FINAL PRELIMINARY DRAINAGE REPORT

Florida Department of Transportation

District Four

C.R. 510 Project Development and Environment (PD&E) Study

Limits of Project: C.R. 510/85 Street from C.R. 512 (M.P. 0.0) to 58 Ave (M.P. 5.283)

Indian River County, Florida

Financial Management Number: 405606-2-22-02

ETDM Number: 14233

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

Authorized Signature

Tomas Alfonso Ruiz, PE, CFM, LEED AP
Print/Type Name

Senior Drainage Engineer
Title

12895 SW 132nd St, Suite 100
Address

Miami, FL 33186
Address

NO. 69213
Seal

TOMAS ALFONSO RUIZ
LICENSE
NO. 69213
STATE OF FLORIDA
PROFESSIONAL ENGINEER

EXECUTIVE SUMMARY

This report provides the drainage documentation required to support the Project Development and Environment (PD&E) Study prepared for CR-510 From CR-512 To 58th Avenue. This report identifies possible locations for stormwater treatment ponds. In addition, it also evaluates the Right-of-Way (R/W) needed to accommodate the stormwater management facilities.

The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

This project is located in Indian River County, Florida, in the vicinity of the City of Sebastian. According to the Indian River County Zoning Map (see **Appendix A**), the project is located in the following zoning areas: Agriculture, Commercial District, Multi-Family Residential, and Single-Family Residential. Agriculture zoning around the project area is approximately 50%. Refer to **Figure 1-3** for the location of the project.

The project area was divided into ten (10) main drainage systems (i.e. Basin 1 to 10), as shown in **Figure 4-1**. Basin numbers were assigned in increments of 1, starting with the basin at the project begin location. These systems have a combined total area of 146 Acres.

A review of the previous drainage plans and existing permit information shows that roadside swales, pipes and culverts are the primary source of conveyance. Runoff within the project moves towards the north and ultimately discharges into the Sebastian River, except for runoff in Basin 10 which moves towards the south and is discharged into Sub-Lateral G.

A Pond Siting Team, comprised of representatives from various FDOT departments and consultant, was assembled by the FDOT Project manager per FDOT District Four Pond Siting Procedures. The objective of the Pond Siting Team was to identify potential pond sites and score each site based on a weighted matrix. The Weight of Factor (WOF), for the matrix, was established through consensus by the Pond Siting Team. Values for the WOF ranged from 1 to 10 with higher scores being assigned to factors that the Pond Siting Team deemed to have a greater impact on the overall suitability of a potential pond site. Several ponds sites were identified for each Drainage System and ranked. The selection of a preferred site for each drainage system will occur during final design.

Stormwater management systems proposed by this study meet current water quality standards as set forth in Chapter 62-302 of the Florida Administrative Code. The approach for meeting both water quality and attenuation requirements was to provide for the greater of the two. Since the project is discharging into an Outstanding Florida Waterbody (OFW), an additional 50% of treatment volume specified for Offline Retention and Wet Detention System was provided. Right-of-Way acquisition is needed for Basins 2, 5, 6, 8, and 9 to meet current permitting requirements. The total Right of Way acquisition needed for the recommended alternative was estimated to be 17.40 Acres. Based on hydraulic modeling, the Pre-Post discharge criteria was met for all basins, where the post-development discharge was determined to be less than the pre-development discharge.

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This report provides the drainage documentation required to support the Project Development and Environment (PD&E) Study prepared for CR-510 from CR-512 to 58th Avenue. This report documents the stormwater management systems required to meet stormwater quality and quantity criteria. In addition, possible locations for stormwater ponds and Right-of-Way (R/W) needed to accommodate the proposed stormwater management facilities are identified. Finally, this report documents existing St. John's River Water Management District (SJRWMD) and Sebastian River Improvement District (SRID) Permits, and provides a recommended permitting approach that can be used when this project goes to final design.

1.1 Project Description

The scope of the project includes reconstruction of CR-510 from an existing two-lane roadway facility to one with four lanes. The project was broken down into four (4) distinct segments. Each segment has unique characteristics as well as potential differences in right-of-way, operational, geometric and environmental features. These segments consist of Urban and/or Sub-Urban typical sections. See **Figures 1-1**, **1-2** and **1-3** below for typical sections of each segment. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

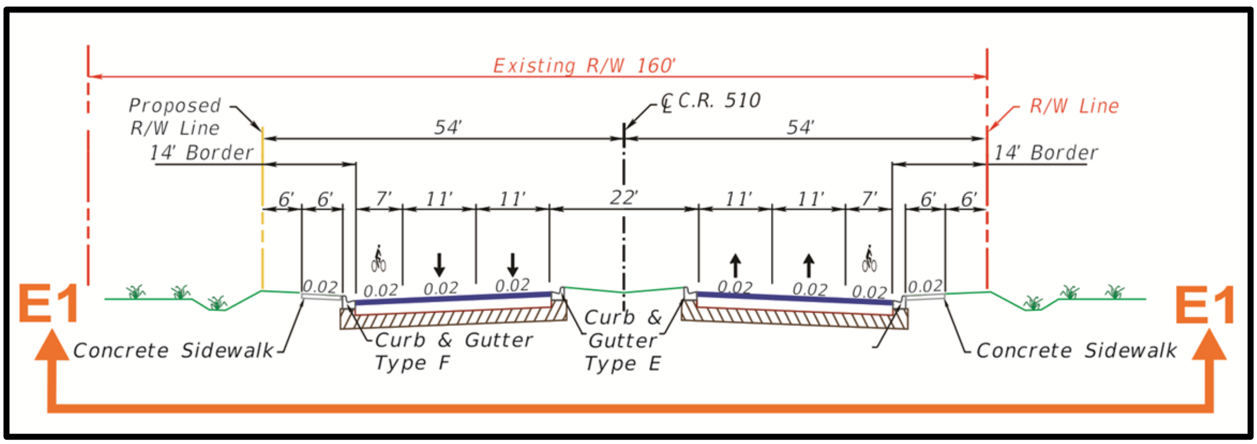


Figure 1-1: Urban typical section; Segments 1 & 2

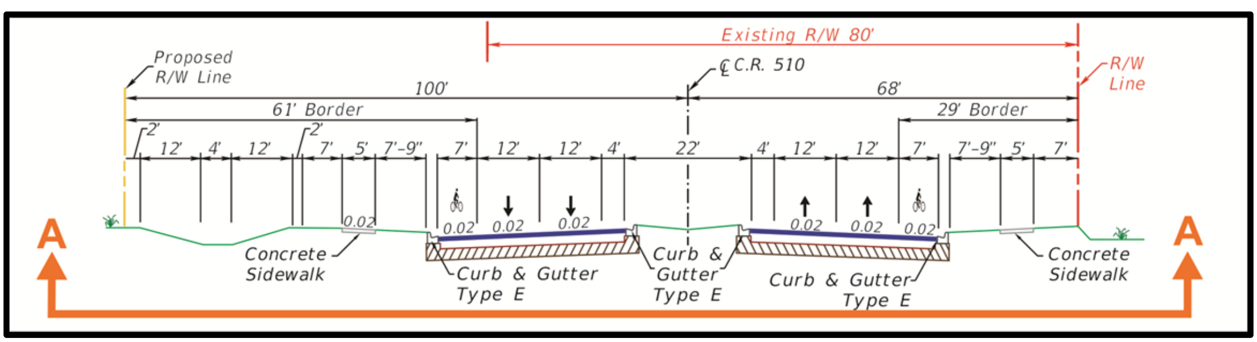


Figure 1-2: Sub-Urban typical section; Segment 3

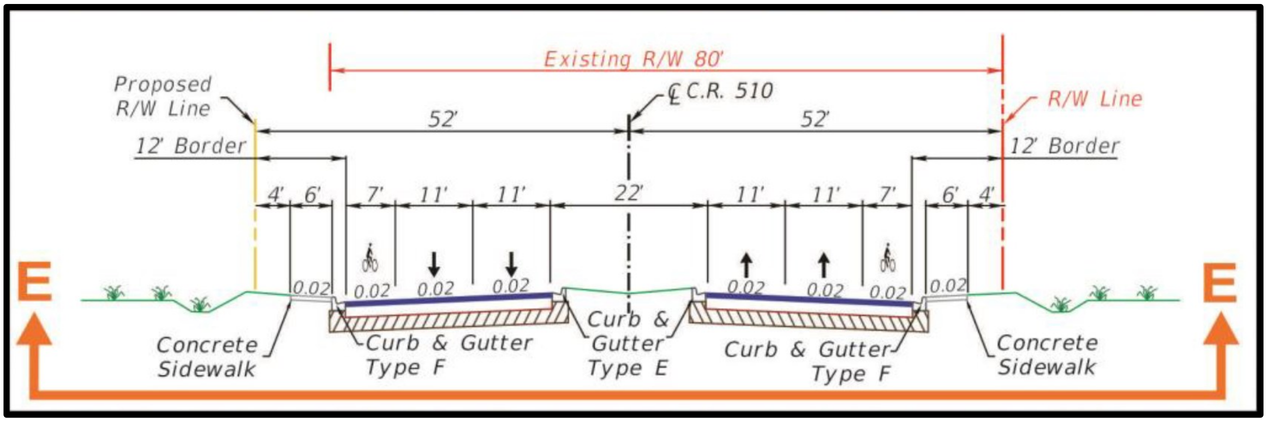


Figure 1-3: Urban typical section; Segment 4

1.2 Project Location

This project is located in Indian River County, Florida, in the vicinity of the City of Sebastian. According to the Indian River County Zoning Map (see **Appendix A**), the project is located in the following zoning areas: Agriculture, Commercial District, Multi-Family Residential, and Single-Family Residential. Agriculture zoning around the project area is approximately 50%. Refer to **Figure 1-4** for the location of the project.

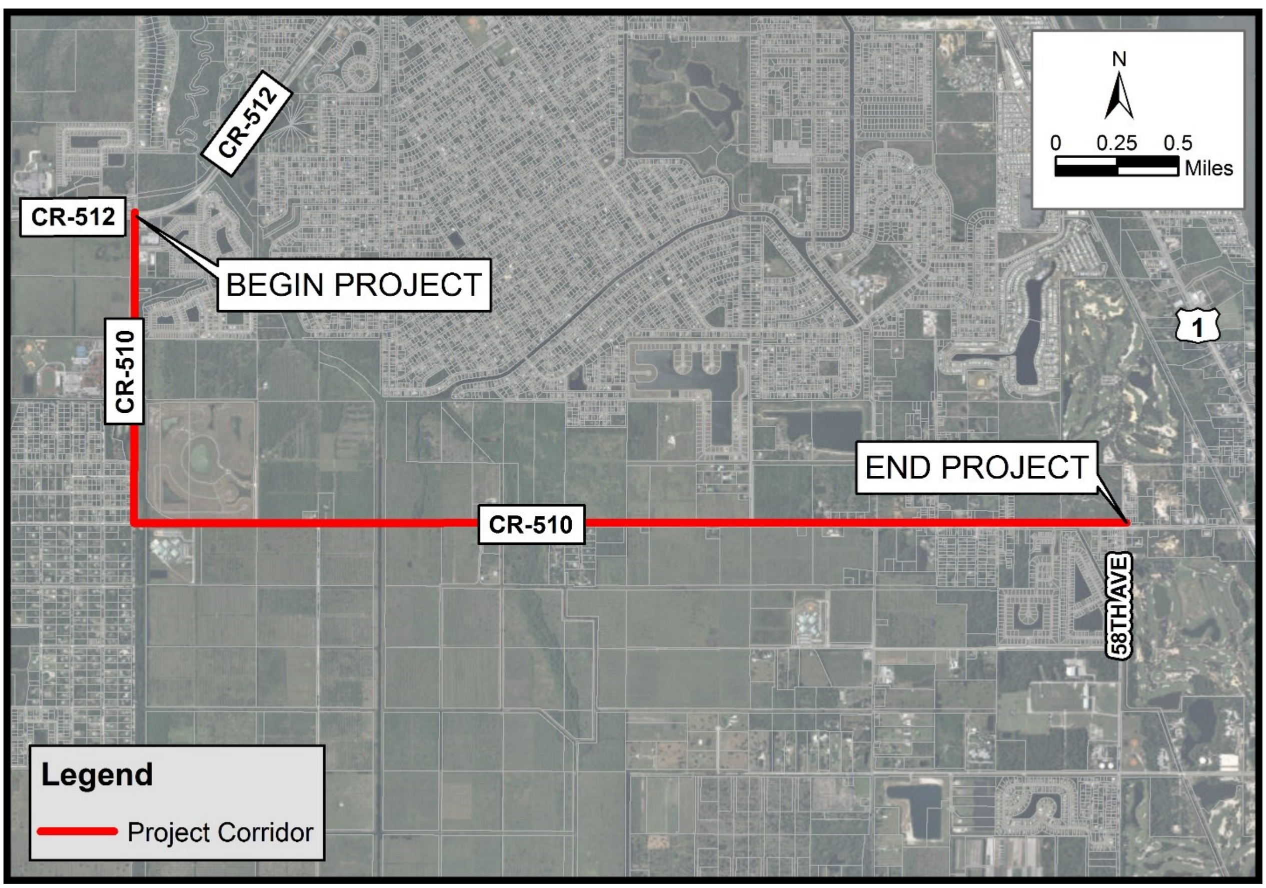


Figure 1-4: Project Area

2 DATA COLLECTION

2.1 Vertical Datum

The vertical datum used in this report and calculations is **NAVD 88**. This datum was chosen due to the fact that most of the existing data collected in the study area is in NAVD 88. In addition, the Florida Department of Transportation (FDOT) standard datum is NAVD 88. For government agencies such as the Army Corps of Engineers (ACOE), Federal Emergency Management Agency (FEMA), and St. John River Water Management District (SJRWMD), NGVD 29 is primarily used. Where practical, elevations are shown in both NAVD 88 and NGVD 29. The vertical datum shift was identified for the approximate centroid location of the study area by using the National Geodetic Survey VERTCON online tool. Coordinates of the centroid are shown below in **Table 2-1**. The datum shift used to convert NAVD 88 to NGVD 29 for this project is (+) 1.46 ft. See **Appendix A** for National Geodetic Survey VERTCON datum shift.

