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**IFB NO. Y17-718-CC**

**INVITATION FOR BIDS  
FOR  
DEPUTY JONATHAN "SCOTT" PINE COMMUNITY PARK**

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**PART H  
ROADWAY/UTILITY TECHNICAL PROVISIONS/SPECIFICATIONS  
REPORTS**

**VOLUME III**

**PART H**  
**TECHNICAL PROVISIONS**

**TP 101 - Mobilization**

**MOBILIZATION**

Mobilization shall include all items detailed in Article 101 of the Standard Specifications, the Special Provisions and on the plans, except as directed by the Engineer.

Preservation of Property Corners including all items detailed in Section 7-11 of the Standard Specifications shall be included in the contract price for mobilization.

**Basis of Payment**

The work and incidental costs covered under Mobilization will be paid for at the contract lump sum price and will be paid in partial payments in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Items*
5	25
10	50
25	75
50	100

\*Partial payments as detailed above will be limited to 10% of the original Contract amount for the roadway pay items. Any amount of mobilization in excess of 10% of the roadway pay items will be paid upon completion of all work.

Payment shall be made under:

Pay Item:

101-1	Mobilization	Lump Sum
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**TP 102 – Maintenance of Traffic**

**MAINTENANCE OF TRAFFIC**

All Maintenance of Traffic work shall conform to the requirements of Section 102 of the Standard Specifications, Index 600 of the FDOT Design Standards, the plans, and/or as herein modified, except as directed by the Engineer.

The road shall be kept open to two-way traffic on a paved surface during construction except when full closures are allowed by the plans or by the Engineer. The Contractor shall not be permitted to isolate residences or places of business. Access shall be provided to all residences and all places of business whenever construction interferes with the existing means of access.

The Contractor shall furnish, erect and maintain all necessary traffic control devices, including flagmen and pilot cars, in accordance with the *Manual of Uniform Traffic Control Devices for Streets and Highways*, published by the U.S. Department of Transportation, Federal Highway Administration. The Contractor shall provide and maintain in a safe condition the entire project limits included, but not limited to pre-existing conditions, driving lanes, temporary approaches, crossings, and intersections with trails, roads, streets, business parking lots, residences, garages and completed work. The Contractor shall take all necessary precautions for the protection of the work and the safety of the public in accordance with Section 102.

The Contractor shall present his signed and sealed Maintenance of Traffic Plan that is approved by Orange County Traffic Engineering to the Engineer at the preconstruction conference, and shall be fully and solely responsible for the adequacy of the Maintenance of Traffic plan regardless of the source. The plan shall be signed and sealed by a professional engineer licensed in the State of Florida.

The Contractor shall be responsible for installation of signs for all business along the project corridor. Signs should be manufactured and installed in accordance with FDOT design standards. No special compensation will be made to the contractor to defray costs of any of the work or delays for complying with the requirements of installing business signs, but such costs shall be considered as having been included in the price stipulated for the Maintenance of Traffic pay item.

**Basis of Payment**

All materials, work and incidental costs related to Maintenance of Traffic will be paid for at the contract lump sum price. All material, labor and equipment necessary for the construction and maintenance of the entire project limits included, but not limited to pre-existing conditions, driving lanes, temporary approaches, crossings, intersections with trails, roads, streets, business parking lots, residences, garages, temporary driving lanes, side streets, driveway connections, and completed work, as may be directed by the Engineer shall be included in the contract price.

Payment shall be made under:

**Pay Item:**

102-1            Maintenance of Traffic            - Lump Sum

## PART H TECHNICAL PROVISIONS

### TP 104 - Prevention, Control and Abatement of Erosion and Water Pollution

#### **PREVENTION, CONTROL and ABATEMENT of EROSION and WATER POLLUTION**

##### **LAND CLEARING**

Prevention, control and abatement of erosion and water pollution shall conform to the requirements of Section 104 of the Standard Specifications, National Pollution Discharge Elimination System (NPDES) requirements, except as modified by these Technical Provisions or as directed by the Engineer.

The Contractor shall present at the Preconstruction Conference its Storm Water Pollution Prevention Plan (SWPPP) and a separate schedule to manage erosion and water pollution. This schedule shall include a complete outline of the proposed construction of all erosion and pollution control and abatement items required.

The Contractor shall be responsible for the preparation and submittal of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Florida Department of Environmental Protection (FDEP) and shall obtain the FDEP Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

##### **DEWATERING**

The term treatment as used in this technical provision means the application of all FDEP approved techniques and/or methods available to remove the exceedances out of dewatering effluent except impounding. Impounding is not considered a treatment method for purposes of compensation under this technical provision.

The CONTRACTOR shall include in his/her bid all applicable costs, including monitoring, resulting from treatment and disposal of contaminated groundwater with concentration levels that exceed the allowable limits of the FDEP generic permit, and shall not be entitled to any adjustment in the Contract Price as a result of any change in the permit fees or unanticipated treatment and disposal costs.

Prior to any work commencing, and for the duration of the work, the CONTRACTOR is responsible for meeting all the conditions of the applicable permits and submitting any required reports to the appropriate agencies.

The CONTRACTOR shall dewater only in relation to the location and relocation of facilities owned by the COUNTY. No compensation shall be provided for dewatering performed for facilities that are not owned by the COUNTY.

##### **Permitting**

If exceedances are found in the dewatering effluent, the CONTRACTOR will be required to:

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**TP 104 - Prevention, Control and Abatement  
of Erosion and Water Pollution**

1. Immediately notify the COUNTY and report the exceedances that are encountered.
2. Meet with the FDEP to determine any and all alternatives that are acceptable.
3. Obtain prior COUNTY approval of treatment and disposal alternatives.
4. Obtain prior written COUNTY authorization to use pay item TP 104-14
5. Apply and obtain any and all permits and/or treatment approvals that FDEP requires including, but not limited to:
  - a. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1), F.A.C.). Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or diesel fuel contamination.
  - b. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660, F.A.C.). The coverage is available only through the individual NPDES permit issued by FDEP. Allows discharges from sites with general contaminant issues, i.e. ground water and/or soil contamination other than petroleum fuel contamination.
  - c. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity (62-621.300(2), F.A.C.).
  - d. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-621.300(4) (a), F.A.C.).
6. Apply and obtain any and all permits and/or treatment approvals that the Water Management District requires including, but not limited to:
  - a. No-Notice Short-Term Dewatering Permit (40E-20.302(3), F.A.C.) If the CONTRACTOR'S proposed work is expected to exceed 90 days in duration, or does not meet any of the other requirements listed with the requirements of Rule 40E-20.302(3), the CONTRACTOR must apply for and obtain a Dewatering General Water Use Permit (40E-20.302(2) F.A.C.)

The CONTRACTOR shall not be entitled to file, or recover under, any delay claim based on preparation of permit applications and the time required for obtaining the applicable permits. If, prior to or during the dewatering, it is determined that the disposal or discharge of the dewatering effluent is not authorized by the FDEP's Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity, the CONTRACTOR shall diligently pursue further required permit(s) from FDEP or other agencies without resort to delay claims or recompense from the COUNTY for either permit application activities or the time required to obtain such permits.

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#### **TP 104 - Prevention, Control and Abatement of Erosion and Water Pollution**

The CONTRACTOR shall consider and anticipate the potential need to obtain the herein discussed permits in developing his schedule, and shall make every effort to avoid or minimize potential impacts to his critical path that might result from delays in dewatering activities due to the time necessary for the CONTRACTOR to obtain the necessary permits. The CONTRACTOR shall make every effort to schedule activities requiring dewatering as late as possible during his schedule, and shall schedule activities not impacted by dewatering as early as possible. For each day, up to a maximum of one hundred eighty (180) days that the CONTRACTOR diligently pursues such permit(s) and is unable to avoid adversely impacting his critical path, a day will be added to the time allotted to the CONTRACTOR to complete performance of the Project.

#### **Treatment**

The CONTRACTOR shall implement the appropriate treatment that is acceptable to FDEP, COUNTY, and, if necessary, the Water Management District to attain compliance for all exceedances encountered during dewatering activities. Treatments may include, but are not limited to: chemical treatment, ion exchange treatment, filtration, and disposal of discharged groundwater in a properly permitted facility.

The CONTRACTOR shall:

1. Make every effort to minimize the spread of contamination into uncontaminated areas;
2. Provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions;
3. Ensure such provisions adhere to all applicable laws, rules or regulations covering hazardous conditions in a manner commensurate with the level of severity of the conditions;
4. If necessary, provide contamination assessment and remediation personnel to handle site assessment, determine the course of action necessary for site security, and perform the necessary steps under applicable laws, rules, and regulations for additional assessment and/or remediation work to resolve the contamination issue;
5. Delineate the contamination area(s), any staging or holding area required, and develop a work plan that will provide the schedule of projected completion dates for the final resolution of the contamination issue;
6. Maintain jurisdiction over activities inside any delineated contamination areas and any associated staging or holding areas;
7. Be responsible for the health and safety of workers within the delineated areas; and

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of Erosion and Water Pollution**

8. Provide continuous access to representatives of regulatory or enforcement agencies having jurisdiction.

**Basis of Payment**

All work and incidental costs required to comply with the articles of this specification will be paid at the contract lump sum price for Prevention, Control and Abatement of Erosion and Water Pollution.

Payment will be made under:

Pay Item:

104-14	Prevention, Control and Abatement of Erosion and Water Pollution	Lump Sum
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**TP 110 – Clearing and Grubbing**

**CLEARING AND GRUBBING**

All clearing and grubbing shall be performed in accordance with the requirements of Section 110 of the Standard Specifications, except as directed by the Engineer.

Scope of work to include but not be limited to, the removal of all rigid, asphalt pavement, Portland cement concrete pavement, curb, curb and gutter, ditch pavement, sidewalk, driveway aprons, concrete slabs, concrete structures, brick, fences, gravity walls, retaining walls, pipes, etc.

Clearing and Grubbing shall also include the removal of existing pavement and base course and backfilling with suitable material, as shown in the construction plans. Removal of the existing roadway shall also include the proper disposal of the removed materials as specified above.

**Basis of Payment**

All work and incidental costs required to perform clearing and grubbing as herein specified will be paid for at the contract lump sum price.

Payment shall be made under:

Pay Item:

110-1-1	Clearing and Grubbing	Lump Sum
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**TP 120 – Excavation, Embankment and Grading**

**EXCAVATION, EMBANKMENT and GRADING**

All excavation, embankment and grading work shall conform to the requirements of Section 120 of the "Standard Specifications" and the provisions of this section, except as directed by the Engineer.

**Basis of Payment**

Excavation, Embankment and Grading will be paid for at the contract lump sum price.

Payment shall constitute full compensation for all work described herein and in the Special Provisions and shall include grading of shoulders, graded road connections, slopes, compaction, special fill, final dressing, excavation, subsoil excavation and replacement material, and all work required for completing the project that is not paid for under the other pay items. Also included is removal and off-site disposal or on-site utilization of all materials, structures, abandoned utilities and obstructions as directed by the Engineer.

Payment shall be made under:

Item 120-9	Excavation, Embankment and Grading	Lump Sum
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**TP 160 – Stabilized Subgrade**

**STABILIZED SUBGRADE**

All work shall be performed in accordance with the requirements of Section 160 of the Standard Specifications (Stabilizing) and shall be constructed to the limits, thickness, and specified limerock bearing ratio as shown on the plans, except as directed by the Engineer.

**Method of Measurement**

Quantities of stabilized subgrade measured for payment under this Section shall be the actual area in square yards of satisfactorily installed stabilized subgrade.

**Basis of Payment**

Stabilized subgrade will be paid for at the contract unit price per square yard installed and accepted and shall include the cost of furnishing and hauling additional stabilizing materials required, and all mixing, shaping and compacting of the stabilized area. The increased thickness of the Type B stabilization under curb and gutter sections shall be considered incidental and included in the contract unit price.

Payment shall be made under:

Pay Item:

160-4	Type B Stabilization (12”) (Min. LBR 40)	Per Square Yard
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### TP 270- Soil Cement Base (Primed)

#### **SOIL-CEMENT BASE (PRIMED)**

Construction of a Soil Cement Base shall consist of soil, water, and portland cement uniformly mixed, moistened, compacted, finished and cured in accordance with these specifications and shall conform to the lines, grades, thicknesses and typical cross-sections shown on the plans. Soil cement base that is not finished and cured within (36) hours after compaction has been achieved may be rejected and subject to removal and replacement if so directed by the Engineer.

#### **Testing**

- A. The Contractor shall submit a mix design prepared by an independent Geotechnical Engineer to the Engineer for acceptance before using the material for road construction. Processing of the base shall proceed after the design mix is accepted by the Engineer. A modified Portland Cement Association (PCA) Short Cut Procedure for sand soil test method may be used in lieu of the wet-dry/freeze-thaw test method. However, a 7-day minimum laboratory compressive strength of 300 psi shall be used to determine the cement content when using the modified PCA test method.
  
- B. Construction of the soil cement base shall proceed only after 48 hours prior notice has been received by the Engineer and the County's geotechnical engineer. The geotechnical engineer shall be present during construction. The following is the minimum information/test data to be obtained during construction:
  - 1. Area & Date of Construction
  - 2. Average Cement Content
  - 3. Uniformity of Mix
  - 4. Moisture Content at Time of Compaction
  - 5. Percent Compaction
  - 6. Compacted Thickness
  - 7. 7-Day Compressive Strength Tests

The geotechnical engineer will prepare and submit to the Engineer a signed report documenting all field tests and observations.

#### **Materials**

- A. Portland Cement

Portland Cement shall be Type I, II, III, or Type I-S or Type I-P and shall comply with FDOT Standard Specification Section 921. Portland Cement shall also comply with ASTM C-150 and/or AASHTO M-85 and be produced in the United States. Cement which is

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**TP 270- Soil Cement Base (Primed)**

partially set, lumpy or caked shall not be used. One cubic foot of Portland Cement shall be considered to weigh 94 lbs.

**B. Water**

Water shall be clean and free from substances deleterious to the hardening of the soil cement mixture.

**C. Soil**

Only soils which have proven themselves to produce a high quality soil cement base shall be acceptable. New sources of soil cement material shall be accepted by the County prior to use.

Specific Requirements for Soil:

Organic Material (As per FM 1-T267)	Maximum 5%
Total Clay and Silt Content (minus No. 200 [75µm sieve) (As per AASHTO T 88, no hydrometer test)	Maximum 25%
Plastic Index (As per AASHTO T 90)	Maximum 10%
Liquid Limit (As per AASHTO T 89)	Maximum 25%
Gradation: (As per AASHTO T 88)	

Passing 2 inch [50 mm] sieve    Minimum 100%

Passing No. 4 [4.75 mm] sieve    Minimum 55%

Passing No. 10 [2.00 mm] sieve    Minimum 37%

As an exception to the above requirements, the Contractor may use any material meeting the requirements for Limerock in Section 911 of the FDOT Standard Specifications.

**D. Prime Coat**

The prime coat shall be emulsified Asphalt Grades SS-I or SS-IH, or Special MS-Emulsion, diluted per the manufacturer's recommendations.

**Equipment**

Soil Cement may be constructed with any machine, combination of machines or equipment that will produce the results meeting the requirements for soil pulverization, cement application, mixing, uniform depth control, water application, incorporation of materials, compaction, finishing and curing as required to comply with these specifications.

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#### **TP 270- Soil Cement Base (Primed)**

##### **Construction Methods**

###### **A. General**

The Soil-Cement base shall be placed under the supervision of a competent superintendent having a minimum of two (2) years experience in the construction of soil-cement base courses. Soil-Cement base proportioning and construction shall only be performed when ambient temperatures measured in the shade are at 45°F and rising and that temperatures are not forecast to fall below 35°F for 48 hours following placement of the material. All mixing, shaping, finishing and compaction shall be completed within four hours starting from the time mixing commences.

###### **B. Mix Proportioning**

The Soil-Cement base shall be proportioned using Strength Design criteria. Proportioning of the soil, cement and water shall be performed in a pugmill at a central mix plant. Mixing shall be sufficiently achieved to prevent cement balls from forming when water is added. The Contractor shall continuously monitor plant batching and mixing of the materials and submit to the Engineer reports of the gradation, cement content and moisture content prepared by the independent Geotechnical Engineer. The County's Geotechnical Engineer shall monitor the installation and conduct applicable tests and inspections as outlined in this Section.

###### **C. Preparation**

Before construction operations are begun, the area to be paved shall be graded and shaped as required to receive the spread of soil-cement mixture delivered from the plant and allow construction in conformance with the grades, lines, thicknesses and typical cross sections shown on the plans. Additional soil needed, if any, shall be placed as directed. Unsuitable soil or materials shall be removed and replaced with acceptable soil. The subgrade shall be compacted to the density, thickness, lines, grades, and typical sections shown on the plans. The contractor shall maintain the required density until the base is placed on the subgrade.

###### **D. Pulverization**

The soil to be used in mixing shall be so pulverized that, at the completion of moist-mixing, 100 percent by dry weight passes a 1" sieve, and a minimum of 80% passes a No. 4 sieve, exclusive of gravel or stone retained on these sieves.

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#### **TP 270- Soil Cement Base (Primed)**

##### **E. Application of Cement**

The specified quantity of Portland Cement required for full depth treatment shall be metered out at the plant in accurate proportion in accordance with the mix design. The percentage of moisture in the soil, at the time of cement application at the plant, shall not exceed the quantity that will permit a uniform and intimate mixture of soil and cement during proportioning and shall not exceed 2% below the optimum moisture content for the soil cement mixture.

##### **F. Mixing**

After the cement has been applied, it shall be thoroughly mixed with the soil at the pugmill. Mixing shall continue until the cement has been thoroughly blended with the soil in order to prevent the formation of cement balls when water is applied. Any uncompacted soil and cement mixture that has not been compacted and finished shall not remain undisturbed for more than thirty (30) minutes.

##### **G. Application of Water and Moist Mixing**

Immediately after and/or during the mixing of soil and cement, the moisture content of the soil cement mixture shall be determined by the laboratory. Water shall be applied uniformly in quantities required to obtain the proper design moisture content within the range provided by the contractor's geotechnical engineer. After the final application of water, mixing shall continue until a uniform and intimate mixture of soil, cement and water is obtained.

When water application and mixing have been completed, the percentage of moisture in the mixture, based on oven-dry weights, shall be no more than two percentage points above the specified optimum moisture content, and shall be less than that quantity which will cause the soil cement mixture to become unstable during compaction and finishing.

##### **H. Spreading**

The mixed base material shall be hauled to the placement site in trucks equipped with protective covers and immediately placed on top of the prepared subgrade. The material shall be graded to conform to the lines and grades of the finished pavement section as shown on the project drawings and shall be placed in a sufficient thickness to assure the minimum required compacted thickness free from high and low spots. No more than 60 minutes will be allowed between placement of adjacent passes of the spreader at any location, except at construction joints.

##### **I. Compaction**

The material shall be placed in a single, uniformly thick, loose layer and evenly compacted to

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#### **TP 270- Soil Cement Base (Primed)**

a density not less than 97% of the modified maximum density determined by AASHTO T-134 on representative samples of soil cement mixture obtained from the roadway at the time compaction begins. Not more than four hours shall elapse from the time of batching to final compaction and the material shall not remain undisturbed for more than two hours. The surface of the base course may require the addition of water during the final rolling and shaping operation to prevent excessive surface moisture losses prior to sealing the base.

#### **J. Finishing**

After the mixture has been initially compacted, the surface of the soil cement shall be shaped to the required lines, grades and cross-section. During the shaping operations, the surface shall be lightly scarified to loosen any imprints left by the compacting or shaping equipment, when deemed necessary. The resulting surface shall then be compacted to the specified density with a pneumatic tire roller. Rolling shall be supplemented by broom-dragging, if required.

The moisture content of the surface material must be maintained at not less than its specified optimum moisture content during finishing operations. Surface compaction and finishing shall be done in such a manner as to produce a smooth, dense surface, free of surface compaction planes, cracks, ridges, or loose material. Surface-finishing methods may vary, provided a smooth, dense surface free of surface compaction planes is produced. The moisture and density requirements shall be determined by the methods prescribed in AASHTO T-134.

#### **K. Surface Requirements (Scalping or Hard-Planing)**

After completing compaction and finishing but not later than the beginning of the next calendar day after constructing any section of the base, the surface shall be tested with a template cut to the required crown and/or with a 15 foot straight-edge laid parallel to the centerline. All irregularities greater than 1/4 inch shall be immediately corrected with a blade adjusted to the lightest cut which will insure a surface that does not contain depressions greater than 1/4 inch under the template or the straight-edge. The material removed shall be wasted. Additional wetting during and after that final shaping operation shall be provided to keep the base continuously moist.

#### **L. Prime/Curing**

After finishing the soil cement it shall be protected against drying for 7 days by applying a bituminous curing material as soon as possible after completing finishing operations. The finished soil cement shall be kept continuously wet until the curing material is placed. Curing material shall consist of a mixture of 60% grade SS-1 and 40% water applied at the rate of 0.15 to 0.20 gallons per square yard.

The prime coat bituminous material specified shall be uniformly applied to the surface of the completed soil cement. The exact rate and temperature of application to give complete coverage

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### **TP 270- Soil Cement Base (Primed)**

without excessive runoff will be accepted by the Engineer. At the time the bituminous material is applied, the soil cement surface shall be dense, free of all loose and extraneous material, and contain sufficient moisture to prevent penetration of the bituminous material. Water shall be applied in sufficient quantity to fill the surface voids of the soil cement immediately before the bituminous curing material is applied. The bituminous material shall be sanded using a sufficient amount of clean sand to prevent bleeding or traffic pick-up.

#### **M. Construction Joints**

Prior to the beginning of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face.

#### **N. Thickness**

During various stages of construction test holes or trenches shall be dug in the mixture to determine the thickness. After completing the base, test holes shall be dug or drilled at intervals of not more than 300 feet (closer intervals if necessary) and the thickness of the base shall be determined from measurements made in these test holes.

Where the base is deficient in thickness by more than 1/2 inch, the area of deficient base shall be removed and replaced with base of the required thickness at the Contractor's sole expense. At the Engineer's option such deficient thickness base may be left in place, provided the deficiency is not more than one inch. This deficiency shall be made up in asphaltic concrete, provided the control grades can be maintained. Payment will be made on the basis of full depth soil-cement. No additional payment will be made for asphaltic concrete required to make up deficiencies in soil-cement base thicknesses.

#### **Opening To Traffic**

The Contractor will not be permitted to drive heavy equipment over the completed sections, but light weight pneumatic-tired equipment may be permitted after 24 hours, provided the surface has hardened sufficiently to prevent the equipment's marking the surface and provided the protection and curing specified are not impaired.

#### **Maintenance**

The Contractor shall maintain the base to a true and satisfactory surface until the wearing surface is constructed. Should any repairs or patching be necessary, they shall extend to the full depth of the base and shall be made in a manner that will assure restoration of a uniform base course conforming to the requirements of these specifications. The bituminous curing coating shall be maintained until the wearing surface is constructed.



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**TP 270- Soil Cement Base (Primed)**

**Inspection**

The Engineer, Geotechnical Engineer and Contractor shall inspect the base for deficiencies after a minimum of seven 7 days have elapsed and prior to applying the asphalt wearing surface. All deficiencies shall be corrected and accepted by the Engineer 48 hours prior to commencing paving operations.

**Method of Measurement**

Quantities measured for payment under this Section shall be the actual area in square yards of soil cement base constructed to limits, thicknesses, lines and grades shown on the plans, completed and accepted.

**Basis of Payment**

Soil Cement Base will be paid for at the contract unit price per square yard completed and accepted. The cost of the cement, prime coat and cover material, including the spreading of each, shall be included in the contract unit price.

Payment shall be made under:

Item No

270-6	6" Soil Cement Base Course (300 PSI) Primed	Per Square Yard
270-12	12" Soil Cement Base Course (300 PSI) Primed	Per Square Yard

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TP 334 – Superpave Asphaltic Concrete Pavement

**SUPERPAVE ASPHALTIC CONCRETE PAVING**

**334-1 GENERAL**

Work specified in this Provision consists of the application of Asphaltic Concrete structural courses properly produced and laid upon a prepared and accepted base in accordance with these specifications and in conformity with the lines, grades, thicknesses and cross-sections provided in the plans. Base preparation and Asphaltic Concrete Friction Courses are covered under separate provisions.

This Provision is intended to stand alone for the production and placement of structural course asphalt and replaces Sections 330 and 334 of the FDOT Standard Specifications for Road and Bridge Construction except when specific references are made to these or other Sections. Any references to FDOT Specification Sections shall mean the latest FDOT Standard Specifications for Road and Bridge Construction, including Supplements. Any incorrect references to or conflicts with the FDOT specifications, test methods, or standards shall be brought to the attention of the Engineer for clarification.

The Engineer will have the right to disapprove of any material or process that does not conform to these specifications.

The Contractor shall document all QC procedures, Process Control, inspection, and all test results and make them available for review by the Engineer throughout the Contract duration.

All test methods designated as FM refer to the FDOT Florida Sampling and Testing Methods.

**334-2 CONTRACTOR QUALITY CONTROL REQUIREMENTS**

**334-2.1 GENERAL:** The Contractor shall be responsible for the overall quality of the materials and workmanship of the work covered under this Provision.

Ensure that the qualifications and certifications of personnel and laboratories are maintained throughout the Contract duration. Provide proof of qualifications and all applicable certifications to the County prior to construction operations commencing. Notify the County immediately when there is a change in any qualification or certification during the Contract duration.

**334-2.2 PERSONNEL:** Provide personnel who are both qualified and certified in all activities related to asphalt mix production at the plant and placement on the roadway, especially for the sampling, testing and inspection of materials and construction activities. At a minimum, a certified Paving Level II technician shall be present on site at all times during paving operations. Provide documentation to the Engineer that the personnel responsible for the production and placement of asphalt products under the Contract are qualified and certified.

Ficquette Road Intersection Improvements, CIP 2722

TP 334

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#### TP 334 – Superpave Asphaltic Concrete Pavement

**334-2.3 TESTING LABORATORY:** Furnish or have furnished a fully equipped asphalt laboratory (permanent or portable) at the production site. Provide documentation to the Engineer that any Laboratory used is FDOT qualified and certified.

**334-2.4 EQUIPMENT:** Provide equipment and methods conforming to Section 320 of the FDOT Standard Specifications for Road and Bridge Construction. Provide a sufficient number of trucks to transport the asphalt mixture from the plant to the job site such that paving of each lane can proceed in one smooth uninterrupted operation. In determining the number of trucks required the Contractor shall consider the capacity of the trucks, the length of the approved haul route from the plant to the job site, traffic conditions, weather conditions, and any other factors that could impact the round trip travel time. Stopping the paver to wait for trucks bringing the asphalt mixture will not be acceptable. In addition to meeting the requirements in Section 320-5, the paving machine shall be capable of pushing the asphalt truck as it dumps the asphalt mixture into the hopper. Stopping the paving machine to allow the next asphalt truck to back up to it to fill the hopper is not an acceptable procedure, and shall not be allowed.

Unless otherwise approved by the Engineer, the paving machine shall weigh a minimum of 26,000 pounds.

**334-2.5 MINIMUM QUALITY CONTROL REQUIREMENTS:** Perform the following activities necessary to maintain quality and process control and meet specification requirements:

**Stockpiles:** Ensure each aggregate component is placed in an individual stockpile, and separated from adjacent stockpiles, either by space or by a system of bulkheads. Prevent the intermingling of different materials in stockpiles. Form and maintain stockpiles in a manner that will prevent separation, contamination, segregation, etc. Identify each individual stockpile, including RAP, as shown on the mix design.

**Incoming Aggregate:** Obtain gradations and bulk specific gravity (Gsb) values from aggregate supplier for reference; determine the gradation of all component materials; routinely compare gradations and Gsb values to mix design.

**Cold Bins:** Calibrate the cold gate/feeder belt for each material; determine cold gate/feeder belt settings; observe operation of cold feeder for uniformity.

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**Dryer:** Observe pyrometer for aggregate temperature control; observe efficiency of the burner.

**For Batch Plants:** Determine percent used and weight to be pulled from each bin to assure compliance with Mix Design, check mixing time, and check operations of weigh bucket and scales.

**For Drum Mixer Plants:** Determine aggregate moisture content, and calibrate the weigh bridge on the charging conveyor.

**Control Charts:** Plot and keep charts updated daily for all Quality Control Sampling and Testing and post in the asphalt lab where they can be seen. Maintain the following charts:

1. Sample test results for the following: No. 8 sieve, No. 200 sieve, asphalt binder content, air voids, and density.
2. Gradation of incoming aggregate.
3. Gradation and asphalt content of RAP.
4. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.

The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. It is recognized, however, that depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.

#### **334-2.6 MINIMUM PROCESS CONTROL TESTING REQUIREMENTS:**

##### **Asphalt Plant**

1. Hot Mix Asphalt: Determine the asphalt binder content; mix gradation and volumetric properties at a minimum frequency of one per day. In the event that the daily production exceeds 1,000 tons, perform these tests a minimum of two times per day.

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2. Aggregate (Including RAP): One sample per 1,000 tons of incoming material as it is stockpiled for gradation. The testing of RAP material shall include the determination of asphalt binder content and gradation of extracted aggregate.
3. Monitor the mix temperature for the first five loads and every fifth load thereafter.
4. Monitor the aggregate moisture content from stockpiles or combined cold feed aggregate - one per day.
5. Other tests (as determined necessary by the Contractor) for process control.

#### **Roadway**

1. Monitor the mix temperature for the first five loads and every fifth load thereafter.
2. Monitor the prime/tack spread rate as needed to control operations and ensure that it meets or exceeds the target spread rate.
3. Monitor the pavement cross slope at a frequency necessary to fulfill the requirements of the plans and section 334-3.10.3 below, and identify a system to control the cross slope of each pavement layer during construction.
4. Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed to ensure that the spread rate meets or exceeds the target spread rate. When determining the spread rate, use an average of five truckloads of mix.
5. Monitor mat placement thickness every 25' to ensure the minimum design thickness is met.
6. Monitor the pavement temperature with an infrared temperature device. Monitor the roadway density with either 6 inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement. When the layer thickness is greater than or equal to 1 inch (or the spread rate is greater than or equal to 105 lb/yd<sup>2</sup>) and an approved rolling pattern may be used in lieu of density testing, monitor the density (for informational purposes only) by cutting and testing a 6 inch diameter core at a minimum frequency of three cores per day. Maintain daily records of the testing results and make them available for review by the Engineer throughout the life of the Contract.

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7. Monitor the pavement smoothness with a 15-foot rolling straightedge as required by section 334-3.10.4 below.

### **334-3 GENERAL CONSTRUCTION REQUIREMENTS**

#### **334-3.1 DESCRIPTION**

Construct plant-mixed hot bituminous pavements. Establish and maintain a quality control system in accordance with section 334-2 above that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

#### **334-3.2 LIMITATIONS OF OPERATIONS**

**334-3.2.1 Weather Limitations:** Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the laying operations.

#### **334-3.2.2 Limitations of Laying Operations:**

**334-3.2.2.1 General:** Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is substantially dry. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

**334-3.2.2.2 Temperature:** Spread the mixture only when the air temperature in the shade and away from artificial heat is at least 40°F and rising for layers greater than 1 inch in thickness and at least 45°F and rising for layers 1 inch or less in thickness (including leveling courses). The minimum temperature requirement for leveling courses with a spread rate of 50 lb/yd<sup>2</sup> or less is 50°F and rising.

**334-3.2.2.3 Wind:** Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

**334-3.2.2.4 Night Paving:** Provide sufficient lighting for night operations.

#### **334-3.3 ROADWAY SURFACE PREPARATION**

**334-3.3.1 Cleaning:** Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of

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a vacuum truck. Power brooms or blowers may be used when the use of a vacuum truck is impractical, supplemented by hand brooming where necessary.

**334-3.3.2 Patching and Leveling Courses:** Where an asphalt mix is to be placed on an existing pavement or old base which is irregular, or wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses. Wherever a patch is required, the width shall be taken out to the full width of each lane affected and the length shall extend far enough longitudinally to fully encompass the affected area. The existing pavement receiving a patch or leveling course shall be milled as shown on the plans or as required by the Engineer.

**334-3.3.3 Application Over Surface Treatment:** Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.

**334-3.3.4 Coating Surfaces of Contacting Structures:** Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.

#### **334-3.3.5 Tack Coat:**

**334-3.3.5.1 Tack Coat Required:** Apply a tack coat, meeting the requirements of Section 300 in the FDOT Standard Specifications for Road and Bridge Construction, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes. The use of Trackless Polymer Modified Asphalt Emulsion Tack Coat (MTSS-1HM) is not allowed unless approved by the Engineer.

**334-3.3.5.2 Tack Coat at Engineer's Option:** Apply a tack coat on the following surfaces only when so directed by the Engineer:

1. Freshly primed bases.
2. Surface treatment.

#### **334-3.4 ASPHALT PLANT PREPARATION**

Ensure the following requirements are met at the asphalt plant:

##### **Asphalt Cement**

- Asphalt cement is delivered to the asphalt plant at a temperature not to exceed 370°F.

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- Asphalt cement is maintained in storage within a range of 230 to 370°F in advance of mixing operations.
- Constant heating is maintained within these limits, and that high fluctuations in temperature during a day's production is avoided.

#### **Aggregate Blending:**

- All aggregates to be blended or proportioned are placed in separate bins at the cold hopper.
- Proportioning is performed by means of securely positioned calibrated gates or other approved devices.

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#### **Aggregate Cold Bins:**

- Bin compartments are constructed to prevent any spilling or leakage of aggregate from one bin to another.
- Bin compartments have the capacity and design to permit a uniform flow of aggregates.
- Bin compartments are mounted over a feeder of uniform speed, which will deliver the specified proportions of aggregate to the drier.
- Bins are equipped with vibrators to ensure a uniform flow of aggregate at all times.
- Each bin compartment is provided with a gate which is adjustable in the vertical direction.
- Gates can be held securely at any specified vertical opening.
- Gates are equipped with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

#### **Mineral Filler:**

Mineral filler (if required in the mix design) is fed or weighed in separately from the other aggregates.

#### **Aggregate Heating and Drying:**

- Aggregates are heated and dried before screening.
- The temperature of the aggregates is controlled so that the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

#### **Aggregate Screening:**

- Oversized pieces of aggregate are removed by the use of a scalping screen.
- Oversized material is not returned to the stockpile for reuse unless it has been crushed

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- and reprocessed into sizes that will pass the scalping screen.
- The quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes.
  - A maximum of 10% plus-10 material in the minus-10 bin is maintained.

