains shall generally be installed at intervals of not more than fifteen hundred (1,500) LF. Valves shall not be placed within curbs, sidewalks or driveways. If placement in a sidewalk is unavoidable, the valve box lid and marker shall be recessed to be flush with the surface.

4.2. Valves shall open in a counterclockwise direction. When the distance between pipe centerline to ground surface grade is greater than four (4) feet, valves shall have valve stem extensions standing within six (6) inches of ground surface grade.

4.3. All valves, bends, tees, crosses and dead ends shall be restrained by a Mechanical restraint system. Use concrete Gravity blocks when instances warrant such installations. Gravity blocks shall be “poured-in-place” concrete having a minimum compressive strength of three thousand (3,000) PSI after twenty-eight (28) days of cure time. Thrust blocks will not be allowed unless specifically approved by SID.

4.4. All materials, fittings and appurtenances intended for use in pressure pipe systems shall be designed and constructed for a minimum working pressure of one hundred fifty (150) PSI unless the specific application dictates a higher working pressure requirement.

4.5. Standard pressure three (3) inches diameter and larger pipefitting shall be ductile iron conforming to AWWA C110, or AWWA C153 (short body) with mechanical joints unless flanged or restrained joints are required. Gray cast iron fittings are not allowed. Ductile iron fittings shall be coated with Protecto 401. Mechanical joint fittings, twenty-four (24) inches and smaller shall be rated for three hundred fifty (350) PSI. Flanged joint fittings twenty-four (24) inches shall be rated for two hundred fifty (250) PSI working pressure. All fittings thirty (30) inches and larger shall be rated for two hundred fifty (250) PSI working pressure. When sizes are less than three (3) inches diameter, fittings shall be suitable for the pipe material and application. Glands for mechanical joint fittings shall be ductile iron, and tee bolts and nuts shall be Cor-Ten steel. Only bolt systems furnished by the manufacturer for mechanical joints are acceptable; nuts and bolts shall be new, not reused. Pipe gaskets shall be new as supplied by the pipe manufacturer. All flanges shall be ductile iron Class 125, ANSI B16.1. Full face, one eighth (1/8) inch thick black neoprene flat faced gaskets shall be used on all flanged joints. All joints shall conform to AWWA C111. Bolts, nuts and washers for flanges shall be hot dip galvanized.

5. AIR RELEASE VALVES

5.1. Shall meet AWWA C512, latest revision. Body, cover and baffle material shall be cast iron or ductile iron conforming to ASTM A126 or A536. Float and trim material shall be stainless steel. Resilient seat material shall be chloramines resistant. Air release valves shall have a minimum 3/32” orifice for a minimum working pressure of 150 psi. Valve inlet and outlet shall be threaded. Combination Air/Vacuum Valves are typically used. Except where otherwise specified, interior ferrous surfaces, exclusive of stainless steel surfaces, of all valves shall be coated with two-part thermosetting epoxy coating or fusion bonded epoxy coating. Flange faces of valves shall not be epoxy coated. Exterior surfaces shall be coated with a primer. The epoxy shall be suitable for use in potable and reclaimed water.

6. CONSTRUCTION

6.1. Construction and testing shall be the same as for water mains, but no disinfection is required.

WASTEWATER PUMPING/ LIFT STATIONS -- DESIGN

1. TYPE

1.1. The standard wastewater lift station shall be a below grade installation with submersible pumps. All stations shall be designed for four hundred eighty (480) volt, three (3) phase, sixty (60) cycle electric service if available. In no case will service voltage less than two hundred forty 240 be approved. The use of phase converters is not acceptable.

1.2. All stations shall have a lightning arrestor, phase monitor, PLC/telemetry system, antenna, grounding system and surge suppressor.

1.3. Grinder pumps are not acceptable for SID owned, SID-operated or SID-maintained stations.

2. PUMPS

2.1. Two (2) or more pumps are required. When peak flow exceeds five hundred (500) gpm, three (3) pumps are required. When two (2) pumps are provided, each shall be capable of handling the anticipated maximum flow with the same capacity. The pumps shall rest in self-seating bases. The pump and impeller shall pass a minimum of three (3) inches of solids, and all fixtures and fasteners, including guide rails and brackets shall be of 316 stainless steel. SID requires Flygt pumps except in special conditions where EMU or Ebara may be approved.

2.2. Projects constructed in phases will be allowed only at the discretion of SID. When projects are constructed in phases, master lift stations that will have minimal flows for a considerable time shall be equipped with temporary pumps with reduced capacity as approved by SID.

3. CONTROLS

3.1. Control voltage shall be one hundred twenty (120) VAC, except for floats, which shall be twenty-four (24) VAC. The PLC/RTU panel, PLC, and radio telemetry system shall have 316 stainless steel enclosures, rated NEMA 4X with quarter-turn quick releases latches and 316 SS sun shields. The manual high-level override system and the automatic “LEAD-LAG” alternating control system shall be controlled with mercury-free weighted polypropylene float switches. The control floats shall be located within the wet well with a 316 stainless steel support rack used to secure additional cabling for each float providing a means of adjusting the actuation point of each float. The floats shall be located so that they are not affected by incoming flow or by pump suction vortexes.

3.2. The automatic controls shall include “three (3) position switches” (Hand, Off, Automatic) that control selection for fixed sequences or automatic alternation for the pumps. There shall be a low-level alarm float, a low-level stop float, a “LEAD” float, a “LAG” float and a high-level alarm float, all of which are inputs to the PLC for the sequential and alternating controls. Two (2) additional floats shall be provided for each additional pump installed. There shall also be a high-level back-up float connected to a timer and relay in the power and control panel for overriding the automatic controls and starting both pumps. In the high-level override mode, the pumps shall be cycled by the high-level back-up float with additional shutdown protection from the four hundred eighty (480) VAC phase monitor, the starter overloads, and the motor high temperature switch.

3.3. An audible high-level alarm with a local silence push button, in addition to a high level red flashing warning light, shall be provided.

4. TELEMETRY SYSTEM

4.1. An emergency alarm and status reporting radio telemetry that is an integral part of the programmable logic controller (PLC) for the lift station shall be provided. The PLC/telemetry system shall be in a common NEMA 4X 316 stainless steel panel with 316 stainless steel sun shields, and equipped with one quarter (1/4) turn latches. The radio modem, the Prosoft communications module (interfacing the radio modem with the Allen-Bradley PLC DH+ network), the complete PLC system with all the twenty-four (24) VDC I/O modules, output interposing delays, field interfacing and interconnection terminal blocks, power supplies, one hundred twenty (120) VAC uninterruptible power supply (UPS), the one hundred twenty (120) VAC phase monitor and surge protectors will all be placed in the common panel.

4.2. The radio telemetry system shall include spread spectrum transceiver(s) to interface with the Prosoft-to-PLC module and then directly to the existing SID central unit (or existing stations that shall be configured as repeaters for direct contact with the existing SID central unit). Each station shall be configurable as a repeater station providing direct communications with the existing SID central unit as additional stations are added.

4.3. A complete antenna tower and antenna assembly shall be provided to provide a line of sight communications with the SID central unit or existing stations that shall be configured as repeaters. The antenna tower system shall include a five (5) ohms maximum grounding system, lightning protection, antenna cable surge protection and a foundation and tower structure rated for one hundred eighty (180) mph wind loading. The monitoring and control points shall be as directed by SID with all central unit software and screen development additions and modifications provided by the Applicant. All development software and logic development required at each lift station for the automatic controls, local controls, radio telemetry interfacing and central unit to the lift station interfacing shall be provided by the Applicant.

4.4. The telemetry system shall be complete in every detail and satisfy all requirements of SID.

5. VALVES & PIPING

5.1. A plug valve is required on the discharge side of each pump. A check valve with outside weighted spring and lever is required between the pump and plug valve. The valves shall be located within a lockable valve vault adjacent to the lift station. A four (4) inch diameter phenolic case pressure gauge with a stainless steel diaphragm and 316 SS, three quarter (3/4) turn shut-off ball valve shall be provided on the discharge line of each pump within the valve vault. Provisions for removal of the gauge for cleaning shall likewise be provided. The discharge lines from each pump shall be ductile iron suitably coated to minimize corrosion.

5.2. An emergency pump connection shall be provided and shall be the same size as the pump discharge piping.

6. WET WELLS & VALVE VAULTS

6.1. Wet wells shall have a minimum six (6) feet inside diameter for two (2) pump stations and ten (10) feet diameter for three (3) pump stations. The effective wet well capacity, or utilized capacity, shall provide a holding period not exceeding a ten (10) minute pump cycle with a maximum six (6) pump starts per hour. The bottom section and slab of the wet well and valve vault shall be a monolithically cast section. The sidewalls and top slab shall be pre-cast in accordance with ASTM C478. Alternative methods for constructing wet well bases will be considered by SID only if the size and depth of the wet well so dictate. The wet well floor shall have a minimum one to one (1:1) slope to the pump intakes. Where continuous operation is important, consideration should be given to dividing the wet well into two (2) sections, suitably interconnected, to facilitate repairs and cleaning.

6.2. Valve vaults shall be sized to accommodate the force main pipe size and associated valves. The bottom floor shall have grout placed at one percent (1%) minimum slope to a two (2) inches diameter PVC trapped drain connected to the wet well. The exterior of all wet wells and valve vaults shall be coated as required for manholes with coal tar epoxy, excluding the above ground exterior portion. The interior of wet wells and valve vaults shall be coated with Mainstay or ThoRoc. Wet wells shall be fitted with a permanently installed fall-through prevention net system that is easily retractable for access to the opening below. This system shall be a “Hatch Safety Net” or approved equal.

7. STANDBY POWER RECEPTACLES

7.1. Standby power receptacles shall be provided on all lift stations to match plugs on the emergency generators. The lift station receptacles shall be one hundred (100) amperes minimum, six hundred (600) VAC, load breaking for through-the-wall panel mounting with a thirty (30) degree angle adapter and a spring-loaded water tight door or receptacle cover. The receptacle and plugs on all four hundred eighty (480) VAC lift stations and generators shall match for four hundred eighty (480) VAC, three (3) phase, three (3)-wire systems with a ground. The receptacles and plugs on all two hundred forty (240) VAC lift stations and generators shall match for two hundred (240) VAC, three (3) phase, four (4)-wire systems with a ground and neutral.

7.2. An example of an acceptable one hundred (100) amperes, six hundred (600) VAC, four (4) pole, four (4)-wire (4P4W) receptacle is Russellstoll, Part No. JRSB1044FR.

8. ENCLOSURES

8.1. Station design shall include unencumbered access and operation ease. Direct vehicle access shall be provided for maintenance purposes. The exterior top of the wet well shall not be more than eighteen (18) inches above the road grade adjacent to the station. All lift stations shall be enclosed with vinyl clad galvanized fencing. Fencing shall be constructed with a minimum ten (10) gauge, chain link fabric, six (6) feet high and with a twelve (12) foot wide gate centered on the wet well or at a location accepted by SID. SID may approve the use of decorative fencing. The interior fenced area, and an additional two (2) feet beyond, shall be covered with eight (8) mil visqueen overlain with a minimum six (6) inches of three quarter (3/4) inch washed rock.

8.2. An easement of sufficient size or deed or right-of-way will be required for the lift station property and/or access road.

9. WATER SERVICE

9.1. Water service shall be provided at all SID owned, operated and maintained lift station sites. A one and one half (11/2) inches service shall be provided that includes a RPZ device and meter, a one and one half (11/2) inches ball valve with hose connection, and a three quarter (3/4) inch hose bib with hose rack, located as directed by SID.

10. PRIVATELY OWNED STATIONS

10.1. Privately owned wastewater force mains and pump/lift stations are discouraged and will not generally be approved within SID. The Owner of a privately-owned force main or pump/lift station is responsible for all maintenance and operation. SID assumes no responsibility for changes in pumping capacity due to decreasing or increasing pressures within the SID force main network at the point of connection.

11. FLOAT SPECIFICATIONS

11.1. The level floats shall be mercury-free, weighted, SPDT, three point five (3.5) amperes minimum at two hundred forty (240) VAC contacts, polypropylene enclosed with fifty (50) feet of SJO extra flexible copper cable, equal to Eco-Float Model GSI-50-NONC.

12. FIELD POWER AND CONTROL PANEL CONTROL DEVICES

12.1. The control devices located in the dead front panel of the power and control panel shall be thirty point five (30.5) mm corrosion resistant, heavy-duty oil tight devices equal to the Cutler-Hammer series F34 for all push buttons, selector switches and pilot lights and ENM Cat. No. T50B2 for the NEMA 4X, one hundred twenty (120) VAC, six (6) digits, not-reset elapsed time meters.

12.2. The motor run lights shall be press-to-test, one hundred twenty (120) VAC transformer type with red glass lens. Each motor shall have a hand-off-auto selector switch with additional contacts for hand and auto position inputs to the PLC.

12.3. There shall be an alternator selector switch at each station for selection of fixed sequences of pump No. 1 LEAD and No. 2 LAG or No. 2 LEAD and No. 1 LAG or automatic alternation. These three (3) modes of operation shall be inputs to the PLC. Additional selector switches and other related items shall be provided as needed, to reflect the same operational philosophy for additional pumps at each station. Note that the schematics and other details supplied in this document reflect a two-pump station. Such details, subject to SID approval, shall be modified as required for additional pumps to reflect the same operational philosophy as shown in the details and described herein.

13. PROGRAMMABLE LOGIC CONTROLLER (PLC)

13.1. Each lift station shall have a PLC for automatic control and monitoring of the system and for direct data network interfacing with the telemetry system radio modem for communications with the SID central unit. The PLC system shall be a modular construction with open architecture programming through SID maintenance computers with development software registered to SID. There shall not be any hard-wired inputs and outputs required to transmit and receive data from the PLC to the telemetry system for communications with the SID central unit. The PLC and telemetry system radio modem shall be in a common 316 stainless steel enclosure with sun shield and shall be networked for data transfer through a Prosoft communications module for the telemetry system.

13.2. Digital PLC input and output modules shall be twenty-four (24) VDC powered from a ten (10) amperes minimum output at twenty-four (24) VDC power supply. All outputs shall have a twenty-four (24) VDC powered interposing relay with DPDT contacts rated for ten (10) amperes resistive and one half (½) HP at two hundred forty (240) VAC. All PLC I/O wiring shall be wired to terminal blocks with two (2) computer printed labels. Each PLC I/O terminal block shall have a computer printed marker on the panel side with the PLC address and on the field side with the device number to which the I/O is connected. The terminals shall be equal to Phoenix Contact UK Series with Type ZBM6-CMS computer printed markers, vertical marked.

13.3. The PLC shall be an Allen-Bradley Rockwell Automation SLC500 Series PLC with a No. SLC 5/03, Part No. 1747-L532 processor as a minimum with a DH+ communications port and an RS-232 which may also be configured for a DH-485 network.

13.4. An additional Allen-Bradley system that is acceptable for the PLC is the Control Logix system configured to communicate with the Prosoft communications module for interfacing with the telemetry system radio modem. The Prosoft communications module shall be a Part No. 3150-MCM with two (2) Modbus Plus configurable ports to interface with the CPU RS232 ports or a Prosoft Part No. MV146-DFCM module with two (2) active serial ports for configuration as Allen-Bradley DFI half/full duplex master/slave communication ports through RS-232, RS-422 or RS-485 connections. The communications module required shall match the communications module at the SID's central unit.

13.5. All configuration and development software required for the PLC and the communications module shall be supplied and registered to the SID. The PLC control and monitoring logic shall be fully annotated with I/O tag names to match the field devices, descriptions of all the logic functions, rung comments with details of the functionality of the section of logic and all other descriptive comments required to clarify the sequences and sections of the logic.

14. EMERGENCY GENERATOR

14.1. An emergency generator shall be provided for every lift station. The generator shall be sized to start and to operate all pumps at the same time under their ultimate flow conditions, as defined by the SID. Generators shall operate on natural gas. Specifications are currently being developed for a natural gas – powered generator.

14.2. The following list of accessories will be part of the generator specifications.

(1) All-weather generator housing with air vents and lockable access doors.
(2) Full instrumentation indicators including oil and water temperature, oil pressure, fuel gauge, engine coolant gauge, engine rpm, volt, amps, and run-time hours.
(3) Emergency shutdown for temperature and oil pressure.
(4) A manufacturer-recommended fuel line check valve
(5) "Raycor" type water separators with two (2) extra filters.
(6) Equipment controls for engine start, throttle, and shutdown
(7) Electric start and one hundred twenty (120) VAC downtime battery charger.

15. SPARE PARTS

15.1. The following minimum spare parts shall be supplied:

(1) All parts recommended as spares on manufacturer's parts list.
(2) Fuses – two (2) of every size.
(3) Dedicated lights – ten (10) of every size.
(4) Lens – two (2) of every color.
(5) Filters – one (1) of each.