Table 2-1: Datum Conversion from NAVD 88 to NGVD 29

Location	**Latitude**	**Longitude**	**Shift (ft.)**
Centroid of Study Area	27˚ 44’ 55”	80˚ 29’ 19”	(+) 1.463

2.2 Regional Watershed and Receiving Waterbodies

The study area lies within the jurisdictions of St. John’s River Water Management District (SJRWMD). It is specifically within the Sebastian River Improvement District (SRID) and Indian River Farms Water Control District (IRFWCD). Refer to **Figure 2-1** for a map of the Regional watershed in the project area and **Appendix A** for Water Control Districts map.

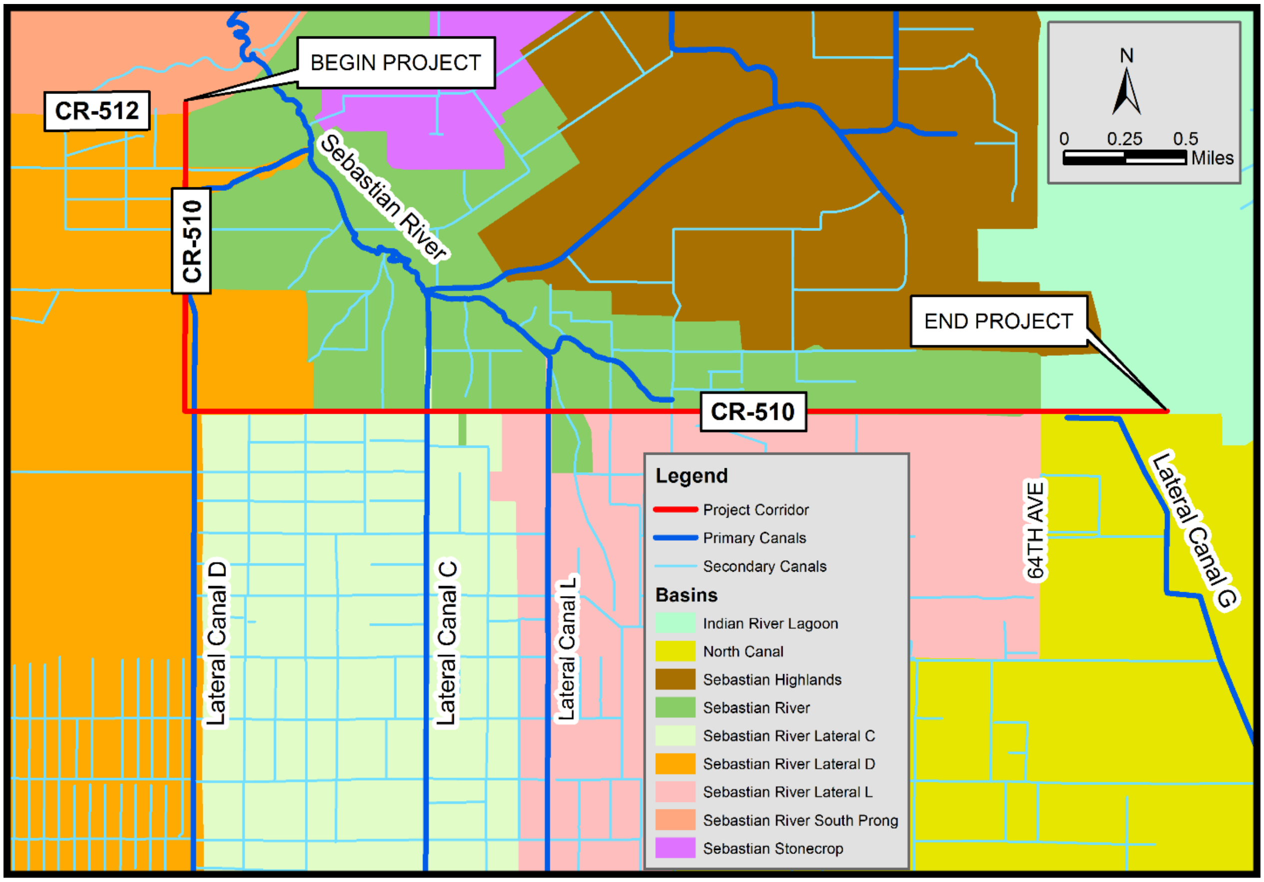


Figure 2-1: Regional watershed

2.3 Seasonal High Groundwater Table

Seasonal High Groundwater Table (SHGWT) data was obtained from an April 2017 Geotechnical Report prepared by GCME, Inc for a CR-510 PD&E Study. A review of the report identified that the Average October Ground Water Level from the beginning of the project to roughly 400 ft. west of Powerline Road is approximately 16.00 ft.-NAVD (17.50 ft.-NGVD), and gradually increases to an estimated seasonal high groundwater table elevation of approximately 19.00 ft.-NAVD (20.50 ft.-NGVD) to the end of the project corridor. GCME, Inc performed Double Ring Infiltration Test (DRIT) at five locations along the project corridor. Results from the DRIT vary from 14.36 to 18.85 ft.- NAVD (15.86 to 20.35 ft.-NGVD). See **Appendix H** for excerpts of the geotechnical report and results from the DRIT.

2.4 Soil Properties

A review of the April 2017 Geotechnical Report indicates that percolation rates along the project corridor are fairly poor with values ranging from 6.14 E-06 to 9.69 E-05 cfs/ft^2. Exfiltration trenches will not be proposed for this project. However, the hydraulic conductivity values are reported for future reference, if needed.

In addition to percolation testing, results from previous soil and water samples were obtained to identify the soil corrosion properties (i.e. resistivity, pH level, sulfate content and chloride content) in the project area. **Table 2-2** shows that drainage culverts will be subject to a slightly to moderately aggressive environment based on the environment criteria for substructure environmental classifications set forth in **Section 1.3.2** of the Structures Design Guidelines. See **Appendix H** for Geotechnical Report excerpts.

Based on a desktop review of the U.S. Department of Agriculture (USDA) soil map for Indian River County, nine (9) general mapping units underlie the existing and potential pond sites in the study area. Refer to **Table 2-3** and **Appendix A** for soil types.

Table 2-2: Corrosion Properties

Boring No.	pH	Resistivity (Ω – cm)	Chlorides (ppm)	Sulfates (ppm)	Steel Classification	Concrete Classification
AB-E3	5.6	5,990	105.0	106.0	Extremely	Slightly
AB-N49	7.0	3,590	90.0	140.0	Moderately	Slightly
AB-N79	7.1 5	5,490	105.0	114.0	Slightly	Slightly
AB-N85	7.4	3,890	75.0	125.0	Moderately	Slightly
AB-S96	7.6	-	105.0	106.0	Moderately	Slightly
AB-S118	6.9	10,000	120.0	130.0	Moderately	Slightly
B-102	7.6 5	5,190	90.0	132.0	Slightly	Slightly
B-201	7.0 6	6,490	75.0	137.0	Slightly	Slightly
B-302	7.3 9	9,690	90.0	127.0	Slightly	Slightly
TB-1	9.0 8	8,100	10.0	16.0	Slightly	Slightly
B-3	6.3 1	1,070	130.0	106.0	Moderately	Moderately
BC-2	9.1 19	19,000	8.9	1.5	Slightly	Slightly
BC-3	4.2	890	11.0	700.0	Extremely	Extremely

NOTE: Boring map located in **Appendix H**.

Table 2-3: Soil Types		
Map Unit Symbol	**Map Unit Name**	**Description**
3	EauGallie fine sand	Hydrologic Soil Group A/D poorly drained
5	Myakka- Myakka, wet, fine sands, 0 to 2 percent slopes	Hydrologic Soil Group A/D poorly drained
6	Oldsmar fine sand	Hydrologic Soil Group A/D poorly drained
10	Riviera Fine sand, 0 to 2 percent slopes	Hydrologic Soil Group A/D poorly drained
12	Archbold sand, 0 to 5 percent slopes	Hydrologic Soil Group A moderately well drained
13	Wabasso fine sand	Hydrologic Soil Group C/D poorly drained
14	Winder fine sand, 0 to 2 percent slopes	Hydrologic Soil Group C/D poorly drained
16	Pineda fine sand	Hydrologic Soil Group C/D poorly drained
51	Riviera fine sand, depressional, 0 to 1 percent slopes	Hydrologic Soil Group A/D very poorly drained

2.5 Wellfield

The project area is not located in the cone of influence of any wellfields. The nearest Indian River County Wellfield (N29) is approximately 1 mile away. See **Appendix A** for the Indian River County Wellfield Map.

2.6 Known Contamination Sites

The Contamination Screening Evaluation Report (CSER) that was prepared for this PD&E study identified 9 potential contamination sites within or in close proximity to the project area. Based on the findings in the CSER, 6 sites where identified as low risk, 2 sites were identified as medium risk and 1 site was identified as high risk. See **Figure 2-2** below. **Table 2-4** identifies the site number, name of business, the contaminant present and a brief description of groundwater impacts in relation to the project.

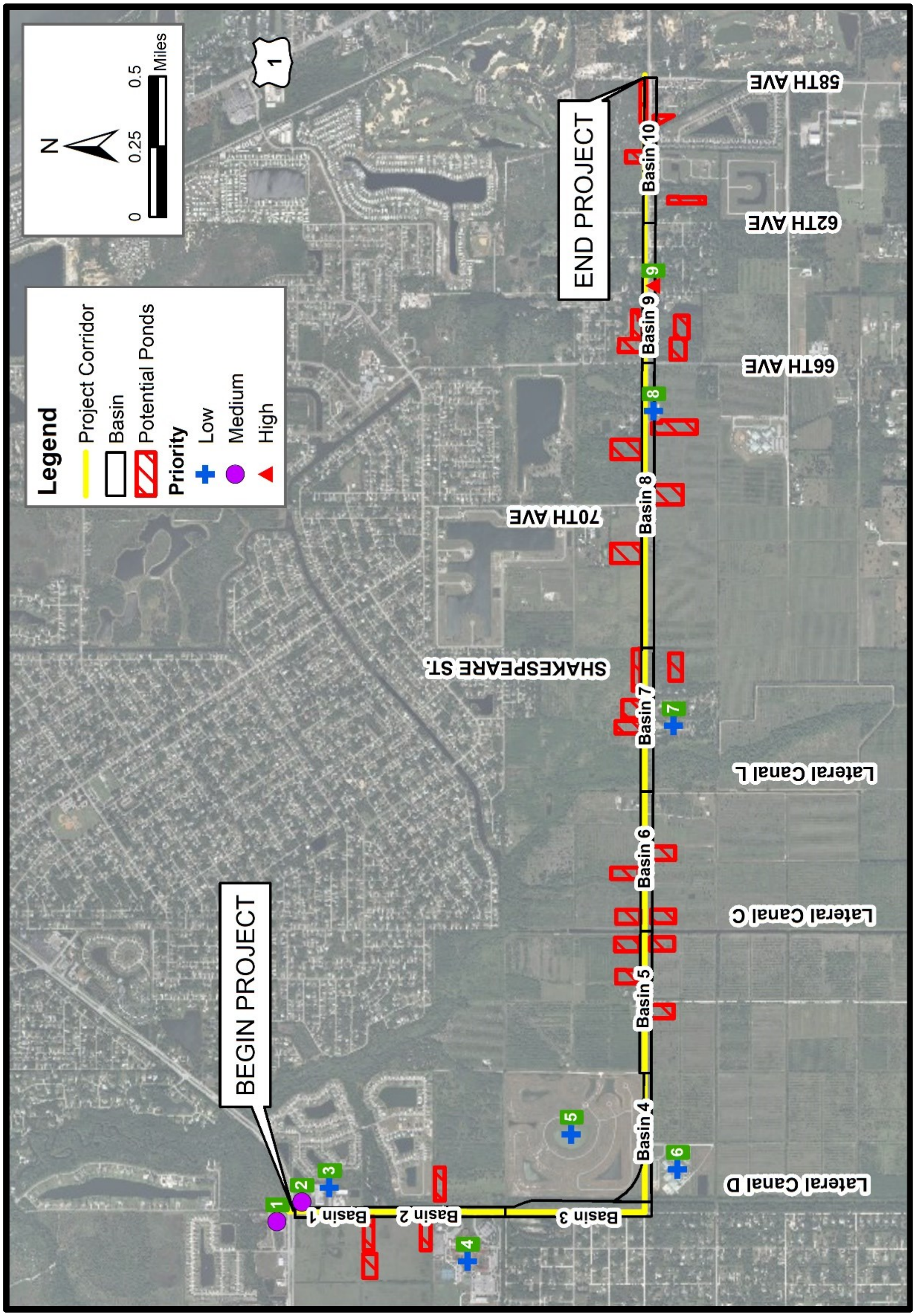


Figure 2-2: Known Contamination Sites

Table 2-4: Contamination Sites

Site #	Name of Business	Basin	Contaminant(s)	Risk	Description
1	Sunoco #0613-2641	1	Petroleum products	Medium	This site has been cleaned after the latest recorded Petroleum spill. Migration of the contaminant to the existing pond is not anticipated.
2	Shark Mart Mobil	1	Petroleum products	Medium	Contaminated soil was removed and did not report any petroleum constituents in excess of FDEP's standards. Migration of the contaminant to the proposed pond locations is not anticipated.
3	Publix Super Market #1035	1	Fuel	Low	There are no groundwater impacts currently at this site.
4	Sebastian River High School	2	Biomedical Waste	Low	There are no groundwater impacts currently at this site.
5	Yukon Land Corporation	4	Contaminant(s) in Above Ground Storage Tanks	Low	There is no documentation or evidence of contamination.
6	Treasure Coast Elementary	4	Biomedical Waste	Low	There are no groundwater impacts currently at this site.
7	Stough's Grove Service	7	Gasoline	Low	Storage tank was removed. Groundwater and soil that was tested did not report contaminants in excess of FDEP's standards. Migration of the contaminant to the proposed pond locations is not anticipated.
8	Ryall Groves Inc.	8	Contaminant(s) in Above Ground Storage Tanks	Low	There is no documentation or evidence of contamination.
9	Bethel Service Station	9	Petroleum products	High	Soil excavation was conducted onsite. Plume has been reported to extend as far as 64th Ave but not into the west adjoined property. Since this site is currently listed as an active petroleum cleanup site, migration of the contaminant to the proposed pond locations is not anticipated.

3 DESIGN STANDARDS

3.1 Standards

The drainage design and construction criteria for the proposed improvements will adhere to FDOT Standards and will comply with the best management practices set forth in **Table 3-1**.