#### **334-3.5 MIXTURE PREPARATION**

Ensure the following requirements are met:

**334-3.5.1 Batch Mixing:** The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, shall be conveyed to the empty mixer. The accurately measured hot asphalt binder shall be introduced into the mixer simultaneously with, or after, the hot aggregates. The blended materials shall be continuously mixed until thoroughly uniform with all particles fully coated. The mixing time begins when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and continues until the material begins to leave the mixing unit. In no case will the mixing time be less than 35 seconds.

**334-3.5.2 Continuous Mixing:** The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, shall be introduced into the mixer in synchronization with the accurate feeding of the hot asphalt cement. The blended materials shall be sufficiently mixed until thoroughly uniform with all particles fully coated.

**334-3.5.3 Mix Temperature:** The ingredients of the mix shall be heated and combined in such a manner as to produce a mixture with a temperature, when discharged from the pugmill or surge bin, which is within the master range as defined below.

The temperature of the completed mixture shall be determined using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. A 1/4 inch hole on both sides of the truck body within the middle third of the length of the body, and at a distance from 6 to 10 inches above the surface supporting the mixture shall be provided.

The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and once every five loads thereafter. The temperature of the asphalt mix at the plant and at the roadway shall be taken at the normal frequency before the mix is placed. The temperature shall be recorded on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may take additional temperature measurements at any time.

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The master range for all mix designs will be the established temperature from the mix design  $\pm 30^{\circ}\text{F}$ . Reject for use on the project any load or portion of a load of asphalt mix at the plant or at the roadway with a temperature outside of this master range. The Engineer will be immediately notified of the rejection.

If any single load at the plant or at the roadway is within the master range but differs from the established mix temperature by more than  $\pm 25^{\circ}\text{F}$  or if the average difference of

the temperature measurements from the established mix temperature for five loads exceeds  $\pm 15^{\circ}\text{F}$ , the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 334-1; at this time the normal frequency may be resumed.

#### **Table 334-1**

#### **Temperature Tolerance From Verified Mix Design**

Any Single Measurement

$\pm 25^{\circ}\text{F}$

Average of Any Five Consecutive Measurements

$\pm 15^{\circ}\text{F}$

**334-3.5.4 Maximum Period of Storage:** The maximum time that any mix may be kept in a hot storage or surge bin shall be 72 hours.

**334-3.5.5 Contractor's Responsibility for Mixture Requirements:** Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

#### **334-3.6 MIXTURE TRANSPORT**

Transport the mixture in tight vehicles previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Cover each load during cool and cloudy weather and at any time there is a probability of rain.

#### **334-3.7 MIXTURE PLACEMENT**

##### **334-3.7.1 Requirements Applicable to All Mixture Types:**

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**334-3.7.1.1 Alignment of Edges:** Lay all asphalt concrete mixtures, including leveling courses, other than the pavement edge just adjacent to curb and gutter or other true edges, by the stringline method to obtain an accurate, uniform alignment of the pavement edge. Control the unsupported pavement edge to ensure that it will not deviate more than  $\pm 1.5$  inches from the stringline.

**334-3.7.1.2 Temperature of Spreading:** Maintain the temperature of the mix at the time of spreading within the master range as defined in 334-3.5.3.

**334-3.7.1.3 Rain and Surface Conditions:** Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is standing water on the surface to be covered. Once the rain has stopped and water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 334-3.7.1.2, the Contractor may then place the mixture caught in transit.

**334-3.7.1.4 Speed of Paver:** Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

**334.3.7.1.5 Automatic Screed Control:** For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25 feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

**334-3.7.1.6 Number of Crews Required:** For each paving machine operated, use a separate crew, each crew operating as a full unit. The technician who will be in charge of all paving operations shall be state approved and properly certified as deemed appropriate by the Engineer. The Contractor's technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the Engineer at all times when placing mix.

**334-3.7.1.7 Checking Depth of Layer:** Check the depth of each layer at frequent intervals, and make adjustments when the thickness deviates from the

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design thickness. When making an adjustment, allow the paving machine to travel a minimum distance of 32 feet to stabilize before the second check is made to determine the effects of the adjustment.

**334-3.7.1.8 Hand Spreading:** In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.

**334-3.7.1.9 Straightedging and Back-patching:** Straightedge and backpatch after obtaining initial compaction and while the material is still hot.

#### **334-3.7.2 Requirements Applicable to Courses Other Than Leveling:**

**334-3.7.2.1 Spreading and Finishing:** Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the work is completed, the required specified thickness is placed. Carry a uniform amount of mixture ahead of the screed at all times.

**334-3.7.2.2 Thickness of Layers:** Construct each course of Type SP mixture in layers of thickness as shown in Section 334-4.1.3.

**334-3.7.2.3 Laying Width:** For regular roadways, pave to the full lane width, except in areas where physically constrained. For other applications such as sidewalks, provide a spreader capable of placing and screeding to the plan width. If necessary due to the traffic requirements, lay the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, lay the mixture to the full width with machines traveling in echelon. Plan longitudinal joints such that they are not placed where a permanent wheel path will occur.

**334-3.7.2.4 Correcting Defects:** Before starting any rolling, check the surface. Correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

#### **334-3.7.3 Requirements Applicable Only to Leveling Courses:**

**334-3.7.3.1 Patching Depressions:** Before spreading any leveling course, fill all depressions in the existing surface more than 1 inch deep by spot patching with leveling course mixture, and then compact them thoroughly.

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**334-3.7.3.2 Spreading Leveling Courses:** Place all courses of leveling by the use of two motor graders, equip one with a spreader box. Other types of leveling devices may be used if approved by the Engineer.

**334-3.7.3.3 Rate of Application:** When using Type SP-9.5 (fine graded) for leveling, do not allow the average spread of a layer to be less than 50 lb/yd<sup>2</sup> or more than 75 lb/yd<sup>2</sup>. The quantity of mix for leveling shown in the plans represents the average for the entire project.

#### **334-3.8 MIXTURE COMPACTION**

**334-3.8.1 Equipment and Sequence:** For each paving or leveling train in operation, furnish a separate set of rollers, with their operators.

Select equipment, sequence, and coverage of rolling to meet the specified mix design density. The coverage is the number of times the roller passes over a given area of pavement.

Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

**334-3.8.2 Standard Rolling Procedure:** Meet the following equipment, sequence, and coverage requirements:

1. Seal Rolling: Provide two coverages with a tandem steel-wheeled roller, weighing 5 to 12 tons, following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use static mode only for all compaction. No vibration will be allowed.
2. Intermediate rolling: Provide five coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.
3. Final rolling: Provide one coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12 tons, after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

For patching and leveling courses, the first structural layer placed on a milled surface, and on the first overbuild course, use only a self-propelled pneumatic-tired roller.

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The Contractor may use equipment, sequences, or coverages other than those specified in the standard rolling procedure if so authorized by the Engineer.

**334-3.8.3 Compaction at Crossovers, Intersections, etc.:** When using a separate paving machine to pave the crossovers, compact the crossovers with one, 8 to 12 ton tandem steel roller (static mode only). If placing crossovers, intersections, and acceleration and deceleration lanes with the main run of paving, also use a traffic roller to compact these areas.

**334-3.8.4 Rolling Procedures:** Ensure that the initial rolling is longitudinal.

Where the lane being placed is adjacent to a previously placed lane, pinch or roll the center joint prior to the rolling of the rest of the lane.

Roll across the mat, overlapping the adjacent pass by at least 6 inches. Roll slowly enough to avoid displacement of the mixture, and correct any displacement at once by the use of rakes and the addition of fresh mixture if required.

Continue final rolling to eliminate all roller marks.

**334-3.8.5 Number of Pneumatic-tired Rollers Required:** Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

**334-3.8.6 Compaction of Areas Inaccessible to Rollers:** Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.

**334-3.8.7 Correcting Defects:** Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the Engineer. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements.

Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface.

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Correct all high spots, high joints, and honeycombing as directed by the Engineer.

Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.

#### **334-3.9 JOINTS**

**334-3.9.1 General:** When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided below), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

**334-3.9.2 Transverse Joints:** Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled.

When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.

**334-3.9.3 Longitudinal Joints:** For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

#### **334-3.10 SURFACE REQUIREMENTS**

**334-3.10.1 General:** Construct a smooth pavement with good surface texture and the proper cross-slope.

**334-3.10.2 Texture of the Finished Surface of Paving Layers:** Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 334-3.10.5.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface in sections less than 1 mile in length and across the full width of the roadway unless approved by the Engineer.

**334-3.10.3 Cross Slope:** Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish a level with a minimum length of 4 feet or a digital measuring device approved by the

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Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times during paving operations. Utilize electronic transverse screed controls on the paving machine (unless directed otherwise by the Engineer) to obtain an accurate transverse slope of the pavement surface.

**334-3.10.3.1 Quality Control Checks:** Measure the cross slope of the pavement surface by placing the measuring device perpendicular to the roadway centerline. Report the cross slope to the nearest 0.1%. Record all the measurements on an approved form and submit to the Engineer for documentation. The cross slope report shall be submitted to the Engineer prior to the next scheduled paving operation.

Measure the cross slope at a minimum frequency of one measurement every 100 feet during paving operations to ensure that the cross slope is uniform and in compliance with the design cross slope. When the difference between the measured cross slope and the design cross slope exceeds  $\pm 0.2\%$  for travel lanes (including turn lanes) or  $\pm 0.5\%$  for shoulders, make all corrections immediately to bring the cross slope into the acceptable range.

When the cross slope is consistently within the acceptable range, upon the approval of the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 250 feet during paving operations.

For intersections, tapers, crossovers, transitions at beginning and end of project and similar areas, adjust the cross slope to match the actual site conditions or as directed by the Engineer.

**334-3.10.4 Pavement Smoothness:** Construct a smooth pavement meeting the requirements of this Specification. The County will provide a representative to be present when smoothness testing is performed.

**334-3.10.4.1 General:** Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Make them available at the job site at all times during paving operations. Obtain a smooth surface on all pavement courses placed, and then straightedge all final structural and friction course layers in accordance with 334-3.10.4.5.

**334-3.10.4.2 Test Method:** Perform all straightedge testing in accordance with FM 5-509 with one pass of the rolling straightedge operated along the outside wheel path of each lane being tested. The Engineer may require additional testing at other locations within the lane.

**334-3.10.4.3 Traffic Control:** Provide traffic control in accordance with 334-3.2 and FDOT Design Standard Indices (600 series as applicable) during all testing. When traffic control cannot be provided in accordance with the

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applicable indices, submit an alternative Traffic Control Plan. The cost of this traffic control is included in the Contract bid prices for other pay items.

#### **334-3.10.4.5 Quality Control Checks:**

**334-3.10.4.5.1 General:** Straightedge the final Type SP structural layer and friction course layer with a rolling straightedge. Test all pavement lanes and ramps where the width is constant using a rolling straightedge and document all deficiencies on a form approved by the Engineer. Notify the Engineer of the location and time of all straightedge checks a minimum of 48 hours before beginning. Testing shall be conducted by a certified Paving Level I or higher technician. Maintain a field record during testing on a form approved by the Engineer identifying the areas tested and listing the location and degree of all deficiencies found. The field record shall be signed by the technician conducting the test and the Engineer or Engineer's Representative observing the test.

**334-3.10.4.5.2 Rolling Straightedge Exceptions:** Testing with the rolling straightedge will not be required in the following areas: intersections, tapers, crossovers, parking lots and similar areas. In addition, testing with the rolling straightedge will not be performed on the following areas when they are less than 50 feet in length: turn lanes, acceleration/deceleration lanes and side streets. However, correct any individual surface irregularity in these areas that deviates from the plan grade in excess of 3/8 inch as determined by a 15 foot manual straightedge, and that the Engineer deems to be objectionable, in accordance with 334-3.10.5.

In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

**334-3.10.4.5.3 Intermediate Layers:** Straightedge all intermediate Type SP layers (structural and overbuild) as necessary to construct a smooth pavement.

On roadways with a design speed 50 miles per hour or greater, when an intermediate Type SP layer will be opened to traffic, straightedge the pavement with a rolling straightedge and correct all deficiencies in excess of 3/8 inch within 72 hours of placement, unless directed otherwise by the Engineer. Correct all deficiencies in accordance with 334-3.10.5.

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**334-3.10.4.5.4 Final Type SP Structural Layer:** Straightedge the final Type SP structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations. Correct all deficiencies in excess of 3/16 inch in accordance with 334-3.10.5, and retest the corrected areas prior to placing the friction course.

For bicycle paths, straightedge the final structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. Correct all deficiencies in excess of 5/16 inch in accordance with 334-3.10.5. Retest all corrected areas. If the Engineer determines that the deficiencies on the bicycle path are due to field geometrical conditions, the Engineer will waive corrections.

**334-3.10.4.5.5 Friction Course Layer:** Acceptance for pavement smoothness will be based on verified Quality Control measurements using the rolling straightedge. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations.

At the completion of all paving operations, straightedge the friction course as a separate operation. As an exception, if approved by the Engineer, straightedge the friction course behind the final roller of the paving train. Correct all deficiencies in excess of 3/16 inch in accordance with 334-3.10.5. Recheck all corrected areas.

**334-3.10.5 Correcting Unacceptable Pavement:** Correct all areas of unacceptable pavement at no cost to the County. Correct deficiencies in the Type SP structural layers or in the friction course by removing and replacing the full depth of the layer, extending for a distance on either side of the defective area as determined by the Engineer, but in no case less than 50 feet on either side of the defective area for the full width of the paving lane. At the discretion of the Engineer, removal and replacement of the entire limits of the new pavement may be required.

#### **334-3.11 FINISHED SURFACE PROTECTION**

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends

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below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160°F.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The County may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.

#### **334-3.12 STRIPING**

Following final cooling and compaction of the mat and prior to opening to traffic, place temporary painted traffic stripes in accordance with TP-710 and Standard Specification 710 on each paved surface that will receive traffic, including intermediate structural courses, final structural courses that will serve as the surface course, and friction courses. Following thirty (30) days after placement of the final surface course, structural or friction, place thermoplastic striping in accordance with TP-711 and Standard Specification 711 and place raised reflective pavement markers. Final pavement markings are subject to a 180 day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work. The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The County reserves the right to check the color and retroreflectivity within 30 days prior to the end of the observation period. Replace, at no additional expense to the County, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

#### **334-4 SUPERPAVE ASPHALTIC CONCRETE**

##### **334-4.1 DESCRIPTION**

**334-4.1.1 General:** Construct a Superpave Asphaltic Concrete pavement using the type of mixture specified in the Contract on a properly prepared and accepted base. Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Meet the requirements of 334-2 for personnel, plant, methods and equipment. Meet the general construction requirements of 334-3.

**334-4.1.2 Traffic Levels:** The requirements for Type SP Asphaltic Concrete mixtures are based on the design traffic level of the project, expressed in 18-Kip Equivalent Single Axle Loads (ESAL's). The traffic levels applicable for this specification are as shown in Table 1.

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<b>Table 1 Superpave Traffic Levels</b>		
<b>Traffic Level</b>	<b>Million ESAL's</b>	<b>Typical Applications</b>
A	<0.3	Local roads, county roads, and city streets where truck traffic is light or prohibited
B	0.3 to <3	Arterial roads, Collector roads, access streets, medium duty city streets and the majority of county roadways
C	3 to < 10	

The traffic level(s) for the project are as specified in the Contract. A Type SP mix one traffic level higher than the traffic level specified in the Contract, up to a Traffic Level C mix, may be substituted at no cost to the County. In situations where the design traffic level is not specified in the Contract, a Traffic Level C mix shall be used.

**334-4.1.3 Layers:** Use only fine graded Superpave mixes.

**334-4.1.3.1 Layer Thickness:** The allowable structural layer thicknesses for fine Type SP Asphaltic Concrete mixtures are as follows:

- Type SP-9.5..... 1 1/4 – 1 1/2 inches
- Type SP-12.5..... 1 1/2 – 2 1/2 inches
- Type SP-19.0..... 2- 3 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on fine mixes when used as a structural course:

- Type SP-9.5 - Limited to the top two structural layers, two layers maximum.
- Type SP-12.5 - May not be used in the first layer of courses over 3 1/2 inches thick, nor in the first layer of courses over 2 3/4 inches thick on limited access facilities.
- Type SP-19.0 - May not be used in the final (top) structural layer.

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**334-4.1.3.2 Additional Requirements:** The following requirements also apply to fine Type SP Asphaltic Concrete mixtures:

**334-4.1.3.2.1** When construction includes the paving of adjacent shoulders ( $\leq 5$  feet wide), the layer thickness for the upper pavement layer and shoulder shall be the same and paved in a single pass, unless called for differently in the contract documents.

**334-4.1.3.2.2** All overbuild layers shall be Type SP Asphalt Concrete designed at the traffic level as stated in the Contract. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the contract documents. On variable thickness overbuild layers, the minimum allowable thickness may be reduced by 1/4 inch, and the maximum allowable thickness may be increased 1/2 inch, unless called for differently in the contract documents.

#### 334-4.2 MIX COMPOSITION

**334-4.2.1 General:** Compose the asphalt mixture using a combination of aggregates (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate proportions to meet the grading and physical properties of the approved mix design. Aggregates from various sources may be combined.

**334-4.2.2 Mix Design:** Submit to the Engineer the proposed mix design and proof that this mix design is on the FDOT District 5 accepted list. The Engineer will verify with the FDOT District 5 Bituminous Engineer that the mix is on the approved list. No mix design revisions will be allowed. A new design mix will be required for any substitution of an aggregate product, binder, or other design component unless approved by the Engineer. The Engineer will consider any marked variations from mix design parameters or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of that mix design. Provide certification from the plant (either in a statement on the delivery ticket or on a separate sheet) that the mix provided is in conformance with the design mix.

**334-4.2.3 Additional Information:** Provide the following information to the Engineer with each FDOT approved mix design submitted for use:

- The approved FDOT Mix Design Number.
- The design traffic level and the design number of gyrations ( $N_{\text{design}}$ ).

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- The source and description of the materials to be used.
- The FDOT source number product code of the aggregate components furnished from an FDOT approved source.
- The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation in handling and processing as necessary.
- A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly -No. 200 [-75 μm]) should be accounted for and identified for the applicable sieves.
- The bulk specific gravity value for each individual aggregate (and RAP) component, as identified in the FDOT aggregate control program.
- A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.
- A target temperature at which the mixture is to be discharged from the plant and a target roadway temperature. Do not exceed a target temperature of 340°F for modified asphalts and 315°F for unmodified asphalts.
- The physical properties achieved at four different asphalt binder contents, one of which shall be at the optimum asphalt content, and must conform to all specified physical requirements.
- The ignition oven calibration factor.

**334-4.3 MATERIALS**

**334-4.3.1 General Requirements:** Meet the material requirements specified in Division III of the FDOT Standard Specifications for Road and Bridge Construction. Specific references are as follows:

Coarse Aggregate: Stone, Slag, Crushed Gravel, Crushed Reclaimed Portland Cement Concrete Pavement, Crushed Glass.....	Section 901
Fine Aggregate.....	Section 902
Superpave PG Asphalt Binder .....	Section 916-1

**334-4.3.2 Superpave Asphalt Binder:** Unless specified otherwise in the Contract, use a PG 58-22 or PG 67-22 asphalt binder unless the use of a different binder or recycling agent has been approved by the Florida Department of Transportation and the Engineer for a particular mix design.

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##### **334-4.3.3 Use of Reclaimed Asphalt Pavement (RAP) Material:**

**334-4.3.3.1 General Requirements:** Reclaimed Asphalt Pavement (RAP) may be used as a component material of the asphalt mixture, with the exception of Friction Course mixes, subject to the following requirements:

- Assume responsibility for the production and placement of asphalt mixes which incorporate RAP as a component material.
- Use only RAP that has been approved by the FDOT. Provide documentation of the FDOT approval.
- Limit the amount of RAP material used in the mix to a maximum of 30% by weight of total aggregate, unless otherwise approved the Engineer.
- Use any suitable means to prevent oversized RAP material from showing up in the completed recycled mixture. Take immediate corrective action if oversized RAP material appears in the completed recycled mix.
- Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.
- Provide RAP having a minimum average asphalt content of 4.0% by weight. The Engineer may sample the stockpile to verify that this requirement is met.

##### **334-4.4 ACCEPTANCE**

**334-4.4.1 General:** The asphalt mixture will be accepted based on one of the following methods as determined by the Engineer and/or the Contract Documents:

- 1) Certification, Contractor Process Control Testing, and Acceptance Testing by the Engineer
- 2) Other method(s) as determined by the Contract

**334-4.4.2 Certification by the Contractor:** Submit a Notarized Certification of Specification Compliance letter by an officer of the company who is in responsible charge of paving operations. The letter shall be submitted on company letterhead to the Engineer and shall state that all material produced and placed on the project was in substantial compliance with the Specifications.

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**334-4.4.3 Contractor Process Control Testing:** Provide supporting test data documenting all quality and process control testing as described in 334-2 above. A pre-qualified Independent Laboratory as approved by the Engineer may be utilized for the Process Control testing.

**334-4.4.4 Acceptance Testing by the Engineer:** The Engineer may employ the use of a pre-qualified Independent Geotechnical Engineering firm and/or Laboratory to perform acceptance testing. For every 500 feet of pavement placed per lane per day, take a set of three (3) randomly placed cores, at least two (6") inches in diameter, for determining density and thickness. A minimum of two sets of three cores will be taken per roadway. Acceptance will be based on the following:

**334-4.4.4.1 Density:** The minimum acceptable average density for each course of asphaltic concrete placed shall be ninety-two (92%) percent of the design unit weight ( $G_{mm}$ ) of the job mix, with no test lower than ninety and eight tenths (90.8%) percent or higher than ninety-five (95%) percent.

**334-4.4.4.2 Thickness:** Meet the minimum design thickness on all cores. When a deficiency in thickness is found, the Engineer may require additional cores to be taken to determine the extent of the thickness deficiency. For any thickness that is less than the design thickness, remove and replace the full depth of the layer, extending for a distance on either side of the defective area as determined by the Engineer, but in no case less than 50 feet on either side of the defective area for the full width of the paving lane. At the discretion of the Engineer, removal and replacement of the entire limits of the new pavement may be required. For any thickness that is greater than the design thickness, the Engineer will make a determination about acceptance.

**334-4.4.4.3 Surface Tolerance:** The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 334-3.10.

**334-4.4.4.4 Additional Tests:** The County reserves the right to run any test at any time for informational purposes and for determining the effectiveness of the Contractor's quality control and process control.

#### 334-4.5 METHOD OF MEASUREMENT



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For the work specified under this Section the quantity to be paid for shall be the actual area in Square Yards (SY) of asphaltic concrete placed and accepted within the limits of the contract.

#### **334-4.6 BASIS OF PAYMENT**

Type SP Asphaltic Concrete will be paid for at the contract unit price per square yard, completed and accepted. No additional payment will be made for thickness of asphalt greater than the design thickness.

The bid price for the asphalt mix will include the cost of the liquid asphalt or the asphalt recycling agent. There will be no separate payment for the asphalt binder material in the asphalt mix.

Payment shall be made under:

Item No. 334-1-13    Type SP-12.5 Asphaltic Concrete (2.5”) (Traffic Level C) -  
per square yard (SY)

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#### TP 337 – Superpave Asphaltic Concrete Friction Courses

#### **SUPERPAVE ASPHALTIC CONCRETE FRICTION COURSES**

##### **337-1 DESCRIPTION**

337-1.1 General: Construct a Superpave Asphaltic Concrete Friction Course pavement using the type of mixture specified in the Contract. Superpave Friction Course mixes are identified as Type FC-5, FC-9.5 and FC-12.5. Meet the requirements of TP 334-2 for personnel, plant, methods and equipment. Meet the general construction requirements of TP 334-3.

337-1.2 Thickness: The thickness of the friction course layer will be the plan thickness as shown in the plans per mix type. FC-9.5 will be 1", FC-12.5 will be 1-1/2", and FC-5 will be 3/4".

337-1.3 Contractor's Process Control: Provide the necessary quality and process control of the friction course mix production and placement in accordance with the applicable provisions of TP 334-2 and TP 334-3. The contractor will monitor the spread rate periodically to ensure uniform thickness. Provide quality control procedures for daily monitoring and control of spread rate. If the spread rate drops below the target value, immediately make all corrections necessary to bring the spread rate into the acceptable range.

##### **337-2 MIX COMPOSITION**

337-2.1 General: Compose the asphalt mixture using a combination of aggregates (coarse, fine, or a mixture thereof) and asphalt binder. Some mixtures may require fibers and/or hydrated lime. Size, grade and combine the aggregate proportions to meet the grading and physical properties of the approved mix design and the requirements of this Section.

337-2.2 Mix Design: Any submitted mix design must be pre-approved by the FDOT. Submit to the Engineer the proposed mix design and proof that the mix design is on the FDOT District 5 accepted list. No mix design revisions will be allowed. A new design mix will be required for any substitution of an aggregate product, aggregate gradation, binder, or other design component unless approved by the Engineer. The Engineer will consider any marked variations from mix design parameters or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of that mix design. Provide certification from the plant (either in a statement on the delivery ticket or on a separate sheet) that the mix provided is in conformance with the design mix.

337-2.3 Asphalt Binder: Meet the requirements of Article 336 of the FDOT Standard Specifications for Road and Bridge Construction. Use PG 76-22 asphalt binder meeting the requirements of Article 916-1 of the FDOT Standard Specifications for Road and Bridge Construction. ARB-5 and ARB-12 shall not be used as the asphalt rubber binder unless otherwise approved by the Engineer. Limit the amount of Reclaimed Asphalt Pavement (RAP)

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material used in the mix design to equal to or less than 20% by weight of the total aggregate, unless otherwise approved by the Engineer.

337-2.4 Additional Information: Provide the following information to the Engineer with each FDOT approved mix design submitted for use:

- The approved FDOT Mix Design Number.
- The design traffic level and the design number of gyrations ( $N_{\text{design}}$ ).
- The source and description of the materials to be used.
- The FDOT source number product code of the aggregate components furnished from an FDOT approved source.
- The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation in handling and processing as necessary.
- A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly -No. 200 [-75  $\mu\text{m}$ ]) should be accounted for and identified for the applicable sieves.
- The bulk specific gravity value for each individual aggregate (and RAP) component, as identified in the FDOT aggregate control program.
- A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.
- A target temperature at which the mixture is to be discharged from the plant and a target roadway temperature. Do not exceed a target temperature of 340°F for modified asphalts and 315°F for unmodified asphalts.
- The physical properties achieved at four different asphalt binder contents, one of which shall be at the optimum asphalt content, and must conform to all specified physical requirements.
- The ignition oven calibration factor.

#### **337-3 SPECIAL CONSTRUCTION REQUIREMENTS**

337-3.1 FC-9.5 and FC-12.5:

337-3.1.1 Temperature:

337-3.1.1.1 Air Temperature at Laydown: Spread the mixture only when the air temperature (the temperature in the shade away from artificial heat) is at 45°F and rising.

337-3.1.1.2 Temperature of the mix: Heat and combine the asphalt binder and aggregate in a manner to produce a mix having a temperature, when discharged from the plant and at the time of spreading on the roadway, meeting the requirements of TP 334-3.5.3.

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337-3.1.2 Prevention of Adhesion: To minimize adhesion to the drum during the rolling operations, the Contractor may add a small amount of liquid detergent to the water in the roller.

At intersections and in other areas where the pavement may be subjected to cross-traffic before it has cooled, spray the approaches with water to wet the tires of the approaching vehicles before they cross the pavement.

337-3.1.3 Transportation Requirements of Friction Course Mixtures: Cover all loads of friction course mixtures with a tarpaulin.

337-3.2 FC-5:

337-3.2.1 Hot Storage: When using surge or storage bins in the normal production of FC-5, do not leave the mixture in the surge or storage bin for more than one hour.

337-3.2.2 Longitudinal Grade Controls for Open-Graded Friction Courses: Use either longitudinal grade control (skid, ski or traveling stringline) or a joint matcher.

337-3.2.3 Temperature:

337-3.2.3.1 Air Temperature at Laydown: Spread the mixture only when the air temperature (the temperature in the shade away from artificial heat) is at 65°F and rising. As an exception, place the mixture at temperatures lower than 65°F, only when approved by the Engineer based on the Contractor's demonstrated ability to achieve a satisfactory surface texture and appearance of the finished surface. In no case shall the mixture be placed at temperatures lower than 60°F.

337-3.2.3.2 Temperature of the Mix: Heat and combine the asphalt binder and aggregate in a manner to produce a mix having a temperature, when discharged from the plant and at the time of spreading on the roadway, meeting the requirements of TP 334-3.5.3. The target mixing temperature shall be established at 320°F.

337-3.2.4 Compaction: Provide two, static steel-wheeled rollers, with an effective compactive weight in the range of 135 to 200 PLI, determined as follows:

Total Weight of Roller (pounds)  
PLI = -----  
Total Width of Drums (inches)

(Any variation of this equipment requirement must be approved by the Engineer.) Establish an appropriate rolling pattern for the pavement in order to effectively seat the mixture without crushing the aggregate. In the event that the roller begins to crush the aggregate, reduce the number of coverages or the PLI of the rollers. If the rollers continue to crush the aggregate, use a tandem steel-wheel roller weighing not more than 135 lb/in (PLI) of drum width.

337-3.2.5 Special Equipment

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337-3.2.5.1 Fiber Supply System: Use a separate feed system to accurately proportion the required quantity of mineral fibers into the mixture in such a manner that uniform distribution is obtained. Interlock the proportioning device with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes. Control the proportion of fibers to within plus or minus 10% of the amount of fibers required. Provide flow indicators or sensing devices for the fiber system, interlocked with plant controls so that the mixture production will be interrupted if introduction of the fiber fails.

When a batch plant is used, add the fiber to the aggregate in the weigh hopper or as approved and directed by the Engineer. Increase the batch dry mixing time by 8 to 12 seconds, or as directed by the Engineer, from the time the aggregate is completely emptied into the pugmill. Ensure that the fibers are uniformly distributed prior to the addition of asphalt binder into the pugmill.

When a drum-mix plant is used, add and uniformly disperse the fiber with the aggregate prior to the addition of the asphalt binder. Add the fiber in such a manner that it will not become entrained in the exhaust system of the drier or plant.

337-3.2.5.2 Hydrated Lime Supply System: For FC-5 mixes containing granite, use a separate feed system to accurately proportion the required quantity of hydrated lime into the mixture in such a manner that uniform coating of the aggregate is obtained prior to the addition of the asphalt. Add the hydrated lime in such a manner that it will not become entrained in the exhaust system of the drier or plant. Interlock the proportioning device with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes and to ensure that all mixture produced is properly treated with hydrated lime. Control the proportion of hydrated lime to within plus or minus 10% of the amount of hydrated lime required. Provide and interlock flow indicators or sensing devices for the hydrated lime system with plant controls so that the mixture production will be interrupted if introduction of the hydrated lime fails. The addition of the hydrated lime to the aggregate may be accomplished by Method (A) or (B) as follows:

337-3.2.5.2.1 Method (A) - Dry Form: Add hydrated lime in a dry form to the mixture according to the type of asphalt plant being used.

When a batch plant is used, add the hydrated lime to the aggregate in the weigh hopper or as approved and directed by the Engineer. Increase the batch dry mixing time by eight to twelve seconds, or as directed by the Engineer, from the time the aggregate is completely emptied into the pugmill. Uniformly distribute the hydrated lime prior to the addition of asphalt binder into the pugmill.

When a drum-mix plant is used, add and uniformly disperse the hydrated lime to the aggregate prior to the addition of the asphalt. Add the hydrated lime in such a manner that it will not become entrained in the exhaust system of the drier or plant.

337-3.2.5.2.2 Method (B) - Hydrated Lime/Water Slurry: Add the required quantity of hydrated lime (based on dry weight) in a hydrated lime/water slurry form to the aggregate. Provide a solution consisting of hydrated lime and water in concentrations as directed by the Engineer. Use a plant equipped to blend and maintain the hydrated lime in suspension and to mix it with the aggregates uniformly in the proportions specified.

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337-3.2.5.3 Hydrated Lime Pretreatment: For FC-5 mixes containing granite, pretreat the aggregate with hydrated lime prior to incorporating the aggregate into the mixture. Use a feed system to accurately proportion the aggregate and required quantity of hydrated lime, and mix them in such a manner that uniform coating of the aggregate is obtained. Control the proportion of hydrated lime to within  $\pm 10\%$  of the amount required. Aggregate pretreated with hydrated lime in this manner shall be incorporated into the asphalt mixture within 45 days of pretreatment.

337-3.2.5.3.1 Hydrated Lime Pretreatment Methods: Pretreat the aggregate using one of the following two methods:

Pretreatment Method A – Dry Form: Add the required quantity of hydrated lime in a dry form to the aggregate. Assure that the aggregate at the time of pretreatment contains a minimum of 3% moisture over saturated surface dry (SSD) conditions. Utilize equipment to accurately proportion the aggregate and hydrated lime and mix them in such a manner as to provide a uniform coating.

Pretreatment Method B – Hydrated Lime/Water Slurry: Add the required quantity of hydrated lime (based on dry weight) in a hydrated lime/water slurry form to the aggregate. Provide a solution consisting of hydrated lime and water in a concentration to provide effective treatment. Use equipment to blend and maintain the hydrated lime in suspension, to accurately proportion the aggregate and hydrated lime/water slurry, and to mix them to provide a uniform coating.

337-3.2.5.3.2 Blending Quality Control Records: Maintain adequate Quality Control records for the Engineer's review for all pretreatment activities. Include as a minimum the following information (for each batch or day's run of pretreatment): pretreatment date, aggregate certification information, certified test results for the hydrated lime, aggregate moisture content prior to blending, as-blended quantities of aggregate and hydrated lime, project number, customer name, and shipping date.

337-3.2.5.3.3 Certification: In addition to the aggregate certification, provide a certification with each load of material delivered to the HMA plant, that the material has been pretreated in conformance with these specifications. Include also the date the material was pretreated.

#### **337-4 ACCEPTANCE**

337-4.1 FC-9.5 and FC-12.5: Meet the requirements of TP 334-4.4.

337-4.2 FC-5: Meet the requirements of TP 334-4, excluding TP 334-4.4.4.

Prior to the issuance of substantial completion, the contractor shall submit to the Engineer the complete cross slope report for the entire friction course placed within the project limits.

#### **337-5 FAILING MATERIAL**

Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the County.

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**337-6 METHOD OF MEASUREMENT**

For the work specified under this Section the quantity to be paid for shall be the actual area in Square Yards (SY) of asphaltic concrete friction course placed and accepted within the limits of the contract.

The bid price for the asphalt mix will include the cost of the asphalt binder, asphalt cement, anti-stripping agent, blending and handling and the tack coat application as directed in Article 300-8 of the FDOT Standard Specifications for Road and Bridge Construction, as well as fiber stabilizing additive and hydrated lime (if required). There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix.