16. RECORD INFORMATION

16.1. Record drawings, certified by a Florida Registered Professional Engineer and Professional Land Surveyor, shall be provided for all projects. These drawings shall include appropriate elevations, lengths, stations, and locations, for all facilities and services. Water mains, force mains and reclaimed mains require stationing of all valves, fittings and services separate from sanitary and drainage facilities. Stationing shall start at a connection point, with 0+00, and proceed throughout the project. Changes in direction (such as tees) will require a restart of 0+00 in the new direction. Drawings shall show location of existing facilities where crossed by new facilities. Record information shall show the location of all new facilities relative to established above grade, permanent reference points (i.e. manholes, power poles, structures, etc.). The record drawing information of the new facilities shall be provided to SID in the following format:

- Two (2) sets of prints signed and sealed by the Professional Land Surveyor.
- One (1) complete set in digital format (AutoCad or DXF file and PDF) on CD.
- Files compatible with “Blueprints”, “City View”, “Arc View Online.”

Section 17

WATER AND SEWER GUIDELINES

GUIDELINES - GENERAL

1. GENERAL

1.1. The Seminole Improvement District Minimum Standards (MS) set forth in this document are intended to provide a basis for design and construction for those utilities that come under the jurisdiction of Seminole Improvement District (SID). SID must approve any variations to these MS. Requests to vary the MS must be submitted to SID in writing and in advance of any work performed. It is the intention of SID that the requirements and criteria set forth in these MS shall be applicable in every case where facilities are being constructed, or are to be constructed, and shall be owned and/or operated and maintained by SID. These MS shall also be applicable to any portions of facilities that exist or may lie within public rights-of-way or easements in areas served by SID. These MS are in full compliance with the SID Master Hydraulic Plan (MP). Applicable Federal, State and local laws and regulations shall be considered concurrently with this text.

1.2. The Applicant and/or the Designing Engineer of Record (EOR) is responsible for designing and constructing a complete and cohesive working installation that efficiently interacts with and compliments any existing facilities and does not adversely impact the operation of the existing utility system. SID approval and/or acceptance of plans, specifications, designs, and/or materials does not relieve the Applicant and/or the EOR from this stated responsibility. SID assumes no responsibility for design submittals or for any material specified in those designs. All referenced standards are the latest revisions (such as, but not limited to, the American Water Works Association [AWWA], the American National Standards Institute [ANSI], the American Society for Testing and Materials [ASTM], the National Sanitation Foundation [NSF], the Ductile Iron Pipe Research Association [DIPRA] etc.). SID assumes no responsibility for standards developed by outside agencies. Conflicts arising between these MS and outside agency requirements shall be referred in writing to SID for resolution.

1.3. The water meter is the end point of ownership, operation and water line maintenance for SID. SID shall own fire hydrant mains, fire hydrants, and fire suppression water lines up to and ending with backflow prevention devices unless stated otherwise. SID will not be responsible for maintaining sewer services within private property. SID ownership, operation and maintenance of sewer mains/services shall end at the right-of-way line and/or property line. SID will not operate, maintain or acquire ownership of any on-site wastewater facility that is not constructed to SID MS. Responsibility for these mains or lift stations will reside with the Applicant, unless other agreements are approved. Ownership and maintenance of all facilities within SID boundaries shall be at the discretion of SID.

1.4. The EOR is responsible for securing proper existing utility information, sizing the proposed facilities and preparing plans and specifications all in accordance with these MS and others set forth in the SID MP. SID may apply more stringent or different standards where site-specific conditions warrant. Copies of all design criteria and calculations shall be provided to SID for review.

1.5. All construction plans shall be reviewed and approved by SID. No plan changes shall be made without specific SID concurrence. No construction shall start prior to a pre-construction conference held with a SID Representative in attendance. While SID makes every effort to ascertain whether plans and specifications are in conformance with these MS, it reserves the right to enforce these MS regardless. SID shall be the final interpreter of the intent of the requirements set forth in this document.

2. EASEMENTS

2.1. Easements shall be of sufficient width to guarantee that structures are not placed closer than ten (10) feet to a facility or main. Easements will allow un-hindered access to all such facilities and mains. Easements adjacent and parallel to road rights-of-way shall be at least ten (10) feet wide. Twelve (12) feet easements shall be provided for single mains in open areas. A fifteen (15) feet wide easement will be necessary for mains constructed alongside property lines for single-family type dwellings or through areas not typically accessible. Twenty (20) feet is the minimum easement width when multiple utilities (such as water and sewer) are placed parallel to each other. SID may require wider easements when design conditions warrant. Easements shall be recorded by the Applicant in a manner and at such time as directed by SID. Easements for lift stations shall be sized, reviewed, and approved by SID on an individual basis.

2.2. All work performed under the auspices of these MS shall fully comply with any Well Field Protection Rules, Conservation Ordinances, Comprehensive Plan Requirements and/or Master Plan adopted by SID or enforced through another regulatory agency.

3. OPERATION & MAINTENANCE MANUALS (O&M) / SHOP DRAWINGS

3.1. The EOR shall supply SID with two (2) complete sets of O&M manuals for all electrical, electronic, and mechanical components including, but not limited to, pumps, motors, instrumentation, electrical equipment, telemetry systems, sensors, meters, wiring diagrams, and any other components that comprise the completed and constructed project. An additional O&M manual must be provided for all lift station equipment and installed in the lift station control panel and is in addition to the two (2) sets normally supplied to SID. Two (2) copies of all approved shop drawings for all items being installed for ultimate ownership by SID shall be submitted to SID prior to final transference of ownership to SID. SID reserves the right to request and receive shop drawings for any item at any time during construction**.**

4. OTHER AGENCIES

4.1. The Applicant is responsible for application and procurement of any and all required permits necessary to perform the work. Separate approvals for storm-water systems, road repair and replacement, electrical work, building permits, and any other applicable conditions are also required.

5. EXISTING FACILITIES

5.1. Modification of existing facilities or connecting to existing facilities shall be completed only in the presence of an on-site SID Representative. All connections shall conform to

SID-approved plans and specifications. The Applicant shall be responsible for locating all existing utilities and making corresponding contact with appropriate agencies.

6. EMERGENCY GENERATORS

6.1. The Applicant shall provide permanent emergency generators properly equipped with all appurtenances (electrical cords and lines, batteries, etc.) consistent with the MS. One appropriately sized generator will be furnished for every lift station constructed.

6.2. Provision to ground all generators including cabling and suitable ground rod shall be provided. All generators shall be powered by natural gas, unless otherwise approved by SID. The fuel supply shall be adequate to operate the generator at seventy-five per cent (75%) load for one hundred twenty (120) hours. The generator systems shall include fuel filters, hospital grade mufflers, self-contained electric start, suitable controls, equipment safety protection and other appurtenant items as required by SID.

7. ABOVE-GRADE PIPE PREPARATION AND COATINGS

7.1. All above-grade, non- submerged iron ductile or steel pipe shall be suitably prepared by blasting to a “Near White” as set forth in Steel Structures Painting Council Standard (SSPC-10). All flanges, retaining glands, etc. shall be caulked prior to primer application. If the shop primer coat differs than the following list, then that coating shall be verified compatible with the intermediate and finished coats specified.

7.1.1. PRIMER: Tnemec 90-97 Tnemec, Zinc, with a minimum dry film thickness equal to three point zero (3.0) mils per coat.
7.1.2. INTERMEDIATE COAT: Tnemec Series 66 Hi-Build Epoxoline, with a minimum dry thickness equal to four point zero (4.0) mils per coat.
7.1.3. FINISH COAT: Tnemec Series 73 Endura Shield, with a minimum dry film thickness equal to two point five (2.5) mils per coat.
7.1.4. CLEAR COAT: Tnemec Series 76 Endura Clear, with a minimum dry film thickness equal to one point five (1.5) mils per coat.

7.2. The finish coat color shall match criteria stated in the applicable piping materials sections.

8. BOOSTER PUMP STATION

8.1. Booster pumps shall be subject to SID approval. Telemetry systems shall be compatible with lift station telemetry equipment and shall be “open architecture” designed. Pump operational status and system pressure data shall be telemetered to SID scada systems.

9. CONTRACT SECURITY

9.1. All SID related utility projects will be properly bonded (performance and payment bonds) in an amount equal to one hundred per cent (100%) of the contract price. These bonds shall remain in effect through the warranty period. The warranty period begins on the

day final contract payment is made by SID and ends after three hundred sixty-five (365) days. SID may require a separate maintenance bond in some cases.

9.2. All bonds shall be written by a surety company licensed to do business in the State of Florida as listed in the Department of Treasury Federal Register and countersigned by a Florida resident agent. The surety shall have a rating of "A+" or "A" by Best's Rating Guide.

9.3. S.I.D. may accept other project assurance in lieu of a performance and payment bond.

10. RESTORATION

10.1. The Applicant is responsible for protecting all existing facilities, assets, properties, and appurtenances and will properly restore any and all such items when damaged during construction. Pavement replacement, including curb, gutters and striping shall occur within ten (10) days of the occurrence of the damage, unless otherwise approved by SID.

GUIDELINES - DESIGN

Apply the following guidelines and criteria when making a utility construction plan submission to SID.

1. PLAN SUBMISSIONS

1.1. Submit five (5) signed and sealed sets of utility plans and specifications for approval to SID. Prepare and submit three (3) plan sets on twenty-four (24) inch by thirty-six (36) inch sheets and two (2) plan sets on twelve (12) inch by eighteen (18) inch sheets. Submit all specifications on eight and one half (8-1/2) inch by eleven (11) inch sheets. Plans and specification sheets shall be bound. Scaling smaller than "one inch equals fifty feet" (1 inch = 50 feet) is not acceptable without prior SID approval. Vertical profiles scales shall be one-tenth (1/10) the horizontal profile scales.

1.2. The items listed below must also be included in any utility plan and specification submittal to SID. SID final plan approval will not be issued unless all of the following listed items are included or accounted.

- One (1) approved a site plan
- Two (2) preliminary plats or re-plats showing easements and dedication language
- Two (2) signed and sealed EOR cost estimates
- One (1) set of paving, grading & drainage plans
- One (1) set of the Palm Beach County Fire Marshall's approved plan (if applicable)
- One (1) fire sprinkler Plan (if applicable)
- One (1) "Master Plan" for multi-phase projects (if applicable)
- Cover sheet(s) with relevant location map(s)
- Lift station calculations that include buoyancy and pump data
- Fire flow, sewer and restraint calculations
- Two (2) Florida Department of Environmental Protection (FDEP) "Preliminary Permit forms with attachments (if applicable)
- Two (2) Health and Rehabilitative Services (HRS) permits

1.3. Phase and match lines must be clearly shown.

1.4. Standard SID details will be used unless otherwise approved by SID.

1.5. All applicable detail drawings will be included.

1.6. All submitted drawings must be neat and legible conforming to acceptable drafting standards. Record all revisions in the plan sheet “Revision Block”.

1.7. A Florida Registered Professional Engineer, registered in the appropriate discipline, shall sign and seal each set of plans. Each set of submitted plans will include supporting calculations and applicable permit applications.

1.8. Plan specifications not meeting the criteria set forth in this MS will not be approved. SID must approve any variations that do not conform to the MS.

1.9. Designing water mains under storm drains, drainage ditches or sewers should be avoided.

1.10. Over” and “Under" shall be used to indicate conflicts with existing utilities.

1.11. Profile all gravity sewer mains and indicate all crossings. SID may require off-site water and force main profiles.

1.12. Gravity sewer data, including manhole inverts, rim elevations, and distances between manholes will be included on both profile and plan sheets.

1.13. Avoid designing facilities beyond road rights-of-way since these constructs will require easements.

1.14. Design manholes and sewer mains to lie within paved areas. Outside paved areas, manholes shall have concrete collars.

1.15. Avoid placing water mains and force mains under pavement where possible.

1.16. “Inside” manhole drops greater than two (2) feet are not allowed. Manhole drops greater than two (2) feet require an “outside” drop design.

1.17. Use the American Water Works Association AWWA Publication “M22”, Sizing Water Service Lines and Meters, as a guideline for meter specification, line sizing and service requirements. Specifically address all meter and service line requirements and provide supporting calculations and historical data.

1.18. Specify details for all connections to existing facilities.

1.19. All hydraulic calculations must be provided with lift station submittals.

1.20. All material specified to be installed should be new and unused except as approved by SID.

1.21. Water mains shall be extended across the full width of the property frontage. Exceptions to full frontage extension shall be considered when all the criteria listed below are applicable:

1.21.1. Fire protection is not requested or required by the applicable Fire Marshall.

1.21.2. A fire hydrant is not more than 500 feet as the hose lies from the proposed structure.

1.21.3. There are no existing water mains within 100 feet of each end of the property along the property frontage.

Section 18

WATER AND SEWER INSPECTION AND ACCEPTANCE

INSPECTION REQUIREMENTS

1. No work shall be covered until observed and approved by a Representative of the SID.

2. The SID Representative may inspect all construction and materials and may also inspect preparation, fabrication or manufacture of components, materials and supplies. The inspector is not authorized to revoke, alter or waive any requirements of the specifications, but is authorized to advise the Applicant or Applicant Representative of any observed failure to conform to the plans or specifications. Failure of the inspector to advise the Applicant or Applicant Representative of any item not in conformance to the plans and specifications shall not constitute acceptance of the item. The inspector shall have the authority to reject materials or suspend the work. Advice given by the inspector shall not be construed as binding upon SID.

3. Inspections will be scheduled only during regular working hours only, except for nights when service interruptions are involved. Work will not be scheduled for weekends or holidays. SID shall be provided with at least two (2) full working days' notice for scheduled inspections. SID must grant any exceptions in writing.

4. SID Representatives and/or Inspectors are authorized to visit the project at any frequency or time determined by SID. Inspections shall include, but are not limited to, such items as restraints, valve locations, jacking and boring, directional boring, materials on site, clearances between conflicting lines, or any other aspects involved in the bid project. Scheduled inspections are also required for jack and bore, wet well installation, lift station startups, leakage tests, pressure tests, and any facet involving any existing SID facility that is to be modified.

5. It shall be the Applicant's responsibility to schedule inspections. The Applicant or the Applicant's qualified Representative must be present at all scheduled tests and inspections. A scheduled inspection will be cancelled if the Applicant or Applicant's Representative is not present. The Applicant shall pretest water, force and reclaimed water mains and gravity sewers to minimize the need for additional inspections.

6. The Applicant shall be allowed one (1) scheduled test and one (1) scheduled re-test at no cost to the Applicant for the SID inspector to be present. When additional tests are required, SID will bill the Applicant for the SID Inspector and/or Representative.

7. The Applicant shall be solely responsible for site safety.

PROJECT ACCEPTANCE

1. No facilities shall be put into use until accepted by SID unless approved in writing by SID. SID requires the following items completed prior to acceptance.

    1.1. Signed and sealed record drawings are received and accepted.
    1.2. Final Release of the project by Palm Beach County Health Department (PBCHD) and Florida Department of Environmental Protection (FDEP).
    1.3. The Project's final punch list has been completed.
    1.4. Owner provides a Release of Lien stating all items conveyed to SID are free and clear from liens.
    1.5. One (1) copy of plat with recorded easements is received.
    1.6. Two (2) Operation and Maintenance Manuals have been received and accepted and one (1) has been placed in the lift station panel (if applicable).
    1.7. Copies of all testing (Bacteriological, Densities, Pressures, etc.) results are received.
    1.8. Contracts for service are executed.
    1.9. All other jurisdictional agencies are satisfied.
    1.10. All outstanding charges and fees have been paid.
    1.11. The following documents have been executed and reviewed and accepted by SID.

        1.11.1. Florida Department of Health "Final Release of Water & Sewer Systems"
        1.11.2. Warranty
        1.11.3. Payment Affidavit
        1.11.4. Bill of Sale, Absolute
        1.11.5. Record cost summary
        1.11.6. Grant of Easement (where applicable)
        1.11.7. Legal Description
        1.11.8. Maintenance Bond (where applicable)
        1.11.9. Hold Harmless (where applicable)
        1.11.10. Engineer's Certification
        1.11.11. SID Review and Inspection for Release of Water & Sewer
        1.11.12. Samples of the above are included herein where appropriate
        1.11.13. "Hard- Cost" related to construction contractor materials and installation specifically <u>itemized</u> for potable water main construction, reuse water main construction, and force main construction <u>within collector roads</u>.
        1.11.14. "Soft – Cost" related to design, permitting, and testing by EOR, testing lab, geotechnical consultant, etc. specifically <u>itemized</u> for potable water main construction, reuse water main construction, and force main construction <u>within collector roads</u>.