Table 3-1: Design Criteria

Design Element	Criteria	Source
Design Frequency		
Storm Drains	- 10-Year design frequency standard (1, 8, 24-hour) - Check 100-Year storm (1, 8, 24-hour) - 50-Year design frequency for interstate facility sag vertical curves which have no outlet other than a storm drain system	D.M. Section 3.3
Cross Drains	- 50-Year design frequency	D.M. Section 4.3
Design Tailwater		
All Conditions	- Conditions vary with outfall type	D.M. Section 3.4
Time Of Concentration (TOC)	- Minimum TOC of 10 Minutes - Other TOC calculations to follow NRCS TR-55	D.M. Section 3.5.1
Pipe Slopes		
Minimum	- Min. slope to produce v=2.5 ft./sec flowing full	D.M. Section 3.6.1
Manning's "n" Coefficient		
Pipes	- 0.012 (smooth pipes) 0.024 (corrugated pipe)	D.M. Section 3.6.4
Asphalt (rough texture)	- 0.016 Asphalt Pavement	D.D.G. Appendix B-2
Grades		
Longitudinal Gutter Grade	- minimum longitudinal gutter grade is 0.3%	D.M. Section 3.8.1
Spread Standards		
Design Speed ≤ 45	- Keep ½ lane clear	D.M. Section 3.9.1
45 < Design Speed ≤ 55	- Keep 8-ft. of lane clear	
Design Speed > 55	- No encroachment	
Pipe Size And Length		
Trunk Line	- 18-in Minimum Diameter.	D.M. Section 3.10.1
Length Between Structure	- 18-in Pipe=300-ft. - 24-in–36-in=400-ft. - >42-in=500-ft.	
Exfiltration Trench		
Pipe Diameter	- 24-in minimum	D.M. Section 3.10.1

Table 3-1: Design Criteria		
Design Element	**Criteria**	**Source**
Pipe Lengths	- Access through both ends: 300-ft. 24-in to 30-in pipes; 400-ft. for 36-in and larger pipes. - Access through only one end: 150-ft. 24-in to 30-in pipes; 200-ft. 36-in and larger pipes	D.M. Section 3.10.1
Skimmers/Baffles	- Required at each entrance to exfiltration trench	
Trench Width	- Minimum 4-ft., maximum 8-ft.	
Trench Depth	- Maximum of 20-ft.	
Freeboard		
Storm Drain	- Hydraulic Gradeline Minimum 1-ft. below theoretical gutter elevation - 1.13-ft. below E.O.P. for Types E & F curb and gutter - 1-ft. below grate elevation for inlets Standard Index, 220-221, 230-235, 217-219.	D.D.G. Section 6.5
Ponds	- Minimum 1-ft. above peak design stage, measured from the inside edge of the maintenance berm.	D.M. Section 2.4.5
Permanent Pool Pond Depth		
Wet Detention	- 5-ft. minimum depth, 8-ft. maximum depth	D.D.G. Section 9.2.1.1
Culvert		
Design	- 18-in minimum size, concrete only	SRID Meeting 1/19/2017
Stormwater Management System		
Water Quality	- Water quality standards, as set forth in Chapter 62-302, Florida Administrative Code.	V - II Section 4.1
Discharge Limitations	- Historic Discharges, Post <= Pre	V - II Section 3.2.1
Bridge Clearances		
Vertical	- 2 ft. minimum clearance between design flood stage and the low member of bridge to allow for debris passage. 6 ft. above Normal High Water for controlled canals	P.P.M. 2.10.1

Abbreviations

- D.M. FDOT Drainage Manual; January 2017
- D.D.G Drainage Design Guide; January 2017
- P.P.M. Plans Preparation Manual Volume 1, January 2017
- V-II SJRWMD Permit Information Manual Volume II; 2013

3.2 Water Quality

3.2.1 SJRWMD

The project is located in the jurisdiction of the St. John's River Water Management District (SJRWMD). FDOT attended a coordinating meeting with SJRWMD on January 10, 2017 to discuss the treatment requirements. Refer to **Appendix C** for the meeting notes. Based on the meeting, all projects located in the jurisdiction of SJRWMD are required to meet state water quality standards set forth in Chapter 62-302, Florida Administrative Code (FAC) for the complete roadway pavement. According to the SJRWMD Permit Information Manual Volume II:

1. Offline Retention Systems discharging to an Outstanding Florida Waterbody (OFW, in this case Indian River Lagoon) must provide for an additional 50% of the treatment volume specified for Offline retention. Offline retention must provide for the greater of, 0.5 in of runoff over the total area or 1.25 inches of runoff from the impervious area. It was assumed that the entire project area is discharging to OFW to be conservative since it is not clear which areas are discharging to OFW. This approach should be revisited during final design to adjust the proposed drainage systems.

2. Wet Detention Systems discharging to OFWs (Indian River Lagoon) must provide for an additional 50% of the treatment volume specified for Wet Detention System. Wet Detention Systems must provide for the greater of, 1 in of runoff over the total area or 2.5 in of runoff from the impervious area.

3.3 Water Quantity

3.3.1 SJRWMD

According to the SJRWMD Environmental Resource Applicant's Handbook Volume II, Section 3.2.1:

1. The post-development peak discharge rate must not exceed the pre-development peak rate of discharge for the mean annual 24-hour storm.

2. The post-development peak rate of discharge must not exceed the pre-development peak rate of discharge for the 25-year frequency, 24-hour duration storm for all the areas in the District.

3. The post-development volume of direct runoff must not exceed the pre-development volume of direct runoff for the 25-year frequency, 96-hour duration storm for systems discharging to landlocked lakes which are adjacent to properties of more than one ownership.

The approach to satisfy all three requirements above is to provide for the storm with the greater pre-post peak discharge rate.

3.3.2 SRID

According to the Sebastian River Improvement District (SRID)

1. Proposed project drainage calculations shall address the 2" per day maximum allowable discharge volume requirement for any 24-hour period during a 25 year – 24 hour event.

3.3.3 IRFWCD

According to the Indian River Farms Water Control District (IRFWCD)

a. Peak Discharge: Post-development peak rate of discharge must not exceed pre-development peak rate of discharge for a 24-hour duration storm with certain storm frequencies.

    1. No discharge requirement: Those systems which discharge directly into certain tidal and coastal areas.

    2. 25-year frequency: Those system located elsewhere in the District except in the Upper St. Johns River Hydrologic Basin and the Oklawaha River Hydrologic Basin.

b. Volume: Post-development volume of direct runoff must not exceed the pre-development volume of direct runoff for a 4-day design storm with storm frequencies as specified under Peak Discharge.

4 PRELIMINARY DRAINAGE ANALYSIS

The preliminary drainage analysis conducted for this study consisted of evaluating the project area to estimate the stormwater treatment and conveyance needs. The term stormwater treatment is used throughout this section to refer to both the water quality and peak attenuation requirements for a particular system. Typically, the greater of the two is provided to insure both requirements are met.

This section provides a summary of the preliminary drainage analysis. It follows the general format of identifying existing conditions and then providing recommended improvements that would be needed to accommodate runoff in the post development condition. The analysis was conducted for the recommended alternative, as described in the Preliminary Engineering Report. In basins that require offsite ponds, multiple potential locations were identified. The pond siting process is described in **Section 5** of this report. Only one of the potential ponds will be needed for each basin.

4.1 Stormwater Management Systems

The project area was divided into ten (10) main drainage systems (i.e. Basin 1 to 10), as shown in **Figure 4-1** below. Basin numbers were assigned in increments of 1, starting from the basin at the project begin location. These basins have a combined total area of 145 Acres. In general, the Drainage Basins are the width of the project corridor (Right of Way) and vary in length from approximately 0.5 to 1.0 mile long. Basin delineation was primarily based on existing drainage divides such as canals, intersections, and other high points.

Existing roadway plans and permit documentation were reviewed to identify the existing water quality treatment that is being provided within the project area. See **Section 9.1**. Based on a Desktop Analysis and Field Review, existing offsite properties are draining into the County's Right-of-Way for basins 1, 2, 3, 5, 6, 7, 8, and 9. To prevent commingling of offsite runoff with onsite runoff, a secondary swale or offsite drainage system is proposed. During an agency meeting on January 23, 2017, FDOT and Indian River County (IRC) both agreed that the secondary swale should be constructed on county property outside of the roadway project. Refer to **Appendix C** for meeting notes.

Two different types of offsite drainage systems are proposed. For basins 1, 2, 5, 6, 7 and a portion of 8, existing homes are not close to the Right of Way line. As such, an Open Swale Offsite Drainage System with a 4 feet bottom width, 1V:4H side slopes, located in a 32 feet wide easement is proposed for these areas. For basins 3, 9 and a portion of 8, there are existing homes near the proposed CR-510 Right of Way. As such, a 48 inch-wide Trunkline Offsite Drainage System, located in a 20 feet easement, is proposed for these areas. See **Figure 4-2** for the location of the proposed offsite drainage. Refer to **Appendix A** for a sketch of both offsite drainage systems.