**337-7 BASIS OF PAYMENT**

Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Articles 300 and 320 of the FDOT Standard Specifications for Road and Bridge Construction.

**Payment shall be made under:**

ITEM NO. 337-7-43 ASPHALTIC CONCRETE FRICTION COURSE (1.5" FC-12.5) (Traffic Level C) (Incl. Tack Coat) - PER SQUARE YARD (SY)

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**TP 400 – Concrete Structures**

**CONCRETE STRUCTURES**

The work specified in this Section consists of the construction of concrete structures and other concrete members at the locations and to the dimensions shown on the plans in accordance with Section 400 of the FDOT Standard Specifications for Road and Bridge Construction. All concrete construction not covered under a separate specific technical provision or pay item should be constructed in accordance with this technical provision.

Exposed concrete surfaces shall receive a Class I Surface Finish as required by Article 400-15.2.2 of the Standard Specifications, unless otherwise noted in the construction plans.

**Method of Measurement**

The quantity to be paid for under this Section shall be the volume, in cubic yards, of the classes of concrete shown in the plans, completed, in place, and accepted, except as noted herein.

**Basis of Payment**

Price and payment will be full compensation for the classes of concrete shown in the plans and shall include all labor, excavation, backfilling, compaction, forms, bracing, reinforcing steel, concrete, dewatering, and all items and incidentals necessary to complete this item of work. No separate payment will be made for obtaining the required concrete finish.

Approach slabs will be paid at the contract unit price each for concrete approach slab.

Payment shall constitute full compensation for all work and materials specified herein, and in Sections 400 and 415 of the FDOT Standard Specifications for Road and Bridge Construction.

Payment shall be made under:

**Pay Item:**

400- 1-2	Concrete Class I, Endwalls	per Cubic Yard
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**TP 425**

**INLETS, MANHOLES, AND JUNCTION BOXES**

Construction of Inlets, Manholes and Junction Boxes shall conform to the requirements of Section 425 of the "Standard Specifications" and applicable FDOT Design Standards and Details contained in the plans, except as directed by the Engineer.  
Precast inlet tops shall not be used for any type of inlet.

**Method of Measurement**

The quantities measured for payment under this Section shall be the number of inlets, manholes, junction boxes, yard drains, special end walls, and shallow ditch drains satisfactorily completed and accepted, including drainage structure under drains where required.

**Basis of Payment**

Structures included in this Section will be paid for at the contract unit price each, completed and accepted. Payments shall constitute full compensation for furnishing all materials and completing all work described herein or shown on the plans, including all excavation; dewatering; subsoil excavation and replacement material; backfilling and compacting around structures; disposal of surplus material; and furnishing and placing of all concrete; reinforcing steel; gratings; frames; covers, and any other necessary fittings as shown in the plans, required for acceptable construction, or as directed by the Engineer. Where required, drainage structure underdrains shall be included in the unit price for inlets and manholes. Any alteration of pipe grades up to one (1) foot to clear utilities shall be made and connections to structures made at no additional cost to the County or utility.

Payment shall be made under:

Item No. 425-1-521	Inlets, Ditch Bottom, Type C, <10'	Each
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## **PART H**

# **TECHNICAL PROVISIONS**

### **TP 430- Pipe Culverts and Storm Sewers**

#### **PIPE CULVERTS AND STORM SEWERS**

Construction of Pipe Culverts, Storm Sewers and Mitered End Sections shall conform to the requirements of Section 430 of the Standard Specifications, except as modified herein or as directed by the Engineer. All round and elliptical pipes shall be steel reinforced concrete pipe (SRCP).

Lifting holes in reinforced concrete pipe are prohibited.

Proposed storm sewer pipe to be connected to existing structures shall have openings cut into the existing structure without permanently damaging the structure. All structure openings shall be grouted watertight, with non-shrink grout, after pipe installation, and the structure shall be restored as approved by the Engineer.

The cost of connections to existing structures shall be included in the price bid for the pipe.

Final pipe inspection requirements shall conform to Section 430-4.8 of the Standard Specifications. All culverts and storm sewer pipes shall be videoed by the contractor and inspected and approved by the Engineer prior to final paving.

The only acceptable repair method shall be remove and relay / replace, or as otherwise directed by the Engineer. The repair cost shall be borne solely and completely by the Contractor.

All pipe culvert designated in the plans to be desilted shall be videoed in accordance to Section 430-4.8 of the Standard Specifications and approved by the Engineer prior to payment.

#### **Concrete Pipe Joints**

Each joint in a concrete pipe culvert or storm sewer shall be wrapped on the exterior of the pipe with a band of filter fabric measuring 3 feet wide centered on the joint and lapped a minimum of 2 feet. The filter fabric shall meet the requirements of Section 985 of the Standard Specifications and shall be secured against the outside of the pipe by stainless metal or plastic strapping or by other methods approved by the Engineer. These costs shall be included in the per linear foot price for the pipe.

#### **Method of Measurement**

Quantities measured for payment under this Section shall be the length in linear feet of pipe culvert or storm sewer measured in place, completed and accepted. Measurements shall be from the inside face of structure wall to inside face of structure wall.

For mitered end sections the quantity measured for payment shall be the number completed and accepted.

#### **Basis of Payment**

Pipe Culverts and Storm Sewers will be paid for at the contract unit price completed and accepted. The unit price shall include connection of proposed pipes to existing

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**TECHNICAL PROVISIONS**

**TP 430- Pipe Culverts and Storm Sewers**

structures and the replacement of the backfill, base course, and pavement removed for pipe trenching. Payment shall be full compensation for all work and materials described herein, including excavation (in whatever material is encountered), dewatering, removing unsuitable material and replacing with select bedding material, backfilling, compaction, furnishing and installing all pipe, disposing of surplus materials, and other work as may be required for an acceptable installation.

Payment shall be made under:

Item No

430-94-1	Desilting Pipe, 0-24" ( <u>Includes Video</u> )	LF
430-175-118	Pipe Culvert, Steel Reinforced Concrete, Class III, Round 18"	LF
430-175-215	Pipe Culvert, Steel Reinforced Concrete, Class IV, Elliptical, 12"x18"	LF
430-982-125	Mitered End Section, Round, 18" CD	EA
430-984-623	Mitered End Section, Elliptical, 12"x18" SD	EA

**PART H**  
**TECHNICAL PROVISIONS**

**TP 515 - Pipe Guiderail**

**PIPE GUIDERAIL**

Construction of pipe guiderail shall conform to the requirements of FDOT Index 870, 880, and this Technical Provision, except as directed by the Engineer.

**Method of Measurement**

Quantities measured for payment under this Section shall be the linear feet of two-rail or three rail guiderail measured in place along the length of the top rail and shall include rails, posts, thickened edge sidewalk, rail splice assemblies, base plates, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation.

**Basis of Payment**

Pipe Guiderail will be paid for at the contract unit price per linear foot completed and accepted.

Payment shall be made under:

Pay Item:

515-2-211      Pedestrian/Bicycle Railing, Galvanized Steel, 42" Type 1 (Picket Infill Panel)  
Per Linear Foot

## PART H TECHNICAL PROVISIONS

### TP 520 - Concrete Gutter, Curb Elements and Traffic Separator

#### **CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATOR**

Construction of concrete curb and gutter, concrete traffic separator, and concrete valley gutter shall conform to the requirements of Section 520 of the Standard Specifications, except as directed by the Engineer.

#### **Foundation**

Foundation material upon which the concrete is to be placed shall be compacted to meet the specified densities and shall be thoroughly wetted but free of standing water just prior to placing concrete.

#### **Contraction Joints**

Contraction joints shall be sawed to a minimum depth of 1 1/2 inches. Sawing shall begin as soon as the concrete has hardened to the degree that excessive raveling will not occur. Sawing shall progress in the same direction and sequence as the concrete placement. Every third joint shall be sawed first, then saw intermediate joints.

For concrete placed before noon, all joints shall be sawed the same day of placement. For concrete placed after noon, all third joints shall be sawed the day of placement; all other joints prior to noon the following day.

#### **Curing**

Concrete shall be cured as provided in Section 520-8, except as modified herein or as approved by the Engineer. Curing material shall be applied to the concrete surfaces after finishing as soon as the concrete has hardened sufficiently to prevent marring the surface or within one hour after finishing is completed, whichever occurs first. Applying curing materials shall not be held up due to other activities on the project. Contractor shall schedule and provide manpower necessary to conform to these requirements.

Spraying equipment, including spray tip and nozzle, shall be as recommended by manufacturer's printed literature, or an acceptable equal. Suggested equivalent spraying equipment is:

Pump Sprayer:            Model No. 1949, Chapin Mfg., (800) 444-3140  
Drum Pump Sprayer: 12 Volt DC # 6061, Chapin Mfg.

Equipment shall be maintained and nozzles replaced as required to provide consistent uniform spray pattern.

A uniform coating meeting the manufacturer's recommended minimum application rate shall

## PART H TECHNICAL PROVISIONS

### TP 520 - Concrete Gutter, Curb Elements and Traffic Separator

be applied. Areas appearing to have insufficient curing compound, as determined solely by the Engineer, shall be re-coated immediately to provide required uniform coverage.

Storage containers having greater than a five gallon capacity may be utilized only with prior approval by the Engineer. The contractor shall submit the manufacturer's descriptive literature describing the placement, storage and mixing requirements for storage containers exceeding five gallons. The contractor shall provide and utilize mechanical mixers for all containers larger than five gallons. The mixers shall be equivalent to the manufacture's requirements. The contractor shall conform to all storage, mixing and application requirements.

#### **Repairs**

Where replacement is necessary, complete sections between existing contraction joints shall be removed and replaced.

#### **Method of Measurement**

For curb or curb and gutter, the quantity to be paid will be plan quantity, in linear feet, measured along the face of the completed and accepted curb or curb and gutter.

For valley gutter or shoulder gutter, the quantity to be paid will be plan quantity, in linear feet, measured along the gutter line of the completed and accepted valley gutter or shoulder gutter.

For concrete traffic separator of constant width, the quantity to be paid will be plan quantity, in linear feet, measured along the center of its width, completed and accepted, including the length of the nose.

For concrete traffic separator of varying width, the quantity to be paid will be plan quantity, in square yards, completed and accepted.

#### **Basis of Payment**

Items covered by this Section will be paid for at the contract unit price. Payment shall constitute full compensation for all work described herein, including all labor, equipment, materials and incidentals necessary to complete each item of work.

Payment shall be made under:

#### Pay Item:

520- 1-8	Concrete Curb & Gutter, Special (Ribbon)	per linear foot
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## **PART H TECHNICAL PROVISIONS**

### **TP 522 - Concrete Sidewalks, 4 Inch and 6 Inch Thickness**

#### **CONCRETE SIDEWALKS, 4 INCH AND 6 INCH THICKNESS**

Construction of 4-inch and 6-inch thick concrete sidewalk shall conform to the requirements of Section 522 of the Standard Specifications, and Indexes 304 and 310 of the FDOT Design Standards, except as directed by the Engineer.

#### **Foundation**

Foundation material shall meet the specified densities and shall be thoroughly wetted but free of standing water just prior to placing concrete.

#### **Contraction Joints**

Contraction joints shall be sawed. All joints shall be straight lines oriented at 90 degrees to the edge of sidewalk, radially if in a curve, or as directed otherwise. The minimum depth of joints shall be 1 1/2 inches or 1/4 the nominal thickness of concrete placed, whichever is greater.

Joint installation shall proceed in the same direction and sequence as the concrete placement. Sawing shall begin as soon as the concrete has hardened to the degree that excessive raveling will not occur. Every third transverse joint and all longitudinal joints shall be sawcut within 8 hours after finishing. Remaining transverse joints, shall be sawcut by noon the following day.

#### **Construction Joints**

Construction joints shall be constructed at the end of all pours and at other locations where the concrete placement operations are stopped for as long as 30 minutes. They shall be placed at least 10 feet from any other transverse construction joint or end of pavement section.

Metal keyways shall be installed at all construction joints in sidewalks 6-inches and greater in thickness. Concrete thickness shall be increased by 2-inches for a minimum distance of 6-inches either side of construction joints.

#### **Curing**

Concrete shall be cured as provided in Section 520-8, except as modified herein. Curing material shall be applied to the concrete surfaces after finishing as soon as the concrete has hardened sufficiently to prevent marring the surface or within one hour after finishing is completed, whichever occurs first. Applying curing materials shall not be held up due to other activities on the project. Contractor shall schedule and provide manpower necessary to conform to these requirements.

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### **TECHNICAL PROVISIONS**

#### **TP 522 - Concrete Sidewalks, 4 Inch and 6 Inch Thickness**

Spraying equipment, including spray tip and nozzle, shall be as recommended by the manufacturers' printed literature, or an acceptable equal. Suggested equivalent spraying equipment is as follows:

Pump Sprayer:	Model No. 1949, Chapin Mfg., (800) 444-3140
Drum Pump Sprayer:	12 Volt DC # 6061, Chapin Mfg.

Equipment shall be maintained and nozzles replaced as required to provide a consistently uniform spray pattern.

A uniform coating meeting the manufacturer's recommended minimum application rate shall be applied. Areas appearing to have insufficient curing compound, as determined solely by the County, shall be re-coated immediately to provide the required uniform coverage.

Storage containers having greater than a five gallon capacity may be utilized only with prior approval of the Engineer. The Contractor shall submit the manufacturer's descriptive literature describing the placement, storage and mixing requirements for storage exceeding five gallons. The Contractor shall provide and utilize mechanical mixers for all containers larger than five gallons. The mixers shall be equivalent to or exceed the manufacture's requirements.

The Contractor shall conform to all storage, mixing and application requirements.

#### **Replacement**

Where 6-inch concrete has to be replaced due to cracks, it shall be replaced with a uniform thickness of 8-inch concrete covering no less than 40 square feet and extending to existing sawed contraction joints. Replacement concrete shall extend at least 3-inches beneath existing concrete at a minimum thickness of 3-inches.

#### **Method of Measurement**

Quantities measured for payment under this Section shall be the actual area in square yards of concrete constructed in place.

#### **Basis of Payment**

Concrete Sidewalk including ramps, detectable warning surfaces (armor tiled domes) and driveways will be paid for at the contract unit prices, completed and accepted. Payment shall constitute full compensation for all work described herein, and shall include all labor, equipment, materials, clearing and grubbing, excavation, grading, compaction, expansion material (asphalt impregnated), and all incidentals necessary to complete the work to the lines, grades, and thickness indicated on the plans.



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**TECHNICAL PROVISIONS**

**TP 522 - Concrete Sidewalks, 4 Inch and 6 Inch Thickness**

Subgrade preparation and additional concrete required for thickened slabs as indicated on the plans or as directed by the Engineer shall be included in the contract unit price for 6-inch Concrete Sidewalk.

Payment shall be made under:

Pay Item:

522-1	Sidewalk Concrete, 4" Thick	Per Square Yard
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**PART H**  
**TECHNICAL PROVISIONS**

**TP 524 - Concrete Ditch and Slope Pavement**

**CONCRETE DITCH AND SLOPE PAVEMENT**

Work specified in this Section consists of the construction of Concrete Ditch and Slope Pavement in the flow channel of drainage ditches and on roadway slopes. Work shall conform to the requirements of Section 524 of the Standard Specifications, except as directed by the Engineer.

**Materials**

Class NS concrete meeting the requirements of Section 347 shall be used.

**Construction Joints**

Metal keyways shall be installed at all construction joints in pavement 6-inches and greater in thickness. Concrete thickness shall be increased by 2-inches for a minimum distance of 6-inches either side of construction joints.

**Method of Measurement**

The quantities to be paid for under this Section shall be the area in square yards of Concrete Ditch and Slope Pavement completed and accepted. No deduction shall be made for any areas occupied by manholes, inlets, or other drainage structures or by public utility appurtenances within the pavement area.

**Basis of Payment**

Payments shall constitute full compensation for furnishing all materials and completing all work described herein or shown on the plans, including all disposal of surplus material; furnishing and placing of all concrete; reinforcing steel and any other necessary fittings as shown in the plans, required for acceptable construction, or as directed by the Engineer.

Unless specifically noted on the plans for an item to be paid under the Concrete Slope Pavement pay item, the payment shall be made under Concrete Ditch Pavement pay item.

Payment shall be made under:

<u>Pay Item:</u>		
524-1-29	Concrete Ditch Pavement, 4", Reinforced	Per Square Yard

## **PART H TECHNICAL PROVISIONS**

### **TP 570 - Performance Turf**

#### **PERFORMANCE TURF**

The Contractor shall establish a stand of grass in all areas designated on the plans and disturbed by construction in accordance with Chapter 15, Environmental Control, Article XVII, Fertilizer Management Ordinance of the Orange County Code; Sections 162 and 570 of the Standard Specifications, except as directed by the Engineer.

Work under this Section shall include all seeding, mulching, sodding, fertilizing and watering necessary to provide routine maintenance of the grassed area until the work is accepted by the Engineer.

There must be at least 90% coverage of healthy grass prior to acceptance by the Engineer. The Engineer, at any time, may require replanting of any areas in which the establishment of the grass stand does not appear to be developing satisfactorily.

The Contractor shall mow grassed areas twice monthly, or as required by the Engineer, until final acceptance of the work.

#### **Seeding and Mulching**

Grass seed shall be common Bermuda and Bahia. In addition, brown top-millet will be included during summer months and annual rye in the winter months. All seed shall meet the requirements of the State Department of Agriculture.

#### **Sodding**

Sodding shall be Bahia. It may be placed in rolls or as individual pieces. In established areas, replacement sod shall be of the same type as the existing sod, unless otherwise approved by the Engineer.

#### **Fertilizers**

Fertilize as necessary based on soil testing performed in accordance with Section 162. For fertilizer rates and application times follow Chapter 15 Environmental Control, Article XVII Fertilizer Management Ordinance of the Orange County Code.

#### **Method of Measurement**

Payment shall be calculated based on the quantity in square yards as specified in the completed and accepted plans. The cost of establishing grass in other areas disturbed by construction activities shall be borne by the Contractor.

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**TECHNICAL PROVISIONS**

**TP 570 - Performance Turf**

**Basis of Payment**

Payment shall be paid for at the contract unit price per square yard. Payment shall constitute full compensation for furnishing all materials and completing all the work specified herein, including ground preparation, fertilizing, seeding, mulching, sodding, watering, mowing and complete maintenance of the grassed area until final completion and acceptance by the Engineer.

Payment shall be made under:

Pay Item:

570-1-2	Performance Turf (Sod)	Per Square Yard
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## **PART H**

# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

#### **SIGNALIZATION**

The signalization shown on the plans shall be constructed in accordance with Sections 603, 620, 630, 632, 634, 635, 639, 641, 649, 650, 653, 660, 665, 670, 671, 676, 678, 690, 699, 780, 782, 783, 785, and 786 of the Standard Specifications, except where noted on the plans and indicated by the following Technical Provisions. All traffic signal equipment shall be listed on the Florida Department of Transportation's Approved Products List or Qualified Products List.

#### **SHOP DRAWINGS**

The Contractor shall provide shop drawings for all signalization equipment and installation. These shop drawings will be reviewed and approved by the Engineer prior to the Contractor placing orders for the signalization equipment and beginning construction.

#### **CONDUIT**

Conduit shall be furnished and installed according to Section 630 of the "Standard Specifications", the Special Provisions and the plans. The work may include furnishing and installing conduit aboveground, underground, under pavement, underground jacked, and bridge mounted.

#### **SIGNAL AND INTERCONNECT CABLE**

Signal and Interconnect Cable shall conform to the requirements of Section 632 of the "Standard Specifications". Interconnect Cable shall consist of a minimum of 36 and a maximum of 72 single mode strands of fiber optic trunk cable. The actual number of twisted pair wires will be as shown on the plans. Drop cable shall be 12 single mode fiber optic strands.

#### **SPAN WIRE ASSEMBLIES**

Span wire assemblies shall be furnished and installed according to Section 634 of the "Standard Specifications", the Special Provisions and the plans. The work may include furnishing and installing span wire assemblies in diagonal, box or suspended box configurations, and furnishing and installing fiberglass insulators and messenger wire.

#### **PULL AND JUNCTION BOXES**

Pull and Junction Boxes shall conform to the requirements of Section 635 of the "Standard Specifications" and shall be listed on the FDOT's Approved Product List (APL). Pull and Junction Boxes shall be marked in accordance with Section 603.

## **PART H**

# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

#### Pull Box Installation

Pull Boxes shall be installed in accordance with the Roadway and Traffic Design Standards, Index No. 17721. The Pull Box cover shall be flush with the finished grade or sidewalk. Pull Boxes shall not be installed in roadways, driveways, parking areas, ditches, or public sidewalk curb ramps.

#### General Requirements

Signal or interconnect cables shall not be pulled through a pull box used for loop termination. Use separate pull boxes for signal and interconnect cables.

Ground all metal covers in accordance with Section 620.

Special pull boxes shall be 24” diameter and shall have cable hangers/racks and be capable of storing slack fiber optic cable while maintaining the minimum bend radius of the cable and house the appropriate fiber splice enclosure equipment.

#### **ELECTRICAL POWER SERVICE**

Electrical power service assemblies shall be furnished and installed according to Section 639 of the "Standard Specifications", the Special Provisions and the plans. The work may include furnishing and installing overhead and underground electrical power service, electrical service wire, and electrical service disconnects.

#### **PRESTRESSED CONCRETE POLES**

Prestressed concrete poles shall be furnished and installed according to Section 641 of the "Standard Specifications", the Special Provisions and the plans. The work may include guying, furnishing and/or installing concrete strain poles.

#### **WOOD STRAIN POLES**

Wood strain poles shall be furnished and installed according to the plans and Special Provisions. Wood strain poles shall be treated with preservative as per Section 955 of the "Standard Specifications". The work may include guying, furnishing and/or installing wood strain poles.

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# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

#### **MAST ARM/POLE ASSEMBLIES**

Mast arm/pole assemblies and foundations shall be designed and installed according to the Florida Department of Transportation's Standard Mast Arm Assemblies drawings and specifications and the plans.

Mast arm/pole assemblies shall have a galvanized finish in accordance with ASTM A 123 and ASTM A 153, or have a triglycidyl isocyanurate or urethane polyester powder finish coating equivalent in color to Federal Standard FS 27038 (semi gloss black) over the galvanized surface. The finish powder coating shall be electrostatically applied and cured by heating.

Mast arm/pole assemblies shall include all hardware, anchor bolts and foundations necessary for a complete installation.

#### **VEHICULAR SIGNAL ASSEMBLIES**

Vehicular signal assemblies shall conform to Section 650 of the standard specifications, except as modified in this technical provision.

All vehicular signal displays (red, amber, green, ball-type and arrow-type) shall have light emitting diode (LED) lamps. Signal heads and LED lamps must be listed on the Florida Department of Transportation's Approved Products List.

#### **PEDESTRIAN SIGNAL ASSEMBLIES**

Pedestrian signal assemblies shall conform to Section 653 of the standard specifications, except as modified in this technical provision.

All displays shall be light emitting diode (LED) type with integrated LED countdown displays showing remaining pedestrian clearance time.

Pedestrian signal assemblies must be listed on the Florida Department of Transportation's Approved Products List.

#### **SIGNAL HEAD AUXILIARIES**

Signal head auxiliaries shall be furnished and installed according to the plans, standard specifications and Special Provisions. Aluminum and steel pedestal poles installed as part of a signalized intersection shall have a finish to match the steel strain poles or mast arm/poles.

## **PART H TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

#### **INDUCTIVE LOOP DETECTORS AND LOOP ASSEMBLIES**

Inductive loop detectors and loop assemblies shall be furnished and installed according to Section 660 of the “Standard Specifications”, the Special Provisions and the plans.

Each loop assembly shall include loop lead-in cable to connect the loop to the loop detector in the controller cabinet.

#### **VEHICLE DETECTOR ASSEMBLIES**

Vehicle Detector Assemblies shall include furnishing and installing Opticom type traffic signal pre-emption equipment or video detection systems.

The traffic signal pre-emption equipment shall be compatible with the Opticom system used by Orange County Fire Rescue. This item shall include all equipment necessary to provide a complete and functioning traffic signal pre-emption system at an intersection.

Video detection systems shall include video cameras and equipment necessary to provide traffic signal vehicle detection at an intersection. Video detection systems must be listed on the Florida Department of Transportation’s Approved Products List. All equipment, including supports and methods for mounting video cameras, must be pre-approved by Orange County Traffic Engineering. Video camera supports installed on mast arms shall have a finish similar to the mast arms.

#### **PEDESTRIAN DETECTOR ASSEMBLIES**

Pedestrian detector assemblies shall be furnished and installed according to Section 665 of the “Standard Specifications”, the Special Provisions and the plans.

#### **DETECTOR CABINET**

Detector cabinets shall be furnished and installed according to the plans and Special Provisions. The cabinets shall meet the requirements of FDOT’s Minimum Specifications for Traffic Control Signal Devices.

#### **TRAFFIC CONTROLLER ASSEMBLY**

Traffic Controller Assemblies shall conform to the requirements of Section 670 of the Standard Specifications and shall be compatible with Orange County’s traffic signal system which utilizes Siemens Eagle EPAC controllers and TS 2 Type 1 or 2 cabinets with MMU and fiber optic module. The controllers shall be Nema compatible and be capable of being programmed with up to 6 pre-emption phase movements.



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# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

Two types of Traffic Controller Assemblies shall be provided; a Type 5 base mounted cabinet with a minimum of 14 load bays and 16 detector channels, or a Type 4 pole mounted cabinet with 8 load bays and 8 detector channels.

All Controller Assemblies shall include foundations except pole mounted cabinets.

#### **SYSTEM AUXILIARIES**

Microwave radar vehicular detection unit assemblies shall be used for detection of vehicular traffic and shall be installed as shown on the plans and as directed by the Engineer. The detection unit shall be listed on FDOT's Approved Products List.

Aerial cable storage devices (Sno-Shoe) shall be used to store additional lengths of fiber optic cable along the aerial support wire for later use. They shall be designed to protect the minimum bend radius of the fiber optic cable and shall store a minimum of 100' of excess cable.

Aerial cable tree guards shall be used to protect fiber optic cables from mechanical abrasion caused by tree limbs. They shall be applied around the cable and taped at each end. Tree guards shall be 6' in length and constructed of high impact black polyethylene.

#### **REMOVAL OF EXISTING SIGNAL EQUIPMENT**

Removal of existing traffic signal equipment shall be done according to Section 690 of the "Standard Specifications", the Special Provisions and the plans. Equipment which is removed shall be delivered to Orange County's Traffic Operations building at 4200 South John Young Parkway, except for those items shown in the plans or required by the Engineer to be removed and disposed of by the Contractor.

#### **INTERNALLY ILLUMINATED SIGNS**

Internally illuminated signs shall be furnished and installed according to Section 699 of the "Standard Specifications", the Special Provisions and the plans. Internally illuminated signs shall be double sided and attached to the traffic signal mast arm (using a two point mounting assembly) or attached to a separate clamp-on sign arm attached to a traffic signal pole. The signs shall be illuminated by white LED lamps.

Signs attached to traffic signal mast arms shall include hardware to mount the signs on the mast arms.

Signs attached to sign arms shall include all hardware required to attach the sign and arm to traffic signal poles. The sign arms shall be designed to support the dead load and wind load of

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### **TP 603 – Signalization**

the internally illuminated sign without deflecting, and shall have the same finish as the traffic signal pole to which they are attached.

#### **ITS ELECTRICAL POWER SERVICE**

ITS electrical power service assemblies shall be furnished and installed according to Section 639 and Section 780 of the "Standard Specifications", the Special Provisions and the plans. The work shall include furnishing and installing overhead and underground electrical power service assemblies for ITS devices.

#### **ITS CCTV CAMERA**

The CCTV camera assembly shall include a closed-circuit television (CCTV) color camera enclosed in a domed, environmental housing with an integral motorized lens, a camera positioner, an integral receiver/driver, any and all mounting hardware and power supplies, a local control panel (video interface panel), an image encoding device, a control data transceiver, and the required network communication interface device. The camera assembly shall be capable of individual, or local, camera site control by way of a personal digital assistant (PDA) device or a laptop computer. The camera assembly shall conform to Section 782 of the standard specifications.

The camera assembly shall include, but not be limited to, the following components and features:

- A Color CCTV camera with auto focus zoom lens;
- A positioner with the pan-and-tilt unit (PTU) feature;
- A domed, non-pressurized, watertight, environmental housing;
- Domed mounting hardware shall be adapted for retrofit mounting to existing mast arm support poles or existing signal strain poles;
- Coaxial, power, and data/video cables (composite cable) for power supply, images, and camera controls;
- Transient voltage suppression and protection;
- Network communication device patch cords and/or cables;

The camera assembly shall be permanently mounted by way of a vertical mounting hardware arm that attaches the camera assembly directly to an existing mast arm or strain pole. The mounting arm shall be sealed to prohibit moisture and insects from entering the camera assembly.

The pole location and mounting height for each camera assembly shall be approved by the Engineer. Each mounting location shall be selected based on the desired field of view with the least amount of obstructions, and mounting height requirements for the camera assembly.

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# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

Each camera assembly installation shall also include multiple lightning transient voltage protection devices, one ahead of the network electronic device assembly and one behind the network electronic device assembly.

The image from each camera site and the control data being transmitted to the camera assembly from the Orange County TMC central computer shall be transmitted over an Ethernet network. The image shall be encoded in the Moving Picture Experts Group's (MPEG) standard MPEG-4 digital format at the camera site and decoded with the Orange County TMC head end equipment.

The camera image sensor shall be a 1/4-inch color interline transfer charge coupled device (CCD) that is capable of digital signal processing (DSP) with a 10-bit analog/digital converter. The sensor shall have a composite video of 1.0 volt peak-to-peak (Vp-p). The image sensor shall include a day (color)/night (monochrome) switchover and iris control, both with manual or automatic control capabilities.

The image sensor shall have a minimum resolution of 480 horizontal and 350 vertical television (TV) lines, as required by the NTSC. The sensor's picture elements shall be 768,000 by 494,000 pixels. The sensor shall have full color video sensitivity at a minimum 0.2 Lux faceplate illumination. At a minimum of 0.02 Lux minimum faceplate illumination, the device shall produce an illuminated and useable black and white image with the infra-red (IR) filter removed.

The image sensor shall have selectable automatic gain control that is peak-average adjustable at a 0- to 30-decibel (dB) range, with a minimum signal-to-noise ratio of 50 dB, weighted at 4.5 megahertz (MHz). The image sensor shall have automatic color balance that references the white areas of the scene through the lens and gamma correction with a 0.45 contrast setting. The image sensor shall have an electronic shutter that is selectable from 1/60 to 1/30,000 of a second in eight steps. The image sensor shall have an operating voltage of 24 volts.

The camera lens shall have a minimum 22x optical zoom and a minimum 10x digital zoom. The device shall have the ability to be automatically or manually focused with a focal length of 0.14 to 3.26 inches. The minimum focusing distance shall be a distance of 4 feet. The lens shall also have a minimum aperture of f/1.6 – 3.6mm to 88mm lens and a 1/4- inch with 10 preset position points.

A dome-type environmental housing enclosure shall have an ambient operating temperature of 40 to 122 degrees Fahrenheit (°F) with 95 percent relative humidity.

The dome-type environmental housing enclosure shall have a sustained wind load rating of 120 miles per hour (MPH) with a 30 percent gust factor. The dome-type housing's lower section shall be site-coated with Rain-X or an equivalent product prior to final acceptance. The non-pressurized dome shall be vented with a thermostat-controlled, 24-volt heater and blower for moisture control and shall comply with NEMA 4/IP-66 requirements.

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### **TP 603 – Signalization**

The positioner shall be capable of a 360° continuous pan with a 90° tilt. The device shall have a 100° per second manual pan speed and a 100° per second manual tilt speed. The positioner shall have a minimum preset speed/auto pan of 220° per second and a present position return accuracy of 0.3°, or less than 0.10 percent, with a minimum of 64 presets. The positioner shall have a minimum 8 tours, each with a minimum of 32 presets. The positioner shall have a minimum of 8 programmable blackout zones and have an operating voltage of 24 volts.

#### **ITS FIBER OPTIC CABLE, FIBER OPTIC SPLICE ENCLOSURE, FIBER OPTIC SPLICE TRAY, FIBER OPTIC PATCH PANEL, FIBER OPTIC PATCH CORD/JUMPER CABLE, MULTI-CONDUCTOR COMMUNICATIONS CABLE**

Fiber Optic Cable shall conform to the requirements of Section 783 of the Standard Specifications. The number and type of fibers shall be as specified on the plans.

Fiber optic splice enclosures shall employ a complete fiber management system consisting of splice trays and stress relief system. The enclosures shall conform to Section 783 of the standard specifications and be constructed from galvanized steel and designed to accommodate future expansion and contain modular splice organizers/trays capable of handling splices in a neat and distinguishable fashion. All materials and devices necessary (i.e., sealant or gasket set, strain relief hardware, splice tray support, mounting hardware, etc.) to complete the closure / splice system shall be provided.

The fiber optic splice enclosure shall be mounted to the wall of the special pull box, fiber pull box, or aerially as approved by Orange County and designed to be easily accessible for testing and maintenance. The fiber optic splice enclosure shall be capable of accommodating splice trays, organizers and accept up to a maximum of 36 fusion splices and accommodate a minimum of two (2) cable entries at each end allowing for pass through fibers.

In addition to the above, enclosures for aerial splices shall be equipped with a minimum of two (2) sealable drop ports and provide ultraviolet light protection. The fiber optic splice enclosure shall be moisture-tight (non-filled / no encapsulate), fungus resistant (ASTM 21), re-enterrable for system expansion and repair, provide cable storage support, place no stress on finished splices within the trays, provide cable strain-relief, allow for individual splice tray access, and require only ordinary tools and no chemicals for installation and maintenance. The enclosure end caps shall be factory-drilled to the proper diameter to accept and seal the fiber optic cable entries without jeopardizing its waterproof characteristics. The enclosure and all cable entries shall utilize a water-blocking technique that permits total immersion in water for a period of seven (7) continuous days without compromise. Water penetration within the compartment containing the splices constitutes a failure and replacement of the enclosure will be at the Contractor's expense.

## **PART H**

# **TECHNICAL PROVISIONS**

### **TP 603 – Signalization**

Fiber optic splice trays shall be used to secure and manage the optical fibers. They shall have internal routing features that prevent the fibers from bending with a radius smaller than its operating design limits.

Fiber optic patch panels shall be used to terminate fiber optic cables in cabinets as shown on the plans and as directed by the Engineer. The fiber optic patch panels shall conform to Section 783 of the standard specifications. The Contractor shall obtain approval from Orange County Traffic Engineering for the specific panel to be used.