WARRANTY

Date:

To:
Address:
City State Zip

PROJECT NAME

WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEMS

To whom it may concern:

_____(Owner/Developer) a Florida corporation, hereby warrants the water distribution and wastewater collection system for the project known as "_____", as recorded in Plat Book ___, Pages _____ (or as described in the attached Exhibit "___"), Public Records of Palm Beach County, given to Seminole Improvement (SID), against defective materials or workmanship to the extent required by the policy established by SID as of the date hereof, as follows:

_____(Owner/Developer) a Florida corporation agrees to be responsible for the repair of any defect in materials or workmanship for a period of one (1) year from the date of acceptance of said systems by SID for permanent service for water distribution and wastewater collection systems as described in Exhibit "___" attached hereto and made a part hereof, and agrees to cause any of said repairs to be made upon proper notification provided such notification is received by _____ on or before _____, (day, month & year), after which date this warranty shall terminate and be of no further force and effect.

Sincerely yours,

COMPANY

BY: _____
NAME AND TITLE

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PAYMENT AFFIDAVIT

STATE OF FLORIDA

SS:

COUNTY OF PALM BEACH

Personally appeared before me, the undersigned authority _____ who being by first duly sworn, on oath, deposes and says:

1. That _____ (name) is the _____ (title) of _____, a Florida corporation.

2. That _____, a Florida corporation, is the Land ***Developer*** of that project known as "_____, as described in the attached Exhibit "___" or as recorded in the Plat Book ___, Pages _____ Public Records of Palm Beach County.

3. To the best of Affiant's knowledge and belief all labor and materials furnished and used in connection with the construction of the water supply and sewage disposal facilities described in Exhibit "___" attached hereto and made a part hereof, which were installed within the "dedicated roadways" and "utility easements" depicted on the construction plans for the Project's water supply and sewage disposal facilities, have been paid for in full and that there are no unpaid bills for labor performed or materials furnished as to said construction.

4. That Affiant, to the best of his/her knowledge and belief, does not know of any person, firm or corporation who has or claims to have any lien for said labor performed or materials furnished.

5. Affiant makes this Affidavit to induce SEMINOLE IMPROVEMENT DISTRICT to accept a Bill of Sale for said water supply and sewage disposal facilities.

AFFIANT FURTHER SAITH NAUGHT.

_____

Developer's NAME & TITLE

Sworn to and subscribed before me this _____ day of _____, (month & year), by _____, who is personally know to me or has produced _____ as identification.

_____
Signature Notary Public State of Florida

_____
Print Name – Notary

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BILL OF SALE, ABSOLUTE

KNOWN ALL MEN BY THESE PRESENTS, that _____, a Florida corporation of Palm Beach County, Florida, party of the first part, for an in consideration of the sum of Ten and No/100 ($10.00) lawful money of the United States, to it paid by SEMINOLE IMPROVEMENT DISTRICT, a political subdivision of the State of Florida of 4001 Seminole Pratt-Whitney Road, Loxahatchee, FL 33470, party of the second part, the receipt whereof is hereby acknowledged has granted, bargained, sold, transferred and delivered, and by these presents does grant, bargain, sell, transfer and deliver unto the said party of the second party, its executors, administrators and assigns, the following goods and chattels:

Water distribution and sewage collection system consisting of those components set forth within "_____, as described in the attached Exhibit "___", hereto; all as is and located within the property described as _____ as recorded in Plat Book ___ Pages _____ Public Records of Palm Beach County and made a part hereof

TO HAVE AND TO HOLD THE SAME UNTO THE SAID PARTY OF THE SECOND PART, ITS EXECUTORS, ADMINISTRATORS AND ASSIGNS FOREVER.

AND, it does, for itself and its successors and assigns covenant to and with the said party of the second part, its successors and assigns, that it is the lawful owner of the said goods and chattels; that they are free from all encumbrances; that it has good right to sell the same aforesaid, and that it will warrant and defend the sale of the said property, goods and chattels hereby made, unto the said party of the second part its successors and assigns against the lawful claims and demands of all persons whomsoever.

IN WITNESS WHEREOF, it has hereunto set its hand and seal this _____ day of ____, 20__.

Signed, sealed and delivered
in the presence of:
_____, a Florida Corporation

WITNESSES:

_____ _____
Signature Name and Title

_____
Print Name

_____ [Corporate Seal]
Signature

_____
Print Name

The foregoing instrument was acknowledged before me this _____ day of _____, (month & year), by _____, as _____ (title) of _____, a Florida corporation. This person is personally known to me or has produced _____as identification.

_____
Signature Notary Public State of Florida

_____ (Notary Stamp)

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RECORD COST SUMMARY

ITEMIZED MATERIALS COST
EXHIBIT ""
Project Name & Project No.

ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
WATER:				
`	**Total:**			**$**
SEWER:				
RECLAIMED WATER:				
	Total:			**$**
TOTAL WATER, SEWER & RECLAIMED WATER				**$**
ENGINEERING & SURVEYING				
SUBTOTAL				

Engineer's Name
Address
CityStateZip
Telephone Number & Fax

Engineer
Florida Registration Number
Date

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GRANT OF EASEMENT

THIS EASEMENT, executed this _____ day of _____ by _____ with offices at _____ (hereinafter referred to as the "GRANTOR"), Seminole Improvement District, an independent special 298-District , having their principal place of business at 4001 Seminole Pratt-Whitney Road, Loxahatchee, Florida 33470 (hereinafter referred to as "GRANTEE").

W I T N E S S E T H:

GRANTOR, for and in consideration of the sum of Ten Dollars ($10.00) and other good and valuable considerations, as well as for the undertakings by the GRANTEE as hereinafter provided, the receipt and sufficiency of which is hereby acknowledged, has and by these presents does hereby grant and convey to GRANTEE an exclusive easement for the purposes of installing and maintaining utilities on, in, over, and under the following described real property attached hereto and incorporated herein as Exhibit "A".

Said exclusive easement shall be used by GRANTEE for access to, and further for use by GRANTEE for the construction, operation, and maintenance of a wastewater/sewage collection system, and/or the construction, operation and maintenance of a potable water distribution system, and removal of the equipment, pipes, mains, pumps, lift stations, and machinery from time to time placed on or under said easement, and to excavate ditches or trenches for the location and placement of such wastewater/sewage collection system, and/or such potable water distribution system as may be necessary for the construction, operation, and maintenance of such system or either system, and any lateral or necessary connection lines, pipes, or mains.

The GRANTOR, its successors and assigns, shall not plant any plants (other than grass) or build any structure in the easement area unless approved by GRANTEE. The GRANTOR, its successors, and assigns shall be responsible for maintaining all grass and all other permitted plans and structures within the easement without recourse to the GRANTEE.

GRANTOR does hereby fully warrant the title to said land and will defend the same against the lawful claims of all persons whomsoever claimed by, through, or under it, that it has good right and lawful authority to grant the above-described easement, and that the same is unencumbered. Where the context of this Easement Agreement allows or permits, the same shall include the successors or assigns of the parties.

GRANTOR agrees to provide for the execution of a joiner and non-disturbance agreement by any and mortgagees or lienors of mortgages or liens encumbering this easement.

This Easement shall be binding upon and shall inure to the benefit of the respective parties, their successors or assigns and grantees.

This Easement shall be governed by the laws of the State of Florida as now and hereafter in force. The venue of any litigation arising out of this Agreement shall be exclusively in Palm Beach County, Florida.

IN WITNESS WHEREOF, the undersigned has signed and sealed this document on the day and year first above written.

Signed, sealed and delivered in the presence of:

Witnesses: _____

_____ By_____

_____

STATE OF FLORIDA
COUNTY OF PALM BEACH

The foregoing instrument was acknowledged before me this _____ day of (month & year) by _____ as _____ of _____, who is personally known to me or who has produced _____ as identification, and who did take an oath.

_____
Notary Public, State of Florida

Print Name: _____

LEGAL DESCRIPTION

The Plat of _____ as recorded in Plat Book _____ Page ____ through ____, Public Records, Palm Beach County, Florida.

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MAINTENANCE BOND

BOND # _____

KNOW ALL MEN BY THESE PRESENTS, that we _____as Principal, and _____ as Surety are held and firmly bound into the Seminole Improvement SID, Florida as Obligee, in the penal sum of_____ ($_____) to which payment will and truly be made we do bind ourselves, our and each of our heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

WHEREAS, the said Principal entered into an Agreement pertaining to the Installation of Required Water and Sewer Improvements with the Seminole Improvement District dated _____; and

WHEREAS, said Agreement provides that the Principal will furnish a bond covering the guarantee obligations for the period of one (1) year after the acceptance by SID of the project; and

WHEREAS, the said Agreement has been completed, and performance accepted, on the _____ day of _____, (month & year).

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that, if the principal fails at any time during and up to the _____ day of _____, (month & year) to cure all defects in workmanship or materials in the said work, pay all costs and expenses in connection therefore, and reimburse the SID for all losses, damages, expenses, costs and attorneys' fees, including appellate proceedings, that the SID sustained because of a default by Principal under the said Agreement or guarantee, then the Surety shall undertake to do same immediately or, instead, shall pay to the SID, when requested in writing by the SID, a sum designated by the SID to be sufficient for the SID to undertake to cure such defects (such sum to include the cost of a competitively bid contract to cure such defects, and the SID's administrative and consultative costs in preparing, and advertising for, such Contract), pay such expenses, or reimburse the SID for all losses, damages, expenses, costs, and attorneys' fees, including appellate proceedings, that the SID sustained because of a default by Principal under the said Agreement or guarantee. This bond shall remain in effect until released in writing by the SID.

The liability of the Surety shall at no time exceed the penal sum of the bond, and shall not be construed as being annually cumulative.

SIGNED, SEALED, AND DATED: _____

(Principal)	(Surety)
Name	Name
By: _____	By: _____
Date: _____	Countersigned by: _____

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HOLD HARMLESS

TO: Seminole Improvement SID
4001 Seminole Pratt-Whitney Road
Loxahatchee, FL 33470

RE: _____
_____
_____

In consideration of the Seminole Improvement District ("SID") for allowing the (description of matter in question), the Name of Company ("Company or Property Owner") accepts the following:

The "Company or Property Owner" hereby agrees to hold the SID harmless for any damage that the SID may cause to the (property at hand), in the event, the SID would need to perform work in these easements. This includes any damage done as a result of (type of work done on property) and "Company or Property Owner" agrees to repair or replace (the property) at the Company's or Property Owner's expense.

ACCEPTED AND ACKNOWLEDGE:

BY: _____
PRINT NAME: _____
TITLE: _____

NOTARY CERTIFICATE

STATE OF FLORIDA
PALM BEACH COUNTY

The foregoing instrument was acknowledged before me this _____ day of _____ (month & year), by _____ as _____ of _____, who is personality know to me or has produced _____ as identification.

_____ Notary Stamp
Notary Signature

ENGINEER'S CERTIFICATION

Project Name
Project Engineer

As a registered Engineer in the State of Florida, to the best of my knowledge, information, and belief, it is my professional opinion that the required improvements for _____, *(Project Name, Project Engineer and Project Number)* based on field reviews under my responsible charge, have been constructed in substantial accordance with the approved SID construction plans and the Manual of Standards for Water Distribution and Wastewater Collection/Transmissions and Reclaimed Water Systems of the Seminole Improvement District, Florida, in effect on the date of plan approval.

Attached, as itemized below, are: Copies of measurements and tests made on the work and materials during the progress of construction and a "Record Drawing" copy of each of the construction plans, showing the original design in comparison to the actual finished work with all material deviations noted thereon.

In my professional opinion, the deviations noted will not impair the intended functioning of the constructed improvement. Attachments to this completion statement are as follows:

1.) Density tests by: _____ Company Name _____

2.) Record drawing info by: _____ Company Name_____

By: _____
Engineer's Name & Title

Date: _____

ba/projagenda/legaldocs

Seminole Improvement District
REVIEW & INSPECTION FOR RELEASE OF
THE WATER, WASTEWATER AND/OR RECLAIMED WATER SERVICE

Date

PROJECT:
WATER PERMIT NO.: _____
SEWER PERMIT NO.: _____

The Seminole Improvement District has conducted a conditional final review and inspection of the Water, Wastewater and/or Reclaimed water service facilities for the above referenced project. We have received record drawings and final Engineering certification documents and are releasing the system for usage.

However, before final project release, an additional Water and Sewer inspection will be conducted in conjunction with the other applicable final inspection. This inspection will cover, but is not limited to, reflective pavement markers (RPM), fire hydrants, gate valves, manhole rings and covers, concrete collars, etc.

cc: Engineer of Record

ba/projagenda/legaldocs

NOTICE OF COMPLIANCE
WITH CHAPTER 556, FLORIDA STATUTES

The undersigned Contractor does hereby confirm to the Owner, Engineer of Record, and the Seminole Improvement District-District Engineer that the Contractor has reviewed the provisions of Chapter 556, Florida Statutes, and has provided to "Sunshine 811." the information required under F.S. 556.105 before the commencement of any excavation or demolition required for the Work.

Executed this _____ day of _____, 20_____.

_____
(Name of Contractor)

_____
(Signature)

_____
(Print Name)

_____
(Title)

Section 19

WATER AND SEWER APPROVED PRODUCT LIST

1. **DUCTILE IRON PIPE**

	Pipe Size	Special Thickness Class
1.1. Water *(Push-on or Restrained)*:		
	4" to 12"	Pressure Class 350, minimum
	14" to 36"	Pressure Class 250, minimum
Fire Lines:	3" & up	Special Class 53

Pipe must be Cement Lined IAW AWWA C104

1.2. Force Main (Push-on or Restrained):		
	4" to 12"	Pressure Class 350, minimum
	14" to 36"	Pressure Class 250, minimum

Pipe shall be internally coated with Protecto 401

1.3. Gravity Main (Push-on or Restrained):		
	4" to 12"	Pressure Class 350, minimum
	14" to 36"	Pressure Class 250, minimum

Pipe shall be internally coated with Protecto 401

1.4. Flanged Piping: All sizes – Special Class 53

2. **POLYVINYL CHLORIDE (PVC) PIPE**

2.1. Water & Force Main:	4" to 12" - AWWA C-900 SDR 18
	14" to 36" - AWWA C-905 SDR 25
2.2. Gravity Main:	4" to 15" - ASTM D 3034 SDR 26
	18" & up - ASTM F 679 (T-1 wall thickness)

3. **MECHANICAL JOINT AND FLANGED FITTINGS** (AWWA/ANSI)

3.1. Tyler/Union

3.2. American

3.3. U.S. Pipe

Fittings must be Ductile Iron and Cement Lined IAW AWWA C-153 for water and Protecto 401 internally coated for wastewater.

4. **MECHANICAL JOINT PIPE AND FITTING RESTRAINTS**

4.1. U.S. Pipe Field Lok

4.2. American DIP Lok-Fast

4.3. EBBA Iron Mega Lug

5. **FIRE HYDRANTS**

5.1. American No. B84B

5.2. Clow Medallion

6. **RESILIENT SEAT GATE VALVES**

6.1. Mueller-Sure Seal

6.2. Kennedy

6.3. American

6.4. M & H (Dresser)- Style No. 3067

6.5. U.S. Pipe

6.6. Clow

7. **PLUG VALVES**

7.1. Dezurik

7.2. Henry-Prott

7.3. Clow

7.4. Kennedy

7.5. Homestead

8. BUTTERFLY VALVES- 14" AND LARGER

8.1. Henry-Prott

9. **TAPPING SLEEVE AND VALVE - MECHANICAL JOINT** (DIP)

    9.1. American -1004 Series

    9.2. Clow -5205

    9.3. Mueller - H-615 Series

    9.4. M & H -1174

10. **TAPPING SLEEVE** (Stainless Steel or Epoxy Coated only)

    10.1. JCM #432 (stainless) or #412 (epoxy)

    10.2. Rockwell #622 (epoxy)

    10.3. Romac - SST

11. **CORPORATION - BALL VALVE**

    11.1. Ford -FB1000 (1100)

    11.2. McDonald 4704B-22

12. **CURB STOP - BALL VALVE WITH LOCKING WING**

    12.1. Ford - B11-333

    12.2. McDonald - 6101W

13. **U - BRANCH**

    13.1. Ford - U48-43

    13.2. McDonald - 08U2M

14. **SERVICE SADDLES** (Double Strap Brass Only)

    14.1. Ford - 202B

    14.2. McDonald - 3286

15. **POLYETHYLENE TUBING** (PE 3408 IAW AWWA C901, SDR9)

    15.1. Driscoplex

15.2. Isco

16. **ELECTRONIC MARKER**

16.1. Scotchmark Electronic Markers (3M) No. 1252 (Blue)

17. **VALVE BOXES**

17.1. Tyler (6850 Series)

18. **MANHOLE FRAME AND COVER**

18.1. U.S. Foundry 420-C-ORS Series Ring

18.2. Neenah R-1788-D Ring with Type A or B Self Sealing Lid

18.3. U.S. Foundry 465-B-ORS Ring with Type A (4" only) (Requires case by case approval)

19. **CONFLICT AND AIR RELEASE MANHOLE FRAME AND COVER**

19.1. U.S. Foundry 663-AB-M

19.2. Neenah R-1740-D2

20. **MANHOLE ADJUSTING RINGS** (Max. 4" on existing structures only)