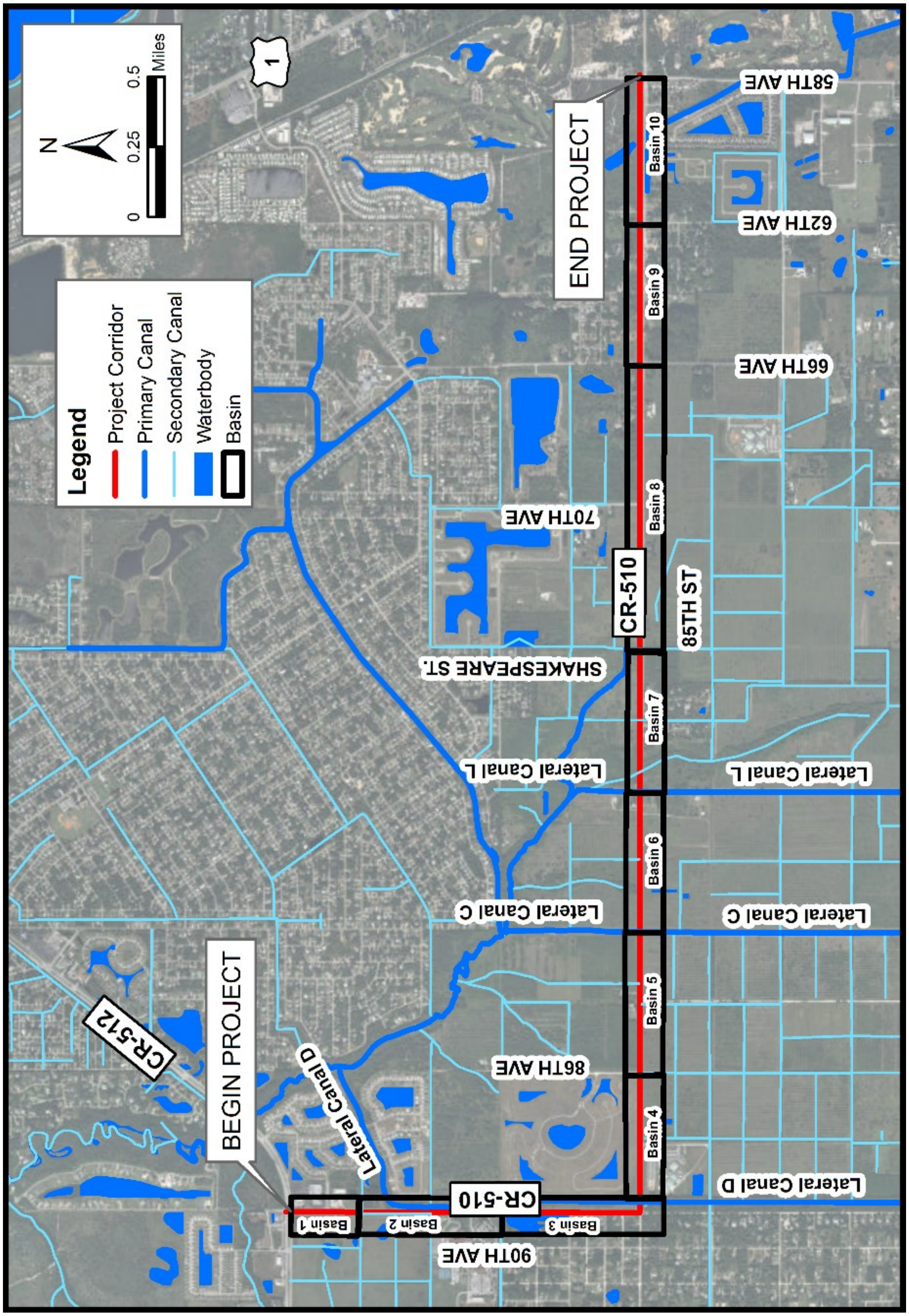


Figure 4-1: Drainage Basins

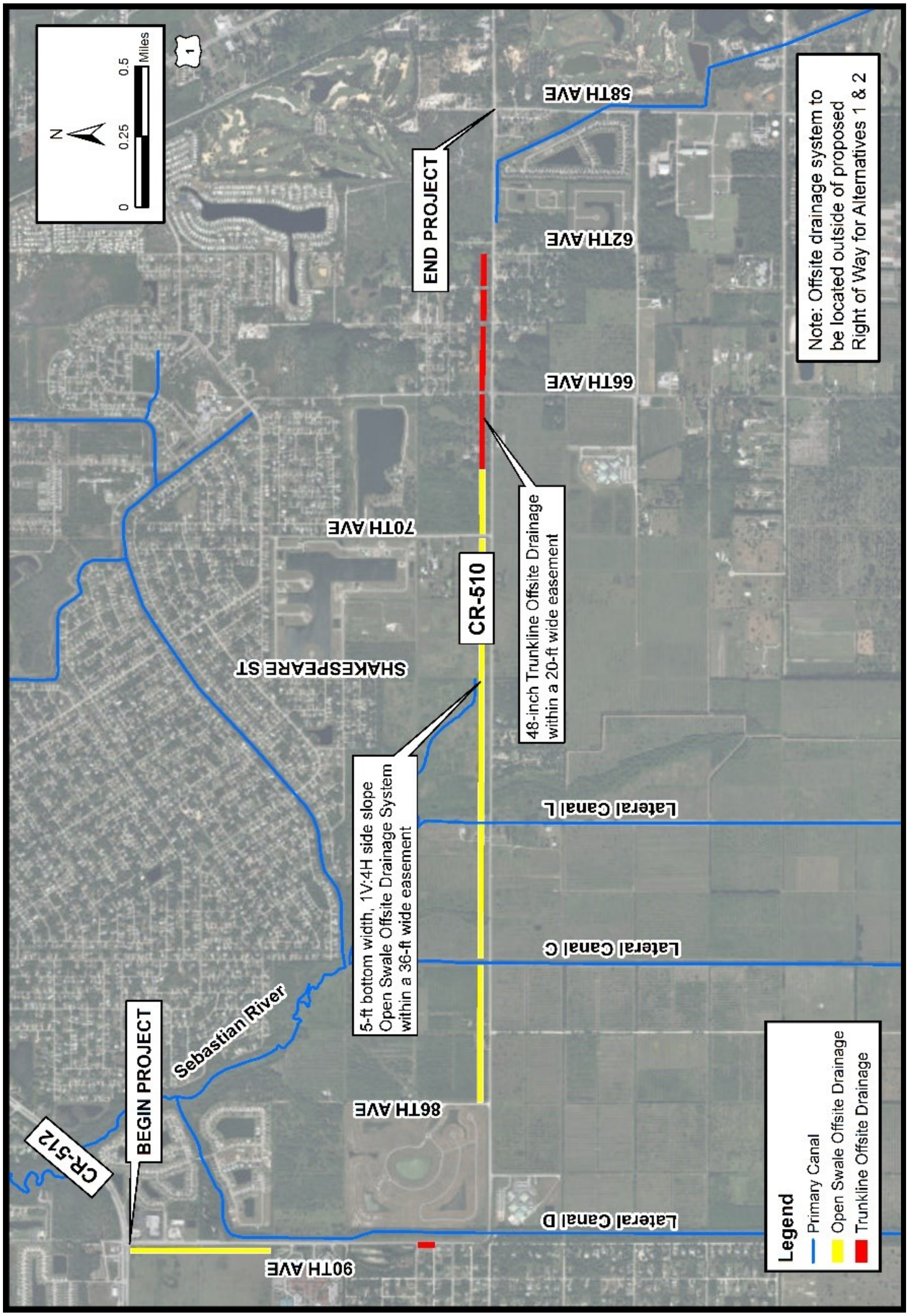


Figure 4-2: Proposed Offsite Drainage System

4.2 Methodology

St. John's River Water Management District (SJRWMD) recommended pond type is dry retention. The procedure outlined below was followed to determine the pond type for each basin.

- Determine representative typical section for each basin. See **Appendix B**.
- Estimate bottom elevation of roadside swale.
- Select pond type for each basin based on depth from swale bottom to SHGWT. If this depth was estimated to be 3-ft. or greater, then dry retention was selected, otherwise wet detention was selected. Dry detention was not considered since it is not desirable to remove pollutants, according to **Section 12.1** of the SJRWMD Permit Manual Volume II.

The five general steps, outlined below, were followed to develop a conceptual stormwater management facility design. See **Appendix B** for preliminary drainage analysis calculations.

1. Determine basin characteristics.
    a. Establish begin and end stations.
    b. Calculate impervious, pervious, and total areas for pre-development and post-development.
    c. Identify Seasonal High Ground Water Table (SHGWT).
2. Calculate water quality treatment to meet SJRWMD Outstanding Florida Waters (OFW) Requirements
    a. Calculate treatment volume needed for dry retention and wet detention systems
    b. Determine additional 50% required for OFW.
    c. Add items 2a and 2b.
3. Calculate peak runoff volume (using NCRS Method).
    a. Determine design rainfalls (25Y-24H, 25Y-96H & mean 24-H).
    b. Calculate pre-development and post-development peak runoff for design rainfalls in 3a.
4. Determine volumetric size of proposed stormwater management facility.

   a. Select the greater of items, 2c and 3b.

   b. Separate item 4a into dry-retention and wet-detention as needed.

5. Estimate area needed for stormwater management system

   a. Determine space available for treatment within Indian River County (IRC) Right of Way.

   b. Use 5a to determine if Right of Way acquisition for pond is needed.

4.3 Basin 1

4.3.1 Existing Condition

Basin 1 covers CR-510 from CR-512 to 600-ft. south of Stone Point Drive. Refer to **Figure 4-3** for a map of the basin. The drainage area is approximately 3.17 Acres in size. The total impervious area is approximately 2.09 Acres. A review of previous drainage plans and existing permit documentation shows that runoff is being conveyed towards the north via roadside swales, pipes and culverts, and outfalls to Pond D. There are two permits that applies to this basin, Permit No.s 56415 and 93656-1.

According to Permit No. 56415, Pond D provides treatment for CR-512 from the intersection of CR-512 and CR-510 to the bridges over the South Prong of the Sebastian River. The permit shows that existing treatment volume required and provided for CR-512 are 1.29 and 4.23 ac-ft., respectively. As such, according to the permit, Pond D has a surplus capacity of 2.94 ac-ft. (Provided treatment of 4.23 ac-ft. – Required Treatment of 1.29 ac-ft.).

Permit No. 93656-1 states that the west swale of CR-510 (from CR-512 to Shark Blvd or Basins 1 and 2) is used to drain offsite properties located west of the project area. Based on a Desktop Analysis and Field Review, approximately 73.50 Acres of offsite properties are draining into the west swale of CR-510. The existing treatment volume provided by the swale within the permitted section of CR-510 (from CR-512 to Shark Blvd or Basins 1 and 2) is 0.17 ac-ft.

4.3.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 1, under the recommended alternative, includes adding 11-ft travel lanes, 7-ft bicycle lanes, a 22-ft median, curb and gutter on both sides and 6-ft sidewalks with a 6-foot grass buffer between the curb and the sidewalks. The proposed roadway will be widened east of CR 510. To prevent commingling of offsite runoff with onsite runoff, the existing swale west of CR-510 will be reserved for an offsite drainage system.

The proposed improvements, under the recommended alternative, will add 0.20 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 2.29 Acres (Existing area of 2.09 Acres + Increased area of 0.20 Acres). Preliminary calculations indicate that 0.77 ac-ft. of treatment will be required to accommodate the onsite runoff for the recommended alternative. See **Table 4-1** for the treatment summary for Basin 1. According to Permit No. 56415, existing Pond D has a surplus capacity of 2.94 ac-ft. (total lake volume of 4.23 ac-ft. – treatment volume of 1.29 ac-ft. provided for CR-512). This surplus capacity is sufficient accommodate the proposed roadway improvements under the recommended alternative. Runoff from Basin 1 will increase the water level of Pond D by approximately 6.00 inches.

Table 4-1: Basin 1 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment[1] Provided (ac- ft.)	Surplus[2] Capacity (ac-ft.)
Recommended Alternative	2.29	0.77	2.94	2.17

[1]Surplus capacity in Pond D before Basin 1 is treated.
[2]Surplus capacity in Pond D after Basin 1 is treated.

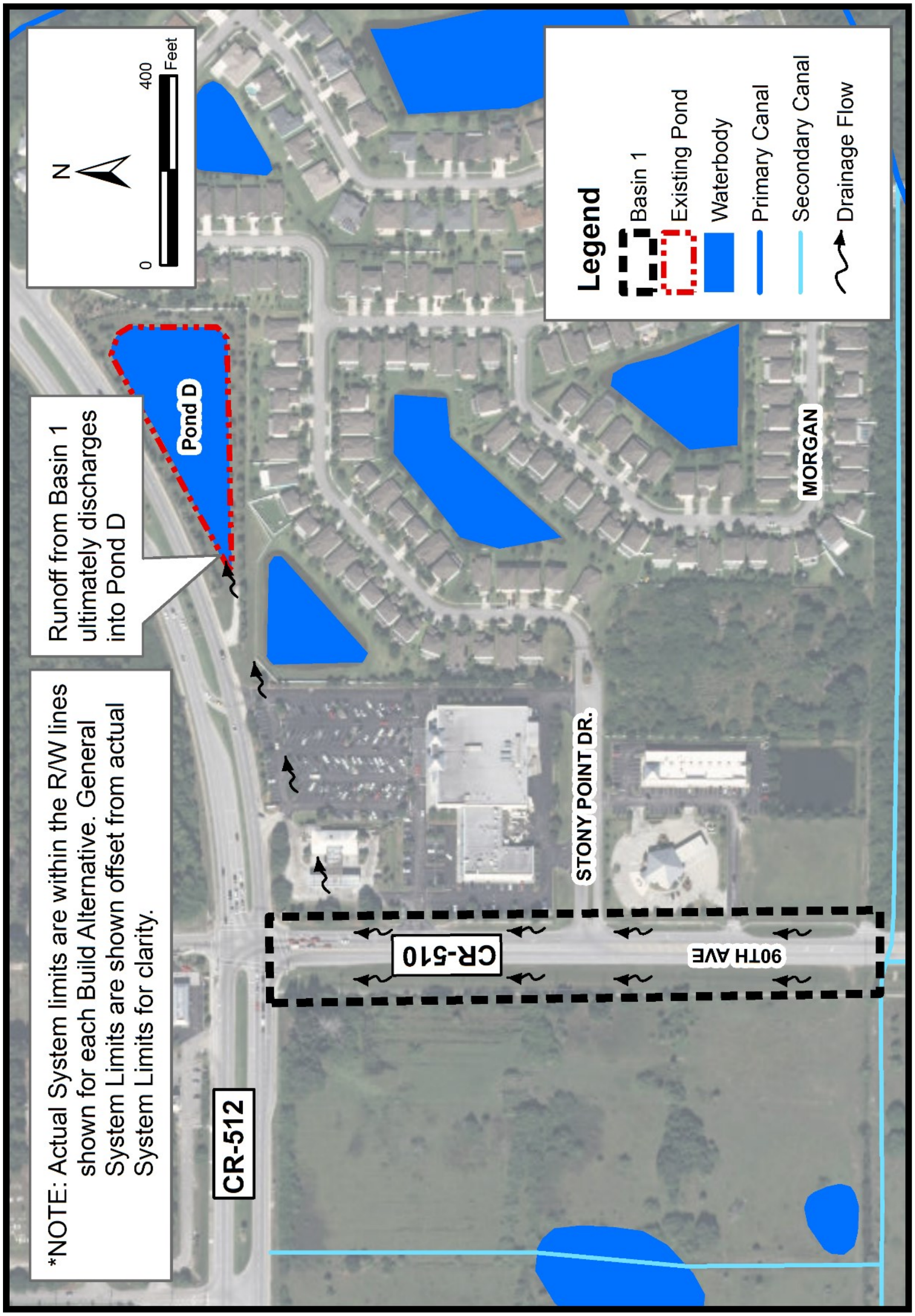


Figure 4-3: Basin 1

4.4 Basin 2

4.4.1 Existing Condition

Basin 2 covers CR-510 from 600-ft. south of Stone Point Drive to 89th Street. Refer to **Figure 4-4** for a map of the basin. The drainage area is approximately 6.58 Acres in size. The total impervious area is approximately 3.41 Acres. A review of previous drainage plans and existing permit documentation shows that runoff from the north and south portion (with respect to 400-ft. north of Mako Way) of the basin is being conveyed by roadside swales, pipes and culverts and ultimately discharges into Lateral Canal D. In addition, runoff from the southwest portion of the basin discharges into Lake A. As mentioned in **Section 4.4.1**, Permit No. 93656-1, states that the west swale of CR-510 (from CR-512 to Shark Blvd or Basins 1 and 2) is used to drain offsite properties located west of the project area. The total area of the offsite properties is approximately 158.4 Acres. The existing treatment volume provided by the swale within the permitted section of CR-510 (from CR-512 to Shark Blvd or Basins 1 and 2) is 0.17 ac-ft.

4.4.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 2, under the recommended alternative, includes adding 11-ft travel lanes, 7-ft bicycle lanes, a 22-ft median, curb and gutter on both sides and 6-ft sidewalks with a 6-foot grass buffer between the curb and the sidewalks. The proposed roadway will be widened east of CR 510. To prevent commingling of offsite runoff with onsite runoff, the existing swale west of CR 510 will be reserved for an offsite drainage system.

The proposed improvements, under the recommended alternative, will add 1.34 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 4.75 Acres (Existing area of 3.41 Acres + Increased area of 1.34 Acres). Preliminary calculations indicate that 1.61 ac-ft. of treatment will be required to accommodate the onsite runoff for the recommended alternative. A wet detention pond is proposed to treat and attenuate 1.65 ac-ft. of runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.04 ac-ft. (Provided Treatment of 1.65 ac-ft. - Required Treatment of 1.61 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-2** for the treatment summary for Basin 2. Approximately 2.60 Acres of Right-Of-Way will be needed to accommodate the required treatment volume of the recommended alternative. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There are no county-owned properties within this basin.

Table 4-2: Basin 2 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	4.75	1.61	1.65	0.04

[1]Surplus capacity in proposed pond after Basin 2 is treated.