Fiber optic patch cord/jumper cable shall be used to connect fiber optic equipment in cabinets as shown on the plans and as directed by the Engineer.

The fiber optic patch cord/jumper cable shall conform to Section 783 of the standard specifications. The Contractor shall obtain approval from Orange County Traffic Engineering for the specific patch cord/jumper cable to be used.

The patch cord/jumper cables required may include but are not limited to duplex in ST to ST, SC to SC, or SC to LC connectors, with strain relief, 900 um buffering of each fiber after initial 250 um buffering, ceramic ferrels, aramid yarn strength member, and a minimum bend radius of 12 inches.

Single mode patch cord/jumper cables shall have yellow sheathing. Single mode patch cord/jumper cables shall have yellow sheathing. All patch cord/jumper cables shall be 3 meters in length unless specified otherwise.

Multi-conductor communications cable shall be Category 5e, used primarily for communications and incidental low voltage device power.

### **ITS FIELD CABINET**

ITS field cabinets shall provide an environmentally secure enclosure to house ITS field device equipment, subsystems and systems. The cabinets shall be pole or ground mounted.

The ITS field cabinets shall conform to Section 785 of the standard specifications.

### **ITS VEHICLE DETECTION SYSTEM**

Wireless magnetometer vehicle detection systems shall be used for detection of vehicular traffic and shall be installed as shown on the plans and as directed by the Engineer. The detection system shall be listed on FDOT's Approved Products List.

**PART H**  
**TECHNICAL PROVISIONS**

**TP 603 – Signalization**

The detection system shall consist of wireless sensors flush mounted with the roadway surface, access point devices that receive, process and relay sensor data, repeaters that relay data between sensors and access points, and contact closure cards that convert the detection signals to contact closure signals in the traffic signal controller.

**METHOD OF MEASUREMENT**

Quantities measured for payment under this Section shall be in lump sum for each complete traffic control signal system installed at an intersection.

**BASIS OF PAYMENT**

Signalization will be paid for at the contract lump sum prices for each traffic control signal system installed at an intersection, completed and accepted. The cost of the signal communication system between signals shall be included in the contract price for each intersection signalization. Payment shall constitute full compensation for all work described herein and shown in the plans.

Payment shall be made under:

ITEM NO. 603-1      SIGNALIZATION      –LUMP SUM (LS)

PART H  
TECHNICAL PROVISIONS

**TP 700 - Highway Signing**

**HIGHWAY SIGNING**

The furnishing and installing of all Highway Signing as shown on the plans shall conform to the requirements of Section 700 of the Standard Specifications, except as amended herein or as directed by the Engineer. All highway signs shall be of the type specified and installed at the locations shown on the plans.

The materials and methods shall comply with Sections 700-3 through 700-6 of the Standard Specifications and shall be accepted by the Orange County Traffic Engineering Division prior to installation.

Sign posts for single column signs shall be a minimum of 14 gauge 2"x2" square welded steel with 3/8" knockouts on 1" centers on all four sides. The posts shall be listed on the FDOT's Qualified Products List and shall be galvanized and sealed with a polymer topcoat.

**Method of Measurement**

The quantities measured for payment under this Section shall be in accordance with Article 700-11 of the Standard Specifications.

**Basis of Payment**

Payment for furnishing and installing highway signs shall be in accordance with Section 700-12 of the Standard Specifications.

Payment shall be made under:

Pay Item:

700-1-12	SINGLE POST SIGN, F&I GM, 12-20 SF	AS
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**PART H**  
**TECHNICAL PROVISIONS**

**TP 706 - Raised Retro-Reflective Pavement Markers  
and Bituminous Adhesive**

**RAISED RETRO-REFLECTIVE PAVEMENT MARKERS and BITUMINOUS  
ADHESIVE**

The furnishing and installing of all retro-reflective pavement markers as shown on the plans shall conform to the requirements of Section 706 of the Standard Specifications, except as amended herein or as directed by the Engineer. All retro-reflective pavement markers shall be Class B and the type shall be as shown on the plans.

**Method of Measurement**

The quantities measured for payment under this Section shall be in accordance with Article 706-6 of the Standard Specifications.

**Basis of Payment**

Section 706-7 of the Standard Specifications is deleted and the following is substituted:

The quantity for the furnishing and installing of retro-reflective pavement markers shall be paid for at the contract unit price per each.

Payment shall be made under:

Pay Item:

706-3-1	REFLECTIVE PAVEMENT MARKERS (Y/Y)	EA
706-3-2	REFLECTIVE PAVEMENT MARKERS (W/R)	EA



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**TP 710 - Painted Pavement Markings**

**PAINTED PAVEMENT MARKINGS**

The placing of painted traffic stripes and markings as shown on the plans shall conform to the requirements of Section 710 of the Standard Specifications, except as amended herein or as directed by the Engineer.

**Method of Measurement**

Quantities measured for payment shall be the units for each designated item in the proposal. The quantity to be paid for under this Section shall include all labor and material for the placing of all pavement markings as shown on the plans, including the removal of any existing pavement markings.

**Basis of Payment**

All materials, work and incidental costs related to Painted Pavement Markings will be paid for at the contract lump sum price for work completed and accepted. Payment shall be full compensation for all the work specified herein and shall include all equipment, labor and materials required for an acceptable installation. Payment for this section shall include one (1) application of painted pavement markings to be applied to the final pavement surface during the 30 day cure period.

Payment shall be made under:

**Pay Item:**

710-90	Painted Pavement Markings, Final Surface	LS
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**PART H**  
**TECHNICAL PROVISIONS**

**TP 711 - Thermoplastic Traffic Stripes and Markings**

**THERMOPLASTIC TRAFFIC STRIPES AND MARKINGS**

The placing of thermoplastic traffic stripes and markings as shown on the plans shall conform to the requirements of Section 711 of the Standard Specifications, except as amended herein or as directed by the Engineer.

**Materials**

The materials to be used under this Section shall be in accordance with Article 711-2 of the Standard Specifications.

**Method of Measurement**

The quantities to be paid for under this Section shall be the length measured in linear feet, net miles of Thermoplastic Solid Traffic Stripe or the per each quantity of messages and directional arrows as measured and accepted by the Engineer. The payment shall include all labor and material for the placing of all pavement markings as shown on the plans, including removal of existing pavement markings.

**Basis of Payment**

The quantity for the placing of the thermoplastic pavement markings shall be paid for at the contract unit price.

Payment shall be made under:

Pay Item:

711-11-123	Thermoplastic, White, Solid For Crosswalk and Roundabout, 12"	LF
711-11-125	Thermoplastic, White, Solid For Stop Line and Crosswalk, 24"	LF
711-11-141	Thermoplastic, White, Extension, 6" (6/10)	GM
711-11-170	Thermoplastic, Arrows (Right) & (Left)	EA
711-11-224	Thermoplastic, Yellow, Solid For Diagonals and Chevrons, 18"	LF
711-11-241	Thermoplastic, Yellow, Guide Line, 6" (2/4)	GM
711-16-101	Thermoplastic, Standard - Other, White, Solid, 6"	GM
711-16-201	Thermoplastic, Standard - Other, Yellow, Solid, 6"	GM

**PART H**  
**TECHNICAL PROVISIONS**

**TP 900-1- As Built Plans**

**AS-BUILT PLANS**

The As-Built Plans shall incorporate all the changes made to the red line As-Built plans. They shall show locations and elevations of paving, swales, ditches, pipe inverts and structures constructed and all relocated or reset property corners, section corners and 1/4 section corners.

Upon the completion of the project, the Contractor shall submit to the County one (1) set of 24"x36" paper Full Size Drawings with Statement of Certifications, certifying that the project was constructed according to the Construction Plans and Specifications, and that the AS BUILT PLANS are correct representation of what was constructed. The plans shall delineate all red line information contained on the As-Built Plans.

The Contractor shall include the Statement of Certification on either the cover sheet certifying all of the sheets or certify each individual sheet. The Statement of Certifications shall be signed and sealed by a Professional Engineer and/or a Professional Surveyor and Mapper, both registered in the State of Florida.

**Basis of Payment**

As-Built Plans will be paid for at the contract lump sum price, completed and accepted.

Payment shall be made under:

Pay Item:

900-1	As-Built Plans	Lump Sum
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**PART H**  
**TECHNICAL PROVISIONS**

**TP 900-2 Indemnification**

**INDEMNIFICATION**

The Contractor shall indemnify, defend, and hold harmless the COUNTY and all its officers, agents, and employees, from all claims, losses, damages, costs, charges, or expenses arising out of any acts, action, neglect, or omission by the Contractor during the performance of the Contract, whether direct or indirect, and whether to any person or property to which the COUNTY or said parties may be subject, except that neither the Contractor nor any of its subcontractors are liable under this Section for damages arising out of the injury or damage to persons or property directly caused or resulting from the sole negligence of the COUNTY or any of its officers, agents, or employees.

Payment shall be made under:

Pay Item:

900-2	Indemnification	Lump Sum
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**SECTION 01025**  
**MEASUREMENT AND PAYMENT**

**PART 1 - GENERAL**

**1.01 REQUIREMENTS INCLUDED**

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

**1.02 GENERAL PROVISIONS**

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

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

### 1.03 CASH ALLOWANCES

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

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

#### 1.04 WORK NOT PAID FOR SEPARATELY

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

#### 1.05 MEASUREMENT FOR PAYMENT

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

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

B. Lump Sum Contracts/Items - Generally:

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

## 1.06 MEASUREMENT AND PAYMENT ITEMS

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

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



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

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

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

**Table A**

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

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

	<p>specifications. Payment will be made at the lump sum price divided into equal monthly payments based on the Contract Time and acceptance by County of the progressive as-built drawings and tables.</p>
	<p><b>Reference ID 10.150.xxx Maintenance of Traffic</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Maintenance of Traffic (MOT) in accordance with County requirements and Florida Department of Transportation (FDOT) standards.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian traffic including flag men, uniformed police officers, barricades, warning lights/flashers, and safety ropes. Also included is furnishing, installing and maintaining a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special requirements for the safe and expeditious movements of traffic.</p>
	<p><b>Reference ID 10.160.xxx Public Information Officer</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Public Information/Relations in accordance with County requirements.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to provide and maintain communication with those individuals having a residence, business, or property adjacent to or within 1,000-feet of the construction area. Payment shall include the rental of venues, preparation of and conducting all meetings, and preparation of and disbursement of printed materials.</p>
	<p><b>Reference ID 10.170.xxx License Agreement/Notification to Homeowner</b></p>
	<p>a. Measurement: Shall be measured as lump sum to obtain notarized License Agreement from affected property owners and all items shall be included in the lump sum price. This item shall include furnishing all labor, materials, equipment and services necessary to obtain notarized Licensed Agreement from affected property owners prior to beginning any work on private property.</p> <p>b. Payment: Pay item to be apportioned to the total of the water/wastewater system improvements of the Work requiring the execution of License Agreement(s) and paid monthly based on the Work in the areas completed as part of the pay application that require the execution of License Agreement(s).</p>
	<p><b>11 SITE WORK</b></p>
	<p><b>11.1 – Miscellaneous</b></p>
	<p><b>Reference ID 11.110.xxx Erosion and Sediment Control</b></p>
	<p>a. Measurement: Measurement shall be based on satisfactory Erosion and Sediment Control in accordance with the County requirements and</p>

	<p>specifications (Section 01560).</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment to control and prevent sediment transportation from the Work area to adjacent properties, including installation, maintenance, and removal of temporary erosion and sediment controls.</p>
	<b>Reference ID 11.120.xxx Unsuitable Materials</b>
	<p>a. Measurement: Unsuitable Material shall be measured in actual cubic yards removed and disposed of in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual removed quantities.</p> <p>b. Payment: Payment will be made at the contract unit price bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to remove and dispose of unsuitable material including the removal of overburden.</p>
	<b>Reference ID 11.130.xxx Fill Dirt</b>
	<p>a. Measurement: Fill Dirt shall be measured in actual cubic yards of suitable material placed and compacted in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual placed quantities.</p> <p>b. Payment: Payment will be made at the contract unit prices bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to replace and compact suitable material including the removal of overburden.</p>
	<b>11.2 - Road Work</b>
	<b>Reference ID 11.210.xxx Concrete Base (various thickness)</b>
	<p>a. Measurement: Concrete Base shall be measured in actual square yards of high early strength concrete base with prime and tack coats installed in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Concrete Base and shall include all labor, materials and equipment to install, and spread concrete base. No separate payment will be made for prime and tack coats.</p>
	<b>Reference ID 11.211.xxx Limerock Base (various thickness)</b>
	<p>a. Measurement: Limerock Base shall be measured in actual square yards of limerock base with prime and tack coats installed in accordance with the County requirements and specifications (Section 02571).</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard</p>

	as stated in the proposal for Limerock Base and shall include all labor, materials and equipment to install, spread, and compact limerock base. No separate payment will be made for prime and tack coats.
	<b>Reference ID 11.212.xxx Soil Cement Base (various thickness)</b>
	<p>a. Measurement: Soil Cement Base shall be measured in actual square yards of limerock base with prime and tack coats installed in accordance with the County requirements and specifications (Section 02571).</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Soil Cement Base and shall include all labor, materials and equipment to install, spread, and compact limerock base. No separate payment will be made for prime and tack coats.</p>
	<b>Reference ID 11.220.xxx Temporary Paving (cold mix overlay) (various thickness)</b>
	<p>a. Measurement: Temporary Paving shall be measured in actual square yards of temporary paving furnished and installed in accordance with the Plans and Specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Temporary Paving and shall include all labor, materials, and equipment to apply the cold mix overlay in accordance with County requirements and specifications. The unit price bid shall also include traffic signalization repair, and temporary striping and markings.</p>
	<b>Reference ID 11.230.xxx Milling and Resurfacing</b>
	<p>a. Measurement: Milling and Resurfacing shall be measured in actual square yards over which the milling and subsequent resurfacing is completed and accepted at the thickness as indicated in the Drawings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Milling and Resurfacing and shall include all labor, materials, and equipment to mill surface; dispose of milled materials; and apply Type S-III asphalt surface overlay in accordance with County requirements and specifications. The unit price bid shall also include traffic signalization repair, and permanent striping and markings.</p>
	<b>Reference ID 11.240.xxx Road Crossing Pavement Restoration</b>
	<p>a. Measurement: Road Crossing Pavement Restoration shall be measured in actual square yards of existing asphalt paving and subgrade removal and replacement furnished and installed in accordance with the County requirements and specifications. The width measured for payment of asphalt surface repair, as measured perpendicular to the centerline of the pipe, shall be limited to the width shown on the Drawings (maximum pay width of 8-feet). The length shall be as measured along the centerline of the pipe.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Road Crossing Pavement Restoration and shall</p>

	include all labor, materials, and equipment necessary to provide a safe, smooth driving surface. The Work shall include saw cutting, pavement removal and proper disposal of exiting pavement, installing high early concrete and asphalt surface into a properly prepared subgrade, traffic signalization repair, and temporary and permanent striping and markings in accordance with the County requirements and specifications.
	<b>Reference ID 11.241.xxx Asphalt Roadway Replacement (various thickness)</b>
	<p>a. Measurement: Asphalt Roadway Repair shall be measured in actual square yards of existing asphalt paving and subgrade removal and replacement furnished and installed in accordance with the County requirements and specifications. The width measured for payment of asphalt surface repair, as measured perpendicular to the centerline of the pipe, shall be limited to the width shown on the Drawings. The length shall be as measured along the centerline of the pipe.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Asphalt Roadway Replacement and shall include all labor, materials, and equipment necessary to provide a safe, smooth driving surface. The Work shall include saw cutting; pavement removal and proper disposal of exiting pavement, installing prime coat, tack coat, and asphalt, compaction, traffic signalization repair, and temporary striping and markings in accordance with the County requirements and specifications. Payment will be made once and shall include both temporary and permanent Asphalt Roadway Replacement.</p>
	<b>Reference ID 11.250.xxx Concrete Pavement Replacement (various thickness)</b>
	<p>a. Measurement: Concrete Pavement Replacement shall be measured in actual square yards of concrete removed and replaced. Width of replaced sidewalk shall match that of existing sidewalk. Replaced portions of driveways shall conform to the lines and grades of removed portions of driveways. Thickness of pavement shall be as indicated in the plans and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Concrete Pavement Replacement and shall include all labor, materials, and equipment for saw-cutting, removal and proper disposal of existing concrete, compaction, form work, concrete replacement, restoration, and clean-up for a complete installation.</p>
	<b>Reference ID 11.251.112 Construct Public Sidewalk ADARamp</b>
	<p>a. Measurement: Measurement for Construct Public Sidewalk ADA Ramp shall be made per actual number of sidewalk ramps with detectable warning surface installed.</p> <p>b. Payment: Payment for Construct Public Sidewalk ADA Ramp shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for</p>

	furnishing all labor, materials, and equipment necessary for installing new concrete sidewalk ramps to current FDOT Index 304. This includes clearing, grubbing compaction, forming, concrete and detectable warning surface placement, finishing, restoration and clean up.
	<b>Reference ID 11.252.110 Concrete Paver Replacement</b>
	<p>a. Measurement: Concrete Paver Replacement shall be measured in actual square yards of concrete pavers removed and replaced. Replaced portions of driveways shall conform to the lines and grades of removed portions of road or driveways.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Concrete Paver Replacement and shall include all labor, materials, and equipment for saw-cutting, removal and proper storage of existing pavers, furnishing and installing new base materials, compaction, paver replacement, restoration, and clean-up for a complete installation</p>
	<b>Reference ID 11.260.xxx Driveway Culvert Storm Pipe Replacement (various sizes)</b>
	<p>a. Measurement: Culvert Storm Pipe Replacement shall be measured in actual linear feet satisfactorily removed and replaced, as measured along the length of the centerline of the completed pipeline.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Culvert Storm Pipe Replacement and shall include all labor, materials, and equipment to remove and replace the respective storm pipe including temporary stormwater management, protection of existing utilities and irrigation, dewatering, excavation, pipe replacement, connection to existing storm pipes utilizing collars wrapped in 6-feet of filter fabric, replacement of mitered end sections, backfill, compaction, grading, sod replacement, restoration and clean-up.</p>
	<b>Reference ID 11.270.xxx Storm Underdrain Pipe Replacement (various sizes)</b>
	<p>a. Measurement: Storm Underdrain Pipe Replacement shall be measured in actual linear feet satisfactorily removed and replaced, as measured along the length of the centerline of the completed pipeline.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Storm Underdrain Pipe Replacement and shall include all labor, materials, and equipment to remove and replace the respective storm pipe including temporary stormwater management, protection of existing utilities and irrigation, dewatering, excavation, pipe replacement, connection to existing storm pipes utilizing collars wrapped in 6-feet of filter fabric, replacement of mitered end sections, backfill, compaction, grading, sod replacement, restoration and clean-up.</p>

	<b>Reference ID 11.280.xxx Concrete Curb and/or Curb and Gutter Replacement</b>
	<p>a. Measurement: Concrete Curb and/or Curb and Gutter Replacement shall be measured in actual linear feet removed and replaced measured along the centerline of the curb within the excavation of the trench to a maximum width equal to the width of asphalt pavement cut. All additional curb and gutter damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Concrete Curb and Gutter Replacement and shall include all labor, materials, and equipment for saw-cutting, removal and proper disposal of existing concrete curb and gutter, compaction, and concrete curb and gutter replacement for a complete installation.</p>
	<b>Reference ID 11.290.xxx Sod Replacement</b>
	<p>a. Measurement: Sod Replacement shall be measured in actual square yards of sod furnished, laid, fertilized, watered and maintained for all areas as specified on the Drawings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Sod Replacement and shall include all labor, materials, and equipment necessary to furnish, install, fertilize, water and maintain a healthy stand of grass including any soil amendments or conditioning required to bring the existing soil to within acceptable pH levels as recommended by the sod grower.</p>
	<b>11.3 - Install/Replace Fence or Wall</b>
	<b>Reference ID 11.310.xxx Chain Link Fence Install/Replacement (various heights)</b>
	<p>a. Measurement: Chain Link Fence Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the fence within the construction excavation. All additional fencing damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Chain Link Fence Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing chain link fence and concrete and install new chain link fence including replacement fence, gate, support posts and concrete for a complete installation.</p>
	<b>Reference ID 11.320.xxx Wood Fence Install/Replacement (various heights)</b>
	<p>a. Measurement: Wood Fence Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the fence within the construction excavation. All additional fencing damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet</p>



	as stated in the proposal for Wood Fence Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing wood fence and concrete and install new wood fence including replacement fence, gate, support posts and concrete for a complete installation.
	<b>Reference ID 11.330.xxx Concrete Block Wall Install/Replacement (various heights)</b>
	<p>a. Measurement: Concrete Block Wall Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the wall within the construction excavation. Any additional wall damaged shall be replaced by the Contractor at his own expense.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Concrete Block Wall Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing concrete block and construct a new concrete block wall including replacement concrete block with concrete fill for a complete installation.</p>
	<b>Reference ID 11.340.xxx Brick Wall Install/Replacement (various heights)</b>
	<p>a. Measurement: Brick Wall Replacement shall be measured in actual linear feet removed and replaced as measured along the centerline of the wall within the construction excavation.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Brick Wall Replacement and shall include all labor, materials, and equipment to remove and properly dispose of existing brick and construct a new brick wall including replacement brick and mortar for a complete installation.</p>
	<b>11.4 - Bypass Pumping</b>
	<b>Reference ID 11.410.xxx Bypass Pumping Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Measurement for this item shall be based on the complete bypass operation and contingency plan in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment of the applicable Contract lump sum price shall be full compensation for furnishing all labor, materials, equipment as necessary for bypass operations and contingency plan as required, including pumps, piping, and hoses; tankers; temporary bypass and service piping; hauling and proper disposal of wastewater; plugging; gasoline/diesel fuel; protection of existing facilities, utilities, and property; traffic maintenance; signs and barriers; and all incidental work required to satisfactorily complete this item.</p>
	<b>Reference ID 11.420.xxx Bypass Pump Station (various flows)</b>
	<p>a. Measurement: Measurement for this item shall be based on the complete bypass operation and contingency plan in accordance with the County requirements and specifications.</p>

	<p>b. Payment: Payment of the applicable Contract lump sum price shall be full compensation for furnishing all labor, materials, equipment as necessary for bypass operations and contingency plan as required, including pumps, piping, and hoses; tankers; temporary bypass and service piping; hauling and proper disposal of wastewater; plugging; gasoline/diesel fuel; protection of existing facilities, utilities, and property; traffic maintenance; signs and barriers; and all incidental work required to satisfactorily complete this item.</p>
	<p><b>11.5 - Abandon or Remove Pipe/Structure</b></p>
	<p><b>Reference ID 11.510.xxx Abandon-in-Place Pipe</b></p>
	<p>a. Measurement: Abandon-in-Place Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily abandoned-in-place in accordance with the County requirements and specifications (Section 02080). Pipe abandonment shall be measured along the centerline without deduction for valves and fittings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Abandon-in-Place Pipe and shall include all labor, materials, and equipment to excavate, backfill and compact; sheet, shore, and brace; dewater; completely drain and properly dispose of pipe contents; grout fill, and plug or cap existing pipes of all services and sizes designated "to be abandoned" on the Drawings. Also included in this item is the removal of existing valve boxes located on valves connected to piping designated to be retired. Valve boxes shall be removed, backfilled and compacted with suitable material.</p>
	<p><b>Reference ID 11.520.xxx Abandon-in-Place Manhole</b></p>
	<p>a. Measurement: Measurement of Abandon-in-Place Manhole shall be made per actual number of existing manholes satisfactorily abandoned-in-place in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Abandon-in-Place Manhole and shall include all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole top riser, grout fill, and cap existing manhole designated "to be abandoned" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole).</p>
	<p><b>Reference ID 11.530.xxx Remove Existing Pipe</b></p>
	<p>a. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with the County requirements and specifications (Section 02080). Pipe removal shall be measured along the centerline without deduction for valves and fittings. Also included in this item is the removal and salvage of items including air release valves and vaults, and fire hydrant assemblies.</p>

	<p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Remove Existing Pipe and shall include all labor, materials, and equipment to sheet, shore, and brace; dewater; excavate; completely drain and properly dispose of pipe contents; plug or cap; restoration, sod, clean-up; remove and salvage pipe of all services and sizes designated "to be removed" on the Drawings, backfill and compact. Also included in this item is the removal and salvage of items (as listed in Specification Section 02080) attached to the piping to be removed.</p>
	<p><b>Reference ID 11.540.xxx Remove Existing Manhole</b></p>
	<p>a. Measurement: Measurement for Remove Existing Manhole shall be made per actual number of manholes satisfactorily excavated and removed in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment for Remove Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit prices shall be full compensation for furnishing all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole designated "to be removed" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole)</p>
	<p><b>12 PRESSURE PIPES</b></p>
	<p><b>12.1 - Pressure Pipes with Fittings and Restrained Joints</b></p>
	<p><b>Reference ID 12.110 Water Main with Fittings and Restrained Joints (RJ) (various sizes)</b></p>
	<p>a. Measurement: Water Main installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Water Main w/Fittings and restrained joints and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, (search for dewatering in document, add this language to any item that references dewatering) backfill, compaction, and grading, all testing, potable water system protection, disinfection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer</p>

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

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

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

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

	shoring, bracing, dewatering, backfill, compaction, grading, tapping sleeve, plug, restraining devices, restraint of existing piping in accordance with the County requirements, swabbing, restoration and clean-up and all other items required for a complete, acceptable and operable installation.
	<b>Reference ID 12.520.xxx Air Release Valve Assembly (various sizes)</b>
	<p>a. Measurement: Measurement for Air Release Valve Assembly shall be made per actual number of air release valves with enclosures satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Air Release Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the valve including saddle, fittings, pipe, concrete pad, pre-cast vault or enclosure, excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, restoration and all other items required for a complete, acceptable and operable installation.</p>
	<b>Reference ID 12.530.xxx Offset Air Release Valve Assembly (various sizes)</b>
	<p>a. Measurement: Measurement for Offset Air Release Valve Assemblies shall be made per actual number of offset air release valves with enclosures satisfactorily furnished and installed to provide a complete and functional unit.</p> <p>b. Payment: Payment for the Offset Air Release Valve Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the valve including saddle, fittings, pipe, concrete pad, pre-cast vault or enclosure, excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, restoration and all other items required for a complete, acceptable and operable installation.</p>
	<b>Reference ID 12.540.xxx Fire Hydrant Assembly</b>
	<p>a. Measurement: Measurement for Fire Hydrant Assemblies shall be made per actual number of fire hydrant assemblies satisfactorily furnished and installed to provide a complete and functional unit. The pipe and necessary restraint system connecting the fire hydrant assembly to the water main shall be included in the unit price, regardless of the length necessary to locate the hydrant at the direction of the County</p> <p>b. Payment: Payment for the Fire Hydrant Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the fire hydrant complete with hydrant tee, hydrant extension, pipe, fittings, isolation valve and box,</p>



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

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

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

	removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.
	<b>Reference ID 12.730.xxx Pipe Burst Forcemain (various sizes)</b>
	<p>a. Measurement: Pipe Burst Forcemain installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings in accordance with the County requirements and specifications.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Forcemain and shall include all labor, materials, and equipment necessary for a complete pipe installation by pipe bursting and testing including coordination with existing utilities; protection of existing utilities including service connections; tree protection; excavation, sheeting, shoring and bracing; dewatering; backfill, compaction, and grading; pre and post-installation video; repair of sags in line; all testing; potable water system protection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<b>13 WASTEWATER COLLECTION SYSTEM</b>
	<b>13.1 - Cleaning Sanitary Sewers</b>
	<b>Reference ID 13.110.xxx Light Cleaning Sanitary Sewer Laterals (various sizes)</b>
	<p>a. Measurement: Measurement for Light Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 1 pass of the lateral with a cleaning nozzle in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment for Light Cleaning Sanitary Sewer Laterals shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily clean a sanitary sewer lateral to an acceptable condition for CCTV inspection by making a single pass of the main with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<b>Reference ID 13.111.xxx Light Cleaning Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: Light Cleaning Sanitary Sewer Mains shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned by making a single pass of the main with a cleaning nozzle as measured along the length of the centerline of sewer, which cleaning was performed, between</p>

	<p>manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Light Cleaning Sanitary Sewer Mains and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs by making a single pass of the main with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<p><b>Reference ID 13.120.xxx Medium Cleaning Sanitary Sewer Laterals (various sizes)</b></p>
	<p>a. Measurement: Measurement for Medium Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 2 to 4 passes of the lateral with a cleaning nozzle in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment for Medium Cleaning Sanitary Sewer Laterals shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily clean a sanitary sewer lateral to an acceptable condition for CCTV inspection by making 2 to 4 passes of the lateral with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<p><b>Reference ID 13.121.xxx Medium Cleaning Sanitary Sewer Mains (various sizes)</b></p>
	<p>a. Measurement: Medium Cleaning Sanitary Sewer Mains shall be measured in actual linear feet of sanitary sewer main satisfactorily cleaned by making 2 to 4 passes of the main with a cleaning nozzle as measured along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Medium Cleaning Sanitary Sewer Mains and shall include all labor, materials, and equipment necessary to satisfactorily clean a sanitary sewer main to an acceptable condition for CCTV inspection and ready for any and all repairs by making 2 to 4 passes of the main with a cleaning nozzle including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<p><b>Reference ID 13.130.xxx Heavy Cleaning Sanitary Sewer Laterals (various sizes)</b></p>
	<p>a. Measurement: Measurement for Heavy Cleaning Sanitary Sewer Laterals shall be made per actual number of sanitary sewer laterals satisfactorily cleaned by making 5 or more passes of the lateral with a cleaning nozzle</p>

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

	hoses, and nozzles; mechanical methods of root removal and grease removal, all herbicides or chemical treatment, protection of property, restoration and clean-up.
	<b>Reference ID 13.150.xxx Mechanical Tuberculation Removal</b>
	<p>a. Measurement: Mechanical Tuberculation shall be measured in actual linear feet of sanitary sewer mains (&lt; 12-inch diameter) satisfactorily cleaned by mechanically removing tuberculation/mineral deposit from the interior of the main and de-scaling the main. Measurement shall be along the length of the centerline of sewer, which cleaning was performed, between manholes, measured to the nearest foot from inside wall of the manhole to the inside wall of the other manhole and not including the manhole chamber, in accordance with County requirements and specifications (Section 02761)</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Mechanical Tuberculation/Mineral Deposit Removal and shall include all labor, materials, and equipment necessary to satisfactorily remove tuberculation/mineral deposits from the interior of the main including water, hoses, and nozzles, protection of property, restoration and clean-up.</p>
	<b>13.2 - CCTV Sanitary Sewers</b>
	<b>Reference ID 13.210.xxx CCTV Inspection Sanitary Sewer Mains (various sizes)</b>
	<p>a. Measurement: CCTV Inspection Sanitary Sewer shall be measured in actual linear feet of satisfactory visual inspection completed utilizing closed-circuit television in accordance with the County requirements and specifications (Section 02762). CCTV inspection shall be measured along the length of the centerline of the inspected sanitary sewer.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for CCTV Inspection Sanitary Sewer and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CCTV visual inspection of the sanitary sewer and subsequent report including qualified personnel, DVD, and all incidentals related to sewer main inspection.</p>
	<b>Reference ID 13.220.xxx CCTV Lateral Inspection from Main</b>
	<p>a. Measurement: Measurement for CCTV Lateral Inspection from Main shall be made per actual number of sanitary sewer laterals satisfactorily visually inspected utilizing closed-circuit television panned and tilted from the main in accordance with the County requirements and specifications (Section 02763).</p> <p>b. Payment: Payment for CCTV Lateral Inspection from Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete CCTV visual inspection of the sanitary sewer lateral from the main and</p>

	subsequent report including qualified personnel, DVD, and all incidentals related to sewer lateral inspection.
	<b>Reference ID 13.230.xxx CCTV Lateral Inspection from Cleanout</b>
	<p>a. Measurement: Measurement for CCTV Lateral Inspection from Cleanout shall be made per actual number of sanitary sewer laterals satisfactorily visually inspected utilizing closed-circuit television in accordance with the County requirements and specifications (Section 02763).</p> <p>b. Payment: Payment for CCTV Lateral Inspection from Main shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete CCTV visual inspection of the sanitary sewer lateral from the cleanout and subsequent report including qualified personnel, DVD, and all incidentals related to sewer lateral inspection.</p>
	<b>13.3 - Install / Replace Sanitary Sewer Main</b>
	<b>Reference ID 13.310.xxx Sanitary Sewer Main 8-inch Diameter (various depths)</b>
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Sanitary Sewer Main and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, applicable pavement restoration, all testing and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<b>Reference ID 13.320.xxx Sanitary Sewer Main 10-inch Diameter (various depths)</b>
	<p>a. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes. The depth shall be calculated from the invert to the top of the surface. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet</p>



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

	<b>Reference ID 13.350.xxx Sanitary Sewer Main Connection to Existing Manhole</b>
	<p>a. Measurement: Measurement for Sewer Main Connection to Existing Manhole shall be made per actual number of core bores and connections to existing manholes satisfactorily furnished and installed.</p> <p>b. Payment: Payment for Sewer Main Connection to Existing Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete connection to an existing manhole including protection of existing utilities, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, wall seal, core drilling, and bench adjustment.</p>
	<b>13.4 – Install/Replace Sanitary Manholes</b>
	<b>Reference ID 13.410.xxx Sanitary Manhole 4-foot Diameter (various depths)</b>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.</p>
	<b>Reference ID 13.420.xxx Sanitary Manhole 5-foot Diameter (various depths)</b>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including</p>

	excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions.
	<b>Reference ID 13.430.xxx Sanitary Manhole 6-foot Diameter (various depths)</b>
	<p>a. Measurement: Measurement for Sanitary Manhole shall be made per actual number of sanitary manholes of each type and depth satisfactorily removed if applicable, furnished and installed. Depth shall be measured from the center of the invert to the top of the lid.</p> <p>b. Payment: Payment for Sanitary Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove an existing manhole if applicable and for a complete sanitary manhole installation including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and final grading, applicable pavement restoration, crushed rock base, connection of new or existing sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the manhole rim, interior and exterior surface coatings to provide a complete and operable sanitary manhole. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions</p>
	<b>13.5 - Sanitary Manhole Rehabilitation</b>
	<b>Reference ID 13.510.xxx Adjust Existing Manhole Frame and Cover (paved and unpaved areas)</b>
	<p>a. Measurement: Measurement for Adjust Existing Manhole Frame and Cover shall be made per actual number of sanitary manhole frames and covers raised or lowered to the finish grade of the pavement.</p> <p>b. Payment: Payment for Adjust Existing Manhole Frame and Cover shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to replace, raise or lower and/or adjust the existing manhole frame and cover to the finish grade of the pavement including excavation, backfill, compaction, final grading and applicable sodding/pavement restoration.</p>
	<b>Reference ID 13.511.xxx Replace Existing Manhole Frame and Cover (paved and unpaved areas)</b>
	<p>a. Measurement: Measurement for Adjust Existing Manhole Frame and Cover shall be made per actual number of sanitary manhole frames and covers</p>