20.1. U.S. Foundry Adjusting Ring - Type A

20.2. U.S. Foundry Adjusting Ring - Type B

20.3. Neenah R-1979 Series

21. **MANHOLE INFLOW PROTECTORS** (to be furnished on a case by case basis)

21.1. Southwest Packing & Seals Inc. - Rainstopper PBC-1

21.2. L.F. Manufacturing Inc. Rain Guard LFN-SV

21.3. Parsons

22. **SANITARY GRAVITY MAIN TAPPING TEE**

22.1. Genco “Sealtite” Wastewater Pipe Saddle

22.2. Inserta Fitting Co.

23. **MARKING TAPE FOR WATER, AND FORCE AND REUSE MAINS** (Mylar tape 6" wide/2" lettering)

24. **PAINT SPECIFICATIONS FOR UNDERGROUND CONCRETE STRUCTURES** (All Exteriors & Manhole Interiors)

    24.1. Kop-Coat- 300M

    24.2. Florida Liners Protectar 150

    24.3. MAB Coal Tar Epoxy

    24.4. Tremec Coal Tar Epoxy

25. **PAINT SPECIFICATIONS FOR WET WELL AND VALVE VAULT INTERIOR**

    25.1. Mainstay - ML-72 & DS-5

    25.2. ThoRoc - Sewerguard HBS 100

26. **AIR RELEASE VALVES - 1" MINIMUM** (Water)

    26.1. Val-Matic - VM-22

    26.2. Apco - Model 200

    26.3. Crispin

27. **AIR RELEASE/VACUUM VALVE - 2" MINIMUM** (Wastewater)

    27.1. Val-Matic - VM-301-S

    27.2. Apco - Model 401

    27.3. Crispin SIOASB

28. **HDPE PIPE STIFFENERS** (Used with HDPE Pipe)

    28.1. Smith-Blair Inc.

    28.2. Romac

29. **CASING SPACERS**

    29.1. Cascade Waterworks (Stainless Steel)

29.2. PSI - Model CBG-2

29.3. APS Spacing Systems

30. **PAINT SPECIFICATIONS FOR EXPOSED DUCTILE IRON PIPE**

30.1. Water Mains -TNEMEC Safety ***Blue***

30.2. Fire Lines and Hydrants - TNEMEC Safety ***Red***

30.3. Force Mains - TNEMEC Safety ***Green***

30.4. Reuse Mains - *Pantone Purple 522C*

31. **BACKFLOW DEVICES - USC APPROVED**

31.1. Febco - 825-YS

31.2. Ames – Silver Bullet

32. **WATER METERS**

32.1. Invensys (Sensus)

33. **OS & Y VALVES**

33.1. Invensys (Sensus)

34. **LIFT STATION PUMPS**

34.1. Flygt

34.2. Emu

34.3. Ebara

Section 20

DIRECTIONAL DRILLING

1. SCOPE

1.1. General

It is the intent of this specification to define the acceptable methods and materials for installing sanitary sewer and water mains by the horizontal directional drilling method and the requirements for high density polyethylene (HDPE) pipe installed by directional drilling or in open cut trenches.

1.2. Installation Plan

1.2.1. At least seven (7) days prior to mobilizing equipment Contractor shall submit his detailed installation plan to the Engineer. The plan shall include a detailed plan and profile of the bores and be plotted at a scale no smaller than 1 inch equals twenty (20) feet horizontal and vertical.

1.2.2. The plan shall also include a listing of major equipment and supervisory personnel and a description of the methods to be used.

1.3. Variations In Plan or Profile

The Contractor may request changes to the proposed vertical and horizontal alignment of the installation and the location of the entry and exit points. Proposed changes shall be submitted in writing to the Engineer of Record and received approval of the Engineer of Record prior to construction.

1.4. Alignment

The proposed plan and profile installation locations are based on alignments to accommodate acquired easements, to avoid obstructions, and to properly maintain operation flow velocities.

1.5. Qualifications

Directional drilling and pipe installation shall be done only by an experienced Contractor specializing in directional drilling and whose key personnel have at least five (5) years experience in this work. Furthermore, the Contractor shall have installed directionally drilled pipe at least as large as 20 inches in diameter, have performed crossings at least 2,000 feet in length, and successfully installed at least 100,000 feet in length.

2. MATERIALS

2.1. General

High density polyethylene pipe shall be used in Horizontal Directional Drilling (HDD) installations. All piping system components shall be the products of one

manufacturer and shall conform to the latest edition of ASTM D1248, ASTM D3350, and ASTM F714.

2.2. Piping and Bends

Piping and Bends shall be extruded from a polyethylene compound and shall conform to the following requirements:

2.2.1. The polyethylene resin shall meet or exceed the requirements of ASTM D3350 for PE 3408 material with a cell classification of 335434C, or better.

2.2.2. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black, well dispersed by pre-compounding in a concentration of not less than two (2) percent.

2.2.3. The maximum allowable hoop stress shall be 800 psi at 73.4 degrees F.

2.2.4. The pipe manufacturer shall be listed with the Plastic Pipe Institute as meeting the recipe and mixing requirements of the resin manufacturer for the resin used to manufacture the pipe in this project.

2.2.5. The pipe and bends shall have a minimum standard dimension ratio (SDR) wall thickness as specified by the Engineer of Record.

2.2.6. Joining shall be performed by thermal butt-fusion in accordance with the manufacturer's recommendations.

2.2.7. Sanitary sewer pipe exterior shall be green in color or contain green striping. Sanitary sewer pipe interior shall be light in color for internal video inspection.

2.2.8. Water pipe exterior shall be blue in color or contain blue striping.

2.3. Procedures

2.3.1. General

All polyethylene pipe shall be cut, fabricated, and installed in strict conformance with the pipe manufacturer's recommendations. Joining, laying, and pulling of polyethylene pipe shall be accomplished by personnel experienced in working with polyethylene pipe. The pipe supplier shall certify in writing that the Contractor is qualified to join, lay, and pull the pipe or representative of the pipe manufacturer shall be on site to oversee the pipe joining. Expense for the representative shall be paid for by the Contractor.

2.3.2. Transportation

Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged.

2.3.3. Storage

Pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature condition. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

2.3.4. Handling Pipe

2.3.4.1. The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at butt-fused joints. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.

2.3.4.2. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section.

2.3.4.3. Waterproof nightcaps of approved design may be used but they shall also be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and will be fastened to the pipe in such a manner that the wind cannot blow them loose.

2.3.4.4. The practice of stuffing cloth or paper in the open ends of the pipe will be considered unacceptable.

2.3.4.5. Where possible, the pipe shall be raised and supported at a suitable distance back from the open end such that the open end will be below the level of the pipe at the point of support.

3. INSTALLATION

3.1. General

3.1.1. The Contractor shall install the pipelines by means of horizontal directional

drilling. The Contractor shall assemble, support, and pretest the pipeline prior to installation in the directional drill tunnel.

3.1.2. Horizontal directional drilling shall consist of the drilling of a small diameter pilot hole from one end of the alignment to the other, followed by enlarging the hole diameter for the pipeline insertion. The exact method and techniques for completing the directionally drilled installation will be determined by the Contractor, subject to the requirements of these Specifications.

3.1.3. The Contractor shall prepare and submit a plan to the Engineer of Record for approval for insertion of the HDPE pipe into the opened bore hole. This plan shall include pullback procedure, ballasting, use of rollers, side booms and side rollers, coating protection, internal cleaning, internal gauging, hydrostatic tests, dewatering, and purging.

3.1.4. The required piping shall be assembled in a manner that does not obstruct adjacent roadways or public activities. The Contractor shall erect temporary fencing around the entry and exit pipe staging areas.

3.2. Joining Pipe Sections

3.2.1. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately prior to joining.

3.2.2. Pipe shall be joined to one another by means of thermal butt-fusion. Polyethylene pipe lengths to be joined by thermal butt-fusion shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier.

3.2.3. Mechanical connections of the polyethylene pipe to auxiliary equipment shall be through flanged connections which shall consist of the following:

3.2.3.1. A polyethylene “sub end” shall be thermally butt-fused to the ends of the pipe.

3.2.3.2. Provide ASTM A240, Type 304 stainless steel backing flange, 125-pound, ANSI B16.1 standard, and gaskets as required by the manufacturer.

3.2.3.3. Stainless Steel bolts and nuts of sufficient length to show a minimum of three (3) complete threads when the joint is made and tightened to the manufacturer’s standard. Retorque the nuts after four (4) hours.

3.2.3.4. Butt-fusion Joining: Butt-fusion of pipes shall be performed in accordance with the manufacturer’s recommendations as to equipment and technique. Butt-fusion joining shall be 100% efficient

offering a joint weld strength equal to or greater than the tensile strength of the pipe.

3.3. Testing

3.3.1. The pipe shall be hydrostatically tested after joining into continuous lengths prior to installation and again after installation. Pressure and temperature shall be monitored with certified instruments during the test. After this test, the water will be removed with pigs. Erosion prevention procedures will be used during removal and discharge of the water.

3.3.2. Hydrostatic testing shall be performed in accordance with ANSI/AWWA C600.

3.4. Tolerances

3.4.1. Pipe installed by the directional drilled method must be located in plan as shown on the Drawings, and must be no shallower than shown on the Drawings unless otherwise approved. The Contractor shall plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding 30 feet. This “as built” plan and profile shall be updated as the pilot bore is advanced. The Contractor shall grant the Engineer of Record access to all data and readout pertaining to the position of the bore head and the fluid pressures and flows. When requested, the Contractor shall provide explanations of this position monitoring and steering equipment. The Contractor shall employ experienced personnel to operate the directional drilling equipment and, in particular, the position monitoring and steering equipment. No information pertaining to the position or inclination of the pilot bores shall be withheld from the Engineer of Record.

3.4.2. Each exit point shall be located as shown with over-length tolerance of 10 feet for directional drills of 1,000 linear feet or less and 40 feet for directional drills of greater than 1,000 linear feet and an alignment tolerance of 5 feet left/right with due consideration of the position of the other exit points and the required permanent easement. For gravity sanitary sewer installations, sags in the pipeline shall not exceed 25 percent of the nominal pipe diameter. Sags will only be allowed where the entering and exiting grades are adequate to provide velocities through the sag area sufficient for moving solids. No more than one (1) sag area shall occur between two (2) manholes. The alignment of each pilot bore must be approved by the Engineer before pipe can be pulled. If the pilot bore fails to conform to the above tolerances, the Engineer may, at his option, require a new pilot boring to be made.

3.4.3. After the pipe is in place, cleaning pigs shall be used to remove residual water and debris. After the cleaning operation, the Contractor shall provide and run a sizing pig to check for anomalies in the form of buckles, dents, excessive out-of-roundness, and any other deformations. The sizing pig run shall be considered acceptable if the survey results indicate that there are no sharp anomalies (e.g. dens, buckles, gouges, and internal obstructions)

greater than two (2) percent of the nominal pipe diameter, or excessive ovality greater than five (5) percent of the nominal pipe diameter. For gauging purposes, dent locations are those defined above which occur within a span of five (5) feet or less. Pipe ovality shall be measured as the percent difference between the maximum and minimum pipe diameters. For gauging purposes, ovality locations are those defined above which exceed a span of five (5) feet.

3.5. Ream And Pullback

3.5.1. Reaming: Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operation shall be conducted at the discretion of the Contractor.

3.5.2. Pulling Loads: The maximum allowable pull exerted on the HDPE pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.

3.5.3. Torsion and Stresses: A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.

3.5.4. The lead end of the pipe shall be closed during the pullback operation.

3.5.5. Pipeline Support: The pipelines shall be adequately supported by rollers and side booms and monitored during installation so as to prevent over stressing or buckling during the pullback operation. Such support/rollers shall be spaced at a maximum of 60 feet on centers, and the rollers to be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback. Surface damage shall be repaired by the Contractor before pulling operations resume.

3.5.6. The Contractor shall at all times handle the HDPE pipe in a manner that does not over stress the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the HDPE pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the HDPE pipe will be installed without damage.

3.6. Handling Drilling Fluids And Cuttings

3.6.1. During the drilling, reaming, or pullback operations, the Contractor shall make adequate provisions for handling the drilling fluids, or cuttings at the entry and exit pits. To the greatest extent practical, these fluids must not be discharged into the waterway. When the Contractor's provisions for storage of the fluids or cuttings on site are exceeded, these materials shall be hauled away to a suitable legal disposal site. The Contractor shall conduct their directional drilling operation in such a manner that drilling fluids are not forced through the sub-bottom into the waterway. After completion of the directional drilling work, the entry and exit pit locations shall be restored to

original conditions. The Contractor shall comply with all permit provisions.

3.6.2. Pits constructed at the entry or exit point area shall be so constructed to completely contain the drill fluid and prevent its escape to the storm drain system or waterway.

3.6.3. The Contractor shall utilize drilling tools and procedures which will minimize the discharge of any drill fluids. The Contractor shall comply with all mitigation measures listed in the required permits and elsewhere in these Specifications.

3.6.4. To the extent practical, the Contractor shall maintain a closed loop drilling fluid system.

3.6.5. The Contractor shall minimize drilling fluid disposal quantities by utilizing a drilling fluid cleaning system which allows the returned fluids to be reused.

3.6.6. As part of the installation plan specified herein before, the Contractor shall submit a drilling fluid plan which details types of drilling fluids, cleaning and recycling equipment, estimated flow rates, and procedures for minimizing drilling fluid escape.

4. DRILLING OPERATIONS

4.1. General

4.1.1. The Contractor shall prepare a plan to be submitted for Engineer of Record approval which describes the noise reduction program, solids control plant, pilot hole drilling procedure, the reaming operation, and the pullback procedure. All drilling operations shall be performed by supervisors and personnel experienced in horizontal directional drilling. All required support, including drilling tool suppliers, survey systems, mud cleaning, mud disposal, and other required support systems used during this operation shall be provided by the Contractor.

4.1.2. Drill pipe shall be API steel drill pipe, Range 2, Premium Class or higher, Grade S-135 in diameter sufficient for the torque and longitudinal loads and fluid capacities required for the work. Only drill pipe inspected under API's Recommended Practice Specification API RP 7G within 30 days prior to start and certified as double white band or better shall be used.

4.1.3. A smoothly drilled pilot hole shall follow the design centerline of the pipe profile and alignment described on the construction drawings.

4.1.4. The position of the drill string shall be monitored by the Contractor with the downhole survey instruments. Contractor shall compute the position in the X, Y and Z axis relative to ground surface from downhole survey data a minimum of once per length of each drilling pipe (approximately 31 foot intervals). Deviations from the acceptable tolerances described in the

Specifications shall be documented and immediately brought to the attention of the Engineer of Record for discussion and/or approval. The profile and alignment defined on the construction drawings for the bores define the minimum depth and radius of curvature. At no point in the drilled profile shall the radius of curvature of the bore be less than 1,600 feet. The Contractor shall maintain and provide to the Engineer of Record, upon request, the data generated by the downhole survey tools in a form suitable for independent calculation of the pilot hole profile.

4.1.5. Between the water's edge and the entry or exit point the Contractor shall provide and use a separate steering system employing a ground survey grid system, such as "TRU-TRACKER" or equal wherever possible. The exit point shall fall within a rectangle 10 feel wide and 40 feet long centered on the planned exit point.

4.1.6. During the entire operation, waste and leftover drilling fluids from the pits and cuttings shall be dewatered and disposed of in accordance with all permits and regulatory agencies requirements. Remaining water shall be cleaned by Contractor to meet permit requirements. Technical criteria for bentonite shall be given in API Spec. 13A, Specification for Oil Well Drilling Fluids Material for fresh water drilling fluids. Any modification to the basic drilling fluid involving additives must describe the type of material to be used and be included in Contractor's drilling plan presented to the Engineer of Record. The Owner retains the right to sample and monitor the waste drilling mud, cuttings and water.

4.2. Environmental Provisions

4.2.1. The Horizontal Directional Drilling operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to the adjacent ditch or land areas involved during the construction process. The Contractor shall provide equipment and procedures to maximize the recirculation or reuse of drilling mud to minimize waste. All excavated pits used in the drilling operation shall be lined by Contractor with heavy duty plastic sheeting with sealed joints to prevent the migration of drilling fluids and/or ground water.

4.2.2. The Contractor shall visit the site and must be aware of all structures and site limitations at the directional drill crossing and provide the Engineer of Record with a drilling plan outlining procedures to prevent drilling fluid from adversely affecting the surrounding area.

4.2.3. The general work areas on the entry and exit sides of the crossing shall be enclosed by a berm to contain unplanned spills or discharge.

4.2.4. Waste cuttings and drilling mud shall be processed through a solids control plant comprised as a minimum of sumps, pumps, tanks, desalter/desander, centrifuges, material handlers, and haulers all in a quantity sufficient to perform the cleaning/separating operation without interference with the drilling program. The cuttings and excess drilling fluids shall be dewatered and dried by the Contractor to the extent necessary for disposal in offsite

landfills. Water from the dewatering process shall be treated by the Contractor to meet permit requirements and disposed of locally. The cuttings and water for disposal are subject to being sampled and tested. The construction site and adjacent areas will be checked frequently for signs of unplanned leaks or seeps.