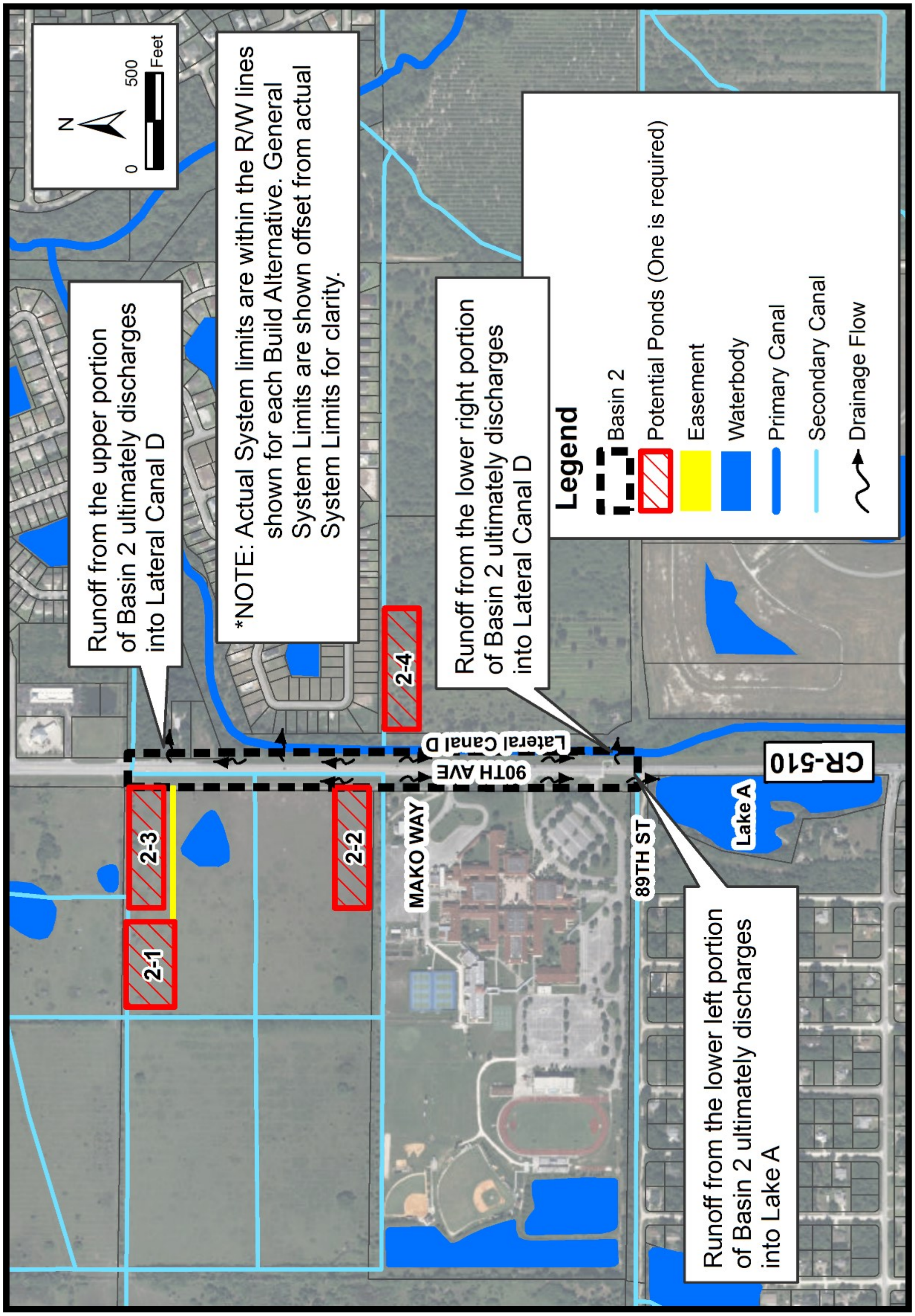


Figure 4-4: Basin 2

4.5 Basin 3

4.5.1 Existing Condition

Basin 3 covers CR-510 from 89th Street to 85th Street. Refer to **Figure 4-5** for a map of the basin. The drainage area is approximately 7.65 Acres in size. The total impervious area is approximately 3.12 Acres. A review of the previous drainage plans and existing permit documentation shows that runoff from the left side of the north portion of this basin (with respect to 86th St) is being conveyed to Lake A via roadside swales and sheet flow. Runoff from all other areas within this basin, is conveyed towards the south and ultimately discharges into Lateral Canal D. According to Permit No. 18847, Lake A provides water quality treatment and attenuation for the Vero Lakes Estate as well as CR-510. Based on a Desktop Analysis and Field Review, approximately 184.2 Acres of offsite properties are draining into the west swale of CR-510 through existing pipes.

4.5.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 3, under the recommended alternative, includes adding 11-ft travel lanes, 7-ft bicycle lanes, a 22-ft median, curb and gutter on both sides and6-ft sidewalks with a 6-ft grass buffer between the curb and the sidewalks. The horizontal curve within this segment will be reconstructed to improve safety conditions. The access provided for the Vero Lake Estate to CR-510 has been limited to 87th Street. Also, access to CR-510 from 86th Street and 86th Place has been eliminated.

In the event that the existing swale near the proposed horizontal curve is to be removed, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. This is to ensure existing drainage patterns are maintained and to prevent commingling of offsite runoff with onsite runoff. Homes adjacent to the basin are located in close proximity to the proposed CR-510 Right-of-Way. As such, a 48 inch-wide Trunkline Offsite Drainage System, located in a 20 feet easement, is proposed for these areas.

The proposed improvements, under the recommended alternative, will add 2.41 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 5.53 Acres (Existing area of 3.12 Acres + Increased area of 2.41 Acres). Preliminary calculations indicate that 1.73 ac-ft. of treatment will be required to accommodate the onsite runoff for the recommended alternative. The approach to meet water quality requirements in the basin is to raise the control structure of Lake A by 4 inches. This will provide 1.80 ac-ft. of treatment which is sufficient to accommodate the proposed roadway improvements. As such, no Right-Of-Way acquisition is needed. See **Table 4-3** for the treatment summary for Basin 3.

Table 4-3: Basin 3 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment[1] Provided (ac- ft.)	Surplus[2] Capacity (ac-ft.)
Recommended Alternative	5.53	1.73	1.80	0.07

[1]Treatment to be provided in Lake A after the control structure is raised.

[2]Surplus capacity in Lake A, with respect to the treatment provided, after the Basin 3 is treated.

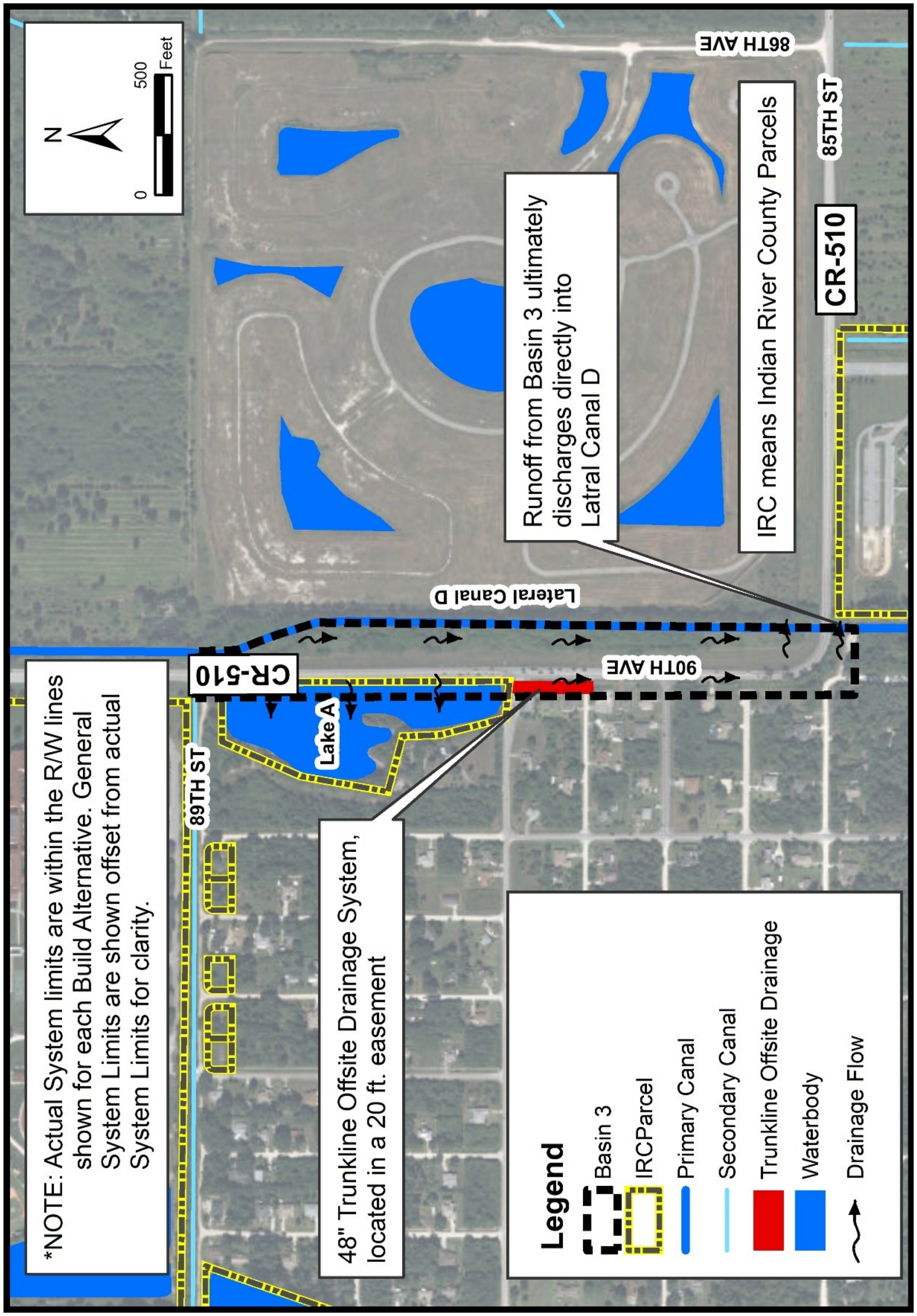


Figure 4-5: Basin 3

4.6 Basin 4

4.6.1 Existing Condition

Basin 4 covers CR-510 from Lateral Canal D to 86th Ave. Refer to **Figure 4-6** for a map of the basin. The drainage area is approximately 6.69 Acres in size. The total impervious area is approximately 2.73 Acres. A review of the previous drainage plans and permit documentation shows that runoff from this basin is being conveyed toward the west by roadside swales, pipes and culverts and ultimately discharges into Lateral Canal D. Currently, there are existing connections to two wet detention ponds of Bluewater Bay PUD for treatment before discharging into the South Prong of the Sebastian River. According to Permit No. 95794, the Bluewater Bay development provides 4" of discharge per 24 hours for CR-510.

4.6.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 4, under the recommended alternative, includes adding 11-ft travel lanes, 7-ft bicycle lanes, a 22-ft median, curb and gutter on both sides and 6-ft sidewalks with a 6-ft grass buffer between the curb and the sidewalks. The horizontal curve within this segment will be reconstructed to improve safety conditions.

The proposed improvements, under the recommended alternative, will add 2.11 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 4.83 Acres (Existing area of 2.73 Acres + Increased area of 2.11 Acres). Preliminary calculations indicate that 1.51 ac-ft. of treatment will be required to accommodate the onsite runoff. See **Table 4-4** for the treatment summary for Basin 4. According to Permit No. 95794, Lake 5 and Lake 6 of the Bluewater Bay PUD are providing 3.18 ac-ft. of treatment volume for CR-510. This is sufficient to accommodate the proposed roadway improvements under the recommended alternative.

Table 4-4: Basin 4 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment[1] Provided (ac- ft.)	Surplus[2] Capacity (ac-ft.)
Recommended Alternative	4.83	1.70	3.18	1.48

[1]Existing treatment provided for CR 510 by Lake 5 and 6 before Basin 4 is treated.
[2]Surplus capacity = total provided treatment by Lake 5 and 6 - required treatment.

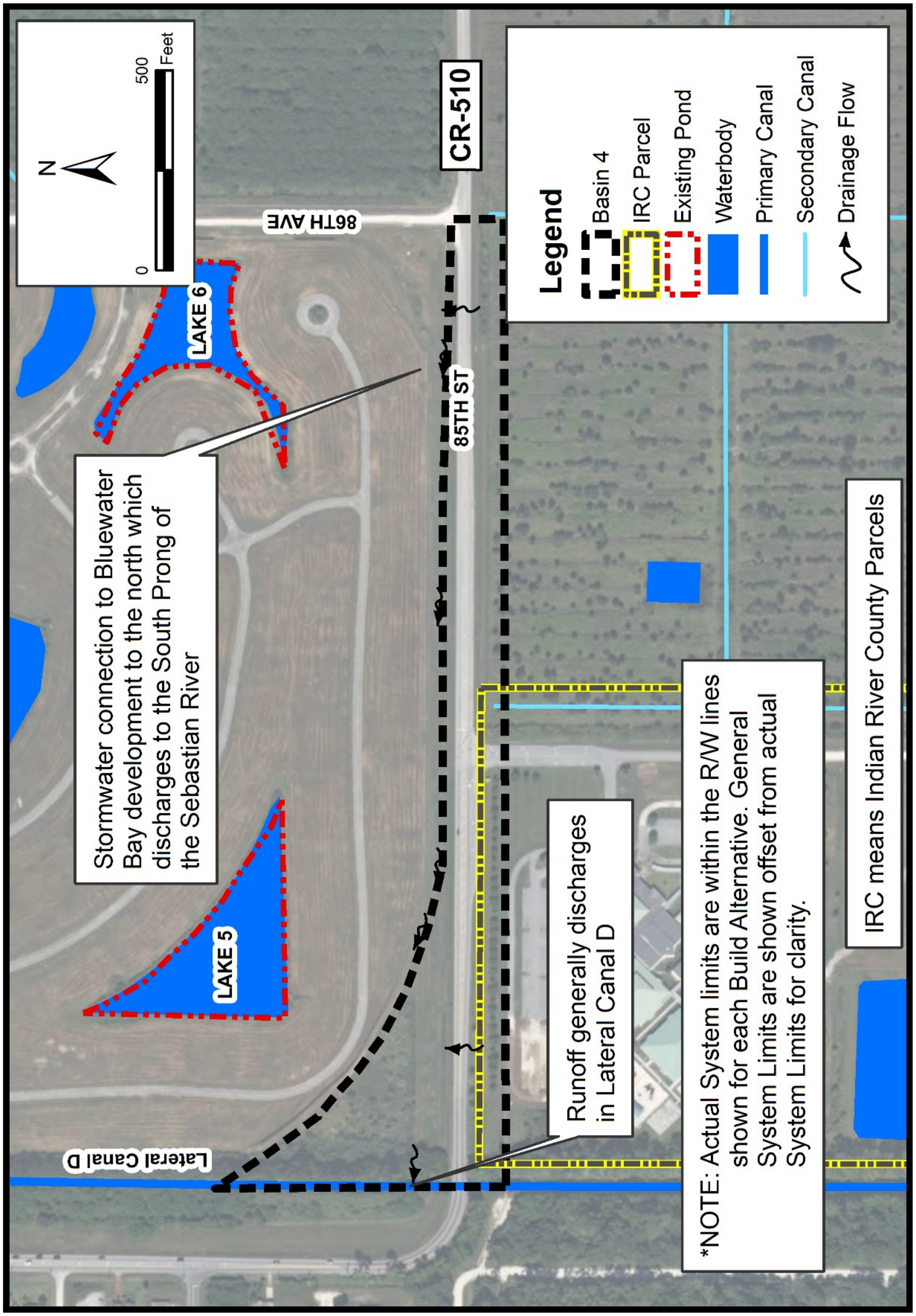


Figure 4-6: Basin 4

4.7 Basin 5

4.7.1 Existing Condition

Basin 5 covers CR-510 from 86th Ave to Lateral Canal C. Refer to **Figure 4-7** for a map of the basin. The drainage area is approximately 10.14 Acres in size. The total impervious area is approximately 1.93 Acres. A review of the previous drainage plans shows that runoff from this basin is being conveyed toward the east by roadside swales, pipes and culverts and discharges directly into Lateral Canal C. Based on a Desktop Analysis and Field Review, approximately 54.30 Acres of offsite properties are draining into the CR-510's Right-of-Way.