	<p>raised or lowered to the finish grade.</p> <p>b. Payment: Payment for Adjust Existing Manhole Frame and Cover shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to replace, raise or lower and/or adjust the existing manhole frame and cover to the finish grade including excavation, backfill, compaction, and final grading and applicable sodding or pavement restoration.</p>
	<p><b>Reference ID 13.520.xxx Seal and Recoat Manhole (various diameters)</b></p>
	<p>a. Measurement: Seal and Recoat Manhole shall be measured in vertical feet of manhole sealed and recoated. Manhole seal and recoat shall be measured along the center vertical length of the manhole.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Seal and Recoat Manhole and shall include, but is not necessarily limited to, all labor, equipment, services, supervision and materials for coating existing manholes as shown on the Contract Drawings. The work shall include all surface preparation, leak repair, crack repair, installation of the coating in accordance with the manufacturer's recommendations, and inspection of the finished coating system.</p>
	<p><b>Reference ID 13.530.xxx Line Manhole (Polyethylene or PVC) (various diameters)</b></p>
	<p>a. Measurement: Line Manhole shall be measured in vertical feet of manhole lined with a polyethylene or PVC interior liner system. Lining of manhole shall be measured along the center vertical length of the manhole.</p> <p>b. Payment: Payment will be made at the contract unit price bid per vertical feet as stated in the proposal for Line Manhole and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete installation of an interior liner system including qualified personnel, sewer structure interior liner system, plugging infiltration, channel reconstruction, pressure cleaning, surface preparation, leak repair, and crack repair.</p>
	<p><b>Reference ID 13.540.xxx Fiberglass Manhole Insert (various sizes)</b></p>
	<p>a. Measurement: Measurement for Fiberglass Manhole Insert shall be made per actual number of fiberglass manhole insert rehabilitation systems satisfactorily furnished and installed, regardless of depth or diameter of manhole</p> <p>b. Payment: Payment for Furnish and Install Fiberglass Manhole Insert shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for the installation of the complete rehabilitation system as specified,</p>

	including qualified personnel, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, cleaning and debris removal, removal and replacement of existing manhole corbel and riser section, fiberglass liner installation, benching, grout, pipe connections and stubouts, new frame and cover with brick or adjustment rings, protection of existing utilities and structures, clean-up, sodding, and adjustment of the manhole rim to finished grade.
	<b>Reference ID 13.550.xxx Re-Construct Manhole Benching</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Re-Construct Manhole Benching shall be made per actual number of manhole benching cleaned and re-constructed in accordance with the Drawings and specifications.</li> <li>b. Payment: Payment for Re-Construct Manhole Benching shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for the cleaning and re-construction of manhole benching including cleaning and debris removal, placement and finishing of concrete, restoration and clean-up.</li> </ul>
	<b>Reference ID 13.560.xxx Manhole Cone Replacement (various diameters)</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Manhole Cone Replacement shall be made per actual number of sanitary manhole cone sections satisfactorily removed and replaced.</li> <li>b. Payment: Payment for Remove Manhole Cone Replacement shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove and replace the manhole cone section including excavation, sheeting, shoring and bracing; dewatering, backfill, and compaction; removal and replacement of frame and cover with brick or adjustment rings; polyolefin sheeting for exterior joint sealing; jointing material, and adjustment of the manhole rim to finished grade.</li> </ul>
	<b>Reference ID 13.570.xxx Replace Inside Drop Connection)</b>
	<ul style="list-style-type: none"> <li>a. Measurement: Measurement for Replace Drop Connection shall be made per actual number of existing sub-standard manhole interior drop connections that are replaced with Orange County Utilities approved interior drop connection.</li> <li>b. Payment: Payment for Replace Drop Connection with Inside Drop Connection shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to remove the existing inside drop connection and install the new standard drop connection to the interior of the manhole.</li> </ul>

	<b>Reference ID 13.580.xxx Repair Manhole Liner (Polyethylene or PVC)</b>
	<p>a. Measurement: Measurement for Repair Manhole Liner shall be made per actual number of existing manhole liners that are repaired or re-attached to the interior wall of the manhole.</p> <p>b. Payment: Payment for Repair Manhole Liner shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to repair or re-attach the manhole liner to the interior of the manhole.</p>
	<b>13.6 - Sanitary Service Laterals and Cleanouts</b>
	<b>Reference ID 13.610.xxx Install/Repair/Replace 4-inch Diameter Sanitary Sewer Lateral (various depths)</b>
	<p>a. Measurement: Repair/Replace Sanitary Sewer Lateral shall be made per actual number of sanitary sewer laterals satisfactorily repaired or replaced, depending upon sewer lateral depth.</p> <p>b. Payment: Payment will be made based on the authorized quantity at the unit price indicated in the Bid Schedule and shall include all labor, materials, and equipment necessary to repair or replace the existing sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<b>Reference ID 13.620.xxx Install/Repair/Replace 6-inch Diameter Sanitary Sewer Lateral (various depths)</b>
	<p>a. Measurement: Repair/Replace Sanitary Sewer Lateral shall be made per actual number of sanitary sewer laterals satisfactorily repaired or replaced, depending upon sewer lateral depth.</p> <p>b. Payment: Payment will be made based on the authorized quantity at the unit price indicated in the Bid Schedule and shall include all labor, materials, and equipment necessary to repair or replace the existing sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>

	<p><b>Reference ID 13.630.xxx Install/Repair/Replace Sanitary Sewer Cleanout (various surfaces)</b></p>
	<p>a. Measurement: Measurement for Repair/Replace Sanitary Sewer Cleanout shall be made per actual number of sanitary sewer cleanouts satisfactorily repaired or replaced, depending upon cleanout depth.</p> <p>b. Payment: Payment for Repair/Replace Sanitary Sewer Cleanout shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to repair or replace the sanitary sewer cleanout including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, all pipe, wyes, bends, sleeves, and plugs necessary to provide a watertight access, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, sodding, irrigation sprinklers, asphalt, concrete curb, driveway or sidewalk and other obstructions.</p>
	<p><b>Reference ID 13.640.xxx Service Lateral Connection to Manhole</b></p>
	<p>a. Measurement: Measurement for Service Lateral Connection to Manhole shall be made per actual number of sanitary sewer lateral service connections made to manholes satisfactorily furnished and installed.</p> <p>b. Payment: Payment for Service Lateral Connection to Manhole shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary for a complete connection to an existing manhole including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, core drilling and wall seal, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<p><b>Reference ID 13.650.xxx Reroute Sanitary Sewer Lateral on Private Property</b></p>
	<p>a. Measurement: Measurement for rerouting the Sanitary Sewer Lateral on Private Property shall be made per the actual number of lateral services rerouted to provide a complete and functional unit.</p> <p>b. Payment: Payment for rerouting Sanitary Sewer Lateral on Private Property shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to reroute the sewer lateral including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, all pipe, wyes, bends, sleeves, and plugs necessary to provide a watertight access, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs,</p>

	irrigation sprinklers, asphalt, concrete curb, driveway or sidewalk and other obstructions.
	<b>13.7 - Cured-In-Place Pipe (CIPP) Liner</b>
	<b>Reference ID 13.710.xxx Sanitary Sewer Main CIPP Liner (various diameters)</b>
	<p>a. Measurement: CIPP Liner shall be measured in actual linear feet of furnished and satisfactorily installed cured-in-place liner in the sanitary sewer main from center of manhole to center of manhole, regardless of depth, in accordance with the County requirements and specifications (Section 02771). CIPP liner installation shall be measured along the length of the centerline of the rehabilitated sanitary sewer.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the Bid Schedule for CIPP Liner and shall include, but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CIPP liner installation including pre and post CCTV inspection, sanitary sewer cleaning (medium cleaning), qualified personnel, providing and processing of liner material, service connection and manhole/wall interface sealing, all costs associated with providing cured CIPP samples for testing, blocking or plugging of incoming lines, grouting, leakage testing, reinstate service laterals, protection of existing utilities, structures, and property, restoration and clean-up.</p>
	<b>Reference ID 13.720.xxx Brim Type – CIPP Lateral Liner (various lengths and diameters)</b>
	<p>a. Measurement: Measurement for Brim Type – CIPP Lateral Liner - shall be made per actual number of satisfactorily installed cured-in-place brim type liners in the existing sanitary sewer laterals measured from the sewer main to the property clean-out, regardless of depth, in accordance with the County requirement, drawings, and specifications (Section 02772).</p> <p>b. Payment: Payment for Brim Type - CIPP Lateral Liner will be made at the contract unit price indicated in the Bid Schedule for Brim Type CIPP Lateral Liner and shall include, but is not necessarily limited to, all labor, materials and equipment necessary to a complete lateral liner installation including pre and post CCTV inspection, sewer lateral cleaning, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, qualified personnel, providing and processing of liner material, blocking or plugging of lateral, grouting, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<b>Reference ID 13.730.xxx FCLRL - CIPP Lateral Liner (various lengths and diameters)</b>
	<p>a. Measurement: Measurement for Full Circumference Lateral Reinforced Liner (FCLRL) - CIPP Lateral Liner shall be made per actual number of satisfactorily installed cured-in-place liners in the existing sanitary sewer</p>



	<p>laterals measured from the sewer main to the property clean-out, regardless of depth, to determine if they are less than or equal or greater than 30' and in accordance with the County requirement, drawings, and specifications (Section 02772).</p> <p>b. Payment: Payment for Full Circumference Lateral Reinforced Liner (FCLRL) - CIPP Lateral Liner shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to satisfactorily install a CIPP lateral liner system including pre- and post-CCTV inspection, sewer lateral cleaning, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, qualified personnel, providing and processing of liner material, blocking or plugging of lateral, grouting, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.</p>
	<p><b>13.8 - Sanitary Sewer Pipe Bursting</b></p>
	<p><b>Reference ID 13.810.xxx Pipe Burst Gravity Sewer Main (various diameters)</b></p>
	<p>a. Measurement: Pipe Burst Gravity Sewer Main installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed pipeline in accordance with the County requirements and specifications (Section 02776).</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Pipe Burst Gravity Sewer and shall include all labor, materials, and equipment necessary for a complete sewer installation by pipe bursting and subsequent testing including excavation, sheeting, shoring and bracing, dewatering, removal and replacement of manhole cone section, backfill, compaction, and grading, qualified personnel, blocking or plugging of influent lines, protection of existing utilities including service connections, repair of sags in line, connection to manholes, connection and reinstatement of service laterals, all testing, restoration and clean-up. This item also includes all necessary removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
	<p><b>14 PUMP STATION</b></p>
	<p><b>14.1 – Wastewater Duplex Pump Station</b></p>
	<p><b>Reference ID 14.110.xxx Duplex Pump Station</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory construction of the new Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to construct a pump station as indicated on the</p>

	<p>Drawings. Contractor shall include in the lump sum price, the Orange County Building Department fee, as noted in Section 01010 Summary of Work. Work includes but is not necessarily limited to the following: pump station improvements including wetwell, top slab, valve vault, pumps, motors, control panel, SCADA control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances as shown on the Drawings. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, masonry walls and gates, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p align="center"><b>Reference ID 14.120.xxx Duplex Pump Station Rehabilitation</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to rehabilitate the existing pump station as indicated on the Drawings. Contractor shall include in the lump sum price, the Orange County Building Department fee, as noted in Section 01010 Summary of Work. Work includes but is not necessarily limited to the following: Pump Station improvements and modifications including fencing and gates, masonry walls and gates, rehabilitate and line the existing wetwell, replacement of the top slab, construct the lined valve vault, pumps, motors, control panel, cables, rails, valves, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p align="center"><b>Reference ID 14.130.xxx Duplex Pump Station Demolition</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory demolition of the existing Pump Station and restoration of the site.</p>

	<p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary for demolition of the <b>existing</b> duplex pump station pumps, piping, valves, removal of electrical and controls and appurtenances, drywell structure, and other work within the limits of the site and restoration of the site. The work also includes removal of all floats, electrical, and appurtenances within manhole acting as the pump station wetwell. All work is to be performed as shown on the drawings and as described in these specifications.</p>
	<p><b>14.2 – Wastewater Triplex Pump Station</b></p>
	<p><b>Reference ID 14.210.xxx Triplex Pump Station</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory construction of the new Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to construct a pump station as indicated on the Drawings. Contractor shall include in the lump sum price, the Orange County Building Department fee, as noted in Section 01010 Summary of Work. Work includes but is not necessarily limited to the following: pump station improvements including wetwell, top slab, valve vault, pumps, motors, control panel, SCADA control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, masonry walls and gates, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
	<p><b>Reference ID 14.220.xxx Triplex Pump Station Rehabilitation</b></p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to rehabilitate the existing pump station as indicated on the Drawings. Contractor shall include in the lump sum price, the Orange County Building Department fee, as noted in Section 01010 Summary of Work. Work includes but is not necessarily limited to the following: Pump</p>

	<p>Station improvements and modifications including fencing and gates, masonry walls and gates, rehabilitate and line the existing wetwell, replacement of the top slab, construct the lined valve vault, pumps, motors, control panel, cables, rails, valves, pressure piping and appurtenances, stand-by generator, fuel tank, and odor control system as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p>
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**PART 2 - PRODUCTS (NOT USED)**

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

END OF SECTION



**Nadic Engineering Services, Inc.**

**Geotechnical Soil Survey Report  
Ficquette Road Intersection  
Improvements  
Orange County, Florida  
Contract No. Y12-905B  
NES Project No.: R15-029**

*Prepared for:*

**GTC Engineering Corporation,  
98 South Semoran Boulevard  
Orlando, FL 32807**

*Prepared by:*

**Nadic Engineering Services, Inc.  
601 N. Hart Blvd  
Orlando, Florida 32818  
407-521-4771**

Consultants in: Civil · Environmental · Geotechnical Engineering  
Offices in: Orlando · Miami

March 15, 2016

**GTC Engineering Corporation**

98 South Semoran Boulevard  
Orlando, Florida 32807

Attention: Mr. Claude L. Cassagnol, P.E.

Re: Geotechnical Roadway Soil Survey Report  
Ficquette Road Intersection Improvements  
Orange County, Florida  
Contract No. Y12-905B  
NES Project No. R15-029

Dear Mr. Cassagnol:

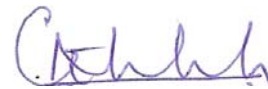
**Nadic Engineering Services, Inc. (NES)** is pleased to submit this Geotechnical Engineering Roadway Soil Survey Report for the above referenced project. The purpose of this exploration was to evaluate the pavement, soil and groundwater conditions along the subject roadway location and to provide geotechnical recommendations for the proposed improvements. This Geotechnical Engineering evaluation was authorized through a subconsultant agreement between GTC and **NES**. This report is presented to support the development of Roadway Plans.

**NES** appreciates the opportunity to work with you on this project and looks forward to a continued association. Please contact us if you have any questions, or if we may be of further assistance to you as this project proceeds.

Sincerely,  
**NADIC ENGINEERING SERVICES, INC.**  
**Engineering Business No. 8214**



Mustafa Syed, B.Sc.  
Staff Engineer



Godwin N. Nnadi, Ph.D., P.E.  
Principal Engineer  
FL Registration No: 50637

MA/GNN: Roadways\Orange County\Ficquette Road\Working Folder\Report

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## **1.0 PROJECT LOCATION AND DESCRIPTION**

Orange County is planning to add an intersection improvement services for Ficquette Road at the future entrance to the new stadium at Dorman Park, on the south side of Ficquette Road. The improvements are planned for the section of Ficquette Road between the intersection of Ficquette Road and New Independence Parkway and the intersection of Ficquette Road and Overstreet Road in Orange County, Florida. The improvement includes the following:

- Sidewalk lanes on both north and south side of Ficquette Road
- Left turn lane with taper on westbound Ficquette Road
- Right turn lane with taper on eastbound Ficquette Road
- At the stadium driveway intersection, 50 foot right turn radii; one entering the lane and two exiting lanes.

The approximate length of the improvements is about 1400 feet. The project site is generally located within Sections 22 and 23, Township 23 South and Range 27 East in Orange County, Florida. A vicinity map showing the proposed roadway improvements is presented on the attached **Figure 1** in **Appendix A**.

This report presents the findings of our subsurface exploration program; an evaluation of the soil, groundwater and pavement conditions encountered, and provides recommendations to support the design and construction of the Ficquette Road Intersection improvements.

## **2.0 PURPOSE AND SCOPE OF SERVICES**

The purpose of this study was to obtain information on the general subsurface conditions including soil and groundwater conditions and the existing pavement condition along the roadway alignment in order to provide recommendations relative to design and construction of the proposed roadway improvements. Our approach is in general accordance with the Florida Department of Transportation (FDOT), "Soils and Foundation Manual." The project purpose was accomplished by:

1. Site reconnaissance to evaluate drill rig access and site conditions.
2. Performed seven (7) Standard Penetration Test borings for roadway soil survey and storm water swale
3. Performed two (2) pavement corings to determine existing pavement thickness.
4. Performed four (4) permeability tests at location of proposed swales.
5. Measured encountered groundwater table in the borings.
6. Classified recovered soil samples in our laboratory and performed tests on selected samples to aid in classification

7. Analyzed and interpreted field and laboratory test data, and incorporated them in this report.

### 3.0 REVIEW OF AVAILABLE DATA

#### 3.1 General

To obtain general information on soil and ground water conditions along the project alignment, NES reviewed data including aerial maps, United States Geological Survey (USGS), Quadrangle Topographic Maps, and the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Soil Survey for Orange County, Florida. A summary of this information is present below in the following report sections. An aerial map of the site location is shown on **Figure 1** in **Appendix A**.

#### 3.2 USGS Topographic Map

The "Windermere, Florida" USGS Topographic Map issued in 2015 was reviewed. The map shows the ground surface elevation in the project vicinity to range from about +100 to +105 feet, North American Vertical Datum of 1988 (NAVD). The project alignment is shown on an excerpt of the USGS topographic map presented on **Figure 2** in **Appendix A**.

#### 3.3 USDA, NRCS Soil Survey

The "Soil Survey of Orange County, Florida" published by the United States Department of Agriculture (USDA), National Resources Conservation Service (NRCS) was reviewed. Refer to **Figure 3** in **Appendix A** for a reproduction of the NRCS map for the project area. Soils found in the project vicinity are listed below.

**Table 1**  
**USDA/NRCS Soil Survey Summary**

Soil Unit	Depth (inches)	Soil Description	USCS*	AASHTO**	USDA SHGWT(feet)***
Smyrna-	0-17	Fine Sand	SP, SP-SM	A-3, A-2-4	0 to 1.0
Smyrna	17-27	Fine sand, Loamy fine Sand	SM, SP-SM	A-3, A-2-4	
(44)	27-80	Sand, Fine Sand	SP, SP-SM	A-3	

\*USCS: Unified Soil Classification System

\*\*AASHTO: American Association of State Highway and Transportation Officials

\*\*\*SHGWT: Seasonal High Groundwater Table

The soils classified as A-3 and A-2-4 are appropriate for use as roadway support and embankment fill. Information contained in the NRCS Soil Survey is very general and may be outdated due to recent development in the site vicinity. Therefore, it may not reflect the actual soil and

.....A-3 and A-2-4 are appropriate for use as embankment fill.....

groundwater conditions, particularly where developments may have modified soil conditions or surface and near surface drainage.

### **3.4 Potentiometric Surface Map**

Based on the review of the “Potentiometric Surface Map of the Upper Floridian Aquifer in the St. Johns River Water Management District and Vicinity, Florida, May 2009” map, published by the USGS, the elevation of the Potentiometric surface in the vicinity of the project alignment appears to range from +70 to +82 feet, NAVD-88. A portion of this map is presented on **Figure 4** in **Appendix A**.

## **4.0 FIELD EXPLORATION PROGRAM AND METHODS**

### **4.1 Field Exploration Program**

To evaluate the subsurface and surface conditions along the proposed roadway improvements Standard Penetration Test (SPT) borings, pavement corings and field permeability tests were performed.

A total of seven (7) roadway borings were completed for the proposed roadway improvements. The borings were completed to a depth of 15 feet below existing grade. Two (2) pavement corings and four (4) field permeability tests were performed to examine the existing pavement conditions and the subsurface percolation rates. The locations of the auger boring, pavement corings and permeability tests were determined in the field by **NES** based on information provided to us by **GTC**. The boring, pavement coring and permeability test locations were staked in the field by a representative of **NES** using a Global Positioning System (GPS). The stations, offsets, and elevations provided herein were provided to **NES** by Geodata Consultants, Inc., the project surveyor.

Upon completion of.....all borings were backfilled upon completion for safety.

Upon completion of groundwater level measurements all borings were backfilled for safety. The approximate locations are presented on **Figure 1** in **Appendix A**. The Roadway Cross Section of Soil Survey is presented on **Sheet 1** in **Appendix B**. The results of the exploration program in the

form of soil profiles are shown in **Sheet 2** in **Appendix B**. The results of pavement coring program are shown on **Table 2** in **Appendix C**. The permeability test results are summarized and presented on **Table 3** in **Appendix C**.

### **4.2 Field Exploration Methods**

#### **4.2.1 Hand Auger Borings**

Soil test borings were performed to a general depth of five (5) feet below natural grade by manually twisting and advancing a bucket auger into the ground in 4 to 6-inch increments. These borings were performed in general accordance with the American Society of Testing and Material (ASTM) Testing

Designation D-1452. As each soil type was revealed, representative samples were placed in air-tight plastic bags and returned to our laboratory for classification and testing.

#### 4.2.2 Standard Penetration Test Borings

The Standard Penetration Test (SPT) borings were performed at boring locations with depths equal to or greater than 15 feet. The borings were drilled in general accordance with ASTM test designation D-1586. Soil sampling using a 1<sup>3</sup>/<sub>8</sub> inch diameter (ID) split-barrel sampler was performed at closely spaced intervals from the ground surface to 15 feet below existing grade. After seating the sampler six inches, the number of successive blows required to drive the sampler 12 inches into the soil constitutes the test result commonly referred to as the “N” value. The “N” value has been empirically correlated with various soil properties and is considered indicative of the relative density of non-cohesive soils and the consistency of cohesive soils. The recovered split-barrel samples were described in the field with representative portions of the samples placed in airtight bags and transported to our laboratory for further visual classification and testing by a geotechnical engineer. Following completion, the SPT borings were backfilled for safety.

#### 4.2.3 Pavement Coring

Two (2) pavement cores were performed along Ficquette Road by **NES** within the project limits. The pavement coring was performed by advancing a six-inch diameter core barrel. The cores were removed and measured for pavement and base thickness. After performing the pavement corings, the coring holes were backfilled using native materials and ready mix asphalt compacted to the top. The pavement cores were then returned to our laboratory for further classification. Pavement conditions encountered within the project limits were categorized according to the classification system outlined in the FDOT Flexible Pavement Condition Handbook. Pavement core locations are shown in **Figure 5** in **Appendix A**. The pavement cores are shown on **Plates 1** and **2** in **Appendix C**.

#### 4.2.3 Field Permeability Test

Four In-situ falling head permeability tests were performed by **NES** personnel at the proposed swale locations. The field permeability was performed by placing a 3-inch diameter casing into an augered hole to the desired depth and washing the soils out of the casing with water. The casing was backfilled with silica quartz sand to approximately 18 inch above the bottom of the casing. The casing was then raised to an average distance of about 12 inches.

Falling head permeability was performed by adding water to the casing to achieve a stable water level for at least 15 minutes. When the water level is stabilized, the water source was removed and the drop in water level in the casing with respect to time was recorded. This relationship was used to calculate the permeability of the soil. Permeability results are presented in the Field Permeability Results section of this report and on **Sheets 4 through 7** in **Appendix C**.

## 5.0 SUBSURFACE SOIL CONDITIONS

### 5.1 General

The results of the borings are presented in the form of soil profiles in the attached **Sheets 2 and 3 in Appendix B**. The roadway borings were classified using the AASHTO Soil Classification System (A-3, A-2-4, etc.). The soils were described using the ASTM soil descriptions, such as sand with silt. Soil classification and stratification are based on visual examinations, interpretation of the boring logs by a geotechnical engineer and laboratory results of selected soil samples.

Stratification lines represent approximate boundaries between soil types of significantly different engineering properties. However, the actual transition between layers may be gradual and different than indicated. These stratification lines should be used with caution; actual earthwork quantities measured during construction should be expected to vary from quantities calculated based on the information from this report. The soil profiles indicate subsurface conditions encountered only at the specific boring locations at the time of the field exploration. Moreover, conditions at the boring locations can change over time.

The following generalized soil descriptions are intended to provide a brief summary of the observed subsurface conditions at the boring locations. The soil strata encountered, soil description, AASHTO classification, and FDOT 505 Embankment Soil Utilization designations are summarized in the following section. A specific description of the soil conditions is provided by the soil profiles.

### 5.2 Roadway Boring Results

The borings completed for the roadway improvements encountered fine sand (Stratum 1) to the boring termination depths as shown below:

**Table 3**  
**Soil Profile Summary**

<b>Stratum</b>	<b>Soil Description</b>	<b>AASHTO</b>	<b>Index 505 Classification</b>
1	Dark brown to light brown fine SAND, with silt and clay	A-3	Select (S)
2	Light brown to dark brown fine silty fine SAND	A-2-4	Select (S)
3	Light brown clayey fine SAND	A-2-6	Plastic (P)

The above subsurface condition is only general descriptions. For further details refer to the report of the boring profiles on **Sheet 2 in Appendix B**.

### 5.3 Field Permeability Test Results

The field permeability test result values are shown in **Table 3 in Appendix A**. Permeability test performed within elevation +99 and +101 feet NAVD-88 ranged from 1.5 feet/day to 4.4 feet/day.

## **5.4 Groundwater**

Groundwater was encountered in borings at elevations ranging from +98.5 to +100 feet NAVD-88 grade at the time of our field investigation in January 2016.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as manmade influences, such as swales, drainage ponds, underdrains, and areas of covered soils (roadways, sidewalks, etc.).

For the purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season of a “normal rainfall year” under current site conditions. A “normal rainfall year” is defined as a year in which rainfall quantity and distribution were at or near historical rainfall averages. The estimated seasonal high groundwater levels presented next to the boring profiles (**Sheets 2 and 3 in Appendix B**) are based on the soil stratigraphy, anticipated groundwater levels, USDA/NRCS information, review of roadway plans, and past experience with similar soil conditions. Generally, the estimated seasonal high groundwater level is not intended to define a limit or ensure future seasonal fluctuations in groundwater levels will not exceed the estimated levels. Post-development groundwater levels could exceed the seasonal high groundwater level estimates as a result of a series of rainfall events, changed conditions at the site which alter surface water drainage characteristics, or variation in the duration, intensity, or total volume of rainfall.

## **6.0 LABORATORY TESTING**

Representative soil samples collected from the auger borings were returned to NES’s laboratory for soil classification and stratification. The samples were classified and stratified in general accordance with the AASHTO soil classification system. The Roadway Soil Survey Sheet (**Sheet 1 in Appendix B**) summarizes the results of the tests completed for each strata number. Soil classification was based on visual observations with the results of the laboratory testing used to confirm the visual classification. Laboratory classification tests consisting of sieve analysis atterberg limit tests and natural moisture content were performed on selected soil samples. The results of all laboratory tests are found in the Summary of Lab Test Results (**Table 2 in Appendix A**). The results of all roadway laboratory tests are summarized on the Roadway Soil Survey Sheet (**Sheet 1 in Appendix B**).

## **7.0 EVALUATION AND RECOMMENDATIONS**

### **7.1 General**

The evaluation and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely spaced borings. The exploration methods used indicate subsurface conditions at specific boring locations, only at the time they were performed and to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may

not become evident until construction. If variations from the conditions described in this report become evident during the course of construction, or project characteristics described in this report change, NES should be retained to re-evaluate the conclusions and recommendations contained in this report in light of such changes.

**7.2 Roadway Construction**

The results of our geotechnical exploration indicate that the subsurface soils encountered along roadway alignment are generally suitable for support of the proposed roadway improvement after proper subgrade preparation. Non-select soils, muck, clays or debris, if encountered within the limits, should be removed and replaced with selected soils in accordance with FDOT Index Nos. 500 and 505. Site preparation and roadway construction should be in accordance with the latest version of the FDOT Standard Specifications for Road and Bridge Construction and FDOT Standard Specification and Index Nos. 500 and 505.

...Stratum No. 1 should be treated as Select (S) materials in accordance with Index No. 505.

The soils encountered in our borings classified as Strata Nos. 1 (A-3) and 2 (A-2-4) should be treated as Select (S) materials in accordance with Index No. 505. Stratum No. 3 (A-2-6) should be treated as Plastic (P). If plastic and/or organic material is encountered along the project alignment during construction, at locations that were not indicated in this report or where soil

borings were not performed, these materials should be removed in accordance with Index Nos. 500 and 505.

All fill soils placed for the roadway improvement should be selected in accordance with Index No. 505. In-place density tests should be performed on the fill soils to verify the specified degree of compaction. The minimum test frequency should be in accordance with the FDOT Materials, Sampling, Testing, and Reporting Guide.

**7.3 Pavement Condition Evaluation**

The results of our pavement coring are presented on **Table 4** in **Appendix C**. The pavement condition is generally poor between the limits of this project. There were areas of branch and longitudinal full depth cracks. Friction course was not encountered in the pavement. Structural courses encountered ranged from 5 inches to 5.5 inches with ABC-2 base. Limerock base was not encountered. Photographs of the pavement cores obtained are shown on **Plate 1 and 2** in **Appendix C**.

**Table 5  
 Pavement Survey Summary**

Roadway	Core No.	Lane	Pavement Thickness (inches)	Base Type	Crack Depth (Inches)
Wallace Road	C-1	L1	5.5	ABC-2	FD
	C-2	R1	5.0	ABC-2	FD

\*FD = Full Depth Cracking

## **8.0 CONSTRUCTION CONSIDERATIONS**

### **8.1 General**

Roadway construction should be performed in accordance with the appropriate sections of the FDOT current edition of the Standard Specifications for Road and Bridge Construction. The proposed improvement should be cleared and all debris completely removed, including vegetation and construction debris from the ground surface. Site preparation and roadway construction should be in accordance with Section 110 of the latest version of the FDOT Standard Specifications for Road and Bridge Construction and FDOT Standard Specifications and Index Nos. 500 and 505.

If needed, backfill should generally consist of select materials (A-3) and (A-2-4) compacted in accordance with the FDOT Standard Specification for Road and Bridge Construction. Removal of organic materials and plastic soils within the project limits should be accomplished in accordance with the FDOT Index 500 unless otherwise shown on the plans.

In-place density tests should be performed on the fill soils to verify the specified degree of compaction. The minimum test frequency should be in accordance with the FDOT Materials, Sampling, Testing, and Reporting Guide.

### **8.2 Excavation**

Excavation should be performed in accordance with Section 125 and 455 D of the current FDOT Standard Specifications for Road and Bridge Construction.

All excavation and below grade construction activities should be in accordance with the Occupational Safety and Health Administration (OSHA). The side slopes of all excavation greater than four feet deep should be sloped at a maximum of 1.5 horizontal to 1 vertical (1.5H: 1V) as required by OSHA. Steeper slopes can be established by a "competent person" (as defined by OSHA) and supported with a system designed by a registered Professional Engineer.

For temporary excavation support system, we recommend the following.

Saturated unit weight	120 pcf
Angle of soil friction	30 degree
Cohesion	0
Surcharge load	250 psf



### **9.0 REPORT LIMITATIONS**

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. We are not responsible for the conclusions, opinions or recommendations made by others based on these data.

The scope of the exploration was intended to evaluate soil and groundwater conditions within the influence of roadway improvement. The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated and does not reflect any variations which may occur among these borings. If any variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had the opportunity to observe the characteristics of the conditions encountered. The applicability of the report should be reviewed in the event significant changes occur in the design, nature or location of the proposed roadway improvement area.

The scope of services of this project, included herein, did not include any environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, and groundwater, air on the site, below and around the site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items and conditions are strictly for the information of the client.