4.2.5. Equipment (graders, shovels, etc.) and materials (such as groundsheets, hay bales, booms, and absorbent pads) for cleanup and contingencies shall be provided in sufficient quantities by the Contractor and maintained at all sites for use in the event of inadvertent leaks, seeps or spills.

4.2.6. Waste drilling mud and cuttings shall be dewatered, dried, and stock piled such that it can be loaded by a front end loader, transferred to a truck and hauled offsite to a suitable legal disposal site. The maximum allowed water content of these solids is 50% of weight.

4.2.7. Due to a limited storage space at the worksites, dewatering and disposal work shall be concurrent with drilling operations. Treatment of water shall satisfy regulatory agencies before it is discharged.

Section 21

UNDERGROUND UTILITY TRENCHING

1. SCOPE

1.1. The work specified in this section consists of the excavation of utility trenches, trench backfill and furnishing and installing roadway sleeves. Utility lines will be installed in the trenches by the various utilities.

2. COORDINATION

2.1. Prior to initiating any construction work on this portion of the project, the Contractor shall arrange a meeting with representatives of the various utilities to coordinate and schedule the underground utility trenching.

3. TRENCH EXCAVATION AND BACKFILL

3.1. In addition to requirements listed below, the work shall comply with the Florida Department of Transportation Utility Accommodation Manual, current addition.

3.2. Trenching includes all excavation to install conduits and direct buried cables indicated on the drawings or specified herein. Prior to trenching excavation, proposed finished grades along the route of the trench shall be staked to ensure proper depths and adequate stub-up lengths of all wire and cable. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut, except for any jack and bore under existing roadways as may be shown on the Drawings. No tunneling shall be done unless indicated on the drawings or unless written permission is received from the Engineer.

3.3. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits and cables on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12” below invert of equipment or installation.

3.4. Prior to backfill, a warning tape shall be installed directly on top of sleeves only. Warning tape shall be 2” wide Mylar tape with “Sleeve Buried Below” message. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, or sand, free from large clods of earth and stones, deposited in 6” layers and rammed until the installation has a cover of not less than the adjacent ground but not greater than 2” above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off.

4. SLEEVES

4.1. General

4.1.1. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail. Sleeves shall be buried to the same depth as the utility trenches unless there is a conflict with other utilities within the right-of-way in which case the sleeves shall be buried to a greater depth so as not to conflict with existing utilities.

4.2. Sleeves

4.2.1. Pipe and fittings for sleeves shall be manufactured from virgin material and shall be PVC (SDR 26) 160 psi water pipe. All joints shall be compression type joints or glue type joints.

4.2.2. All irrigation sleeves shall have a minimum of 24” and a maximum of 36” of cover. The sleeves are to extend a minimum of 18” beyond the back of curb or edge of pavement.

4.3. Electrical Conduit

4.3.1. Pipe and fittings for electrical conduit shall be manufactured from virgin material and shall be PVC SCH 40 (grey) pipe. All joints shall be glue type.

4.4. Warning Tape

4.4.1. Warning tape shall be 2” wide Mylar tape with “Sleeve Buried Below” message.

4.5. Compaction

4.5.1. Trench excavations for sleeves in rights-of-way shall be compacted to the same density as for water distribution and wastewater collection lines. Backfill compaction for each transverse crossing of the right-of-way shall be tested.

Section 22

SLEEVING & CONDUITS

1. SCOPE OF WORK

The work under this Section includes the furnishing, installing and/or laying and jointing of all sleeves, fittings and appurtenances as shown on the Drawings and specified herein.

2. MATERIALS

2.1. General

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified. It shall have structural properties sufficient to safely sustain/withstand strains and stresses to which it is normally subjected and shall be true to detail.

2.2. Sleeves

Pipe and fittings for sleeves shall be manufactured from virgin material and shall be PVC (SDR-26) 160 psi water pipe. All joints shall be compression type joints or glue type joints.

2.3. Electrical Conduit

Pipe and fittings for electrical conduit shall be manufactured from virgin material and shall be PVC SCH 40 (grey) pipe. All joints shall be glue type.

2.4. Warning Tape

Warning tape shall be two (2”) inches wide mylar tape with "Sleeve Buried Below" message tape shall be as manufactured by Thor Enterprises, or an approved equal.

3. CONSTRUCTION

3.1. Trenching includes all excavation to install sleeves indicated on the Drawings or specified herein. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavation, and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done unless indicated on the Drawings or unless written permission is received from the Engineer.

3.2. The bottom of the trench shall be graded to provide uniform bearing and support for conduits and sleeves on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth and tamped. Unstable soil that is not capable of supporting equipment or installation shall be removed and replaced with specified material for a minimum of twelve (12”) inches below invert of equipment or installation.

3.3. Prior to backfill, warning tape shall be installed directly on top of sleeves only. The trenches shall be backfilled with excavated materials approved for backfilling which consist of earth, loam, sandy clay or sand free from large clods of earth and stones and shall be deposited in six inch (6") layers and rammed until the installation has a cover of not less than the adjacent ground, but not greater than two inches (2") above existing ground. Backfilling shall be performed simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, and then mound over and smooth off.

3.4. Route of conduit and sleeves indicated on the Drawings is approximate and shall be modified to conform to existing conditions. Reroute to avoid damage to existing trees. Coordinate actual route with the Engineer and Utility Company. The work shall include clearing and grubbing of selected trees along the trenching route.

3.5. Conduit and sleeves shall be buried twenty- four inches (24") deep unless there is a conflict with other utilities, in which case the sleeves shall be buried to a greater depth so as not to conflict with existing utilities. Conduit for electrical primary cable shall be buried with sixty (60) inches of cover.

3.6. Trench excavations for sleeves and conduits under pavement shall be compacted to the same density as for water distribution and wastewater collection lines. Backfill compaction for each separate location shall be tested.

Section 23

HANDICAP RAMPS

1. DESCRIPTION

1.1. This work consists of constructing concrete handicap ramps with detectable warnings. The work includes the furnishing all material, equipment, and labor necessary for the placement of detectable warning devices at curb ramps or other walking surfaces, complete and ready for service at locations shown on the plans.

1.2. Perform the work in accordance with Sections 11-4.1, 11-4.7 and 11-4.8 of the 2007 Florida Building Code and with the Architectural and Transportation Barriers Compliance Board's "Revised Draft Guidelines for Accessible Public Rights-of-Way," dated November 23, 2005 as amended, supplemented and adopted.

2. CURB RAMPS

2.1. Location

Curb ramps complying with 11-4.7 shall be provided wherever an accessible route crosses a curb. Curb ramps must be located outside of disabled parking spaces and access aisles.

2.2. Slope

Slopes of curb ramps shall comply with 11-4.8.2. The slope shall be measured as shown in Figure 11-11. Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes. Maximum slopes of adjoining gutters, road surface immediately adjacent to the curb ramp, or accessible route shall not exceed 1:20.

2.3. Width

The minimum width of a curb ramp that is a part of a required means of egress shall be not less than forty-four (44") wide, exclusive of flared sides.

2.4. Surface

Surfaces of curb ramps shall comply with 11-4.5.

2.5. Sides Of Curb Ramps

Curb ramps located where pedestrians must use them and all curb ramps which are not protected by handrails or guard-rails shall have flared sides with a slope not exceeding a ratio of 1:12. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp (See Figure 12(b)).

2.6. Built-Up Curb Ramps

Built-up curb ramps shall be located so that they do not project into vehicular traffic lanes or access aisles (See Figure 13).

2.7. Detectable Warnings

Curb ramps shall have detectable warnings complying with 11-4.29.2. Detectable warnings shall extend the full width and depth of the curb ramp.

2.8. Obstructions

Curb ramps shall be located or protected to prevent their obstruction by parked vehicles, signs, lights, landscaping, etc.

2.9. Location At Marked Crossings

Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides (See Figure 15).

2.10. Diagonal Curb Ramps

If diagonal (or corner type) curb ramps have returned curbs or other well-defined edges, such edges shall be parallel to the direction of pedestrian flow. The bottom of diagonal curb ramps shall have forty-eight (48“) inches minimum clear space as shown in Figure 15(c) and (d). If diagonal curb ramps are provided at marked crossings, the forty-eight (48”) inches clear space shall be within the markings (See Figure 15(c) and (d)). If diagonal curb ramps have flared sides, they shall also have at least a twenty-four (24”) inches long segment of straight curb located on each side of the curb ramp and within the marked crossing [See Figure 15(c)].

2.11. Islands

Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least forty-eight (48”) long between the curb ramps in the part of the island intersected by the crossings (See Figure 15(a) and (b)).

3. OTHER RAMPS

3.1. General

Any part of an accessible route with a slope greater than 1:20 shall be considered a ramp and shall comply with 11-4.8.

3.2. Slope And Rise

The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be thirty (30”) inches.

3.3. Clear Width

The minimum clear width of a ramp shall be forty-four (44”) inches.

3.4. Landings

Ramps shall have level landings at bottom and top of each ramp and each ramp run.

Landings shall have the following features:

3.4.1. The landing shall be at least as wide as the ramp run leading to it.

3.4.2. The landing length shall be a minimum of sixty (60") inches clear.

3.4.3. If ramps change direction at landings, the minimum landing size shall be sixty (60") inches x sixty (60") inches.

3.4.4. If a doorway is located at a landing, then the area in front of the doorway shall comply with 11-4.13.6.

3.5. Handrails

If a ramp run has a rise greater than six (6") inches or a horizontal projection greater than seventy-two (72") inches, then it shall have handrails on both sides. Handrails are not required on curb ramps.

3.6. Cross Slope And Surfaces

The cross slope of ramp surfaces shall be no greater than 1:50. Ramp surfaces shall comply with 11-4.5.

3.7. Edge Protection

Ramps and landings with drop-offs shall have curbs, walls, railings, or projecting surfaces that prevent people from slipping off the ramp. Curbs shall be a minimum of two (2) inches high.

3.8. Outdoor Conditions

Outdoor ramps and their approaches shall be designed so that water will not accumulate on walking surfaces.

4. MATERIALS

4.1. Concrete, Reinforcement And Joint Materials

Meet the requirements specified in F.D.O.T. Standard Specifications 520-2. Provide "Ready-Mixed" concrete, unless otherwise approved or specified; in accordance with ASTM C94. Concrete should meet the following criteria:

4.1.1. Compressive Strength: Minimum three-thousand (3,000) psi strength at twenty-eight (28) days

4.1.2. Concrete shall be gap-graded with weathered rounded coarse aggregate with forty-five (45%) percent to forty-eight (48%) percent matrix

4.1.3. Water/Cement Ratio: Not greater than 0.55 by weight

4.1.4. Slump: three (3") inches

4.1.5. Air Content: Between four and one-half (4-1/2) percent and seven

and one-half (7-1/2) percent

4.2. Forms

Meet the requirements specified in F.D.O.T. Standard Specifications 520-3.

4.3. Detectable Warnings

All detectable warning materials shall conform to ANSI A117.1 – 1998 specifications and Americans with Disability Act Accessibility Guidelines (ADAAG) A4.29.2. Detectable warning surfaces shall contrast visually with adjacent walking surfaces either light-on-dark or dark-on-light and shall be textured to provide slip resistance. Submit color samples for detectable warnings for approval by the Engineer. Detectable warning textures on walking surfaces shall consist of truncated domes concrete only. Textures shall contrast with that of the surrounding surface. All detectable warnings shall be subject to routine pedestrian traffic and occasional vehicular traffic. Methods or products used to form ("stamp") Detectable Warnings in wet concrete are not permitted.

5. CONSTRUCTION

5.1. Construct concrete handicap ramps as follows:

5.1.1. Excavation

Excavate to the required depth and to a width that allows installation and bracing of forms. Shape and uniformly compact the subgrade to a surface conforming to the plans.

5.1.2. Forms

For fixed-form construction, use forms that extend the full depth of the concrete and that are adequately braced to prevent bending under the concrete pressure.

5.1.3. Placing and Finishing

Immediately before placing concrete, thoroughly moisten the subgrade. Deposit concrete in a single layer, strike it off with a template, and smooth it with a float to obtain a sandy texture. Do not plaster the concrete. Use a 1/4" radius edging tool to edge all outside edges and joints. Saw or form transverse joints to a depth of not less than one-fourth the thickness of the slab and to a width of approximately 1/8". Install 1/2" thick expansion joint filler between the ramp and any fixed structure that extends the full depth of the ramp. After screeding and consolidating concrete slabs, do not work surface until ready for floating. As soon as concrete will support the mason on knee-boards, float the surface to bring grout to the surface, completely surrounding the aggregate and filling all surface voids. Float to a uniform appearance.

Section 24

LANDSCAPE

1. GENERAL

1.1. The General Contractor shall be responsible for: site preparation and finish grading, including 4"+/- to final grade. The landscape Contractor (hereinafter, the Contractor) shall be responsible for grassing; supplying and planting of trees, shrubs, and other plant material in accordance with sound nursery practices; and maintaining and watering them until final completion and acceptance by the Owner; and other specific work as called for or implied in the plans and specifications.

1.2. Rejection of deficient work: The Landscape Architect or the Owner's representative will monitor the progress of the job on a random basis, as well as at various times for key inspections as called for in these specifications, and shall have the right, at any stage of the operations, to reject any and all work and materials which, in his judgment, is deficient in meeting the requirements set forth in the plans and specifications. The Contractor shall cease work immediately upon notification by the Landscape Architect or the Owner's representative of such deficient work, until the deficient work is corrected. Any rejected material shall be immediately removed from the site and acceptable material substituted in its place.

1.3. The Contractor shall be responsible for the careful and thorough removal of weeds, grass, and other vegetation in the areas to be planted and sodded, unless otherwise directed by the Landscape Architect or the Owner's representative. Repeated applications of appropriate herbicides before installation to kill and to prevent regeneration of weeds and grass in such areas shall be performed by the Contractor.

1.4. The Contractor shall ensure that the Landscape Architect or the Owner's representative is notified of any excess limerock or other unsuitable materials found in the planting areas. Planting in limerock contaminated soil shall be absolutely unacceptable, and failure to notify the Landscape Architect or the Owner's representative of such conditions will make the Contractor entirely responsible for corrective measures including removals and replacements of plant materials and soil if such conditions are discovered after the fact during installation through the warranty period, regardless whether such conditions previously escaped detection. Should any objectionable materials such as old concrete, bricks, or other debris be encountered during planting operations, they shall be removed from the site by the Contractor and properly disposed of.

1.5. The Contractor is entirely responsible for the work until the job is substantially complete as determined by the Landscape Architect or the Owner's representative (see Section 3.17), and shall also be responsible for provisions required for final acceptance (see Section 3.17 and 3.18).

2. Plant Material

2.1. Nomenclature:

2.1.1. Names used are intended to conform to the those given in Standardized Plant Names (most current edition) prepared by the American Joint committee on Horticultural Nomenclature. Names not included therein are to conform generally with names accepted in the nursery trade of the South Florida region.

2.2. Quality

2.2.1. New plant material shall be graded Florida No. 1 or better as outlined in the current edition of Grades and Standards for Nursery Plants, State Plant Board of Florida, current edition.

2.2.2. All plants not listed in Grades and Standards for Nursery Plants shall conform to a Florida No. 1 as to: (1) health and vitality, (2) condition of foliage, (3) root system, (4) freedom from pest or mechanical damage, (5) heavily branched and densely foliated according to the accepted normal shape of the species.

2.2.3. All plant material must have fully developed root systems; be heavily branched and foliated; have appropriate growth habit for the species; be healthy and pest and disease-free; and be selected for size based on balanced height, spread and form, rather than on extreme dimensions.

2.2.4. Verification of specified grades is to be determined at the time of delivery by the Contractor. Grades determined at the time of inspection by the Landscape Architect or the Owner's representative shall be based on the growth characteristics and condition of the plant at the time of inspection. The grade shall not be based on any future or predicted growth potential of the plant.

2.2.5. All plant material shall be subject to inspection by Owner's representative to determine adherence to quality and size.

2.3. Root Systems

Plant material specified by container size shall have fully developed root systems consistent with the size of the container specified. Evidence that any plant material has recently been transplanted from smaller containers or from "grow bags" into the size of container specified for the job without sufficient development of the root systems shall be cause for rejection. Likewise, any plant material having encircling roots, or an insufficiently developed root system or undersized rootball for the specified size shall not be acceptable.

2.4. State Certification

The Contractor shall be responsible for all Certificates of Inspection of plant material shipments required by local and federal authorities.

2.5. Substitutions

2.5.1. Where the plans or specifications identify approved sources for any plant materials, no alternative source(s) shall be approved without written authorization by the Landscape Architect or the Owner's representative during the bid process. Substitutions or decreases in specified sizes of plants will be permitted only with authorization, upon submission of proof that the plant is not obtainable as specified from at least six approved sources.