4.7.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 5, under the recommended alternative, includes adding 12-ft travel lanes, 7-ft bicycle lanes, 4-ft inside shoulders, curb and gutter on both sides and 5-ft sidewalks with a wide buffer between the roadway and the sidewalks. To prevent commingling of offsite runoff with onsite runoff and to ensure existing drainage patterns are maintained, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. Homes adjacent to the basin are not located in close proximity to the proposed CR-510 Right-of-Way. As such, an Open Swale Offsite Drainage System with a 4 feet bottom width, 1V:4H side slopes, located in a 32 feet wide easement is proposed for these areas.

The proposed improvements, under the recommended alternative, will add 3.38 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 5.31 Acres (Existing area of 1.93 Acres + Increased area of 3.38 Acres). Preliminary calculations indicate that 1.66 ac-ft. of treatment will be required to accommodate the onsite runoff for the recommended alternative. A wet detention pond is proposed to treat and attenuate 1.70 ac-ft. runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.04 ac-ft. (Provided Treatment of 1.70 ac-ft. - Required Treatment of 1.66 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-5** for the treatment summary for Basin 5. Approximately 2.70 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There are no county-owned properties within this basin.

Table 4-5: Basin 5 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	5.31	1.66	1.70	0.04

[1]Surplus capacity in proposed pond after Basin 5 is treated.

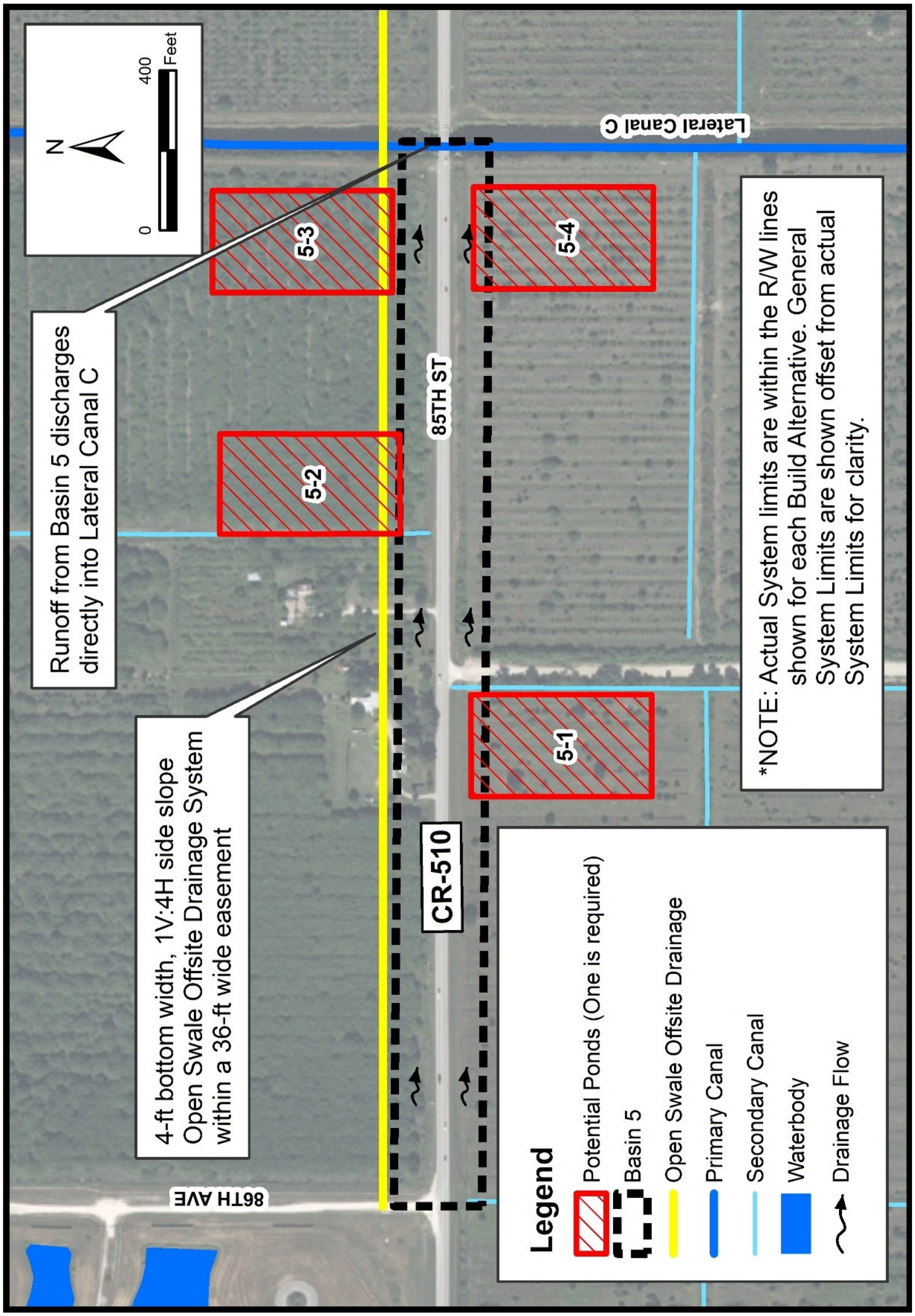


Figure 4-7: Basin 5

4.8 Basin 6

4.8.1 Existing Condition

Basin 6 covers CR-510 from Lateral Canal C to Lateral Canal L. Refer to **Figure 4-8** for a map of the basin. The drainage area is approximately 10.03 Acres in size. The total impervious area is approximately 1.91 Acres. A review of the previous drainage plans shows that runoff from this basin is being conveyed toward the west and east by roadside swales, pipes and culverts. Runoff from the west portion of the basin (with respect to 900-ft. west of 79th Ter) discharges directly into Lateral Canal C and runoff from the east portion of the basin discharges directly into Lateral Canal L. Based on a Desktop Analysis and Field Review, approximately 53.70 Acres of offsite properties are draining into CR-510's Right-of-Way.

4.8.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 6, under the recommended alternative, includes adding 12-ft travel lanes, 7-ft bicycle lanes, 4-ft inside shoulders, curb and gutter on both sides and 5-ft sidewalks with a wide buffer between the roadway and the sidewalks. To prevent commingling of offsite runoff with onsite runoff and to ensure existing drainage patterns are maintained, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. Homes adjacent to the basin are not located in close proximity to the proposed CR-510 Right-of-Way. As such, an Open Swale Offsite Drainage System with a 4 feet bottom width, 1V:4H side slopes, located in a 32 feet wide easement is proposed for these areas.

The proposed improvements, under the recommended alternative, will add 3.34 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 5.25 Acres (Existing area of 1.91 Acres + Increased area of 3.34 Acres). Preliminary calculations indicate that 1.64 ac-ft. of treatment will be required to accommodate the onsite runoff. A wet detention pond is proposed to treat and attenuate 1.70 ac-ft. of runoff for onsite post-development conditions for the recommended alternative. The surplus capacity of the pond after this basin is treated is 0.06 ac-ft. (Provided Treatment of 1.70 ac-ft. - Required Treatment of 1.64 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-6** for the treatment summary for Basin 6. Approximately 2.70 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There are no county-owned properties within this basin.

Table 4-6: Basin 6 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	5.25	1.64	1.70	0.06

[1]Surplus capacity in proposed pond after Basin 6 is treated.

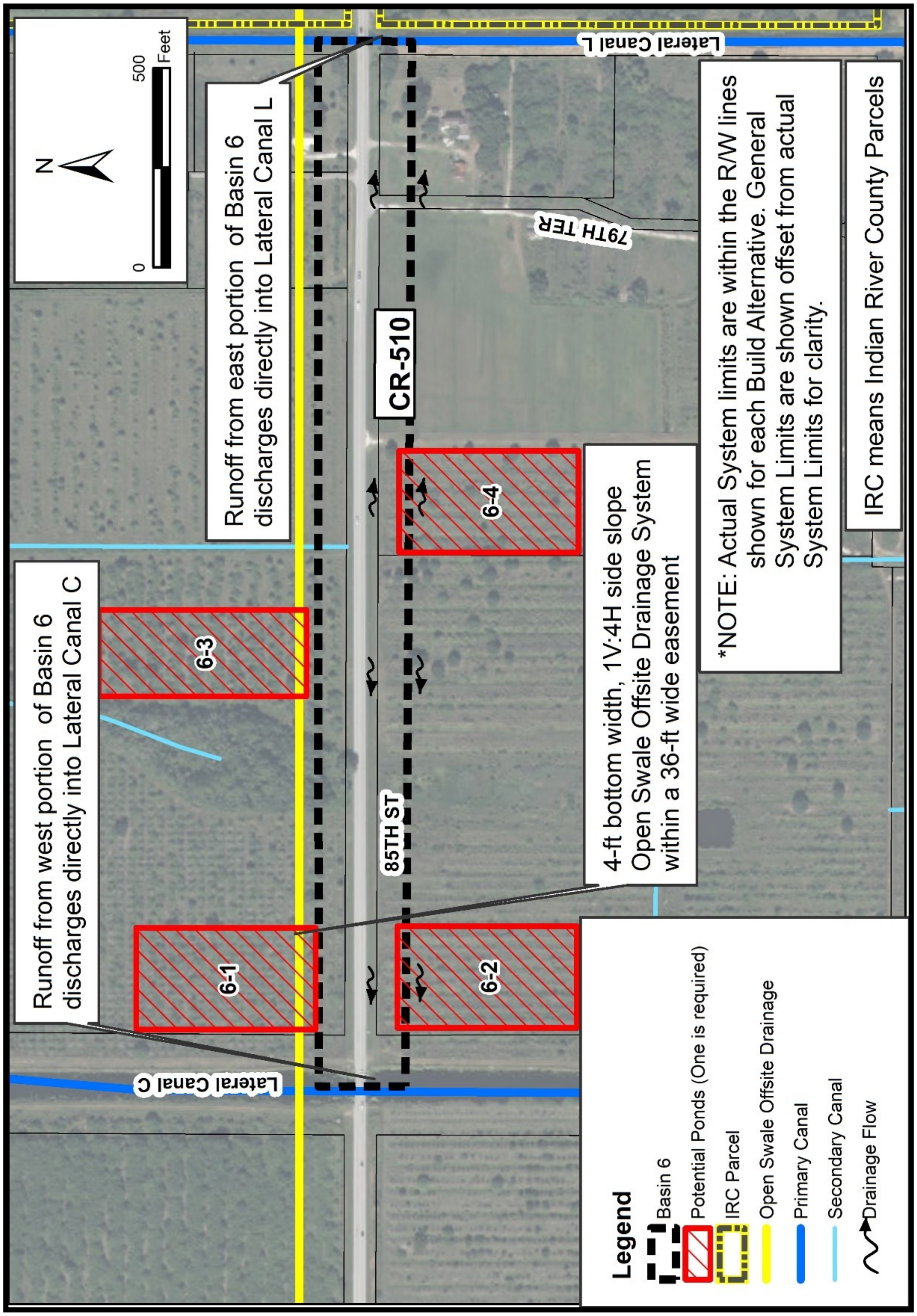


Figure 4-8: Basin 6

4.9 Basin 7

4.9.1 Existing Condition

Basin 7 covers CR-510 from Lateral Canal L to approximately 2,500-ft. west of 70th Ave. Refer to **Figure 4-9** for a map of the basin. The drainage area is approximately 10.22 Acres in size. The total impervious area is approximately 1.95 Acres. A review of the previous drainage plans shows that runoff from this basin is being conveyed toward the west by roadside swales, pipes and culverts and discharges directly into Lateral Canal L. A 72" CMP cross drain is located less than 500-ft. to the east of lateral Canal L. Based on a Desktop Analysis and Field Review, approximately 54.80 Acres of offsite properties are draining into the CR-510's Right-of-Way.

4.9.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 7, under the recommended alternative, includes adding 12-ft travel lanes, 7-ft bicycle lanes, 4-ft inside shoulders, curb and gutter on both sides and 5-ft sidewalks with a wide buffer between the roadway and the sidewalks. To prevent commingling of offsite runoff with onsite runoff and to ensure existing drainage patterns are maintained, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. Homes adjacent to the basin are not located in close proximity to the proposed CR-510 Right-of-Way. As such, an Open Swale Offsite Drainage System with a 4 feet bottom width, 1V:4H side slopes, located in a 32 feet wide easement is proposed for these areas.

The proposed improvements, under the recommended alternative, will add 3.40 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 5.35 Acres (Existing area of 1.95 Acres + Increased area of 3.40 Acres). Preliminary calculations indicate that 1.67 ac-ft. of treatment will be required to accommodate the onsite runoff for the recommended alternative. A wet detention pond is proposed to treat and attenuate 1.70 ac-ft. of runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.03 ac-ft. (Provided Treatment of 1.70 ac-ft. - Required Treatment of 1.67 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-7** for the treatment summary for Basin 7Approximately 2.70 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There is a 4.85 Acres parcel owned by Indian River County (IRC) which is located south of CR-510, between 75th Court and approximately 2,680 ft. to the west of Powerline Road. As such, a portion of the vacant parcel owned by IRC may be used for the roadway improvements.

Table 4-7: Basin 7 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	5.35	1.67	1.70	0.03

[1]Surplus capacity in proposed pond after Basin 7 is treated.