# **APPENDIX A**

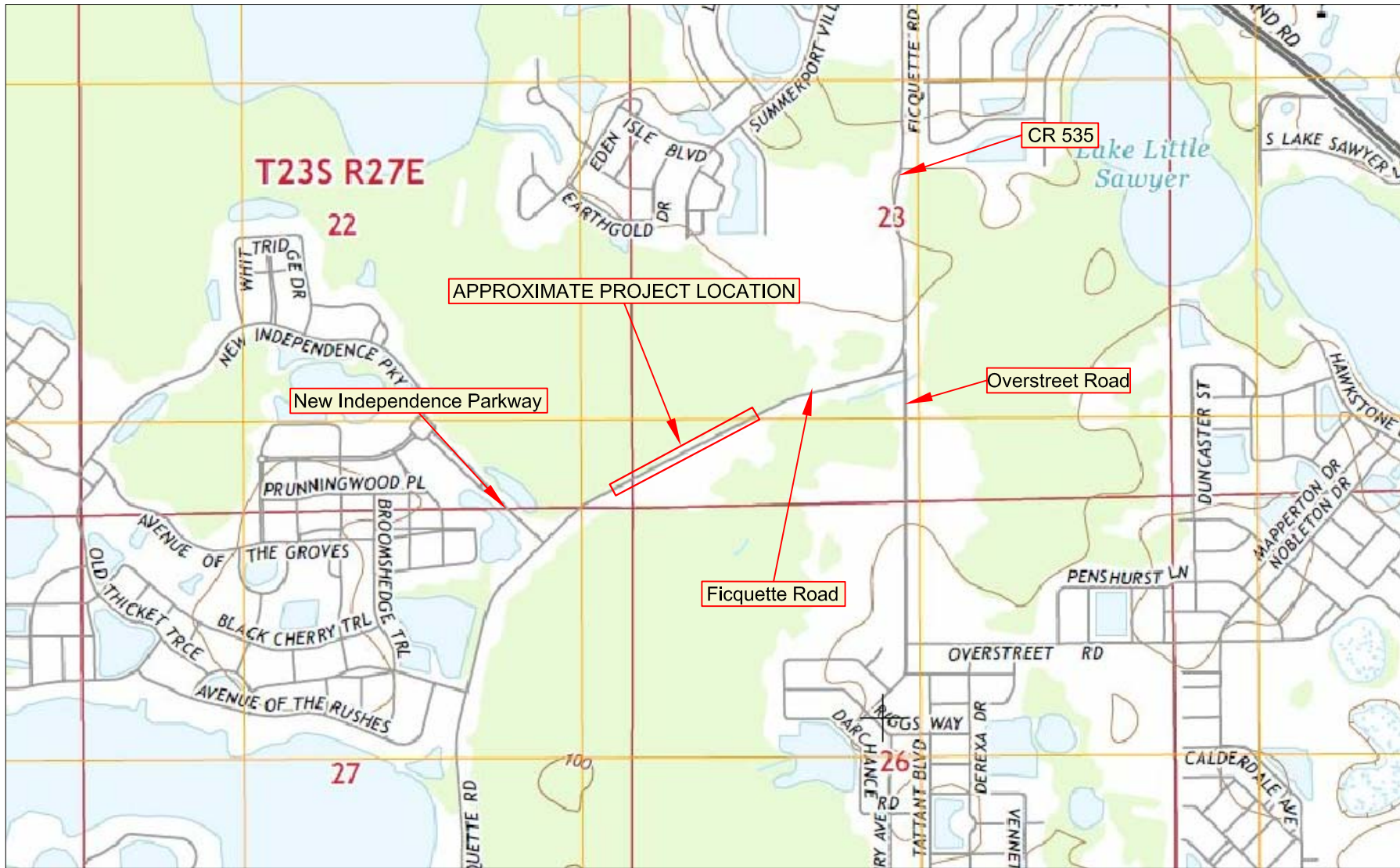
<b>Figure 1</b>	<b>Aerial Map</b>
<b>Figure 2</b>	<b>USGS Topographic Map</b>
<b>Figure 3</b>	<b>USDA/NRCS Soils Map</b>
<b>Figure 4</b>	<b>Potentiometric Surface Map</b>
<b>Figure 5</b>	<b>Boring Location Map</b>
<b>Table 2</b>	<b>Summary of Lab Results</b>
<b>Table 3</b>	<b>Field Permeability Test Results</b>



NOT TO SCALE

REFERENCE: Google Earth Aerial Maps

REFERENCE	PROJECT LOCATION	U.S.G.S QUADRANGLE MAP	ISSUED	PHOTO REVISED	NADIC ENGINEERING SERVICES, INC. 601 N. HART BOULEVARD ORLANDO, FL 32818 PH (407) 521-4771 FAX (407) 521-4772		ORANGE COUNTY PUBLIC WORKS	PROJECT NAME: AERIAL MAP FIQUETTE ROAD INTERSECTION IMPROVEMENT		NES PROJECT No.
United States Geological Survey (USGS)	S22 & 23; T23S; R27E	WINDERMERE	2015		DATE: 01-05-16 DRAWN: MS CHECKED: GNN			COUNTY	CONTRACT No.	R15-029 FIGURE 1
							ORANGE	Y12-905B		



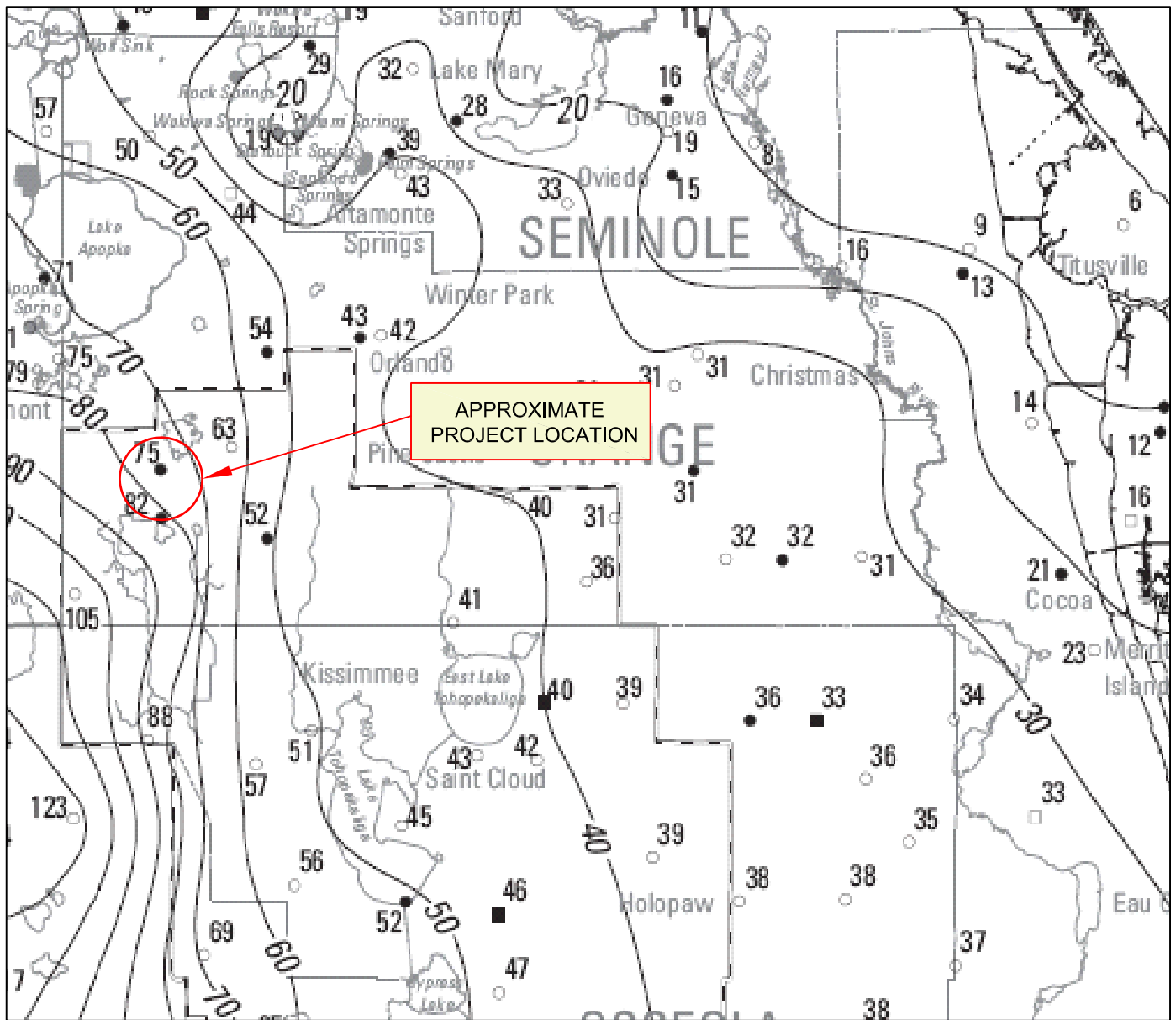
NOT TO SCALE

REFERENCE: United States Geological Survey (USGS)

REFERENCE	PROJECT LOCATION	U.S.G.S QUADRANGLE MAP	ISSUED	PHOTO REVISED	NADIC ENGINEERING SERVICES, INC. 601 N. HART BOULEVARD ORLANDO, FL 32818 PH (407) 521-4771 FAX (407) 521-4772		ORANGE COUNTY PUBLIC WORKS	PROJECT NAME: USGS TOPOGRAPHIC MAP FIQUETTE ROAD INTERSECTION IMPROVEMENT		NES PROJECT No.
United States Geological Survey (USGS)	S22 & 23; T23S; R27E	WINDERMERE	2015		DATE: 12-15-15 DRAWN: BJ CHECKED: GNN			COUNTY	CONTRACT No.	FIGURE 2
							ORANGE	Y12-905B		R15-029







REFERENCE: "Potentiometric Surface of the Upper Floridan Aquifer in the St. Johns River Water Management District and Vicinity, Florida, 2009," published by the United States Geological Survey (USGS).

QUAD: WINDERMERE, FL (Issued 2015)

SECTIONS: 22 & 23

TOWNSHIPS: 23 SOUTH

RANGES: 27 EAST

LEGEND

— 40 — POTENTIOMETRIC CONTOUR-Shows altitude at which water level would have stood in tightly cased wells. Contour interval is 10 feet.

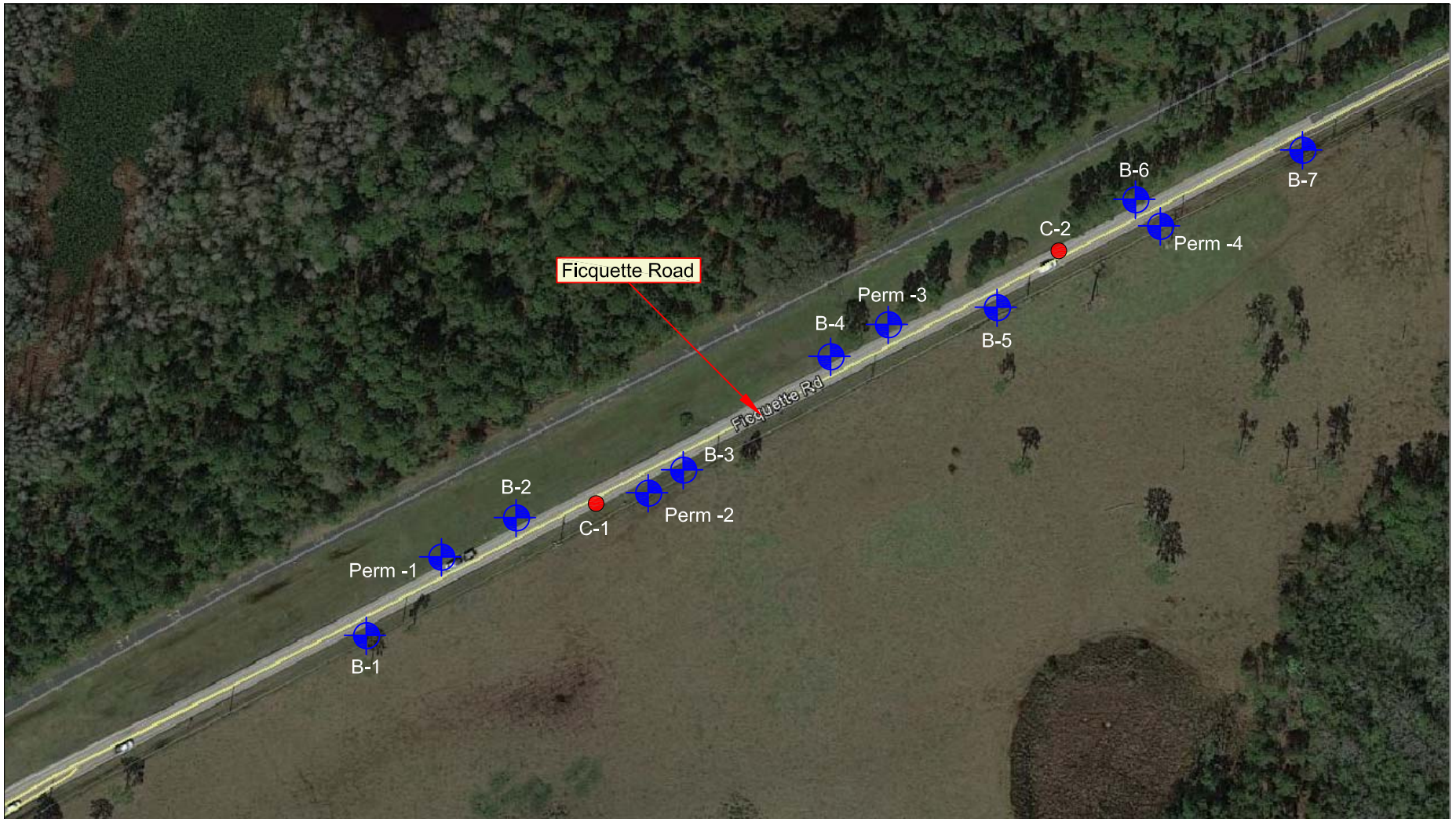
POTENTIOMETRIC SURFACE MAP

FIQUETTE ROAD INTERSECTION  
IMPROVEMENT  
ORANGE COUNTY, FLORIDA



**NES** *Civil  
Geotechnical  
Environmental  
Consulting Engineering*

Note: Elevations shown on map are in feet, National Geodetic Vertical Datum of 1929 (NGVD-29)

DRAWN: MS	SCALE: N.T.S.	PROJECT NO. R15-029
DRAWN: GNN	DATE: 01-05-16	FIGURE 4



NOT TO SCALE

-  Approximate Boring Locations
-  Approximate Pavement Coring Locations

REFERENCE: Google Earth Aerial Maps

REFERENCE	PROJECT LOCATION	U.S.G.S QUADRANGLE MAP	ISSUED	PHOTO REVISED			PROJECT NAME: BORING LOCATION MAP FIQUETTE ROAD INTERSECTION IMPROVEMENT		NES PROJECT No.
GOOGLE EARTH AERIAL MAPS	S22 & 23; T23S; R27E	WINDERMERE	2015		NADIC ENGINEERING SERVICES, INC. 601 N. HART BOULEVARD ORLANDO, FL 32818 PH (407) 521-4771 FAX (407) 521-4772		 <b>ORANGE COUNTY PUBLIC WORKS</b>		R15-029
					DATE: 12-15-15 DRAWN: BJ CHECKED: GNN	COUNTY			CONTRACT No.
						ORANGE	Y12-905B		

**TABLE 2**  
**SUMMARY OF LABORATORY TEST RESULTS**

Location	Boring No.	Approx. Station	Offset (feet)	Sample Depth (feet)	Stratum	Moisture Content (%)	Organic Content (%)	Sieve Analysis (Percent Passing)					Atterberg Limits (%)		Soil Classification
								#10	#40	#60	#100	#200	Liquid Limit	Plasticity Index	AASHTO
Ficquette Road	B-1	53+84	48 RT	7	2	16	--	100	93	83	50	24	--	--	A-2-6
	B-2	56+20	7.5 RT	5	3	23	--	--	--	--	--	33	35	17	A-2-6
	B-4	59+95	7 RT	8	2	17	--	100	97	85	40	12	--	--	A-2-4
	B-6	63+32	10 RT	5	2	20	--	100	99	91	33	17	--	--	A-2-4
	B-7	66+07	47 RT	8	1	29	--	100	98	86	24	6	--	--	A-3

**TABLE 3**  
**FIELD PERMEABILITY TEST RESULTS**

Location ID	Station <sup>a</sup>	Offset (Feet)	Average GSE <sup>b</sup> (Feet)	Approx. Average GWE <sup>c</sup> (Feet)	Estimated SHGWE <sup>d</sup> (Feet)	Estimated SLGWE <sup>e</sup> (Feet)	Measured Horizontal Permeability <sup>f</sup> , K <sub>h</sub> (Ft/Day)
Swale at Ficquette Road	55+16	9 RT	103.9	101.0	102.5	99.5	2
	57+40	59 RT	102.9	100.3	101.8	98.8	1.7
	60+80	10 RT	102.9	100.7	102.2	99.2	4.4
	63+78	51 RT	101.3	99.3	100.8	97.8	1.5

Station<sup>a</sup> Permeability Test location  
 SHGWE<sup>d</sup> Seasonal High Groundwater Elevation

GSE<sup>b</sup> Ground Surface Elevation  
 SLGWE<sup>e</sup> Seasonal Low Groundwater Elevation

GWE<sup>c</sup> Groundwater Elevation  
 Permeability<sup>f</sup>

Groundwater Elevation  
 Permeability value at swale locations only



# **APPENDIX B**

**Sheet 1**  
**Sheets 2 and 3**

**Roadway Soil Survey**  
**Report of SPT Borings**

NES PROJECT NO.: R15-029  
 PROJECT DESCRIPTION: FICQUETTE ROAD INTERSECTION IMPROVEMENT  
 SUBMITTED BY: NES

# NADIC ENGINEERING SERVICES, INC

QUADRANGLE: WINDERMERE  
 SECTION: 22 & 23  
 TOWNSHIP: 23 SOUTH  
 RANGE: 27 EAST

## ROADWAY CROSS SECTION OF SOIL SURVEY

SURVEY BEGINS: 52+00  
 SURVEY ENDS: 75+16.40



### REPORT OF TESTS

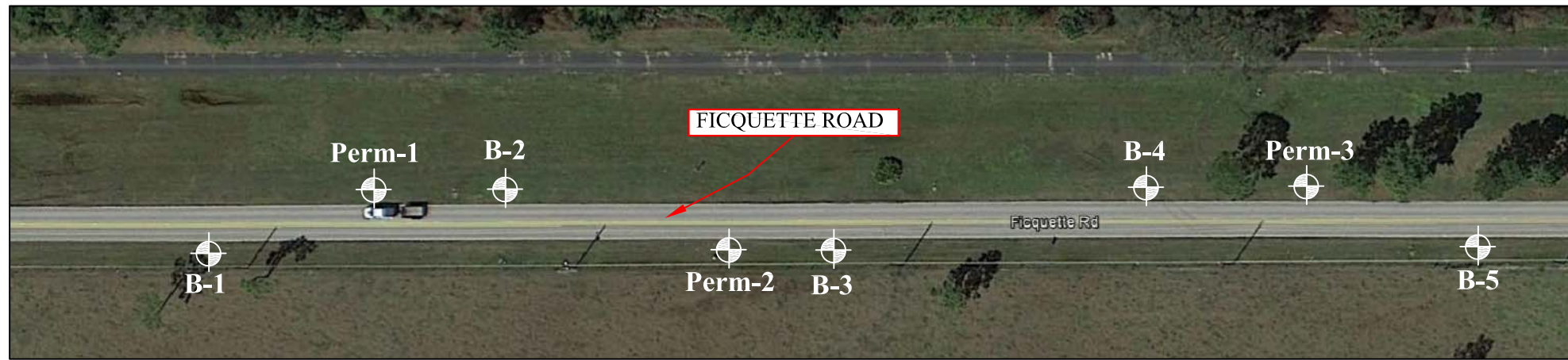
DATE SURVEYED: FEBRUARY, 2016  
 DATE REPORTED: FEBRUARY, 2016

STRATUM NO.	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS						ATTERBERG LIMITS (%)			DESCRIPTION	CORROSION TEST RESULTS					SUBSTRUCTURE ENVIRONMENTAL CLASSIFICATION		
	No. OF TESTS	% ORGANIC	No. OF TESTS	% MOISTURE CONTENT	No. OF TESTS	% PASSING 10 MESH	% PASSING 40 MESH	% PASSING 60 MESH	% PASSING 100 MESH	% PASSING 200 MESH	No. OF TESTS	LIQUID LIMIT	PLASTIC LIMIT		AASHTO GROUP	No. OF TESTS	pH	RESISTIVITY OHM-CM	CHLORIDES PPM	SULFATE PPM	CONCRETE	STEEL
1	-	-	1	29	1 (FULL)	100	98	86	24	6	-	-	-	A-3	DARK BROWN TO LIGHT BROWN FINE SAND, WITH SILT AND CLAY	-	-	-	-	-	-	-
2	-	-	3	10	3 (FULL)	100	93-99	83-91	33-50	12-24	-	-	-	A-2-4	LIGHT BROWN TO DARK BROWN SILTY FINE SAND	-	-	-	-	-	-	-
3	-	-	1	10	1 (-200)	-	-	-	-	33	1	35	17	A-2-6	LIGHT BROWN CLAYEY FINE SAND	-	-	-	-	-	-	-

NOTES:

- STRATA BOUNDRIES ARE APPROXIMATE AND REPRESENT SOIL STRATA AT EACH TEST HOLE LOCATION ONLY. ANY STRATUM CONNECTING LINES SHOWN ARE FOR ESTIMATING EARTHWORK ONLY AND DO NOT INDICATE ACTUAL STRATUM LIMITS. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN FDOT SECTION 2-4. FOR FURTHER DETAILS SEE FDOT SECTION 120-3.
- SOIL PARAMETER NOT TESTED DENOTED AS "-" ABOVE.
- ▼ INDICATES WATER TABLE WHERE ENCOUNTERED AT THE TIME OF SURVEY.  
 ☒ INDICATES ESTIMATED SEASONAL HIGH WATER LEVEL.
- REMOVAL OF PLASTIC AND HIGH PLASTIC MATERIAL OCCURING WITHIN THE ROADWAY SHALL BE ACCOMPLISHED IN ACCORDANCE WITH INDEX No. 500 UNLESS OTHERWISE STATED IN THE PLANS. THE MATERIAL UTILIZED IN EMBANKMENT CONSTRUCTION SHALL BE IN ACCORDANCE WITH FDOT STANDARD INDEX No. 505.
- STRATA 1 AND 2 SHALL BE TREATED AS SELECT (S) MATERIALS PER FDOT INDEX No. 505.
- STRATUM 3 SHALL BE TREATED AS PLASTIC (P) MATERIAL PER FDOT INDEX No. 500 & 505.

ORANGE COUNTY	REVISIONS			 <b>Civil Geotechnical Environmental Consulting Engineering</b>	ENGINEER OF RECORD: DR. GODWIN N. NNADI P.E. NO. 50637 NADIC ENGINEERING SERVICES, INC. 601 N. HART BLVD. ORLANDO, FL 32818	SEAL:		ORANGE COUNTY PUBLIC WORKS		SHEET TITLE: ROADWAY SOIL SURVEY	Project No. R15-029
	DATE	BY	DESCRIPTION					ROAD NAME	COUNTY		
							FICQUETTE	ORANGE			



USGS QUAD MAP: WINDERMERE, FLA  
SECTION: 22 & 23  
TOWNSHIP: 23 South  
RANGE: 27 East  
Photo Issued: 2015

NOT TO SCALE

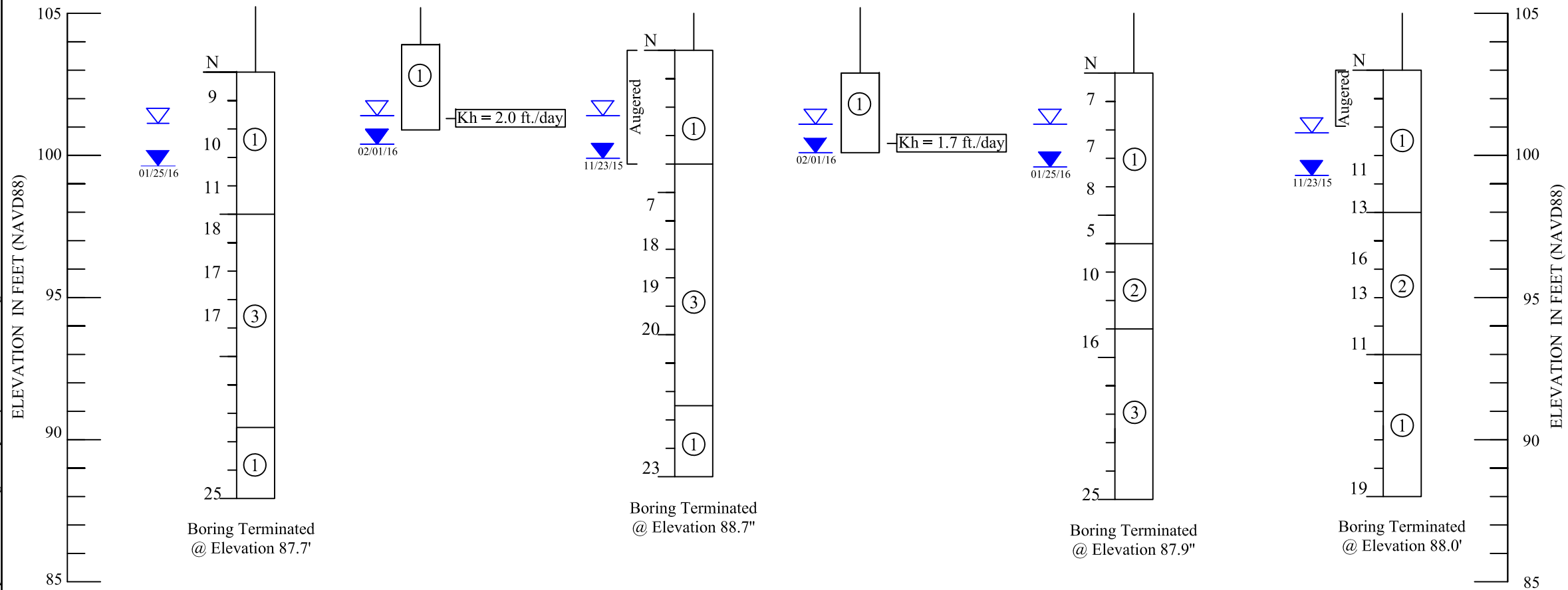
**LEGEND**

- ① Dark brown to light brown fine SAND, with silt and clay, (A-3)
  - ② Light brown to dark brown silty fine SAND, (A-2-4)
  - ③ Light brown clayey fine SAND, (A-2-6)
  - B-1 Approximate Boring location
  - 01/25/16 Groundwater level encountered on date shown
  - Estimated seasonal high groundwater level
  - GNE Groundwater not encountered
  - N Standard Penetration Test Data
- Standard penetration resistance in blows per foot (18" spoon ASTM D-1586)  
Spoon Inside Diameter 1 3/8 in.  
Spoon Outside Diameter 2 in.  
ASTM Standard Automatic Hammer and ASTM Standard Drop Safety Hammer (Rope-Cathead)  
Hammer Weight 140 lbs.  
Drop 30 in.

Boring No:	B-1	Perm-1	B-2	Perm-2	B-3	B-4
Station:	53+84	55+16	56+20	57+40	58+03	59+95
Offset:	48 RT	9.0 RT	7.5 RT	59.0 RT	58 RT	7 RT
Northing:	1502090.7'	1502185.0'	1502233.7'	1502242.0'	1502271.7'	1502404.5'
Easting:	466280.5'	466380.9'	466472.3'	466602.6'	466658.5'	466805.7'
Elevation:	102.7'	103.9'	103.7'	102.9'	102.9'	103.0'
Date Drilled:	1/25/16	02/01/16	11/23/15	02/01/16	01/25/16	11/23/15

**NOTES**

- Standard Penetration Test borings were performed in accordance with ASTM D-1586. Standard Penetration Resistance are shown on the borings at the test depths in blows per foot unless otherwise noticed.
- Subsurface conditions shown on the boring do not represent conditions between boring locations. Actual conditions between the borings may vary from those shown.
- Unified Soil Classifications shown on the boring are based on visual examination and limited laboratory testing.



RELATIVE DENSITY	GRANULAR MATERIALS	
	Drop Safety Hammer SPT (BLOWS/FT.)	Automatic Hammer SPT (BLOWS/FT.)
Very loose	Less than 4	Less than 3
Loose	4-10	3-7
Medium Dense	10-30	7-21
Dense	30-50	21-35
Very Dense	Greater than 50	Greater than 35

CONSISTENCY	SILTS AND CLAYS	
	Drop Safety Hammer SPT (BLOWS/FT.)	Automatic Hammer SPT (BLOWS/FT.)
Very soft	Less than 2	Less than 1
Soft	2-4	1-3
Firm	4-8	3-6
Stiff	8-15	6-11
Very Stiff	15-30	11-21
Hard	Greater than 30	Greater than 21

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**REVISIONS**

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

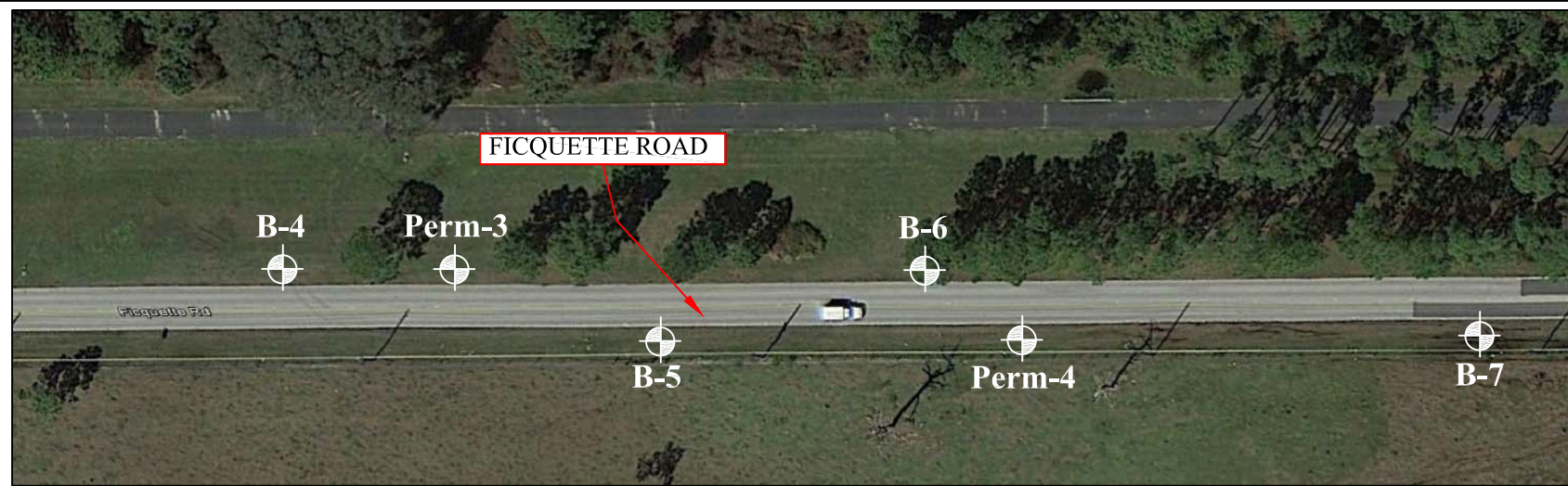
NAMES	DATES
Drawn by: MS	03/15/16
Checked by: GNN	03/15/16
Designed by: N/A	N/A
Checked by: N/A	N/A
Approved by: GNN	

**ORANGE COUNTY PUBLIC WORKS**

601 N. HART BOULEVARD  
ORLANDO, FL 32818  
PH (407) 521-4771 FAX (407) 521-4772

COUNTY: ORANGE CONTRACT NO.: Y12-905B

SHEET TITLE: <b>REPORT OF SPT BORINGS</b>	
PROJECT NAME: FICQUETTE ROAD INTERSECTION IMPROVEMENTS	SHEET NO. 



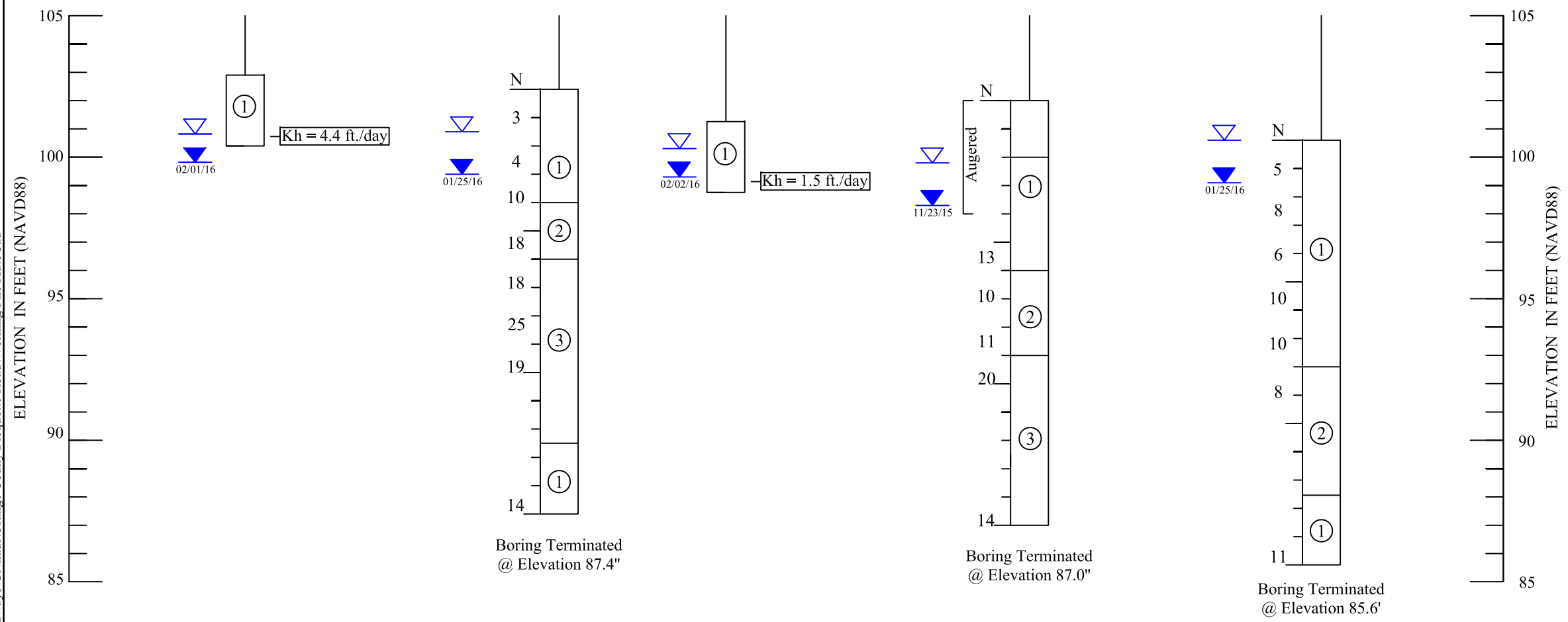
USGS QUAD MAP: WINDERMERE, FLA  
SECTION: 22 & 23  
TOWNSHIP: 23 South  
RANGE: 27 East  
Photo Issued: 2015

NOT TO SCALE

**LEGEND**

- ① Dark brown to light brown fine SAND, with silt and clay, (A-3)
  - ② Light brown to dark brown silty fine SAND, (A-2-4)
  - ③ Light brown clayey fine SAND, (A-2-6)
  - B-1 Approximate Boring location
  - 01/25/16 Groundwater level encountered on date shown
  - ▽ Estimated seasonal high groundwater level
  - GNE Groundwater not encountered
  - N Standard Penetration Test Data
- Standard penetration resistance in blows per foot (18" spoon ASTM D-1586)  
Spoon Inside Diameter 1 3/8 in.  
Spoon Outside Diameter 2 in.  
ASTM Standard Automatic Hammer and ASTM Standard Drop Safety Hammer (Rope-Cathead)  
Hammer Weight 140 lbs.  
Drop 30 in.