2.6. Sod shall be of the species and variety noted in the plans, as indicated in the areas shown. If requested, the Contractor shall submit certifications substantiating that sod supplied is the variety specified. The sod shall be of firm, tough texture having a compact growth of grass with good root development. It shall contain no visible broadleaf weeds and shall be visibly consistent with no obvious patches of foreign grasses. The sod shall have a good layer of earth and be free from fungus, vermin, and disease. It shall be neatly mowed and be mature enough that when grasped at one end, it can be picked up and handled without damage. Sod shall not be accepted if it has not been (or does not appear to have been) freshly cut.

2.7. Mulch shall be clean, fresh material, as noted in the plans.

2.8. Balled and Burlapped Plants

2.8.1. B&B plants shall have been dug and hardened off at the nursery for a minimum of 30 days. All rootballs shall be burlapped or otherwise bound in biodegradable material and tied securely, in accordance with standard nursery practice. No plant shall be accepted when the ball of earth surrounding the roots has been damaged or broken. The diameter of the ball must be sufficient to encompass the fibrous and feeding root systems necessary for the best development of the plant.

2.9. All palms on the job shall have reasonably matched straight trunks and shall be planted perpendicular to normal ground plane, unless otherwise specified. Sabal Palm fronds shall be "hurricane-cut", unless otherwise directed. All Palms shall be delivered to the job site with clear trunk heights as specified. Planting any palms (including Sabals) deeper than the depth at which they were grown to adjust the clear trunk heights or to avoid bracing shall not be acceptable.

2.10. Transplanted plant material shall be dug to minimize root damage and shock. The plants shall be set perpendicular to normal ground plane, so that the final level of ground around the plant conforms generally to the surrounding grades and shall be settled by at least one thorough watering-in of the plant. Soil berms or "saucers" shall be formed around the plants to hold and retain water.

3. EXECUTION

3.1. The Contractor is responsible for ensuring that surface drainage is not affected or

hindered in any manner due to any reason. The Contractor shall notify the Landscape Architect or the Owner's representative of any situation where the existing subsoil is substandard and may affect natural drainage, and where the proposed grading conflicts with drainage conditions in order to determine appropriate field changes. The Contractor shall familiarize themselves with the site, notify the Landscape Architect or the Owner's representative of any conflicting elements or required adjustments in grading, and plan to gain an understanding of these requirements. Any questions as to the intent or form of the site grading shall be directed to the Landscape Architect or the Owner's representative.

3.2. The Contractor shall be responsible for providing the source of water during the entire landscape installation period (i.e. watering truck) if a source of water does not exist on site. Whether or not the irrigation system becomes operational during the landscape installation, the Contractor shall remain solely responsible for providing sufficient water until job completion.

3.3. The Contractor shall be responsible for ensuring that all plant material delivered to the site is maintained and protected from damage, both prior to and after planting. All plants shall be maintained and watered as necessary at the site. No plants shall remain stockpiled on the site for an undue period of time, as determined by the Landscape Architect or the Owner's representative. B&B plants which cannot be planted immediately shall have their earth balls covered with moist soil or mulch for protection from drying out.

3.4. Prior to commencing work, the Contractor shall apply post-emergent herbicide to any existing weeds, grass, and other vegetation, allowing sufficient time for the chemical to work and the results to be noticeable. Repeated applications shall occur in order to achieve a thorough kill. Vegetation shall then be mechanically removed during finish grading operations. Pre-emergent herbicide shall be applied in conjunction with the landscape installation. The objective of these measures is to provide the Owner with a reasonably weed-free installation. The presence or regeneration of significant weeds and grasses in the turf and beds, at the time of completion and within a period of one month afterwards, shall be unacceptable and the Contractor shall be required to initiate additional efforts to successfully meet the performance requirements of this section, as a condition for final payment (retainage) release.

3.5. The Contractor shall make no changes or substitutions without approval by the Landscape Architect or the Owner's representative. The Contractor shall advise the Landscape Architect or the Owner's representative of any conditions that differ from the plan, and that may require a change in the landscape design. The Landscape Architect or the Owner's representative maintains the responsibility and right to inspect the locations of trees, shrub and groundcover masses, and bedlines before the plant material is installed. The Contractor shall request approval by the Landscape Architect or the Owner's representative of field locations prior to planting. The Contractor shall be responsible for relocating any plantings for which the required approval was not specifically requested and given, if in the opinion of the Landscape Architect or the Owner's representative there is reason to do so.

3.6. New plantings shall be set so that the final level of ground around the plant, after settling, shall conform to the surrounding grades, or as otherwise specified; this requires the plants to be set between 1" to 4" above new grade to allow for settling.

3.7. Special Bed Preparation

3.7.1. Beds for annuals shall be excavated to a depth of 12". Should poor soils be found below the excavated fill, the Contractor shall notify the Landscape Architect or the Owner's representative prior to backfilling. Backfill shall consist of equal parts of clean sandy fill and potting soil mix, well mixed. Root zone treatment material shall be incorporated into the entire bed area at the rate recommended by the manufacturer, broadcast by shaker, spreader, or hand, then rototilled in.

3.7.2. Beds for plant material 3 gallon or smaller shall be amended first by rototilling the planted areas to a depth of 6-8". 3" of organic planting soil mix shall then be thoroughly amended into the previously rototilled area to a depth of 6-8". If necessary, existing soil shall be removed so that the finished bed area is at the appropriate elevation in respect to adjacent landscape, lawn, and hardscape areas, and to adjacent structures. This measure shall be included in the line item cost for Site Preparation.

3.8. Setting Plants

All plants shall be centered in the planting holes and set upon at least 4 inches of compacted planting soil to such a depth that the top of the rootball is 1 to 2 inches above finished grade so that finished grade level at which the plant rests after settlement and mulching will be the same at which the plant was grown. Container-grown plants shall be carefully removed from the container so as to avoid damage to the root system. No burlapped plants shall be completely unwrapped; rather the burlap loosened and pulled down from the top 1/3 or so of the rootball. Wire mesh shall also be bent down from the top 1/3 of the rootball and tucked under or snipped off. Nylon straps and any other non-biodegradable material shall be completely removed prior to installation. All root control bags and synthetic burlap shall not be entirely removed, but the sides and bottom thoroughly sliced to allow unrestricted root growth. The top edge of the bag shall be pulled down so as to not become a "wick" for water absorption. Roots shall be spread in their normal position, and all frayed or broken roots shall be cut off cleanly. Planting holes shall be thoroughly backfilled with the specified soil mixture to 3-4" from the top of the rootball. Specified fertilizer and fertilizer tabs shall be installed pursuant to the manufacturer's instructions. Soil "saucers" shall be formed around the trees and shrubs to hold and retain water. No filling around the trunks will be permitted. Care must be taken by the Contractor to set the plants to achieve the intended compositional character of the landscape, with consideration for the best exposure of each plant's "good side" to adjacent structure, walks, etc.

3.9. The Contractor shall ensure that all plant beds abutting a curb or pavement edges are graded so that washing of soil and/or mulch is prevented. This shall be done by cutting a "lip" along such edges, and grading a flat strip or back-sloped area that will intercept rainfall and drainage wash under normal conditions. In no case shall a sloped bed abut a curb or pavement edge in a way that soil and/or mulch would frequently wash out, creating maintenance problems.

3.10. All trees ten (10) feet or more in height shall be securely anchored. Anchors must be installed at a minimum depth of 48". All trees 10' or less in height shall be guyed using two lodge poles or 2"x 2" stakes with secure ties or straps that allow adjustment to maintain tightness. Palms shall be braced with 2" x 4" wood braces. If site specific conditions require, alternate guying and staking methods and materials may be used if approved in advance by the Landscape Architect or the Owner's representative. The Contractor may request a waiver of the requirement to brace palms and guy certain other trees, subject to approval by the Landscape Architect or the Owner's representative. Under any circumstances, the Contractor shall be responsible for any and all consequences of any material which leans or falls during the one year warranty period, including resetting and restaking/reguying or replacing the material and repairing any damages, except under circumstances where documented wind conditions exceed 35 mph.

3.11. All planting areas shall be raked smooth, and all rocks and debris shall be removed. The finished planting areas shall be top-dressed with 3" of the mulch material specified in Section 2 and/or on the plan.

3.12. Pruning shall be done as necessary, but shall be limited to removing dead or injured twigs and branches to compensate for the loss of roots as a result of the transplanting process or as directed by the Landscape Architect or the Owner's representative for visibility. Pruning shall be done in such a manner as not to change the natural habit or shape of a plant, unless specifically requested.

3.13. Sodding

All areas to be sodded must be fine-graded, eliminating all bumps, depressions, stones, and other debris. Fertilizer shall be applied prior to sodding. The solid sod shall be neatly laid, in the areas indicated in the plans, with closely abutting joints. All gaps must be plugged with pieces of sod and the finished lawn must be machine rolled within 24 hours to achieve a uniform surface. The Contractor shall be responsible for bringing the sod edge in a neat, clean manner to the edge of all pavements and planting beds. Where the area to be sodded abuts existing sod, curbs, edgings, and/or pavements, the new sod shall be laid in a clean, level manner without noticeable grade differences, rough edges, or gaps.

3.14. Where seeding is a part of the work, grass seed shall be distributed or broadcast evenly. Seed and fertilizer shall be incorporated into the soil at a depth of ½ to 1 inch and rolled two directions with a 200 lb. roller immediately after seeding. Clean shredded straw, free from insects, sticks and other debris, shall be blown or distributed evenly to provide a solid uniform cover. The entire area shall be disked to a depth of 1 to 2 inches to ensure that the straw makes contact with the soil.

3.15. Maintenance

3.15.1. The Contractor shall be responsible for maintenance of the project during construction and shall bear all risk of loss, theft, or damage to the project by any cause whatsoever during the term of construction, and until all punchlist items are satisfactorily resolved and the job is officially turned over by the Landscape Architect or the Owner's representative to the Owner for maintenance.

3.15.2. Maintenance by the Contractor shall commence after each plant is planted and shall continue until all plants are installed and the job is completed and all punchlist items are satisfactorily resolved, as determined by inspection by the Landscape Architect or the Owner's representative.

3.15.3. Plantings shall be maintained by watering, removing dead branches, resetting plants to proper grades and upright positions, staking to ensure vertical growth, weeding, mowing, and any other operations necessary to complete maintenance, including the replacement of any material that exhibits visible and unsightly evidence of "shocking" without full recovery prior to job completion and final inspection. Areas without irrigation and transplanted material shall be watered until all punchlist items are satisfactorily resolved.

3.15.4. The job shall be in a well-maintained condition at the time of final inspection, as well as at the time of punchlist completion, whereby as a condition for acceptance and maintenance turnover, the job shall have been mowed and groomed within a period of three (3) days.

3.16. Completion and Acceptance

3.16.1. Completion of work shall mean the full and exact compliance and conformity with provisions expressed or implied in the plans and Specifications, and as otherwise directed and determined by the Landscape Architect or the Owner's representative.

3.16.2. The job shall not be accepted as complete unless maintenance has been performed as specified in Section 3.16, above.

3.16.3. All work under this Contract shall not be finally accepted until expiration of the warranty period, which shall commence on the date of the retainage release.

3.17. Final Inspection and Job Closeout Procedures

3.17.1. A final inspection will not be scheduled until the work meets the definition of being "substantially complete," meaning that all work is complete per the plan, specs, and field direction provided by the Landscape Architect or the Owner's representative. The Contractor is responsible for determining that the job is substantially complete and has been properly maintained, before requesting a final inspection.

3.17.2. The following documents shall be submitted to the Landscape Architect or the Owner's representative, and determined to be in complete and acceptable condition before the final inspection will be scheduled:

A. As-Built Landscape Plan
B. As-Built Irrigation Plan
C. Zone Schedule and Operating Times
D. Confirmation that zones are properly identified on the chart mounted inside the controller, with standardized designations and

clear area locations.

E. If a two (2) wire irrigation system is specified the contractor must provide a schedule listing every valve by number together with the decoder identification number.
F. Irrigation Operations manuals (2 copies)
G. Warranty Statement
H. Grounding Certification for controller(s), if applicable.
I. Contractor's Affidavits and Lien Releases

3.17.3. If the Landscape Architect or the Owner's representative find that the job for which an inspection has been scheduled has numerous, obvious, or significant deficiencies, which the Contractor should know to be unacceptable, the Landscape Architect or the Owner's representative reserves the right to cancel the inspection and reschedule it when the job is actually ready for inspection.

3.17.4. When a final inspection is scheduled, the job shall be in a maintained condition, as described in these specifications. The inspection will be cancelled for any job found not to meet this requirement. At no time before turnover shall the job be allowed to have an unkept or poorly maintained appearance.

3.17.5. Upon determination by the Landscape Architect or the Owner's representative that all submittals are complete and professionally acceptable, and the Contractor's affirmation that the job is substantially complete and will be in the properly maintained condition, an inspection will be scheduled. It may take up to one week for this to occur, due to scheduling and notification requirements.

3.17.6. The Contractor is required to visit the job within 24 hours of the scheduled inspection to make sure that the job is ready, with the irrigation system properly operating, and with all required maintenance having been performed. The Landscape Architect or the Owner's representative shall be notified immediately if the inspection cannot occur for any reason.

3.17.7. The Contractor shall provide a minimum of two personnel for the final inspection. The owner or other senior person shall accompany the Landscape Architect or the Owner's representative during the inspection, and another qualified employee shall be stationed at the irrigation controller, fully capable of operating it per instructions given via radio during the inspection. The final inspection will be cancelled if this requirement is not met.

3.17.8. During the inspection, the Contractor shall be responsible for taking thorough notes on all deficiencies identified, to ensure that they are properly addressed and corrected. Minor deficiencies that are immediately corrected by the Contractor's personnel, may not be necessarily included on the punchlist. The Contractor shall not rely on receiving the punchlist to begin correcting the noted deficiencies, as the punchlist may take up to one week to be prepared and issued. Rather, the Contractor shall rely on his own notes from the final inspection to begin making the required corrections as

soon as possible, and in no instance shall these corrections take longer than the 14 calendar days allowed to complete all punchlist requirements.

3.17.9. A maximum of 14 days is allowed for punchlist completion. Liquidated damages may be assessed if this is neglected. A reinspection shall be requested by the Contractor when the punchlist is complete. The reinspection may be handled informally by the Landscape Architect or the Owner's representative, or with the Contractor's attendance required, at the sole discretion of the Landscape Architect or the Owner's representative.

3.17.10. When the punch list is complete as determined by the reinspection, the turnover will be confirmed via memo to the Landscape Architect or the Owner's representative, and the Contractor's Affidavit shall be emailed or faxed to the Landscape Architect or the Owner's representative and the original copy mailed to the Landscape Architect or the Owner's representative within three days of the turnover memo date.

3.18. Warranty

3.18.1. Warranty: All new plant material shall be guaranteed for one (1) year, and shall be alive and in satisfactory growth for each specific plant at the end of the warranty period. The warranty period shall commence upon the date of release of the retainage for the job, or for any defined phase of the job.

3.18.2. At the end of the warranty period, and at any time during that period, any plant material that has died or is not in satisfactory condition as determined by the Landscape Architect or the Owner's representative, shall be removed and replaced with new healthy material of the original specified size and type within 10 calendar days. Excluded are replacements of plants due to acts of God, theft, vandalism, or acts of negligence on the part of others, and due to deleterious soil and/or drainage conditions which the Contractor documented to the attention of the Landscape Architect or the Owner's representative at the time of installation. The new material shall be guaranteed as outlined above, commencing the date accepted. The Contractor shall be responsible for the cost of all material and labor.

3.18.3. The time limit may be extended by agreement for any plant material in questionable condition at the time of the warranty period.

4. ALTERNATIVE SPECIFICATION TO BE USED FOR ROADWAY PROJECTS

4.1. The landscape installation shall be in accordance with Section 580 of the FDOT Local Agency Specifications, current edition, and FDOT's Florida Highway Landscape Guide, and FDOT Standard Index No. 544.

5. MAINTENANCE

5.1. SCOPE OF WORK - The Contractor shall furnish all labor, materials, supervision, equipment, supplies, tools, services, and all other necessary incidentals required to perform complete maintenance of landscape areas as detailed below:

5.2. TECHNICAL SPECIFICATIONS TURF:

5.2.1. General:

5.2.1.1. Turf in built-up areas at the Project is primarily St. Augustine “Floratam”. Bahia sod is to be used in less visible areas and on lake banks.