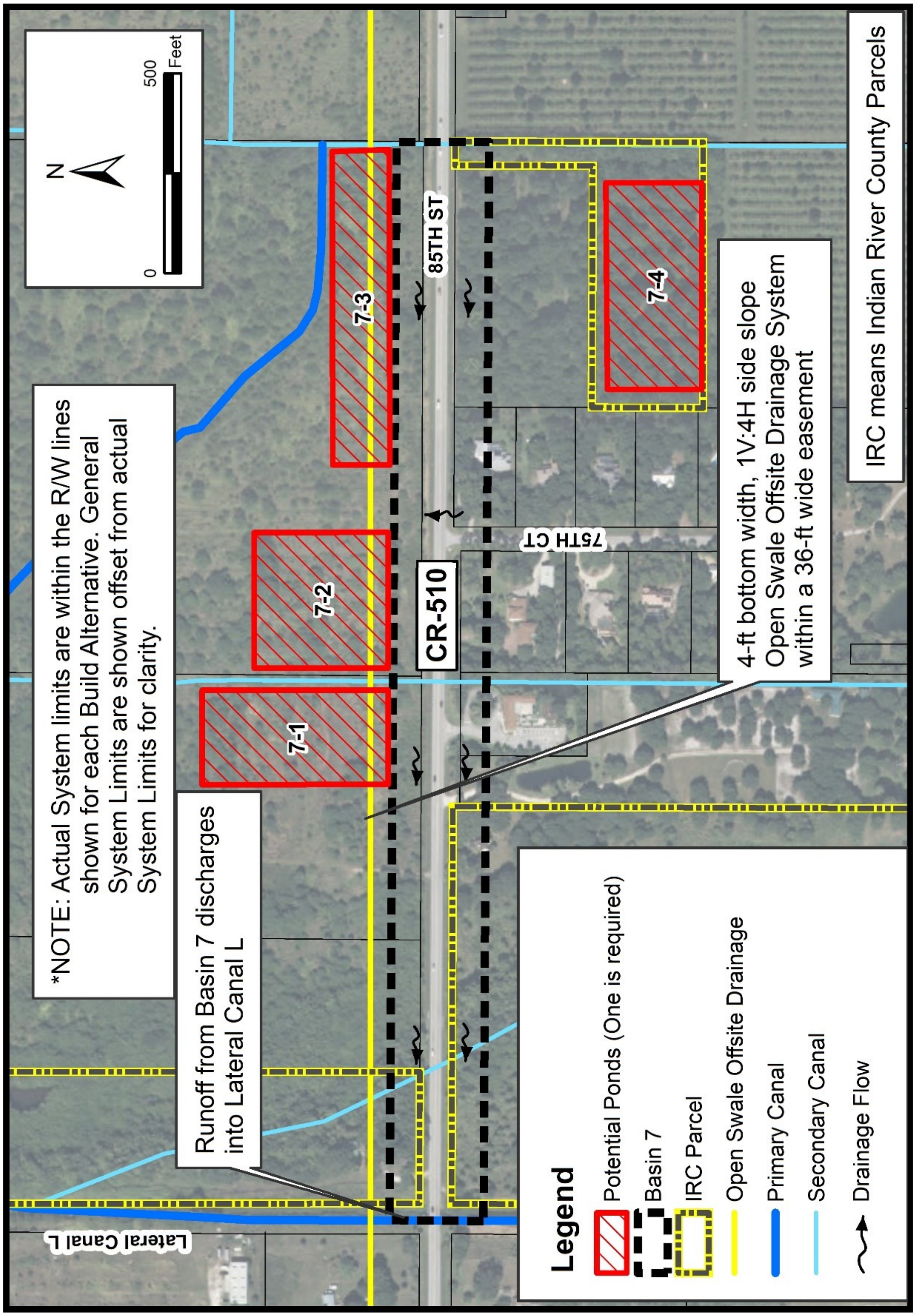


Figure 4-9: Basin 7

4.10 Basin 8

4.10.1 Existing Condition

Basin 8 covers CR-510 from approximately 2,500-ft. west of 70th Ave to 66th Ave. Refer to **Figure 4-10** for a map of the basin. The drainage area is approximately 20.63 Acres in size. The total impervious area is approximately 3.93 Acres. Runoff from this basin is being conveyed toward the west by roadside swales, pipes and culverts and ultimately discharges into Lateral Canal L. A 100" x 60" cross drain is located approximately 2,500-ft. to the west of 70th Ave. Based on a Desktop Analysis and Field Review, approximately 110.5 Acres of offsite properties are draining into CR-510's Right-of-Way.

4.10.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 8, under the recommended alternative, includes adding 12-ft travel lanes, 7-ft bicycle lanes, 4-ft inside shoulders, curb and gutter on both sides and 5-ft sidewalks with a wide buffer between the roadway and the sidewalks. To prevent commingling of offsite runoff with onsite runoff, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. Two different types of offsite drainage systems are proposed. For areas with homes that are not in close proximity to the proposed CR-510 Right-of-Way, an Open Swale Offsite Drainage System is proposed. For areas where homes are in close proximity to the proposed CR-510 Right-of-Way, a 48 inch-wide Trunkline Offsite Drainage System, located in a 20 feet easement is proposed.

The proposed improvements, under the recommended alternative, will add 6.88 Acres of impervious area to the drainage system, respectively. Therefore, the total impervious area will be 10.81 Acres (Existing area of 3.93 Acres + Increased area of 6.88 Acres). Preliminary calculations indicate that 3.38 ac-ft. of treatment will be required to accommodate the onsite runoff. A wet detention pond is proposed to treat and attenuate 3.40 ac-ft. of runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.02 ac-ft. (Provided Treatment of 3.40 ac-ft. - Required Treatment of 3.38 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-8** for the treatment summary for Basin 8. Approximately 4.80 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There are no county-owned properties within this basin.

Table 4-8: Basin 8 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	10.81	3.38	3.40	0.02

[1]Surplus capacity in proposed pond after Basin 8 is treated.

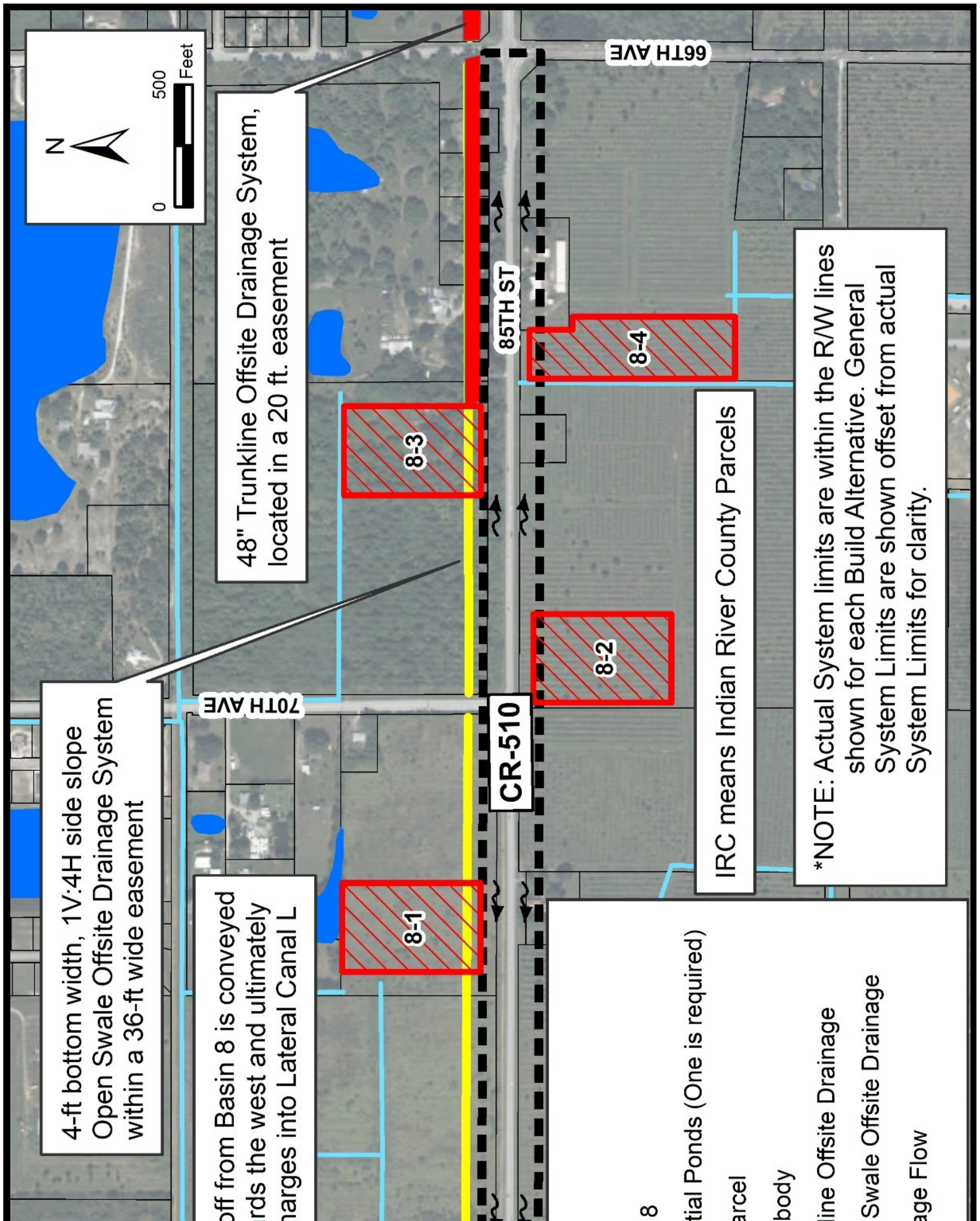


Figure 4-10: Basin 8

4.11 Basin 9

4.11.1 Existing Condition

Basin 9 covers CR-510 from 66th Ave to 62nd Ave. Refer to **Figure 4-11** for a map of the basin. The drainage area is approximately 6.30 Acres in size. The total impervious area is approximately 1.94 Acres. Runoff from this basin is being conveyed toward the west by roadside swales, pipes and culverts and ultimately discharges into Lateral Canal L. Based on a Desktop Analysis and Field Review, approximately 54.5 Acres of offsite properties are draining into CR-510's Right-of-Way.

4.11.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 9, under the recommended alternative, includes adding 11-ft travel lanes, 7-ft bicycle lanes, curb and gutter on both sides, 6-ft sidewalks and a 22-ft median. To prevent commingling of offsite runoff with onsite runoff and to ensure existing drainage patterns are maintained, a secondary swale or offsite drainage system is proposed outside of the County's Right-of-Way. Homes adjacent to the basin are located in close proximity to the proposed CR-510 Right-of-Way. As such, a 48 inch-wide Trunkline Offsite Drainage System, located in a 20 feet easement is proposed.

The proposed improvements, under the recommended alternative, will add 2.79 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 4.73 Acres (Existing area of 1.94 Acres + Increased area of 2.79 Acres). Preliminary calculations indicate that 1.03 ac-ft. of treatment will be required to accommodate the onsite runoff. A dry retention pond is proposed to treat and attenuate 1.05 ac-ft. of runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.02 ac-ft. (Provided Treatment of 1.05 ac-ft. - Required Treatment of 1.03 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-9** for the treatment summary for Basin 9. Approximately 1.90 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There are three (3) parcels owned by Indian River County (IRC) which are located north of CR-510, between Schumann Drive and 64th Avenue.

Table 4-9: Basin 9 Treatment Volume

Alternative	Impervious Area (ac)	Treatment Required (ac-ft.)	Treatment Provided (ac- ft.)	Surplus[1] Capacity (ac-ft.)
Recommended Alternative	4.73	1.03	1.05	0.02

[1]Surplus capacity in proposed pond after Basin 9 is treated.

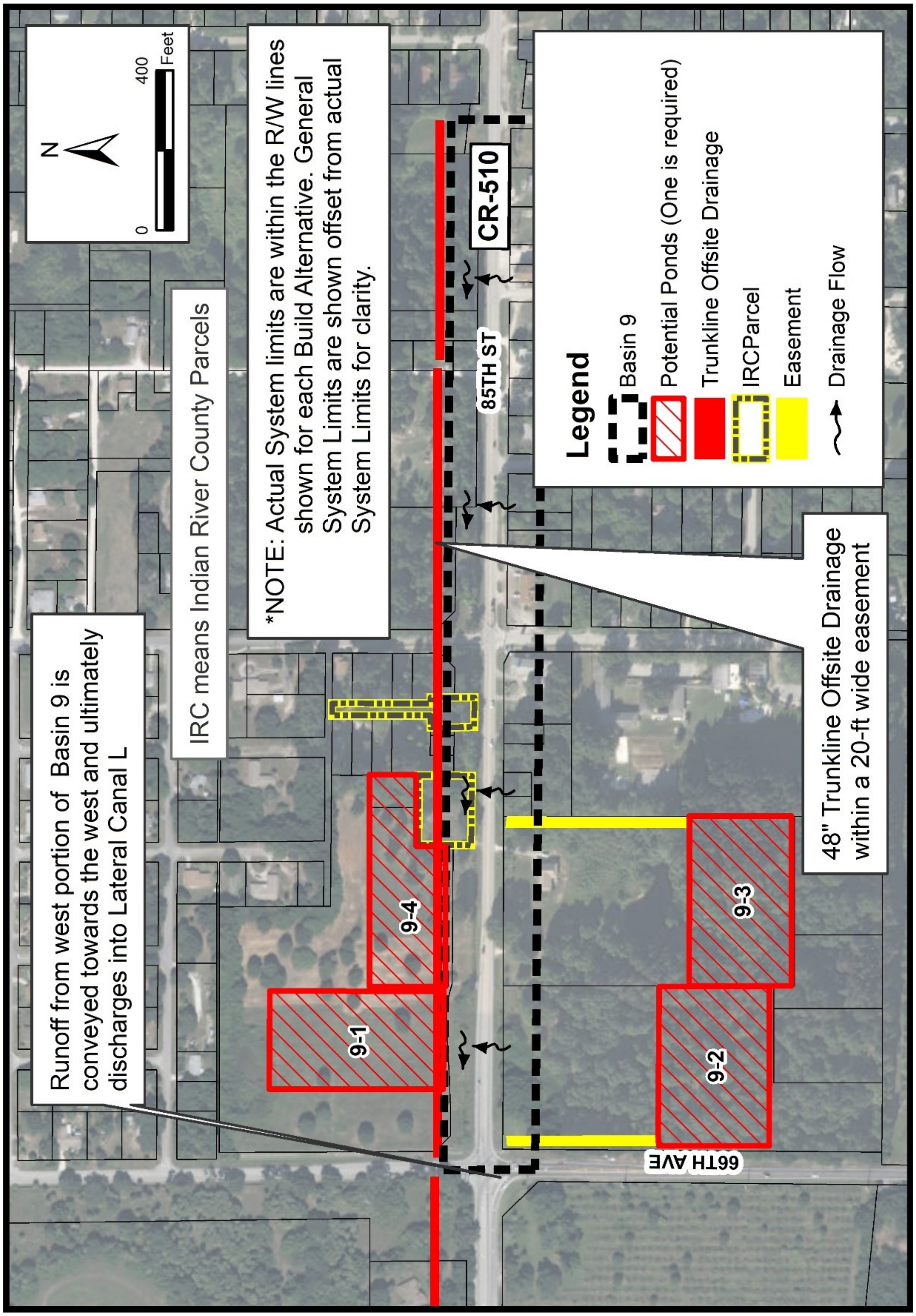


Figure 4-11: Basin 9

4.12 Basin 10

4.12.1 Existing Condition

Basin 10 covers CR-510 from 62th Ave to 58th Ave. Refer to **Figure 4-12** for a map of the basin. The drainage area is approximately 6.47 Acres in size. The total impervious area is approximately 2.49 Acres. Runoff from this basin is being conveyed by roadside swales, pipes and culverts and discharges into Sub-Lateral G-S canal. Based on a Desktop Analysis and Field Review, approximately 18.7 Acres of offsite properties are draining into the CR-510's Right-of-Way.