Boring No:	Perm-3	B-5	Perm-4	B-6	B-7
Station:	60+80	61+97	63+78	63+32	66+07
Offset:	10.0 RT	58.5 RT	51.0 RT	10 RT	47.0RT
Northing:	1502440.0'	1502450.4'	1502440.0'	1502555.0'	1502646.6'
Easting:	466883.4'	467009.9'	466883.4'	467107.7'	467369.5'
Elevation:	102.9	102.4'	101.3'	102.0'	100.6'
Date Drilled:	02/01/16	01/25/16	02/02/16	11/23/15	01/25/16



**NOTES**

- Standard Penetration Test borings were performed in accordance with ASTM D-1586. Standard Penetration Resistance are shown on the borings at the test depths in blows per foot unless otherwise noticed.
- Subsurface conditions shown on the boring do not represent conditions between boring locations. Actual conditions between the borings may vary from those shown.
- Unified Soil Classifications shown on the boring are based on visual examination and limited laboratory testing.

RELATIVE DENSITY	GRANULAR MATERIALS	
	Drop Safety Hammer SPT (BLOWS/FT.)	Automatic Hammer SPT (BLOWS/FT.)
Very loose	Less than 4	Less than 3
Loose	4-10	3-7
Medium Dense	10-30	7-21
Dense	30-50	21-35
Very Dense	Greater than 50	Greater than 35

CONSISTENCY	SILTS AND CLAYS	
	Drop Safety Hammer SPT (BLOWS/FT.)	Automatic Hammer SPT (BLOWS/FT.)
Very soft	Less than 2	Less than 1
Soft	2-4	1-3
Firm	4-8	3-6
Stiff	8-15	6-11
Very Stiff	15-30	11-21
Hard	Greater than 30	Greater than 21

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REVISIONS						NAMES		DATES	
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	Drawn by:	MS	03/15/16	
						Checked by:	GNN	03/15/16	
						Designed by:	N/A	N/A	
						Checked by:	N/A	N/A	
						Approved by:	GNN		

NADIC ENGINEERING SERVICES, INC.  
601 N. HART BOULEVARD  
ORLANDO, FL 32818  
PH (407) 521-4771 FAX (407) 521-4772

**ORANGE COUNTY PUBLIC WORKS**

COUNTY: ORANGE CONTRACT NO.: Y12-905B

SHEET TITLE: <b>REPORT OF SPT BORINGS</b>	
PROJECT NAME: FICQUETTE ROAD INTERSECTION IMPROVEMENTS	SHEET NO. 3

# APPENDIX C

<b>Table 4</b>	<b>Pavement Evaluation and Condition Sheet</b>
<b>Sheets 4 to 7</b>	<b>Field Permeability Data Evaluation Results</b>
<b>Plate 1 and 2</b>	<b>Pavement Core Photographs</b>

**Table 4  
 Pavement Evaluation and Condition Data Sheet**

State of Florida Department of Transportation PAVEMENT EVALUATION AND CONDITION DATA SHEET																			
Orange County Project No.: Y12-905B				Cored By: NES								Date: 01/25/2016				Page No.: 1 of 1			
County: Orange				Roadway Name: Ficquette Road								From: Western Property line of Dorman Park				To: CR 535 Segment F Project			
Road No.:				Begin Station: 52+00.00								End: 75+16.40				Length: 2316.4 ft.			
Core No.:	Northing (ft)	Easting (ft)	Dist. From Left Edge of Lane (ft)	Lane	Wheel Path	Pavement Layer (in)				Base		Crack				Pavt Cond	Rut Depth (in)	Cross Slope (%)	Comments
						FC	S-II	S-III	Core Length (in)	Type	Thickne ss (in)	Depth (in)	Type	Class	Extent				
C-1	1502230.23	466503.13	8.0	L1	-	-	-	5.5	5.5	ABC-2	0.5	FD	BR	II	S	P	-	3.6	
C-2	1502580.40	467183.17	5.4	R1	x	-	-	5	5	ABC-2	2.5	FD	SL	II	S	P	-	4.5	
Remarks: R1= Eastbound Inside Lane L1= Westbound Inside Lane SL=Single Longitudinal Crack BR= Branch Crack FD=Full Depth Crack L=Light Cracking M=Moderate S=Severe Cracking G=Good F=Fair P=Poor LR=Limerock ABC-2=Asphaltic Base Course																			

**FIELD PERMEABILITY  
FALLING HEAD METHOD**

Project No.: R15-029  
Project Name: Ficquette Road Intersection Improvement

Boring ID : Perm -1 (STA: 55+16, OFFSET: 9RT)  
Radius of Borehole, R(ft) = 0.125  
Raduis of Pipe, r(ft) = 0.0833

Boring ID	Runs	S. No	Pipe Stick up 'Hr' (ft)	L (ft)	D1 (ft)	D2(ft)	H0 (ft)	H1'(ft)	H1 (ft)	t1 (sec)	H2'(ft)	H2 (ft)	t2 (sec)	Permeability(ft/day)	
														individual	average
Perm-1	1	1	1.500	1.000	3.000	2.000	2.900	4.400	0.000	0	3.900	0.500	30	2.753	2.134
		2	1.500	1.000	3.000	2.000	2.900	3.900	0.500	30	3.650	0.750	60	1.512	
		3	1.500	1.000	3.000	2.000	2.900	3.650	0.750	60	3.000	1.400	120	2.238	
		4	1.500	1.000	3.000	2.000	2.900	3.000	1.400	120	2.100	2.300	240	2.035	
		5	1.500	1.000	3.000	2.000	2.900	2.100	2.300	240	1.500	2.900	480	0.960	
		6	1.500	1.000	3.000	2.000	2.900	1.450	2.950	480	1.400	3.000	540	0.400	
Perm-1	2	1	1.500	1.000	3.000	2.000	2.900	4.400	0.000	0	3.900	0.500	30	2.753	1.873
		2	1.500	1.000	3.000	2.000	2.900	3.900	0.500	30	3.650	0.750	60	1.512	
		3	1.500	1.000	3.000	2.000	2.900	3.650	0.750	60	3.000	1.400	120	2.238	
		4	1.500	1.000	3.000	2.000	2.900	3.000	1.400	120	2.200	2.200	240	1.770	
		5	1.500	1.000	3.000	2.000	2.900	2.200	2.200	240	1.500	2.900	480	1.093	
		6	1.500	1.000	3.000	2.000	2.900	1.500	2.900	480	1.400	3.000	540	0.787	
Perm-1	3	1	1.500	1.000	3.000	2.000	2.900	4.400	0.000	0	4.067	0.333	30	1.798	1.860
		2	1.500	1.000	3.000	2.000	2.900	4.067	0.333	30	3.671	0.729	60	2.337	
		3	1.500	1.000	3.000	2.000	2.900	3.671	0.729	60	3.000	1.400	120	2.303	
		4	1.500	1.000	3.000	2.000	2.900	3.000	1.400	120	2.200	2.200	240	1.770	
		5	1.500	1.000	3.000	2.000	2.900	2.200	2.200	240	1.500	2.900	480	1.093	
		6	1.500	1.000	3.000	2.000	2.900	1.500	2.900	480	1.400	3.000	540	0.787	

1.96

D1=Depth from ground surface to the bottom of the hole before putting gravel (ft)  
D2=Depth from ground surface to the top of gravel (ft)  
H0 = The depth from ground surface to Groundwater table (ft)  
H1(ft) = Depth of water inside pipe at t = t1 (sec)  
H1'(ft) = Potential Head at t = t1 (sec) with the top of gravel as datum  
H2(ft) = Depth of water inside pipe at t = t2 (sec)  
H2'=Piez. Head at t = t2 (sec)  
Hr = Pipe Stickup length (ft)  
t1= The time it takes water to drop from the top of PVC pipe to H1(sec)  
t2= The time it takes water to drop from the top of PVC pipe to H2 (sec)

Average Permeability (ft/day) = 2.0

Sheet 4

In the situations when the head drops and time past are not consistent, H1'=H0, and t1=0sec is used in the calculations

**FIELD PERMEABILITY  
FALLING HEAD METHOD**

Project No.: R15-029  
Project Name: Ficquette Road Intersection Improvement

Boring ID : Perm -2 (STA: 57+40, OFFSET: 59RT)  
Radius of Borehole, R(ft) = 0.125  
Raduis of Pipe, r(ft) = 0.0833

Boring	Runs	S. No	Pipe Stick up 'Hr' (ft)	L (ft)	D1 (ft)	D2(ft)	H0 (ft)	H1'(ft)	H1 (ft)	t1 (sec)	H2'(ft)	H2 (ft)	t2 (sec)	Permeability(ft/day)	
														individual	average
Perm-2	1	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.642	0.458	30	2.476	1.834
		2	1.500	1.167	3.000	1.833	2.600	3.642	0.458	30	3.433	0.667	60	1.230	
		3	1.500	1.167	3.000	1.833	2.600	3.433	0.667	60	2.800	1.300	120	2.129	
		4	1.500	1.167	3.000	1.833	2.600	2.800	1.300	120	2.100	2.000	240	1.502	
		5	1.500	1.167	3.000	1.833	2.600	2.100	2.000	240	1.350	2.750	480	1.153	
		6	1.500	1.167	3.000	1.833	2.600	1.350	2.750	480	1.100	3.000	960	0.267	
Perm-2	2	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.683	0.417	30	2.238	1.698
		2	1.500	1.167	3.000	1.833	2.600	3.683	0.417	30	3.433	0.667	60	1.468	
		3	1.500	1.167	3.000	1.833	2.600	3.433	0.667	60	2.800	1.300	120	2.129	
		4	1.500	1.167	3.000	1.833	2.600	2.800	1.300	120	2.100	2.000	240	1.502	
		5	1.500	1.167	3.000	1.833	2.600	2.100	2.000	240	1.350	2.750	480	1.153	
		6	1.500	1.167	3.000	1.833	2.600	1.350	2.750	480	1.100	3.000	960	0.267	
Perm-2	3	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.725	0.375	30	2.003	1.516
		2	1.500	1.167	3.000	1.833	2.600	3.725	0.375	30	3.558	0.542	60	0.956	
		3	1.500	1.167	3.000	1.833	2.600	3.558	0.542	60	2.900	1.200	120	2.136	
		4	1.500	1.167	3.000	1.833	2.600	2.900	1.200	120	2.200	1.900	240	1.442	
		5	1.500	1.167	3.000	1.833	2.600	2.200	1.900	240	1.475	2.625	480	1.044	
		6	1.500	1.167	3.000	1.833	2.600	1.475	2.625	480	1.100	3.000	960	0.383	

1.68

D1=Depth from ground surface to the bottom of the hole before putting gravel (ft)

Average Permeability (ft/day) = 1.683

D2=Depth from ground surface to the top of gravel (ft)

H0 = The depth from ground surface to Groundwater table (ft)

H1 (ft) = Depth of water inside pipe at t = t1 (sec)

H1'(ft) = Potential Head at t = t1 (sec) with the top of gravel as datum

H2(ft) = Depth of water inside pipe at t = t2 (sec)

H2'=Piez. Head at t = t2 (sec)

Hr = Pipe Stickup length (ft)

t1= The time it takes water to drop from the top of PVC pipe to H1(sec)

t2= The time it takes water to drop from the top of PVC pipe to H2 (sec)

In the situations when the head drops and time past are not consistent, H1'=H0, and t1=0sec is used in the calculations



## FIELD PERMEABILITY FALLING HEAD METHOD

Project No.: R15-029  
Project Name: Ficquette Road Intersection Improvement

Boring ID : Perm -3 (STA: 60+80, OFFSET: 10RT)  
Radius of Borehole, R(ft) = 0.125  
Raduis of Pipe, r(ft) = 0.0833

Boring	Runs	S. No	Pipe Stick up 'Hr' (ft)	L (ft)	D1 (ft)	D2(ft)	H0 (ft)	H1'(ft)	H1 (ft)	t1 (sec)	H2'(ft)	H2 (ft)	t2 (sec)	Permeability(ft/day)	
														individual	average
Perm-3	1	1	1.500	1.000	2.500	1.500	2.200	3.700	0.000	0	2.850	0.850	30	5.957	4.816
		2	1.500	1.000	2.500	1.500	2.200	2.850	0.850	30	2.350	1.350	60	4.402	
		3	1.500	1.000	2.500	1.500	2.200	2.350	1.350	60	1.450	2.250	120	5.510	
		4	1.500	1.000	2.500	1.500	2.200	1.450	2.250	120	0.800	2.900	240	3.393	
		5	1.500	1.000	2.500	1.500	2.200	0.800	2.900	240	0.700	3.000	300	1.524	
Perm-3	2	1	1.500	1.000	2.500	1.500	2.200	3.700	0.000	0	2.950	0.750	30	5.170	4.111
		2	1.500	1.000	2.500	1.500	2.200	2.950	0.750	30	2.450	1.250	60	4.238	
		3	1.500	1.000	2.500	1.500	2.200	2.450	1.250	60	1.650	2.050	120	4.511	
		4	1.500	1.000	2.500	1.500	2.200	1.650	2.050	120	0.950	2.750	240	3.150	
		5	1.500	1.000	2.500	1.500	2.200	0.950	2.750	240	0.700	3.000	300	3.485	
Perm-3	3	1	1.500	1.000	2.500	1.500	2.200	3.700	0.000	0	2.950	0.750	30	5.170	4.111
		2	1.500	1.000	2.500	1.500	2.200	2.950	0.750	30	2.450	1.250	60	4.238	
		3	1.500	1.000	2.500	1.500	2.200	2.450	1.250	60	1.650	2.050	120	4.511	
		4	1.500	1.000	2.500	1.500	2.200	1.650	2.050	120	0.950	2.750	240	3.150	
		5	1.500	1.000	2.500	1.500	2.200	0.950	2.750	240	0.700	3.000	300	3.485	

4.35

D1=Depth from ground surface to the bottom of the hole before putting gravel (ft)

Average Permeability (ft/day) = 4.3

D2=Depth from ground surface to the top of gravel (ft)

H0 = The depth from ground surface to Groundwater table (ft)

H1 (ft) = Depth of water inside pipe at t = t1 (sec)

H1'(ft) = Potential Head at t = t1 (sec) with the top of gravel as datum

H2(ft) = Depth of water inside pipe at t = t2 (sec)

H2'=Piez. Head at t = t2 (sec)

Hr = Pipe Stickup length (ft)

t1= The time it takes water to drop from the top of PVC pipe to H1(sec)

t2= The time it takes water to drop from the top of PVC pipe to H2 (sec)

In the situations when the head drops and time past are not consistent, H1'=H0, and t1=0sec is used in the calculations

**FIELD PERMEABILITY  
FALLING HEAD METHOD**

Project No.: R15-029  
Project Name: Ficquette Road Intersection Improvement

Boring ID : Perm -4 (STA: 63+78, OFFSET: 51RT)

Radius of Borehole, R(ft) = 0.125

Raduis of Pipe, r(ft) = 0.0833

Boring	Runs	S. No	Pipe Stick up 'Hr' (ft)	L (ft)	D1 (ft)	D2(ft)	H0 (ft)	H1'(ft)	H1 (ft)	t1 (sec)	H2'(ft)	H2 (ft)	t2 (sec)	Permeability(ft/day)	
														individual	average
Perm-4	1	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.642	0.458	30	2.476	1.613
		2	1.500	1.167	3.000	1.833	2.600	3.642	0.458	30	3.517	0.583	60	0.729	
		3	1.500	1.167	3.000	1.833	2.600	3.517	0.583	60	2.950	1.150	120	1.835	
		4	1.500	1.167	3.000	1.833	2.600	2.950	1.150	120	2.250	1.850	240	1.414	
		5	1.500	1.167	3.000	1.833	2.600	2.250	1.850	240	1.700	2.400	480	0.732	
		6	1.500	1.167	3.000	1.833	2.600	1.700	2.400	480	1.400	2.700	960	0.253	
		7	1.500	1.167	3.000	1.833	2.600	1.400	2.700	960	1.250	2.850	1920	0.074	
Perm-4	2	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.683	0.417	30	2.238	1.473
		2	1.500	1.167	3.000	1.833	2.600	3.683	0.417	30	3.517	0.583	60	0.967	
		3	1.500	1.167	3.000	1.833	2.600	3.517	0.583	60	2.850	1.250	120	2.195	
		4	1.500	1.167	3.000	1.833	2.600	2.850	1.250	120	2.250	1.850	240	1.234	
		5	1.500	1.167	3.000	1.833	2.600	2.250	1.850	240	1.700	2.400	480	0.732	
		6	1.500	1.167	3.000	1.833	2.600	1.700	2.400	480	1.350	2.750	960	0.301	
		7	1.500	1.167	3.000	1.833	2.600	1.350	2.750	960	1.250	2.850	1920	0.050	
Perm-4	3	1	1.500	1.167	3.000	1.833	2.600	4.100	0.000	0	3.642	0.458	30	2.476	1.421
		2	1.500	1.167	3.000	1.833	2.600	3.642	0.458	30	3.517	0.583	60	0.729	
		3	1.500	1.167	3.000	1.833	2.600	3.517	0.583	60	2.850	1.250	120	2.195	
		4	1.500	1.167	3.000	1.833	2.600	2.850	1.250	120	2.350	1.750	240	1.007	
		5	1.500	1.167	3.000	1.833	2.600	2.350	1.750	240	1.800	2.300	480	0.696	
		6	1.500	1.167	3.000	1.833	2.600	1.800	2.300	480	1.350	2.750	960	0.375	
		7	1.500	1.167	3.000	1.833	2.600	1.350	2.750	960	1.250	2.850	1920	0.050	

1.50

D1=Depth from ground surface to the bottom of the hole before putting gravel (ft)

D2=Depth from ground surface to the top of gravel (ft)

H0 = The depth from ground surface to Groundwater table (ft)

H1(ft) = Depth of water inside pipe at t = t1 (sec)

H1'(ft) = Potential Head at t = t1 (sec) with the top of gravel as datum

H2(ft) = Depth of water inside pipe at t = t2 (sec)

H2'=Piez. Head at t = t2 (sec)

Hr = Pipe Stickup length (ft)

t1= The time it takes water to drop from the top of PVC pipe to H1(sec)

t2= The time it takes water to drop from the top of PVC pipe to H2 (sec)

Average Permeability (ft/day) = 1.5

In the situations when the head drops and time past are not consistent, H1'=H0, and t1=0sec is used in the calculations

## FICQUETTE ROAD IMPROVEMENTS



Core No.: C-1  
Northing: 1502230.23 ft.  
Easting: 466503.13 ft.  
Location: Ficquette Road Eastbound Lane, L1  
Thickness: 5.5 inches

Condition: Poor  
Crack: Branch Crack

## FICQUETTE ROAD IMPROVEMENTS



Core No.: C-2  
Northing: 1502580.40 ft.  
Easting: 46718.3.17 ft.  
Location: Ficquette Road Westbound Lane, R1  
Thickness: 5 inches

Condition: Poor  
Crack: Single Longitudinal Crack

# **Threatened and Endangered Species Assessment Report**

## **FICQUETTE ROAD INTERSECTION IMPROVEMENTS**

*in Sections 22 and 23, Township 23 South, Range 27 East  
Orange County, Florida*

*Prepared for:*

**GTC Engineering Corporation  
98 South Semoran Boulevard  
Orlando, Florida 32807**

July 20, 2016  
Project No. I151168.00  
Doc: \I151168.00-TEAR-20G16.doc

# Threatened and Endangered Species Assessment Report

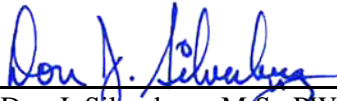
## **FICQUETTE ROAD INTERSECTION IMPROVEMENTS**

*in Sections 22 and 23, Township 23 South, Range 27 East  
Orange County, Florida*

*Prepared for:*

**GTC Engineering Corporation  
98 South Semoran Boulevard  
Orlando, Florida 32807**

Report Authors:



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Senior Environmental Manager, Environmental Services



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Karl Lotspeich  
Senior Director, Environmental Services

July 20, 2016  
Project No. I151168.00  
Doc: \I151168.00-TEAR-20G16.doc



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Table 1.	Classification of Project Corridor Soils
Table 2.	State and Federal Listed Plant Species Documented in Orange County and the Potential for Occurrence on the Ficquette Road Intersection Improvements Project
Table 3.	State and Federal Listed Animal Species Documented in Orange County and the Potential for Occurrence on the Ficquette Road Intersection Improvements Project

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Figure 1	Vicinity Map
Figure 2	Topographic Map
Figure 3	Soils Map
Figure 4	Existing Land Cover Map

## APPENDICES

Appendix A	Information Sources
Appendix B	Wildlife Agency Correspondence



## **Threatened and Endangered Species Assessment Report**

### **FICQUETTE ROAD INTERSECTION IMPROVEMENTS**

*in Sections 22 and 23, Township 23 South, Range 27 East*

Orange County, Florida

Doc: \\151168.00-TEAR-20G16.doc

July 20, 2016

#### **INTRODUCTION**

Pursuant to the request of GTC Engineering Corporation (GTC), Lotspeich and Associates, Inc., a GAI Company (L&A) conducted an assessment of threatened and endangered species for the Ficquette Road Intersection Improvements project corridor in eastern Orange County, Florida (Figure 1). The project will consist of the construction of a designated center turn lane for the proposed Orange County soccer facility to be constructed on Ficquette Road.

The project corridor was investigated during a site inspection, as well as through a review of published data containing information about the corridor's topography, soils, vegetation, and wildlife. The purpose of our research was to document the project corridor's potential to support listed plants and animals, and the potential development constraints posed by their presence. No wetland jurisdiction, subsurface soil, water quality, archaeological, or hazardous materials investigations were conducted by L&A. This report documents the findings of this investigation and the potential ecological permitting requirements and management obligations relative to any listed species documented to occur within or adjacent to the corridor. These findings reflect conditions at the time of the investigation and do not preclude the possibility that on-site conditions may change. The opinions expressed are those of the writer and should not be viewed as binding on any governmental agency.

#### **METHODOLOGY**

The project corridor was investigated through review of published information (Appendix A). Further, L&A staff conducted a review of the state's database of species occurrence records and the bald eagle nest location database (Appendix B). Finally, a field review was conducted by ecologists familiar with the natural communities of Florida to determine the vegetative communities present within and adjacent to the project corridor and determine the presence of, or potential for utilization by, listed plant or animal species. The field investigation also allowed the ecologists to confirm or amend the information collected from database searches and the review of published information. The field investigation was conducted by representatives of L&A on November 12, 2015. Vegetative community types and general observations were recorded via field data sheets and photographs taken of the project corridor. A list of plant species encountered was recorded for the project corridor. This list reflects representative species observed within the corridor and is not necessarily a complete floristic inventory. The corridor was reviewed for the presence of any listed animals through actual observation, signs of scat, prints, or other indications of their presence or utilization of the corridor.

Statements regarding listed species are based on limited field observations and existing data records, and do not exclude the possibility that listed species may occasionally forage on-site or may move into the corridor at a later date, or that protected plants may be discovered on-site when blooming structures are apparent.





## EXISTING SITE CONDITIONS

### Location

The Ficquette Road Intersection Improvements project corridor extends from approximately 1,150 feet south of the intersection of Ficquette Road and Overstreet Road to approximately 500 feet north of the intersection of Ficquette Road and New Independence Parkway in Sections 22 and 23, Township 23 South, Range 27 East in western Orange County, Florida (Figure 1). The corridor is bordered by a recreational trail, and undeveloped lands supporting both man-altered and naturally vegetated plant communities.

### Topography and Drainage

The United States Geological Survey (USGS) topographic map (Windermere, FL Quadrangle) indicate the corridor as being relatively level with elevations of approximately 100 feet of National Geodetic Vertical Datum (NGVD) (Figure 2). On-site drainage appears to occur primarily through roadside swales directing water to cross drains and wetlands adjacent to the project corridor. This corridor lies in the Reedy Creek Drainage Basin of the South Florida Water Management District (District).

### Soils

Soil mapping often provides an indication of the historic and/or current conditions of a site, the potential for presence of sensitive plant communities (e.g., wetlands, scrub, etc.), and/or the potential for presence of listed plants and animal species that are typically limited to specific plant communities. The U.S. Department of Agriculture, National Resource Conservation Service (NRCS) maps the project corridor as traversing one (1) mapped soil units (Table 1) (Figure 3). The corridor is mapped as Smyrna fine sand, a poorly drained soil typically associated with broad level areas of flatwoods. The current status of this soil may be quite different from the NRCS description due to the effects of the construction of the existing roadways, adjacent residential development, and surface water management activities.

**Table 1. Classification of Project Corridor Soils**

Soil Map Unit	Drainage Class <sup>1</sup>	Significant Hydric Inclusions <sup>2</sup>
Smyrna fine sand (44)	Poorly Drained	Yes

Notes:

1. Soil Survey of Orange County, NRCS
2. Hydric Soils of Florida Handbook (1990), Florida Association of Environmental Soil Scientists



## **Land Use and Vegetation**

The land use and vegetative communities occurring within the project corridor were identified using aerial photography and classified using the Florida Land Use, Cover and Forms Classification System (FLUCCS), 1999, as mapped by the District (Figure 4). The project corridor is bordered by a recreational trail and remnant upland and wetland plant communities. Land uses adjacent to the corridor are primarily Roads and Highways (FLUCCS 814) and Recreational Trail (FLUCCS 189). Plant communities within and immediately adjacent to the corridor consist of Improved Pastures (FLUCCS 211), Pine Flatwoods (FLUCCS 411), and Hydric Pine Flatwoods (FLUCCS 625).

The limits of Ficquette Road and the area to which the turn lane improvement project is proposed is categorized as Roads and Highways. Dominant vegetation within the road right-of-way includes bahiagrass (*Paspalum notatum*), wild lettuce (*Lactuca graminifolia*), caesarweed (*Urena lobata*), dog fennel (*Eupatorium capillifolium*), Spanish needles (*Bidens alba*), Brazilian pusley (*Richardia brasiliensis*), dayflower (*Commelina erecta*), and hairy indigo (*Indigofera hirsuta*). There is portion of the right of way on the south side of Ficquette Road towards the east end of the project that supports hydrophytic (wetland) vegetation. Representative species in this wet depression include torpedograss (*Panicum repens*), maidencane (*P. hemitomon*), Asian coinwort (*Centella asiatica*), umbrella pennywort (*Hydrocotyle umbellata*), Mexican primrose willow (*Ludwigia octovalvis*), bacopa (*Bacopa caroliniana*), beakrush (*Rhynchospora* sp.), soft rush (*Juncus effusus*), and hempvine (*Mikania scandens*). This depression appears to be a remnant connection between the wetland communities located to either side of the Ficquette Road right-of-way.

The Pine Flatwoods communities occurs primarily adjacent to the north side of the corridor (north of the recreational trail), and are characterized by a canopy of slash pine (*Pinus elliottii*) and longleaf pine (*P. palustris*), with an understory of wax myrtle (*Myrica cerifera*), saw palmetto (*Serenoa repens*), and gallberry holly (*Ilex glabra*). The ground cover in these areas is typically dominated by bracken fern (*Pteridium pseudocaudatum*) and bushy broomsedge (*Andropogon glomeratus*). There is also an area of modified pine flatwoods on the north side of Ficquette Road where all that remains is two rough rows of slash pine and longleaf pine with an understory of turfgrasses. This area appears to be a remnant from when the corridor was cleared to construct a Recreational Trail in 2004-2006.

Improved Pastures on the south side of Ficquette Road occur immediately adjacent to the right-of-way in a parcel designated for construction of the proposed soccer facility that will be served by the proposed turn lane. The dominant vegetation is bahiagrass, with caesarweed, dog fennel, blackberry (*Rubus cuneifolius*), and scattered longleaf and slash pines.

## **THREATENED AND ENDANGERED SPECIES**

The U.S. Fish and Wildlife Service (Service) and the Florida Fish and Wildlife Conservation Commission (FWC) list wildlife species that are considered “endangered” or “threatened.” The FWC uses an additional category - “species of special concern” (SSC) - for several animals that may ultimately be listed as endangered or threatened. This classification provides the SSC-listed animal with a level of protection that varies from species to species. The Service and the Florida Department of Agriculture and Consumer Services (FDACS) also compile lists of protected plant species. The Service classifies protected plants as either endangered or threatened, while the FDACS’s plant list is categorized into endangered, threatened, and “commercially exploited” species.



Prior to the field inspection, various web sites were accessed in order to collect information concerning the possible presence of state and/or federally listed threatened or endangered species within the project corridor. These web sites included:

- The Service's web site was reviewed for federally listed species found within Orange County;
- The FWC's web site for protected species was accessed to identify state listed species known to occur within Orange County;
- The FWC's web site was reviewed for bald eagle (*Haliaeetus leucocephalus*) nest locations; and,
- The Florida Natural Areas Inventory (FNAI) database and Biodiversity Matrix was reviewed for known occurrences of listed species or critical habitat.

In addition, GIS data layers obtained from the FWC and the FNAI that provide species occurrence records were used in our determination of whether protected species may occur within the vicinity of the project corridor. Our field inspection consisted of a series of meandering pedestrian transects throughout the project corridor to evaluate existing land use and ascertain the likelihood that it supports protected species through the observation of individuals, tracks, burrows, scat, or other indications of listed plants and/or animals.

Based on in-house data searches, numerous protected animal and plants are known to occur in Orange County. From review of the habitat requirements of these plants and animals as well as the subsequent field inspection, it was determined that there is concern for the potential presence of the bald eagle (*Haliaeetus leucocephalus*), gopher tortoise (*Gopherus polyphemus*), Eastern indigo snake (*Drymarchon corais couperi*), sand skink (*Neoseps reynoldsi*), and a variety of listed plants that are known to occur in the habitat types that occur on-site. These findings do not preclude the fact that these or other protected animals may move into the area or forage in the area at a later date, or that protected plants may be discovered on-site when blooming structures are apparent. Habitat requirements and the probability of occurrence for these species are provided below.

L&A conducted a bald eagle nest search following the procedures of the FWC's *Eagle Nest Locator Database* (2015). The bald eagle has been removed from the FWC's list of threatened and endangered species and is no longer listed under the federal Endangered Species Act. However, it should be noted that protection of the bald eagle will continue under the federal Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and by the revised management plans issued by the FWC and the Service. The FWC database search revealed that the project corridor is located outside the protection zone of any documented eagle nests. The database indicates that the nearest nest (designated OR007) is located approximately 0.88 mile northwest of the midpoint of the project corridor. No coordination with the FWC is necessary unless eagles construct a nest within the 660 feet of the project corridor in the future.

The gopher tortoise is listed as threatened by the FWC. The gopher tortoise requires well-drained and loose sandy soils for burrowing, and low-growing herbs and grasses for food. These habitat conditions are best provided in the sandhill (longleaf pine-xeric oak) community, although tortoises are known to use many other habitats, including sand pine scrub, xeric oak hammocks, dry prairies, pine flatwoods, ruderal sites, and maintained roadway rights-of-way. No gopher tortoise or gopher tortoise burrows were observed within or immediately adjacent to the project corridor during the site review. No further coordination with the FWC is necessary unless a potentially occupied gopher tortoise burrow is observed to occur within 25 feet of the work area associated with the proposed turn lane improvements.



Gopher tortoise burrows harbor and protect a number of commensal species, including the Eastern indigo snake, which is listed by both the Service and the FWC as threatened. The Eastern indigo snake prefers drier habitats, but may be found in a variety of habitats from xeric sandhills, to cabbage palm hammocks, to hydric hardwood hammocks. Indigo snakes often forage adjacent to wetlands, particularly seasonal wetlands. This species was not observed during the field investigations, and occurrence of the Eastern indigo snake is considered unlikely. A specific management plan is not required for this species; however, Eastern indigo snakes should be allowed to pass through the work area unmolested if they are observed during site clearing activities. An identification poster is available from the Service's website and can be posted at the site during project construction. This precaution will serve to prevent any potentially adverse effects to Eastern indigo snakes as a result of the proposed roadway improvements.

The sand skink exists in areas dominated by xeric vegetation such as oak dominated scrub, turkey oak barrens, high pine, and xeric hammocks. Skinks typically occur in open sandy patches within these habitat types. The species usually remains underground and burrows 5 to 10 centimeters (2 to 4 inches) beneath the soil to find its food. The sand skink is listed as a Threatened species by both the Service and the FWC. This area of Orange County contains habitat considered to be suitable for this species and the subject parcel falls within the limits of the "Consultation Area" established by the Service in the new sand skink survey protocol (April 4, 2011).

The Service's sand skink survey protocol make presumptions regarding site location (within the "Consultation Area"), site elevations (above 82 feet NGVD), and the mapped presence of several soil types considered to be "suitable." Meeting these conditions, a project proposing to disturb soils must either assume the presence of sand skinks and the "appropriate avoidance, minimization, mitigation, or conservation measures should be implemented," or conduct a sand skink survey to confirm or refute the presence of the species on-site. While visual surveys may be conducted at any time to confirm the presence of sand skinks, the specific survey protocol necessary to refute the presence of this species on-site must be conducted with a 75-day period from the beginning of March through mid-May, and must be conducted for four (4) consecutive weeks within that time period.

The project corridor does meet the site elevation criterion, but it is not subtended by the appropriate soil types. Therefore, it is not likely that the Service would infer that there is the potential for the sand skink to occur on-site. No specimens or indication of its presence (sinusoidal tracts) were observed during L&A's field investigation on November 12, 2015.

The majority of the listed plants documented to occur in Orange County are either associated with wetlands or scrub habitat. While there is no scrub habitat, wetlands occur adjacent to and within the project corridor. No plants listed by the FDACS were observed within the project corridor. It should be noted that the incidental destruction of State-listed rare or commercially exploited plants, as may be caused by clearing associated with construction or agriculture, are neither regulated nor prohibited by the FDACS. No plants listed by the Service were observed within or adjacent to the project corridor. Thus, no further coordination with the FDACS or the Service is currently required as it relates to listed plants. These conclusions are based on field observations and existing data records.

## **SUMMARY**

This listed species assessment was conducted to document the potential usage of the project corridor, or potential presence within the project corridor, by threatened and/or endangered species and the potential constraints and management obligations posed by their presence. The field investigation



identified the potential for the presence of Eastern indigo snake, but its occurrence is unlikely. A site specific educational program and work plan for Eastern indigo snake is not necessary during corridor construction activities.

No listed plants were observed within or adjacent to the project corridor. No coordination with the Service or the FDACS is currently necessary regarding listed plant species.

This assessment should be updated if greater than one year passes prior to any site development activities.



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**Table 2. State and Federal Listed Plant Species Documented in Orange County and the Potential for Occurrence within the Ficquette Road Intersection Improvements Project Corridor.**

Source: Lotspeich and Associates, Inc.