5.2.1.2. Set mower blades for St. Augustine “Floratam” to 3-½” to 4” high.

5.2.1.3. St. Augustine “Floratam” is to be cut before the leaf blades are 5” high.

5.2.1.4. St. Augustine “Floratam” clippings are to remain in place after cutting.

5.2.1.5. Turf on lake banks at the Project is Bahia.

5.2.1.6. Set mower blades for Bahia turf to 3” high:

5.2.1.6.1. Maintain height Bahia turf at 3” high;

5.2.1.6.2. Bahia turf is to be cut when the leaf blades are no more than 4” high;

5.2.1.6.3. Bahia turf clippings are to remain in place after cutting.

5.2.1.6.4. Clippings are to remain.

5.2.2. Equipment:

5.2.2.1. Cutting blades are to be sharpened before every cut event to eliminate turf tearing.

5.2.2.2. A rotary type gasoline-powered edger shall be used.

5.2.2.3. Edgers using string technologies are allowed only with the following exceptions:

5.2.2.3.1. Rough-cut lake banks

5.2.2.3.2. Around hard elements in the landscape where rotary type edgers are impractical.

5.2.2.4. Use a rotary-type edger to establish bed lines where turf meets shrub beds.

5.2.2.5. Use a rotary-type edger where turf of any species is adjacent to

pavement, including sidewalks.

5.2.2.6. In no case is herbicide to be used to edge sod.

5.2.2.7. The Contractor may use a blower to clear turf clippings from paved areas.

5.2.3. Execution

5.2.3.1. St. Augustine “Floratam” turf is to be maintained at height described under *General*

5.2.3.2. Edging of turf at sidewalks, buildings and other hard edges is to be performed at the same frequency as mowing.

5.2.3.3. Edging of turf adjacent to tree, palm, shrub, or patio tree beds is to be performed at least every other time the sod is cut.

5.2.3.4. Bahia turf is to be maintained at the height described above.

5.2.3.5. Do not cut wet grass.

5.2.3.6. Remove all foreign objects from turf before mowing.

5.2.3.7. Alternate mowing directions with each mowing event.

5.2.3.8. Adjust cutting height by setting the mower on a driveway or sidewalk and using a ruler to measure the distance between the ground and the blade.

5.3. TECHNICAL SPECIFICATIONS: TREES AND PALMS

5.3.1. Plant List for Palms

5.3.1.1. Bismarckia nobilis ‘Silver’

5.3.1.1.1. Trim flower stalks as they emerge

5.3.1.1.2. Prune only leaves that are completely dead - early pruning attracts Palmetto

5.3.1.1.3. Weevil.

5.3.1.1.4. Inspect monthly: Palmetto Weevil in leaf bases, Scale insects.

5.3.1.2. Chamaerops humilis

5.3.1.2.1. Inspect monthly: Graphiola Leaf Spot, Scale insects.

5.3.1.3. Livistona decipiens

5.3.1.4. Phoenix sylvestris

5.3.1.4.1. Maintain initial palm frond cut pattern as specified by the Landscape Architect.

5.3.1.4.2. Remove basal aerial roots.

5.3.1.4.3. Inspect monthly: Fusarium wilt, Thielaviopsis Trunk Rot, Texas Phoenix

5.3.1.4.4. Palm decline, Lethal Yellowing, Silky Cane Weevil.

5.3.1.5. Ptychosperma elegans

5.3.1.5.1. Inspect monthly: Nitrogen deficiency, Palm Aphids, Scale insects.

5.3.1.5.2. Inspect for freeze damage when temperatures are 35° or below.

5.3.1.6. Thrinax radiate

5.3.1.6.1. Do not remove fronds below horizontal presentation.

5.3.1.6.2. Inspect monthly: Aphids, Scale insects.

5.3.1.7. Florida Royal Palm

5.3.1.7.1. Inspect monthly: Royal Palm Bug, particularly in the spring.

5.3.1.7.2. Developing aerial roots may be covered with mulch.

5.3.1.8. Sabal Palmetto

5.3.1.8.1. Inspect monthly: Potassium deficiency, Palmetto Weevil.

5.3.1.8.2. Incipient palm diseases not yet present in Palm Beach County but possible include Texas Phoenix Palm Disease, causing rapid defoliation; contact Owner if spotted.

5.3.1.9. Bucida Buceras - Shady Lady

5.3.1.9.1. Staining by the "Black Olive Tent Caterpillar" occurs episodically and results from the frass of the offending insect, not the leaves. Treatment of the tree is not needed. Power washing will clear pavement.

5.3.1.10. Bursera simaruba

5.3.1.10.1. Low wind resistance indicates tight pruning of isolated trees. Croton Scale seen since 2008 treated similarly to Rugose Spiraling White Fly.

5.3.1.11. Ficus rubiginosa

5.3.1.11.1. Occasional scale and/or mites; usually not treated.

5.3.1.12. Ilex cassine

5.3.1.12.1. Mites seen infrequently on trees subject to drought stress; galls form in response to fungal infestations.

5.3.1.13. Quercus virginiana

5.3.1.13.1. Newly planted trees are sometimes attacked by various borers; regular fertilization and water are the best defense. Galls can occur anywhere and are generally of no concern. Scales and/or aphids are not often seen, usually controlled by other insects.

5.3.1.14. Delonix regia

5.3.1.14.1. Very fast growing tree requiring early shaping to establish desired spreading canopy; caterpillars are seen from time to time but trees defoliate. A rare fungus attacks the roots, not often seen in healthy trees. A very messy tree requiring attention to leaf drop and pod drop.

5.3.1.15. Jacaranda mimosifolia

5.3.1.15.1. A very messy tree requiring attention to leaf drop and pod drop.

5.3.1.16. Koelreuteria elegans

5.3.1.16.1. Very fast growing tree requiring attention to branching to assure a healthy tree; subject to Verticillium wilt (prune affected branches); no chemical treatment exists. Proper fertilization essential.

5.3.1.17. M. grandiflora "DD Blanchard"

5.3.1.17.1. Magnolia generally needs continual care and proper fertilizer to perform well in Zone 10 or above; subject to Verticillium wilt (prune affected branches); no chemical

treatment exists. Proper fertilization and irrigation is essential.

5.3.1.18. Tabebuia caraiba

5.3.1.18.1. Somewhat brittle-prune to reduce wind load. Weakened when subjected to frost.

5.3.2. General

5.3.2.1. Palms: Perform regular weekly inspection paying particular attention to premature yellowing of older fronds.

5.3.2.2. Perform regular weekly inspection paying particular attention to misshapen terminal buds.

5.3.2.3. Perform regular weekly inspection looking for Ganoderma fruiting bodies; inform Owner immediately if found.

5.3.2.4. Palms: Pruning to comply with the University of Florida document "Pruning Palms" by Timothy Broschat, which is included herein by reference and available on the internet: http://edis.ifas.ufl.edu/ep443.

5.3.2.5. Trees: Inspected weekly, paying particular attention to deformed leaves or misshapen branches.

5.3.2.6. Trees: Prune every other year starting with the third year after planting (Owner will provide installation date).

5.3.2.7. Trees: Tree pruning and shaping to be performed by or under the direct supervision of an International Society of Arboriculture Board Certified Master Arborist.

5.3.3. Material

5.3.3.1. Use Fertilizer specified elsewhere in this document.

5.3.3.2. Treatment of disease to be performed by licensed pest applicator.

5.3.4. Execution

5.3.4.1. Use fertilizer specified elsewhere in this document.

5.3.4.2. Palms in turf or shrub beds do not need additional fertilizer treatments unless specified by the landscape architect.

5.3.4.3. Trees are to be pruned in compliance with the University of Florida document "Pruning Shade Trees in Landscapes: A Plan for

Training Shade Trees" by Edward Gilman, available on the internet (http//edis/ifas/ufl.edu/ep276) and which is included herein by reference.

5.4. TECHNICAL SPECIFICATIONS: SHRUB SAND MULCH

5.4.1. Plant List and Special Considerations for Shrubs Requiring Height Control: Owner specifies special and additional maintenance steps and precautions for the following shrubs requiring height control that require the following species-specific handling: nothing in these special handling notes shall relieve the Contractor of any horticultural best practices or other requirements herein:

5.4.1.1. Podocarpus makii - maintain design height according to Landscape Architect's design plans.

5.4.1.2. Acalypha wilkesiana - maintain design height according to Landscape Architect's design plans; trim annually April - June to 6' below desired finish height.

5.4.1.3. Acalypha wilkesiana 'Yellow' - maintain design height as directed by Owner; trim annually April - June to 6' below desired finish height.

5.4.1.4. Chrysobalanus icaco - maintain design height according to Landscape Architect's design plans; trim annually April - June to 6' below desired finish height.

5.4.1.5. Clusia guttifera - where visually close take care to avoid leaf scarring when pruning; maintain design height according to Landscape Architect's design plans; trim annually April - June to 6' below desired finish height; remove internal aerial roots after year 5 if needed.

5.4.1.6. Ficus mac. 'Green Island' - maintain design height according to Landscape Architect's design plans; trim annually April - June to 6' below desired finish height. May be trimmed to 14-16" every second year where desired height is 24" ±.

5.4.1.7. Galphimia gracilis - does not respond well when cut back to wood; where visually close, hand trim without shears as stems are brittle and can be hand snapped. The plant can be maintained at 3-4' with this technique. By trimming the tallest 25% of rising stems to a point 12" below the desired crown; cycle the tallest shoots down into the body of the plant.

5.4.1.8. Hamelia patens 'Compacta'- inspect closely when temperatures are below 32°. Intent is to maintain a height of 30"-60", depending on location.

5.4.1.9. Ilex vomitoria 'Stokes Dwarf' - allow plants to grow into each other

forming a solid bed; do not 'round' each plant. This cultivar is male only. Any pruning or shaping to leave lower plant parts unshaded and exposed to full sun.

5.4.1.10. Jatropha integerrima - encourage multiple stems. Leaf miner if present usually superficial.

5.4.1.11. Myrcianthes fragrans - encourage multiple stems.

5.4.1.12. Plumbago auriculata - pruning or shearing to shape when necessary is when dormant only as Plumbago flowers on current growth. Occasionally check for cottony scale or mites.

5.4.1.13. Podocarpus macrophyllus 'Dwarf Pringles' - be aware of scale and sooty mold, particularly on shaded plants or plant parts. Treat any magnesium deficiency with specified fertilizer as shown elsewhere in this document.

5.4.1.14. Chotria nervosa - very cold tender. Plants in full sun may show chlorosis; treat with specified fertilizer (below).

5.4.1.15. Schefflera arbicola 'Trinette' - may be trimmed or shaped at any time. Beware of occasional scale or spider mites, particularly on plants growing in shaded areas or on shaded plant parts.

5.4.2. Plant List and Special Considerations for Shrubs Requiring No Or Limited Height Control:

5.4.2.1. The Project includes the following shrub species that do not require height control and that require the following species-specific handling; nothing in these special handling notes shall relieve the Contractor of any horticultural best practices or other requirements herein:

5.4.2.1.1. Annual Color

5.4.2.1.2. Chrysobalanus icaco - no known issues. May be shaped anytime of the year.

5.4.2.1.3. Equisetum hyemale - no known issues other than a tendency to spread.

5.4.2.1.4. Serenoa repens 'Cinerea' - be aware of scale or sooty mold. Trim brown fronds only.

5.4.2.1.5. Horizontal Cocoplum should be maintained at a height of 12"-18"

5.4.2.1.6. T. dactyloides: annually cut the entire plant to 3" above the ground no later than September 15th each year;

perform annual fertilization no later than August 15 of each year; cut to be made horizontally (do not 'teepee' or haystack').

5.4.2.1.7. Muhlenbergia capillaris: annually cut the entire plant to 3" above the ground no later than September 15th each year; perform annual fertilization no later than August 15 of each year; cut to be made horizontally (do not 'teepee' or haystack').

5.4.2.1.8. Nephrolepis exaltata - watch this plant for slugs, snails, mealy bugs, mites, and scale; presence of denuded frond rachis is indicative. Fungus may appear when wet.

5.4.3. Mulch

5.4.3.1. Mulch in all areas at the Project is Grade B Coco Brown mulch, processed twice to minimize fines.

5.4.3.2. Settled mulch depth is measured two to four weeks after application.

5.4.3.3. Settled mulch depth to be maintained at three (3) inches.

5.4.4. General

5.4.4.1. Shrub pruning to be consistent with University of Florida publication "Pruning Landscape Trees and Shrubs" by Edward Gilman which is included in here Specifications by reference and available on the internet: http://ufdc.ufl.edu/IR00002901/00001.

5.4.4.2. Annual shrub pruning is specifically discouraged in favor of incremental trimming as needed.

5.4.4.3. Shrubs are to appear naturalistic and informal within two weeks after pruning.

5.4.4.4. Shrubs are to appear with optimal form and flowering during the annual winter season of December through April or where optimal for the species.

5.4.4.5. Plant material in shrub beds unless excepted below are to be managed in a manner that encourages natural spreading of the materials, forming a solid monoculture.

5.4.4.6. All pruning shall encourage bedding plants to grow into a solid mass of materials.

5.4.4.7. Maintain a clear separation between dissimilar shrubs in the same bed.

5.4.4.8. Shrubs and groundcovers are to be thoroughly inspected for insect or other pest infestation and for any indication of water stress each time the turf is cut.

5.4.4.9. Turf cutting schedules notwithstanding, all shrubs are to be inspected weekly for pests or water stress.

5.4.4.10. Any shrub in which infestation has affected function or appearance shall be replaced by the Contractor at the Contractor's expense.

5.4.4.11. Each species will maintain a natural, organic and species-characteristic form.

5.4.5. Materials

5.4.5.1. Use only scissor style cutter (anvil cutters are not to be used). Sharpen tools and disinfect before each pruning event.

5.4.6. Execution

5.4.6.1. Remove diseased plants from the site immediately.

5.4.6.2. The following shrub-related tasks are to be performed when turf is cut:

5.4.6.2.1. Remove spent flowers.

5.4.6.2.2. Examine all plant material and turf for early signs of pest infestation or other damage.

5.5. TECHNICAL SPECIFICATIONS: PATIO TREES

5.5.1. Plant List and Special Considerations for Small Woody Trees with Multiple Trunks (Patio Trees):

5.5.1.1. Clusia Tree/ Pitch Apple

5.5.1.1.1. Do not shear. Remove seeds in late summer after they fall and before they germinate.

5.5.1.1.2. On lake banks or other open areas, do not restrict height while maintaining a commensurate width.

5.5.1.1.3. All pruning or trimming of Clusia is to encourage the appearance of a small tree with exposed, multiple trunks; the head is to appear managed but informal with no formal shaping.

5.5.1.1.4. No mechanical trimming devices aside from hand sheared

are to be used on Clusia.

5.5.1.1.5. Trimming of Clusia to occur annually between April 1st and September 1st.

5.5.1.2. Ligustrum japonicum

5.5.1.2.1. Do not shear.

5.5.1.2.2. All pruning or trimming of Ligustrum is to encourage the appearance of a small tree with exposed, multiple trunks; the head is to appear managed but informal with no formal shaping.

5.5.1.2.3. No mechanical trimming devices aside from hand sheared are to be used.

5.5.1.2.4. Trimming to occur annually between April 1st and September 1st.

5.5.1.3. Lagerstroemia indica:

5.5.1.3.1. Do not dead-head; allow natural branching and overall vase-shape. Remove dead wood and spent flower stalks only. Flowers may be pinched in January or February to increase flowers.

5.5.1.3.2. Inspect weekly for powdery mildew and aphids/ sooty mold.

5.5.1.3.3. Pruning to comply with University of Florida document "Pruning Crape Myrtle", made part of these Specifications by reference and available on the internet :http://gardeningsolutions.ifas.ufl.Edu/care /pruning/pruning-crapemyrtles.html.

5.5.1.4. Tabebuia caraiba

5.5.1.4.1. Inspect for damage when temperatures are 32° or below.

5.5.1.4.2. Inspect for damage following heavy winds.

5.5.2. General

5.5.2.1. Patio Trees are composed of exposed multiple trunks supporting a full head.

5.5.2.2. The head portion of patio trees is to be maintained in a naturalistic form and is not to be pollarded, shaped, or in any way cut into a geometric form.

5.5.3. Materials

5.5.3.1. Fertilizer for Patio Trees is specified below in TECHNICAL SPECIFICATIONS: FERTILIZATION and PEST CONTROL.

5.5.4. Execution

5.5.4.1. Patio trees in shrub or turf areas to be fertilized at the same rate as the surrounding turf or shrubs.

5.6. TECHNICAL SPECIFICATIONS: FERTILIZATION, PEST CONTROL

5.6.1. General

5.6.1.1. Fertilizer specifications contained herein assume that the soils at the District are consistent with soils found generally in Palm Beach County Florida.

5.6.1.2. Perform annual soil testing at sites selected with the Owner. Samples to be tested by the University of Florida Extension Office in Palm Beach County, Florida, or by third party laboratories as needed.

5.6.1.3. Where soil sample reports differ from normal and usual soil sample reports for Palm Beach County, inform the Owner immediately and stop all fertilization.

5.6.1.4. Soils at Westlake seem to have some clays and are dense.

5.6.1.5. Fertilizer application to be consistent with the requirements of Palm Beach County Florida Friendly Fertilizer Usage Ordinance.

5.6.1.6. No provision in these Specifications shall be construed as to conflict with any law or regulation governing or regulating the specification or application of pest control or other similar regulated substances.

5.6.1.7. It is understood that “The Label Is The Law” and that no fertilizers or any other compound may be applied without strict compliance with package labeling.

5.6.1.8. It is the desire of the Owner to implement an IPM (integrated pest management) program in conjunction with regular plant material maintenance requiring that the grounds must be visually inspected on a weekly basis by an experienced and licensed pest-control applicator to check for signs of insect or other pest infestation.

5.6.1.9. It is understood that the Owner may accept a low but episodic level pest population before allowing chemical control agents. Contractor

to inform the Owner of pest presence and level before taking action.

5.6.1.10. Pest control agents are to be used only on an “as-needed” basis. Repeat or follow-up treatments are to be performed as required.

5.6.1.11. No pest control agents are to be applied without informing the Owner.

5.6.1.12. Weeds in groundcover and shrub beds will be discouraged through the encouragement of monoculture plantings providing full plant coverage in each bed.

5.6.1.13. The Contractor shall pull by hand any weeds greater than two (2") inches high. The use of herbicides shall be highly discouraged.

5.6.1.14. Contractor to provide evidence to the Owner that materials used executing this work have been purchased and applied. Owner may request:

5.6.1.14.1. Invoices from suppliers for fertilizers or pesticides;

5.6.1.14.2. Photographic evidence showing fertilizers on the ground and in concentrations demonstrating that fertilizers have been applied at the specified rate.

5.6.2. Materials

5.6.2.1. Base fertilizer for all plant material to be University of Florida “Improved Palm Special” 8-2-12-(4Mg) or 8-0-12-(4Mg), with the following sources:

5.6.2.1.1. Total Nitrogen 8% water soluble with 5.60 units (min) slow release N from polymer coated sulfur coated urea;

5.6.2.1.2. Available Phosphate P2O5 2%;

5.6.2.1.3. Soluble Potash K2O 12% with minimum 8.40 units polymer coated sulfur coated potash;

5.6.2.1.4. Chlorine < 2%;

5.6.2.1.5. Total Mg 4% with 4% water soluble sulfur coated or kieserite;

5.6.2.1.6. Total Manganese Mn 2% with 2.00% soluble (0.1 - 0.2% if chelated; (no oxides or sucrates);

5.6.2.1.7. Boron B .15% (Granubor© preferred);

5.6.2.1.8. Total Copper cu .15% (no oxides or sucrates);

5.6.2.1.9. Total Zinc Zn .15% (no oxides or sucrates);

5.6.2.1.10. Total Iron Fe .03% with .03% chelated (no oxides or sucrates);

5.6.2.1.11. Total sulfur S 12% with 5.0% Free Sulfur and 7.0% Combined Sulfur.

5.6.2.2. Contractors shall conform with FS 482 (Department of Health and Rehabilitative Services (HRS)), which requires that anyone either soliciting or performing Horticultural Pest and Disease Control to have obtained a license from HRS.

5.6.2.3. Pest control agents are to be rotated on a regular basis; the Contractor shall provide the Owner with a list of materials used.

5.6.2.4. Applications are to be made in strict accordance with the recommendations of the manufacturer and the recommendation of the licensed pest control applicator. The Contractor shall supply the Owner with the manufacturer's specifications. Do not apply materials when winds are above 10 MPH, or when rain is expected.

5.6.3. Execution

5.6.3.1. Fertilizer application rates are subject to revision with the findings of the annual soil sampling.

5.6.3.2. Fertilizer from bags must be mixed before application to allow Boron and other duty materials to uniformly mix.

5.6.3.3. St. Augustine: Do not apply fertilizer within 60 days of planting.

5.6.3.4. Fertilizer application rates for fertilizer specified above:

5.6.3.4.1. St. Augustine ‘Floratam’ Turf: Apply 4-6 pounds N per year 4-6 times per year;

5.6.3.4.2. Bahia Turf: apply 2# N/1,000 SF 3 times per year with general property fertilization; skip when dormant;

5.6.3.4.3. Shrubs: 2# to 4# N/1,000 SF 4 times per year;

5.6.3.4.4. Trees: 2# to 4# N/1,000 SF 4 times per year;

5.6.3.4.5. Patio Trees: 2# to 4# N/1,000 SF 4 times per year;

5.6.3.4.6. Palm Trees: 1.5#/ 100 SF of canopy 3 times per year.

5.6.3.5. Weeds may be controlled through a regular application of a post-emergent contact herbicide with a short decomposition rate. Post-emergent treatment shall not be applied until planting beds contain glysophate sensitive materials, such as cocoplum.

5.6.3.6. Apply contact herbicides with a narrow-jet spray device. Do not allow contact herbicides to come into contact with desirable plant material.

5.7. IRRIGATION MAINTENANCE

5.7.1. General

5.7.1.1. The irrigation system at the Project is currently providing 100% overlap and reliable coverage.

5.7.1.2. Irrigation system is a Rainbird two wire system with Rainbird heads and valves and Rainbird two-wire clocks with 200 stations.

5.7.1.3. Irrigation control is the Rainbird IQ Platform with IQ-Cloud v3.0 software:

5.7.1.3.1. Contractor Key Person will be responsible for installing and maintaining the IQ-Cloud software on a personal iPhone or Android device;

5.7.1.3.2. Contractor Key Person is to respond to all IQ-Cloud generated alerts as emergencies.

5.7.1.3.3. Irrigation system maintenance is part of this work and includes routine head clearing, spray adjustments, and timer adjustments.

5.7.1.3.4. Irrigation water management is part of this work. The contractor will be required to program, operate and analyze the IQ™ v3.0 Central Control System Software in order to remotely monitor the ESP-LX Series Controllers.

5.7.2. Materials

5.7.2.1. It is understood that irrigation spray and rotor heads may require adjustments as plant material grows.

5.7.2.2. When riser heights must be adjusted:

5.7.2.2.1. Use 3/4" Schedule 80 PVC with cleaner and solvent suitable for PVC.

5.7.2.2.2. Risers are to be a single piece of pipe with no couplers visible.

5.7.2.2.3. Exposed PVC risers to be painted with Rust-Oleum Universal Flat Black Rust Resistant Enamel spray paint: Lowe's Item # 233317 or approved equal.

5.7.2.2.4. Substitution of manufacturers is not allowed without Owner approval.

5.7.2.2.5. Rain Bird IQ™ v3.0 Cloud is the following hardware for setting up the IQ Central Control System:

5.7.2.2.5.1. Rain Bird ESP-LX Series Controller (LXME or LXD)

5.7.2.2.5.2. Rain Bird IQ NCC Network Communication Cartridges to interface with the system controllers

5.7.2.2.5.3. (IP based irrigation controllers-Wi-Fi, Ethernet, Cell) (IQ Spread Spectrum Radio for Client Satellites)

5.7.3. Execution

5.7.3.1. The Contractor shall visually inspect the irrigation system on a per-visit basis, and shall immediately repair any damaged heads or other equipment up to a total construction cost of $250.00.

5.7.3.2. Repair all emergency leaks or system malfunctions that would lead to property damage immediately and contact Owner immediately.

5.7.3.3. Perform the following once per month:

5.7.3.3.1. Check clocks for correct duration and start/stop times.

5.7.3.3.2. Observe every spray head and rotor, affirming that coverage is uniform and that overspray is limited.

5.7.3.3.3. The contractor shall program and operate the system to maximize the features of the ESP-LX Series controllers and IQ™ v3.0 software to the most efficient manner possible, while effectively managing the water budget and local mandates– such as flow management, ET-based programming, communication options and alarm notifications.

5.7.3.3.4. The contractor shall program the system to provide alerts to multiple users identified by the owner. In addition to

the contractor, alerts will be sent to designated representatives from Seminole Improvement District and Minto Communities, Florida. The contractor shall have the primary responsibility to immediately respond to and take corrective action for any system alerts that may lead to system failure, wasted water or property damage. The con- tractor will advise the SID and Minto representatives when the corrective action has occurred and coordinate as necessary with these entities to maintain system integrity.

5.7.3.3.5. The Contractor shall visually inspect the irrigation field controllers on a weekly basis and immediately react to alarms and repair any damaged equipment.

5.7.3.3.6. The Contractor shall perform the following system functions once per week for the first year of installation and respond to concerns as required to properly manage the water use and electrical wiring:

5.7.3.3.6.1. Line Survey System Diagnostics

5.7.3.3.6.2. Flow Report

5.8. GENERAL CLEAN UP

5.8.1. General

5.8.1.1. Routine clean-up of trash and other materials on the site and in the parking areas, including below the buildings, is part of this work.

5.8.1.2. Clean the entire site with a mechanical blower at the end of every routine site visit.

5.8.1.3. Whenever a required work task is performed, inspect the immediate area for trash. Inspect paved areas whenever mowing is performed.

5.9. Storm Damage

5.9.1. The Contractor shall inspect the property during regular hours to prevent or minimize damage during threats of stormy weather.

5.9.2. Repair work necessary due to storm damage beyond the scope of this agreement shall be paid as extra work based on established unit prices provided by the Contractor.

5.9.3. The Contractor shall be familiar with all FEMA, State, County and City rules and regulations. The Contractor will be responsible for documenting all work including debris removal, meeting with agencies and the filing of applications to ensure the District complies and receives all available reimbursements for the

cost of storm / hurricane clean up or any other event that causes damage to District property.

5.9.4. Contractor shall provide a hurricane response plan annually prior to the last day of March.

5.9.5. Where minor debris or fallen trees within the contractor's normal capacity to remove or right to stake exist, contractor shall perform inclusive of the contract amount.

5.9.6. Substitution of any specified materials, plant materials etc. shall not be allowed without approval by the Client.

5.10. Traffic Control

5.10.1. The Contractor shall comply with the laws, ordinances, rules and or requirements of the State, County and City for the maintenance of traffic (MOT) when servicing the Seminole Improvement District, as well as, provide the Seminole Improvement District with a MOT Certification and a copy of the Contractor's MOT policy which shall be site specific to the Seminole Improvement District.

5.10.2. The Contractor shall be responsible for obtaining copies of all required manuals, MUTCD, FDOT Roadway & Traffic Design Standards, or any other related documents so as to become familiar with all applicable laws, ordinance, rules or requirements as they shall apply to providing services and servicing the Seminole Improvement District.

5.10.3. The Contractor shall be responsible for ensuring that at no time landscaping (plants, shrubs, trees, etc.) or vehicles being used to perform or deliver service create a sight or hindrance problem / concern for vehicles or pedestrians.

5.10.4. The Contractor shall be responsible for ensuring all employees, service providers and sub- contractors working under or as a part of the Contractors agreement with the Seminole Improvement District are supplied, equipped and required to wear all applicable safety clothing whenever on the Seminole Improvement District site.

5.11. Implementation

5.11.1. Contractor shall provide a written maintenance schedule for all services to the Seminole Improvement District Manager and Owner's Resident Project Representative no less than three (3) days prior to the start of each month in which the services shall be performed.

5.11.2. Contractor shall indicate in advance if any of its personnel are subcontracted.

5.11.3. Contractor shall provide copies of all licenses, certifications and any other documentation required by Palm Beach County, The City of Westlake, the State of Florida and any Federal laws/rules or ordinances.

5.11.4. No work shall be permitted on Saturday or Sunday without prior authorization from the Seminole Improvement District. No work shall be permitted on holidays unless it is deemed an emergency.

5.12. Payment Retention

5.12.1. Monthly invoices will be paid less a 10% retainage. This retainage is held to satisfy inspection report items and determine that no contracted services were deemed incomplete or insufficient. This written report shall be referred to as the punch list which will identify the item(s) and provide a time period to rectify. Punch list items that persist beyond the allotted cure period will result in a forfeiture of the retainage or a portion as determined by the District Manager at the quarterly review.

5.12.2. Again, the District Manager and District Board (as Selection Committee) will review and evaluate the supplemental information provided by the Proposer/Contractor and assign an appropriate value as a part of the selection process/criteria.

Section 25

HURRICANE READINESS PLAN FOR ACTIVE CONSTRUCTION PROJECTS

1. PURPOSE

The purpose of the Hurricane Readiness Plan is to define roles and responsibilities of the construction entities with a formal plan for a major emergency or hurricane impacting the State of Florida. This plan will serve as a guideline for the Contractors for preparing active construction projects prior to the hurricane and re-establishment of the site, repairing damage, and clean-up of the construction areas as a result of a hurricane.

Contractors will be responsible for the recovery efforts and requesting reimbursement for these efforts within the project limits of their respective ongoing construction projects.

Efforts shall be coordinated with the Seminole Improvement District (S.I.D) representatives responsible for implementing the Emergency Response Plan. Contractors shall cooperate with S.I.D. representatives' directions and requests.

2. DEFINITIONS

2.1. Hurricane *Alert* is a heightened condition when threatening winds (sustained 74 mph) are possible within 72 hours.

2.2. Hurricane *Watch* is the condition when threatening winds are possible within 48 hours.

2.3. Hurricane *Warning* is the condition when threatening winds are possible within 24 hours.

2.4. Road Closed is when the road is impassable, only workers who are attempting to clear the road are allowed.

2.5. Road Passable is when the road is open to law enforcement, emergency workers, contractors and local residents. At least one lane is open on a two lane facility and two lanes-one in each direction on 4 and 6 lane facilities.

3. PART I - TASKS TO BE COMPLETED PRIOR TO THE START OF THE HURRICANE SEASON

3.1. Update project emergency phone numbers (Contractor).

3.2. Discuss need to get all roads open and cleared with Contractor staff.

4. PART II – TASKS TO BE COMPLETE BEFORE THE STORM

4.1. HURRICANE ALERT Start Preparation – 48 to 72 Hours

Contractor Staff:

4.1.1. Provide updated contact information for all essential personnel to project staff.

4.1.2. Fuel/test vehicles and emergency equipment.

4.1.3. Be prepared to open all lanes of traffic.

4.1.4. Identify and fix hazards in anticipation of removal of temporary warning devices (i.e. drop-off hazards).

4.1.5. Remove non-essential barricades.

4.1.6. Pay special attention to maintain evacuation routes.

4.1.7. Discuss any concerns.

4.1.8. Top off fuel storage tanks one (1) week prior to potential storm threat.

4.2. HURRICANE WATCH Start Preparation – 24 to 48 Hours

Contractor Staff:

4.2.1. Remove lane closures (if feasible/directed).

4.2.2. Entire jobsite should be checked for any loose items lying around; they should be stored in the proper place.

4.2.3. All project building tie downs should be checked and secured (cover windows with plywood if deemed necessary).

4.2.4. All vehicles should be filled with a full tank of gas.

4.2.5. Open and widen (if needed) all ditches to facilitate runoff of large volume of water.

4.2.6. Remove any flow restrictions from canals and ditches (i.e. turbidity barrier).

4.2.7. Remove inlet protection from areas prone to flooding.

4.2.8. Secure structures (remove or secure formwork).

4.3. HURRICANE WARNING Start Preparation – within 24 Hours

Contractor Staff:

4.3.1. Secure materials on the bridge decks as well as pipe and other stockpiled materials.

4.3.2. Secure all forms, including caps and footings, for high winds. Add extra cabling, if required.

4.3.3. Place standby pumps in danger areas to alleviate flooding.

4.3.4. Move all floating equipment to safe harbor and tie securely.

4.3.5. Move all mobile equipment to high ground out of the flood plain.

4.3.6. Electrical motors, etc., that would be damaged by standing water should be

stored on higher ground.

4.3.7. All yard material and equipment should be rechecked. All plastic covers should be securely wired with tie wire to prevent tearing caused by high winds.

4.3.8. Job signs and bulletin boards should be taken down and stored.

4.3.9. All scaffold planks, portable signs, barricades, etc., should be secured and/or removed. Any planking not needed should be removed from structures.

4.3.10. Portable welders, air compressors, etc., should be secured.

4.3.11. Form yard material should be checked and bundled.

4.3.12. Lowering of high mast lighting. Take down/remove non-essential MOT devices.

4.3.13. Boom down cranes.

4.3.14. Secure/reinforce essential MOT devices.

4.3.15. Cover/tape exhaust on diesel equipment.

5. TASKS TO COMPLETE AFTER THE STORM – CLEAN UP

5.1. IMMEDIATELY FOLLOWING THE STORM

Immediately Following the Storm is defined as follows: immediately after the tropical storm force winds subside during daylight hours or day break the following day.

Contractor Staff:
Contractor should provide sufficient staff to perform this function.

5.1.1. Re-establish vital traffic control devices, clear all lanes of debris (then clear all debris from the clear zone), and perform other work activities as directed by the Engineer.

5.2. POST STORM RESPONSIBILITIES

Contractor Staff:

5.2.1. Perform repairs as directed by the Engineer.