SCIENTIFIC NAME COMMON NAME	DESIGNATED STATUS		HABITAT	LIKELIHOOD OF OCCURRENCE	OBSERVED
	FDACS	SERVICE			
<i>Asclepias curtissii</i> Curtis' milkweed	E	-	Sand pine scrub, dry hammocks, flatwoods; May-Sept	None - No suitable habitat	—
<i>Asplenium verecundum</i> Delicate spleenwort	E	-	Limestone in grottoes, on cliffs and boulders in shaded woods	None - No suitable habitat	—
<i>Bonamia grandiflora</i> Florida bonamia	E	T	Scrub; Apr-Sept	None - No suitable habitat	—
<i>Calopogon multiflorus</i> Many-flowered grass-pink	E	-	Damp pinelands and meadows (fire maintained); Mar-June	Moderate - Suitable habitat present	—
<i>Carex chapmanii</i> Chapman's sedge	E	-	Hammocks, woodlands; Spring	Low - Limited habitat present	—
<i>Centrosema arenicola</i> Sand butterfly pea	E	-	Open, mixed woodlands, pine or oak-palmetto thickets; Summer-Fall	None - No suitable habitat	—
<i>Clitoria fragrans</i> Butterfly-pea	E	-	Turkey oak, sandy soil, scrub, scrubby flatwoods, roadside; Apr-July	None - No suitable habitat	—
<i>Coelorachis tuberculosa</i> Florida jointtail	T	-	Marshes, margins of ponds; June-July	Low - Limited habitat present	—
<i>Deeringothamnus pulchellus</i> Beautiful pawpaw	E	E	Grassy flatwoods, road edges; Mar-May	Moderate - Suitable habitat present	—
<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i> Scrub buckwheat	E	T	Scrub, sandhill, longleaf pine; all year	None - No suitable habitat	—
<i>Garberia heterophylla</i> Garberia	T	-	Dry sand pine or pine oak scrub and prairies; Summer/Fall	None - No suitable habitat	—
<i>Glandularia tampensis</i> Tampa vervain	E	-	Flatwoods, hammocks, sandy soils, disturbed sites; Jan-June	Low - Limited habitat present	—
<i>Harrisella porrecta</i> Threadroot orchid	T	-	Old orange groves, strand swamps, hammocks, hardwood swamps; Aug-Sept	None - No suitable habitat	—
<i>Illicium parviflorum</i> Star anise	E	-	Bottomland forest and wet hammocks; Apr-June	None - No suitable habitat	—
<i>Lechea cernua</i> Nodding pinweed	T	-	Sandy openings in scrub, fire maintained; July-Jan	None - No suitable habitat	—
<i>Lilium catesbaei</i> Catesby's lily	T	-	Wet flatwoods, bogs, usually with grasses; July-Oct	Low - Limited habitat present t	—
<i>Lobelia cardinalis</i> Cardinal flower	T	-	Riverbanks, springs, coastal hammocks; July-Oct	None - No suitable habitat	—
<i>Lupinus aridorum</i> Scrub lupine	E	E	Sand pine scrub, yellow sand; Mar-Apr	None - No suitable habitat	—
<i>Lycopodiella cernua</i> Nodding club-moss	C	-	Wet depressions, ditches, moist areas	Moderate - Suitable habitat present	—



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SCIENTIFIC NAME COMMON NAME	DESIGNATED STATUS		HABITAT	LIKELIHOOD OF OCCURRENCE	OBSERVED
	FDACS	SERVICE			
<i>Lythrum flagellare</i> Lowland loosestrife	E	-	Low open ground, swamps, thickets; Spring	Low - Limited habitat present	---
<i>Matelea floridana</i> Florida spiny pod	E	-	Bluffs, pine-oak-hickory woods; Apr-Aug	None - No suitable habitat	---
<i>Matelea pubiflora</i> Sandhill spiny pod	E	-	Sandhills and scrubs; Spring-Summer	None - No suitable habitat	---
<i>Monotropa hypopithys</i> Pine-sap	E	-	Upland woods; Oct-Nov	None - No suitable habitat	---
<i>Nemastylis floridana</i> Fall-flowering ixia	E	-	Clearings in swamps, marshes, and wet pine flatwoods; July-Nov	None - No suitable habitat	---
<i>Nolina atopocarpa</i> Florida beargrass	T	-	Grassy areas of flatwoods, bordering savannas, shell middens; May-Aug	None - No suitable habitat	---
<i>Nolina brittoniana</i> Britton's beargrass	E	E	Dry pinelands and sand pine scrub; Mar-May	None - No suitable habitat	---
<i>Ophioglossum palmatum</i> Hand fern	E	-	Bases of cabbage palm leaves in moist hammocks, strand swamps; Mar-June	None - No suitable habitat	---
<i>Osmunda cinnamomea</i> Cinnamon Fern	C	-	Swamps and wetlands; Spring	Low - Limited habitat present t	---
<i>Osmunda regalis</i> Royal fern	C	-	Swamps and wetlands; all year	Low - Limited habitat present	---
<i>Panicum abscissum</i> Cut throat grass	E	-	Wet pinelands, seepage areas; Spring-Fall	None - No suitable habitat	---
<i>Paronychia chartacea</i> Papery whitlow-wort	E	T	Scrub vegetation, shores of karst lakes; June-Dec	None - No suitable habitat	---
<i>Pecluma plumula</i> Plume polypody	E	-	Hammocks; all year	None - No suitable habitat	---
<i>Pecluma ptilodon</i> Swamp plume polypody	E	-	Hammocks and swamps; all year	None - No suitable habitat	---
<i>Pinguicula caerulea</i> Blue flowered butterwort	T	-	Sandy to sandy-peaty soils of pine flatwoods, ditches and roadsides; Dec-May	Moderate - Suitable habitat present	---
<i>Pinguicula lutea</i> Yellow flowered butterwort	T	-	Sandy to sandy-peaty soils of pine flatwoods, ditches and roadsides, and seepage bogs; Feb-May	Moderate - Suitable habitat present	---
<i>Platanthera blephariglottis</i> White-fringed orchid	T	-	Marshes, meadows, bogs, depressions in pine savannas; Aug-Sep	None - No suitable habitat	---
<i>Platanthera ciliaris</i> Yellow-fringed orchid	T	-	Marshes, swamps, bogs, pine savannas and flatwoods, floodplain forests, forest slopes; Aug-Sept	None - No suitable habitat t	---
<i>Platanthera cristata</i> Crested-fringed orchid	T	-	Bogs, meadows, bogs, pine savannas and flatwoods, wet prairies, edge of swamp, seepage slopes; June-Sept	None - No suitable habitat t	---



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SCIENTIFIC NAME COMMON NAME	DESIGNATED STATUS		HABITAT	LIKELIHOOD OF OCCURRENCE	OBSERVED
	FDACS	SERVICE			
<i>Platanthera integra</i> Orange rein orchid	E	-	Swampy meadows, boggy depressions in wet woods; July-Sept	None - No suitable habitat	---
<i>Platanthera nivea</i> Snowy orchid	T	-	Bogs, wet pine savannas and flatwoods, wet prairies; May-June	None - No suitable habitat	---
<i>Pogonia ophioglossoides</i> Rose pogonia	T	-	Sphagnum bogs, meadows, swamps, pine savannas, pine flatwoods, prairies; Mar-May	None - No suitable habitat	---
<i>Polygala lewtonii</i> Scrub milkwort	E	E	White sand, scrub; Feb-May	None - No suitable habitat	---
<i>Polygonella myriophylla</i> Small's jointweed	E	E	Scrub; Apr-Nov	None - No suitable habitat	---
<i>Prunus geniculata</i> Scrub plum	E	E	Sand pine scrub; Feb-Mar	None - No suitable habitat	---
<i>Pteroglossaspis ecristata</i> Non-crested eulophia	T	-	Sand pine scrub, sandhills, pine rockland; July-Sept	None - No suitable habitat	---
<i>Rhaphidophyllum hystrix</i> Needle palm	C	-	River bluffs, ravine slopes, bottomlands	None - No suitable habitat	---
<i>Salix floridana</i> Florida willow	E	-	Wet hammocks, dense bottomland forests, stream margins, swamps; Feb-Apr	None - No suitable habitat	---
<i>Sarracenia minor</i> Hooded pitcher-plant	T	-	Flatwoods, bogs, ditches; Mar-May & Sept	None - No suitable habitat	---
<i>Sideroxylon lycioides</i> Buck-thorn	E	-	Hammocks, floodplains; Apr	None - No suitable habitat	---
<i>Spiranthes brevilabris</i> Ladies' tresses	E	-	Varied habitat, pinelands, wet flatwoods, roadsides; Feb-May	Moderate - Suitable habitat present	---
<i>Spiranthes longilabris</i> Long-lip ladies' tresses	T	-	Prairies, flatwoods, marshes, sandy bogs; Nov-Dec	None - No suitable habitat	---
<i>Spiranthes tuberosa</i> Little pearl-twist	T	-	Dry acid soil, open pine-palmetto woods, pine flatwoods; June	None - No suitable habitat	---
<i>Stenorrhynchos lanceolatus</i> Little pearl-twist	T	-	Open pastures, roadside, wet pine flatwoods, sandhills; Apr-July	Moderate - Suitable habitat present	---
<i>Stylisma abdita</i> Hidden stylisma	E	-	Pinelands, scrub; Spring-Summer	None - No suitable habitat	---
<i>Tillandsia fasciculata</i> Common Giant wild-pine	E	-	Hammocks, cypress swamps, pinelands	Low - Limited habitat present	---
<i>Tillandsia utriculata</i> Giant wild-pine	E	-	Hammocks, cypress swamps, pinelands	Low - Limited suitable habitat	---
<i>Triphora trianthophora</i> Three-birds orchid	T	-	Hammocks, rich woods; July-Nov	None - No suitable habitat	---
<i>Warea amplexifolia</i> Clasping warea	E	E	Dry pinelands and sandhill; Aug-Oct	None - No suitable habitat	---
<i>Zamia pumila</i> Coontie	C	-	Scrub, oak hammock, well-drained sandy or loamy soils; Fall-Winter	None - No suitable habitat	---
<i>Zephranthes simpsonii</i> Simpson's zephyr-lily	T	-	Wet pinelands and pastures, roadsides; Spring	Moderate - Suitable habitat present	---





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**LEGEND:**

E	=	Endangered
T	=	Threatened
C	=	Commercially Exploited
FDACS	=	Florida Department of Agriculture and Consumer Services (2003)
SERVICE	=	U.S. Fish and Wildlife Service



**Table 3. State and Federal Listed Animal Species Documented in Orange County and the Potential for Occurrence within the Ficquette Road Intersection Improvements Project Corridor.**

Source: Lotspeich and Associates, Inc.

SCIENTIFIC NAME COMMON NAME	DESIGNATED STATUS		HABITAT	LIKELIHOOD OF OCCURRENCE	OBSERVED
	FWC	SERVICE			
<b>BIRDS</b>					
<i>Ajaia ajaja</i> Roseate spoonbill	SSC	-	Salt marshes, mangroves, wet prairies, marshes, and agricultural environments	None - No suitable habitat	—
<i>Aphelocoma coerulescens</i> Florida scrub jay	T	T	Oak scrub with open ground	None - No suitable habitat	—
<i>Aramus guarana</i> Limpkin	SSC	-	Slow-moving freshwater rivers, marshes, and lakeshores	None - No suitable habitat	—
<i>Athene cucularia floridana</i> Florida burrowing owl	SSC	-	Open grassland, prairies, farm land, pastures, and airfields; can be found in urban settings	None - No suitable habitat	—
<i>Egretta caerulea</i> Little blue heron	SSC	-	Marshes, lakeshores, ponds, ditches, and pastures	None - No suitable habitat	—
<i>Egretta thula</i> Snowy egret	SSC	-	Marshes, lakeshores, ponds, ditches, and pastures	None - No suitable habitat	—
<i>Egretta tricolor</i> Tricolored heron	SSC	-	Marshes, lakeshores, ponds, ditches, and pastures	None - No suitable habitat	—
<i>Eudocimus albus</i> White ibis	SSC	-	Shallow freshwater and estuarine wetlands	None - No suitable habitat	—
<i>Falco sparverius paulus</i> Southeastern American kestrel	T	-	Forest ecotone, urban areas, farm lands, and clearings	Low - Limited suitable habitat	—
<i>Grus canadensis pratensis</i> Florida sandhill crane	T	-	Wet prairies, littoral zones, and wet pastures; nests in pickerelweed-maidencane marshes	None - No suitable habitat	—
<i>Haliaeetus leucocephalus</i> Bald eagle	T	-	Coastal areas, large lakes, and river shorelines; nests near water bodies	Low - Limited suitable habitat	—
<i>Mycteria americana</i> Wood stork	E	E	Marshes, ponds, and lagoons; nests in cypress and mangrove swamps	None - No suitable habitat	—
<i>Picoides borealis</i> Red-cockaded woodpecker	SSC	E	Mature longleaf and slash pine forests with open mid-story	None - No suitable habitat	—
<i>Caracara cheriway</i> Audubon's crested caracara	T	T	Prairies, open grassland; nest in cabbage palm hammock	None - No suitable habitat	—
<i>Rostrhamus sociabilis plumbeus</i> Everglades Snail Kite	E	E	Freshwater marsh	None - No suitable habitat	—
<i>Sterna antillarum</i> Least tern	T	-	Open flat sand or gravel, spoil areas, and rooftops; adjacent to coastal areas	None - No suitable habitat	—



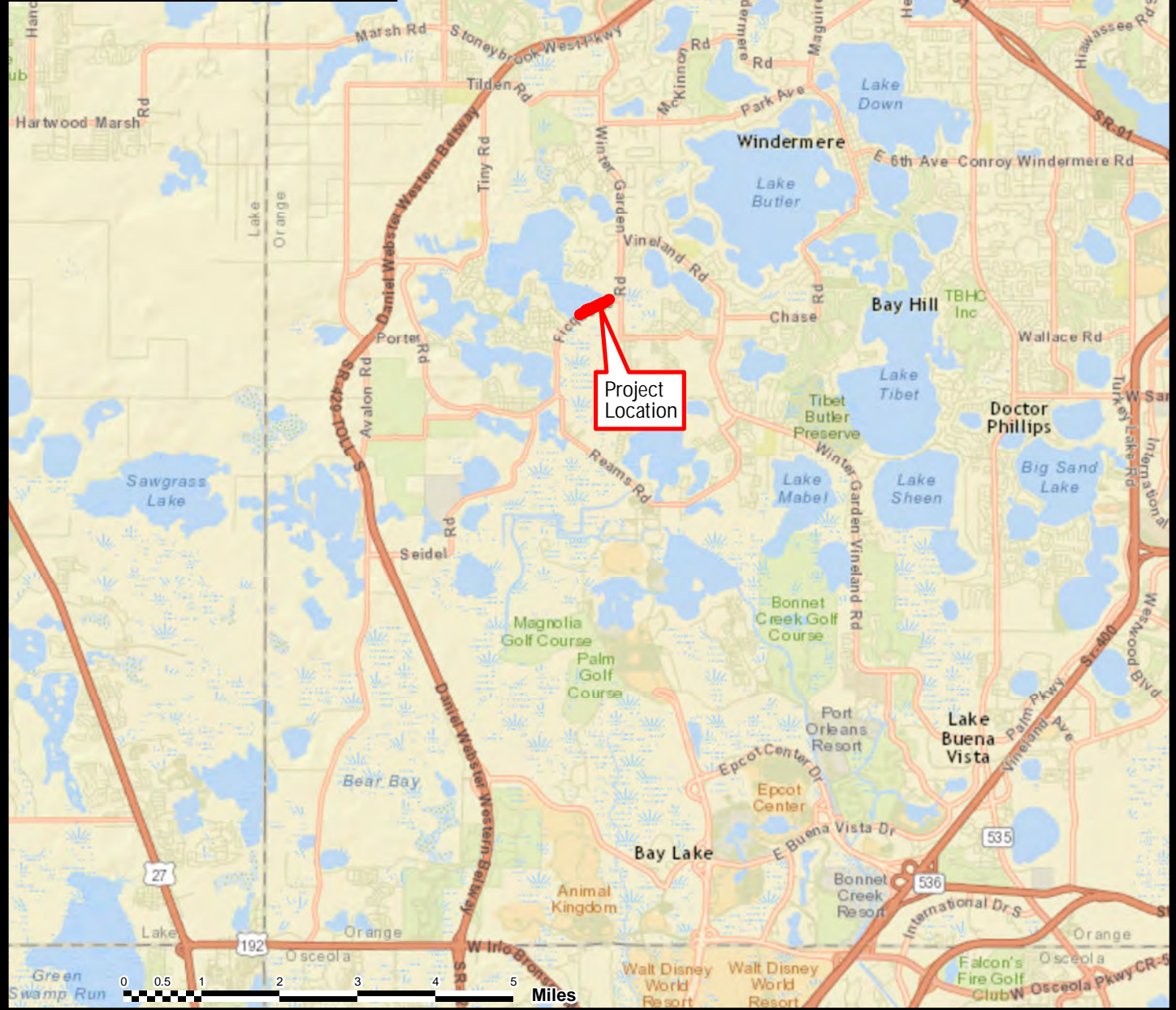
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SCIENTIFIC NAME COMMON NAME	DESIGNATED STATUS		HABITAT	LIKELIHOOD OF OCCURRENCE	OBSERVED
	FWC	SERVICE			
<b>MAMMALS</b>					
<i>Podomys floridanus</i> Florida mouse	SSC	-	Sand pine scrub, coastal scrub, scrubby flatwoods, and sandhills	None - No suitable habitat	---
<i>Sciurus niger shermani</i> Sherman's fox squirrel	SSC	-	Longleaf pine-turkey oak sandhills and flatwoods	Low - Limited suitable habitat	---
<i>Ursus americanus floridanus</i> Florida black bear	T	-	Pine flatwoods, cypress swamps, hardwood swamp, sand pine scrub, and mixed hardwoods	Low - Limited suitable habitat	---
<b>FISH, AMPHIBIANS AND REPTILES</b>					
<i>Alligator mississippiensis</i> American alligator	SSC	T(S/A)	Lakes, ponds, sloughs, and marshes	None - No suitable habitat	---
<i>Cyprinodon var. hubbsi</i> Lake Eustis pupfish	SSC	-	Freshwater, brackish, and marine habitats; range limited to select water bodies	None - No suitable habitat	---
<i>Drymarchon corais couperi</i> Eastern indigo snake	T	T	Varied habitat from wet prairie to xeric pineland and scrub	Moderate - Suitable habitat present	---
<i>Gopherus polyphemus</i> Gopher tortoise	T	-	Sandhills, sand pine scrub, live oak hammocks, palmetto prairie, pine flatwoods, abandoned grove, and pasture	Moderate - Suitable habitat present	---
<i>Neoseps reynoldsi</i> Sand skink	T	T	Rosemary scrub, sand pine scrub, oak scrub, and scrubby flatwoods	None - No suitable habitat	---
<i>Pituophis melanoleucus mugitus</i> Florida pine snake	SSC	-	Longleaf pine-xeric oak, sand pine scrub, dry pine flatwoods, and abandoned fields on well drained soils	None - No suitable habitat	---
<i>Rana capito</i> Gopher frog; crawfish frog	SSC	-	Sandhill, pine flatwoods, and sand pine scrub; needs ephemeral marshes for breeding	Moderate - Suitable habitat present	---
<i>Stilosoma extenuatum</i> Short-tailed snake	T	-	Turkey oak-longleaf pine, occasionally upland hammock, and sand pine scrub	None - No suitable habitat	---

**LEGEND:**

- E = Endangered
- T = Threatened
- T(s/a) = Threatened due to similarity of appearance
- SSC = Species of Special Concern
- FWC = Florida Fish and Wildlife Conservation Commission
- SERVICE = U.S. Fish and Wildlife Service



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## Ficquette Road Intersection Improvements

Sections 22 & 23, Township 23 South, Range 27 East  
Orange County, Florida

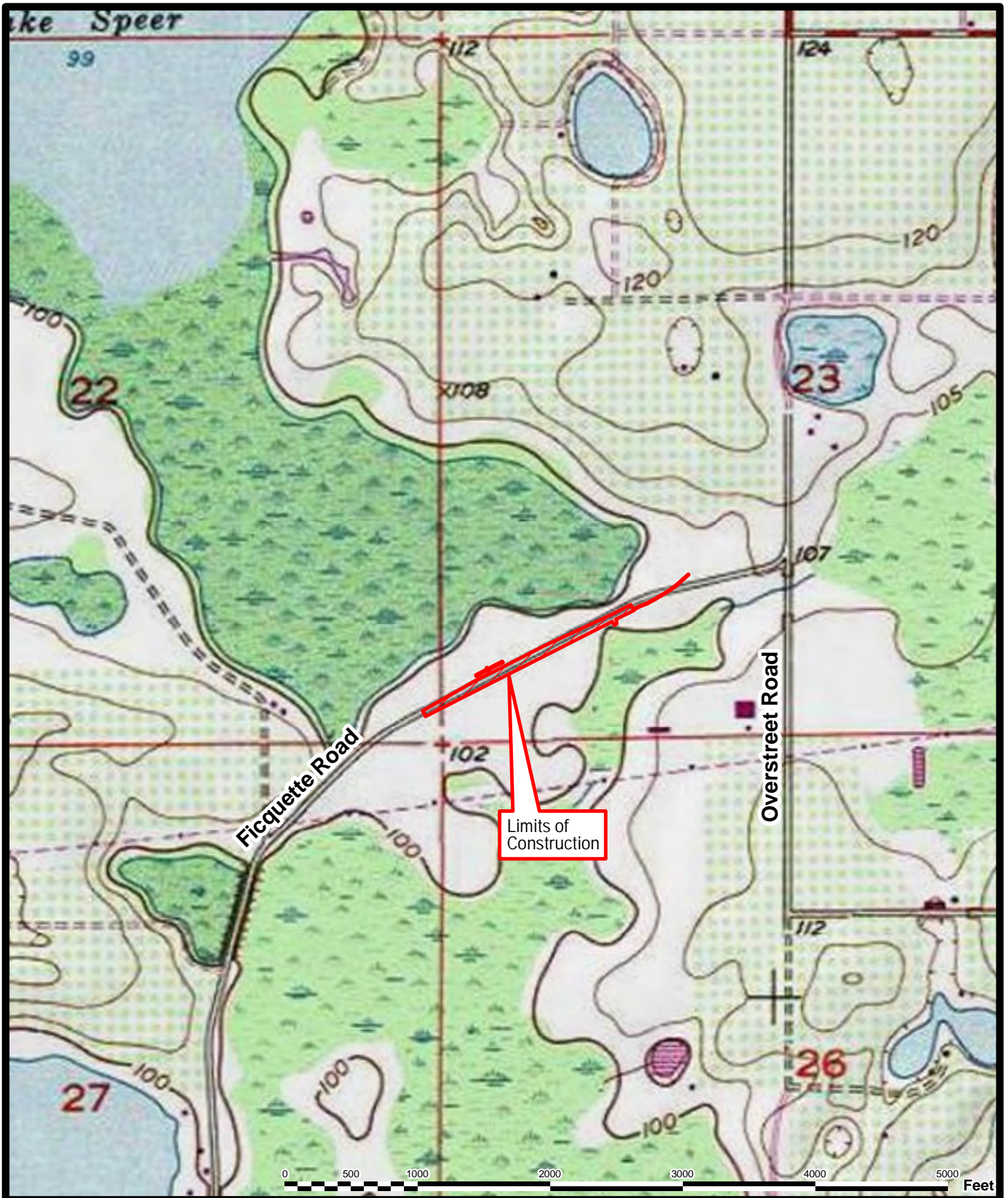
## Project Location Map

File: I151168-F1.mxd Drawn By: JGS Job No.: I151168.00 Date: 20 July 2016



Scale: 1 inch = 2 miles

Figure 1



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### Ficquette Road Intersection Improvements

Sections 22 & 23, Township 23 South, Range 27 East  
Orange County, Florida

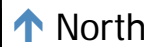
### USGS Topographic Map

USGS 7.5' Topographic Quad Map (Windermere, FL quad)  
provided in digital GIS format by ESRI.

Scale: 1:12,000

Figure 2

File: I151168-F2.mxd | Drawn By: JGS | Job No.: I151168.00 | Date: 20 July 2016





**Legend**

**Limits of Construction**



**NRCS Soils Delineation**



**Soil Classification**

- 41 Samsula-Hontoon-Bassinger association, depressional
- 42 Sanibel muck
- 44 Smyrna fine sand



**Notes**

Soils delineation and classification from NRCS Soil Survey of Orange County, Florida, provided in GIS format by USDA Natural Resources Conservation Service.



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**Ficquette Road  
Intersection  
Improvements**

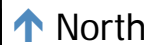
Sections 22 & 23, Township 23 South, Range 27 East  
Orange County, Florida

**Soils  
Map**

Scale: 1:3,600

Figure 3

File: I151168-F3.mxd | Drawn By: JGS | Job No.: I151168.00 | Date: 20 July 2016





**Legend**

**Limits of Construction**



**Existing Land Cover**



**Land Cover Classification**

- 211 Improved Pastures
- 411 Pine Flatwoods
- 625 Hydric Pine Flatwoods
- 630 Mixed Wetland Forests

From Florida Land Use Cover and Forms Classification System, FDOT, 1999



**Notes**

Existing Land Cover delineation and classification, provided in GIS format by SFWMD, and is not a binding jurisdictional determination for any regulatory agency.



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**Fiquette Road Intersection Improvements**

Sections 22 & 23, Township 23 South, Range 27 East  
Orange County, Florida

**Existing Land Cover Map**



Scale: 1 : 3,600

Figure 4

File: I151168-F4.mxd Drawn By: JGS Job No.: I151168.00 Date: 20 July 2016



**APPENDIX A**  
**Information Sources**





**Information sources utilized for the Ficquette Road Intersection Improvements Project:**

- Florida Administrative Code. Chapter 40E. Regulations of the South Florida Water Management District.
- Florida Association of Professional Soil Classifiers. Hydric Soils of Florida Handbook, 1 ed. 1990.
- Florida Department of Agriculture and Consumer Services, Division of Plant Industry. 2010. "Notes of Florida's Endangered and Threatened Plants, 5<sup>th</sup> Ed."
- Florida Department of Transportation, January 1999, Florida Land Use, Cover and Forms Classification System.
- Florida's Endangered and Threatened Species, updated January 2016.
- Florida Fish and Wildlife Conservation Commission, Wildlife Technology Services, January 2015. Eagle Nest Locator.
- Florida Natural Areas Inventory, Species and Communities database.
- Soil Survey of Orange County. 1989. Natural Resources Conservation Service.
- United States Army Corps of Engineers. Section 404 of the Clean Water Act (33 U.S.C. 1344) and 33 CFR Parts 320 through 330.
- United States Fish and Wildlife Service, Orange County Federally-Listed Species. June 2016.
- United States Fish and Wildlife Service. National Wetlands Inventory Map: Windermere, Florida. circa 1988.
- United States Geological Survey - Topographic Quadrangle Map: Windermere, Florida Quadrangle. photorevised 1980.

## **APPENDIX B**

### Wildlife Agency Correspondence



# North Florida Ecological Services Office

Southeast Region

## Federally Listed Species in Orange County, Florida

This information is provided as a guide to project planning, and is not a substitute for site-specific surveys. Such surveys may be needed to assess species' presence or absence, as well as the extent of project effects on listed species and/or designated critical habitat.

The following table lists those federally-listed species known to be present in the county.

Code Key: E = Endangered, T = Threatened, CH = Critical Habitat Designated, C = Candidate <sup>Note 1</sup>

Category	Species Common Name	Species Scientific Name	Code
<b>Mammals</b>	None		
<b>Birds</b>	Audubon's Crested Caracara	<i>Polyborus plancus audubinii</i>	T
	Everglade Snail Kite	<i>Rostrhamus sociabilis plumbeus</i>	E
	Florida Scrub-jay	<i>Aphelocoma coerulescens</i>	T
	Wood Stork	<i>Mycteria americana</i>	E
	Red-cockaded Woodpecker	<i>Picoides borealis</i>	E
<b>Fish</b>	None		
<b>Reptiles</b>	Gopher Tortoise	<a href="#"><i>Gopherus polyphemus</i></a>	C
	Sand Skink	<i>Neoseps reynoldsi</i>	T
	Eastern Indigo Snake	<i>Dymarchon corais couperi</i>	T
<b>Amphibians</b>	Striped Newt	<a href="#"><i>Notophthalmus perstriatus</i></a>	C
<b>Mollusks</b>	None		
<b>Crustaceans</b>	None		
<b>Plants</b>	Britton's Beargrass	<i>Nolina brittoniana</i>	E
	Florida Bonamia	<i>Bonamia grandiflora</i>	T
	Scrub Lupine	<i>Lupinus aridorum</i>	E
	Beautiful Pawpaw	<i>Deeringothamnus pulchellus</i>	E
	Sandlace	<i>Polygonella myriophylla</i>	E
	Papery Whitlow-wort	<i>Paronychia chartacea</i> = <i>Nyachia pulvinata</i>	T
	Scrub Wild Buckwheat	<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>	T

► [Home](#) ► [Species: North Florida County](#) ► [Species: South Florida County](#) ► [Species: Panhandle County](#)

For a list of State species by county use the Florida Natural Areas Inventory's Tracking Lists at <http://www.fnai.org/trackinglist.cfm>

For State listed species details, please go to <http://myfwc.com/imperiledspecies/>

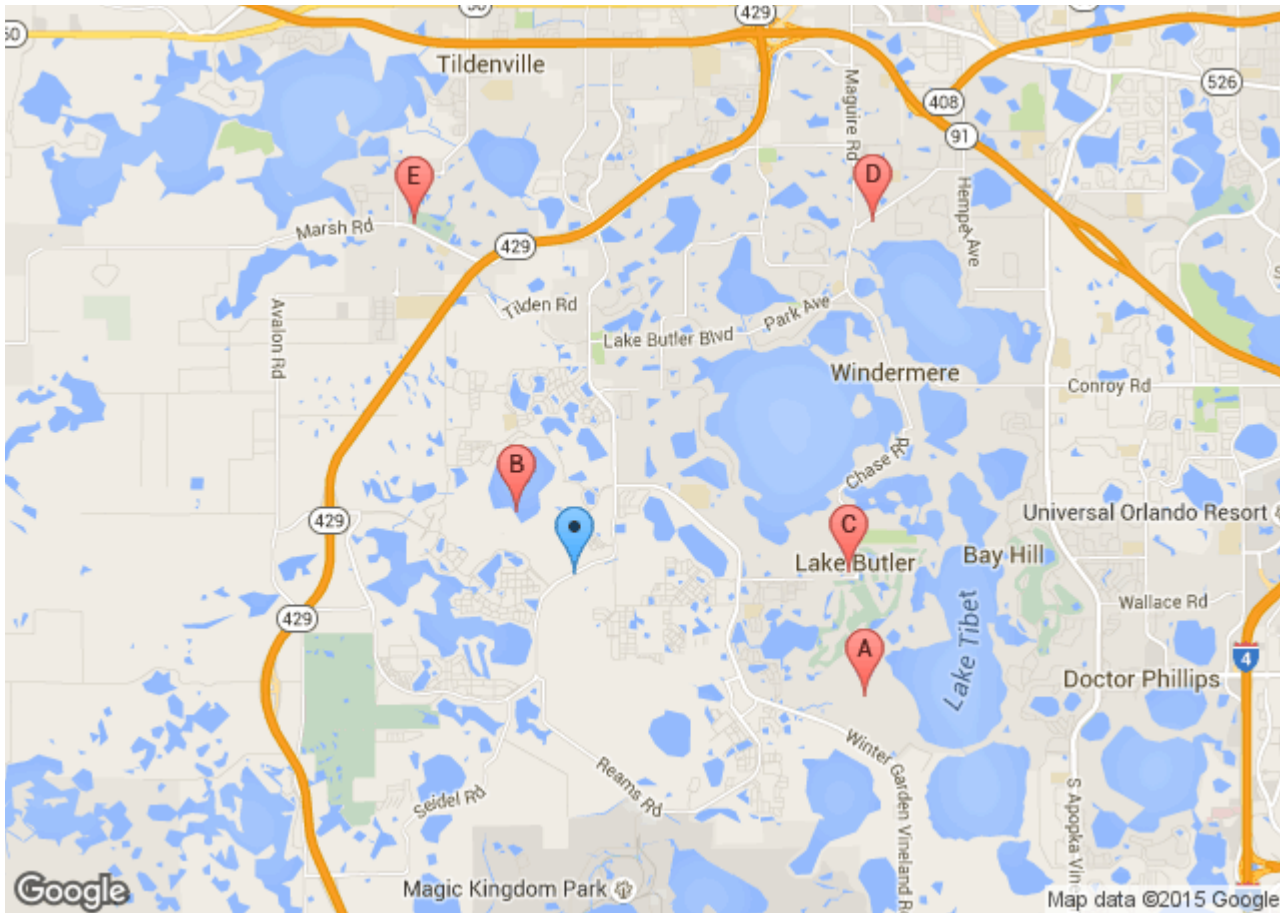
Note 1. [Candidate species](#) receive no statutory protection under the ESA. The FWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA.

**NOTE:** Bald eagles were removed from the endangered species list in June 2007 because their populations recovered sufficiently. However, the protections under the Bald and Golden Eagle Act (Eagle Act) continue to apply. Please see the eagle information on our [Landowner Tools](#) page or our national website at <http://www.fws.gov/migratorybirds/baldeagle.htm> for information regarding new permit requirements under the Eagle Act.

This report was generated using the bald eagle nest locator at <https://public.myfwc.com/FWRI/EagleNests/nestlocator.aspx> on 11/6/2015 1:47:56 PM.

**Search Entered:** Within 5 miles of latitude 28.46534917 and longitude -81.58953226; All Search Results  
5 record(s) were found; 5 record(s) are shown

**Bald Eagle Nest Map:**



**Bald Eagle Nest Data Search Results:**

Results per page:

Letter	Nest ID	County	Latitude	Longitude	Township	Range	Section	Gaz Page	Last Known Active	Last Surveyed	Act 10	Act 11	Act 12	Act 13	Act 14	Dist. (Mi)
A	OR006	Orange	28 26.80	81 32.40	23S	28E	32	85	2003	2014	*	*	*	*	-	3.27
B	OR007	Orange	28 28.47	81 35.98	23S	27E	22	85	2014	2014	*	Y	*	*	Y	0.88
C	OR053	Orange	28 27.94	81 32.56	23S	28E	19	85	2014	2014	*	Y	*	*	Y	2.84
D	OR067	Orange	28 31.10	81 32.31	23S	28E	05	79	2014	2014	*	Y	*	*	Y	4.79
E	OR072	Orange	28 31.08	81 37.02	23S	27E	04	79	2010	2014	Y	N	*	*	-	4.00

"Y" denotes an active nest

"N" denotes an inactive nest

"-" denotes an unobserved nest

"U" denotes a nest that was visited but status was undetermined

"\*" denotes a nest that was not surveyed