4.12.2 Proposed Recommended Alternative Condition

The proposed roadwork within Basin 10, under the recommended alternative, includes adding 11-ft. travel lanes, 7-ft. bicycle lanes, curb and gutter on both sides, 6-ft. sidewalks and a 22-ft. median.

The proposed improvements, under the recommended alternative, will add 2.36 Acres of impervious area to the drainage system. Therefore, the total impervious area will be 4.85 Acres (Existing area of 2.49 Acres + Increased area of 2.36 Acres). Preliminary calculations indicate that 1.06 ac-ft. of treatment will be required to accommodate the onsite runoff. A dry retention pond is proposed to treat and attenuate 1.10 ac-ft. of runoff for onsite post-development conditions. The surplus capacity of the pond after this basin is treated is 0.04 ac-ft. (Provided Treatment of 1.10 ac-ft. - Required Treatment of 1.06 ac-ft.). Offsite runoff will not be treated by this pond. See **Table 4-10** for the treatment summary for Basin 10. Approximately 1.90 Acres of Right-Of-Way will be needed to develop the pond. Several potential pond sites were identified per basin to provide greater flexibility during final design. One potential pond site will satisfy the requirements of the basin. Refer to **Section 5** for the pond siting process. There is a 1.57 Acres triangular- shaped parcel owned by Indian River County (IRC) which is located south of CR-510, between approximately 550 ft. to the east of Paladin Square and 59th Avenue.

Table 4-10: Basin 10 Treatment Volume				
Alternative	**Impervious Area (ac)**	**Treatment Required (ac-ft.)**	**Treatment Provided (ac- ft.)**	**Surplus[1] Capacity (ac-ft.)**
Recommended Alternative	4.85	1.06	1.10	0.04

[1]Surplus capacity in proposed pond after Basin 10 is treated.

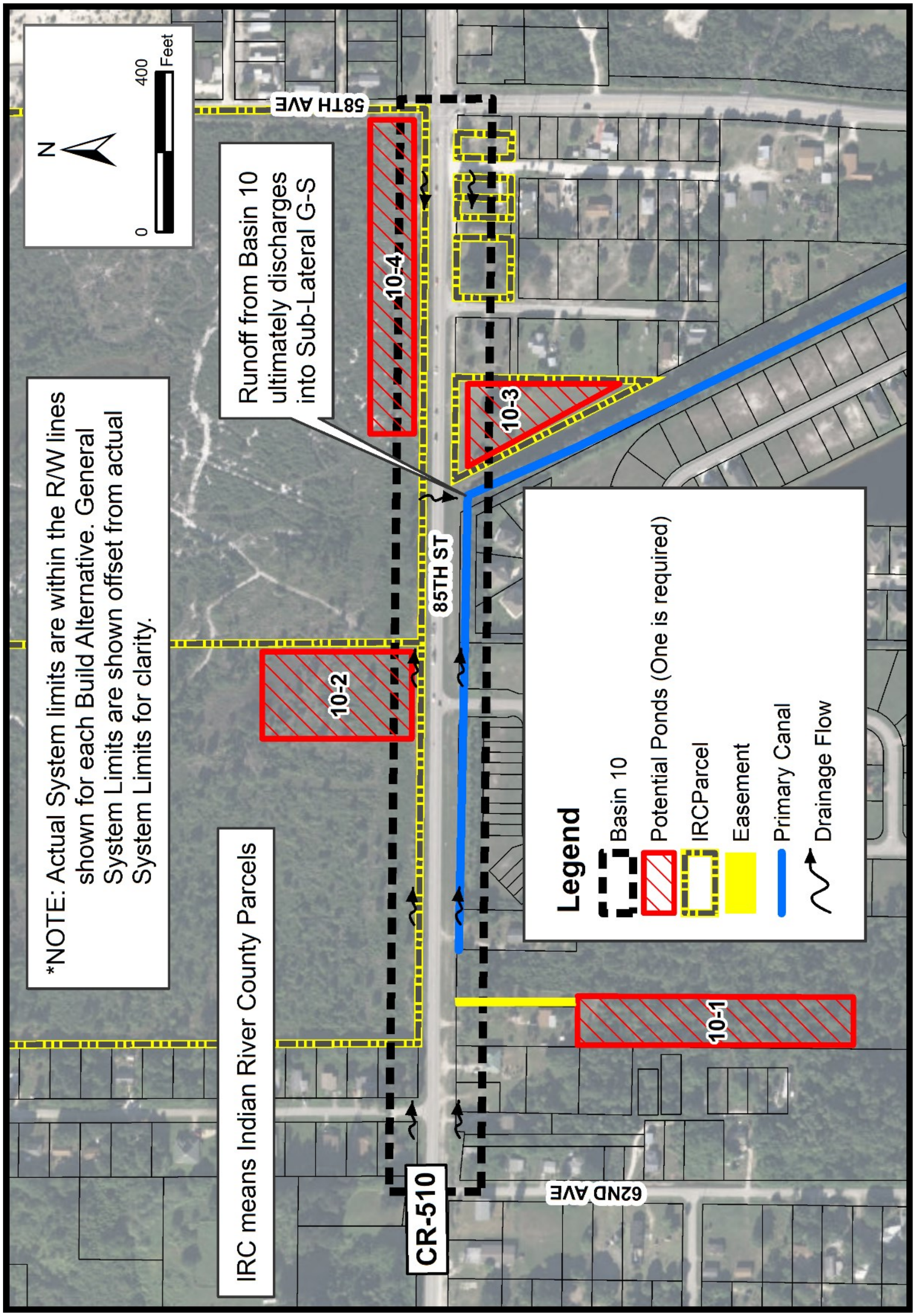


Figure 4-12: Basin 10

4.13 Pond Design Summary

Table 4-11 below provides a summary of the Water Quality and Attenuation requirements, and storage volume that each basin provides.

Table 4-11: Water Quality Summary

Basin	Imp Area (Ac)	Perv Area (Ac)	Total Area (Ac)	1" of Total Area (Ac-ft)	2.5 of Imp Area (Ac-ft)	Greater Volume (Ac-ft)	Add 50% (OFW) (Ac-ft)	Offsite (Ac-ft)	Total Req'd Treat (Ac-ft)	Total Prov'd Treat (Ac-ft)	Surplus[1] Treat (Ac-ft)
Wet Detention											
1	2.29	0.88	3.17	0.26	0.48	0.48	0.72	0.05	0.77	2.94	2.17
2	4.75	1.83	6.58	0.55	0.99	0.99	1.49	0.12	1.61	1.65	0.04
3	5.53	2.13	7.65	0.64	1.15	1.15	1.73	0.00	1.73	1.80	0.07
4	5.45	1.24	6.69	0.56	1.14	1.14	1.70	0.00	1.70	3.18	1.48
5	5.31	4.83	10.14	0.85	1.11	1.11	1.66	0.00	1.66	1.70	0.04
6	5.25	4.78	10.03	0.84	1.09	1.09	1.64	0.00	1.64	1.70	0.06
7	5.35	4.87	10.22	0.85	1.12	1.12	1.67	0.00	1.67	1.70	0.03
8	10.81	9.83	20.63	1.72	2.25	2.25	3.38	0.00	3.38	3.40	0.02
Dry Retention											
Basin	**Imp Area (Ac)**	**Perv Area (Ac)**	**Total Area (Ac)**	**1" of Total Area (Ac-ft)**	**2.5 of Imp Area (Ac-ft)**	**Greater Volume (Ac-ft)**	**Add 50% (OFW) (Ac-ft)**	**Offsite (Ac-ft)**	**Total Req'd Treat (Ac-ft)**	**Total Prov'd Treat (Ac-ft)**	**Surplus[1] Treat (Ac-ft)**
9	4.73	1.58	6.30	0.53	0.69	0.69	1.03	0.00	1.03	1.05	0.02
10	4.85	1.62	6.47	0.54	0.71	0.71	1.06	0.00	1.06	1.10	0.04

[1]Surplus Treat = (Total Prov'd Treat) – (Total Req'd Treat)

5 POND SITING

5.1 Overview - Methodology

A Pond Siting Team, comprised of representatives from various FDOT departments and consultant, was assembled by the FDOT Project Manager per FDOT District Four Pond Siting Procedures. The objective of the Pond Siting Team was to identify potential pond sites and score each site based on a weighted matrix. The Weight of Factor (WOF), for the matrix, was established through consensus by the Pond Siting Team. Values for the WOF ranged from 1 to 10 with higher scores being assigned for factors that the Pond Siting Team deemed to have a greater impact on the overall suitability of a potential pond site. **Table 5-1** shows the weighted matrix used to rank the potential pond sites. Several ponds sites were identified for each Drainage System and ranked. The selection of a preferred site for each drainage System will occur during final design. All four of the Pond Siting Meetings were open to the public and notices were provided on FDOT's website. Notes of the pond Siting Meetings are located in **Appendix D**.

Table 5-1: Weighted Matrix

Item	Factor	Description/Issues Considered	Weighted Value
1	Zoning (Right of Way)	The project is located in a rural area, as such the Zoning will moderately impact the pond locations.	5
2	Land Use	The project is located in a rural area, as such the Land Use will moderately impact the pond locations.	5
3	Right of Way Costs	The Right-of-Way cost associated with the acquisition of the parcel is crucial.	10
4	Drainage Considerations	Priority should be given to locations where the pond will have optimal drainage.	10
5	Flood Zone FEMA	Since CR-510 is an evacuation route, the existing elevation of the road is relatively high. As such, an evaluation of the floodplain impacts will not heavily impact the locations of the ponds.	5
6	Contamination and Hazardous Materials	No parcels within the vicinity of the project area has been identified as contaminated. As such, consideration of contamination and hazardous materials is semi crucial.	5
7	Utilities	There is a gas main and a water main that runs near the project location. The utilities will have medium affect to the location of the ponds.	6

Table 5-1: Weighted Matrix			
Item	**Factor**	**Description/Issues Considered**	**Weighted Value**
8	Threatened and Endangered Species and Associated Costs	There are habitat preservative lands surrounding the project area for endangered species, such as the Caracara. Thus, Threatened and Endangered Species and Associated Costs is a crucial aspect when siting the ponds.	8
9	Noise	Identifying noise impacts has medium impact to the location and placement of pond sites.	5
10	Wetlands and Protected Uplands and Associated Costs	There are wetlands surrounding the project area and will significantly impact the location of the ponds.	8
11	Cultural Resources Involvement and Associated Costs	There are highly sensitive lands surrounding the project area that will significantly impact the location of the ponds.	9
12	Section 4(f)	Identifying the presence of 4F properties, could significantly affect the suitability of the site in question and the associated costs.	9
13	Public Wellfield	There are no wellfields within the project area. The closest Indian River County Wellfield (N29) is approximately 1 mile away. As such, public wellfield has minimal impacts to the locations of the ponds.	6
14	Construction	The location of the ponds will not have significance impacts to the construction.	5
15	Maintenance	The cost of maintaining a pond at a given location is crucial.	9
16	Aesthetics (Compatibility with local master plan)	The need for landscape buffers, fencing and variable pond shapes is standard.	5
17	Public Opinion and Adjacent Residency Concerns	Identifying possible impacts to current or proposed land use is crucial.	8
18	Other: CERP	The CERP is not applicable for this project.	1

5.2 Pond Siting Results

Potential pond sites were scored and ranked in general conformance with FDOT's District Four Pond Siting Procedures. Higher scores were assigned to more desirable pond sites. **Table 5-2** contains the results of the final pond siting process. Two previous versions were created prior to reaching the final pond siting version. Refer to **Appendix D** for all three versions.

Indian River County (IRC) representatives were contacted and invited to participate in the pond siting process. The IRC Representatives attended the second, third and fourth Pond Siting Meetings.

TABLE 5-2: POND SITING SCORES AND RANK

SYS.	POTENTIAL POND SITE / SCORE / RANK			
1	*Pond located within existing R/W*			
2	**2-1**	**2-2**	**2-3**	**2-4**
	769	896	708	706
	2	1	3	4
3	*Pond located within existing R/W*			
4	*Pond located within existing R/W*			
5	**5-1**	**5-2**	**5-3**	**5-4**
	742	754	903	919
	4	3	2	1
6	**6-1**	**6-2**	**6-3**	**6-4**
	853	876	759	829
	2	1	4	3
7	**7-1**	**7-2**	**7-3**	**7-4**
	765	736	692	794
	2	3	4	1
8	**8-1**	**8-2**	**8-3**	**8-4**
	822	853	765	672
	2	1	3	4
9	**9-1**	**9-2**	**9-3**	**9-4**
	635	758	796	695
	4	2	1	3
10	**10-1**	**10-2**	**10-3**	**10-4**
	696	693	889	621
	2	3	1	4

5.3 Wabasso Scrub Conservation Area

The Wabasso Scrub Conservation Area (WSCA) is located in Basin 10. It is considered as an occupied habitat for Florida scrub-jays (Aphelocoma coerulescens) as well as for state listed gopher tortoises (Gopherus Polyphemus) and is managed for conservation of Florida scrub-jays as part of a regional Habitat Conservation Plan. A portion of the WSCA was used as mitigation for impacts to federally listed Florida scrub-jays (Aphelocoma coerulescens), from improvements to C.R. 512, and it is considered a section 4(f) resource as it contains publicly accessible trails and was purchased using Florida Forever Funds. Ponds 10-2 and 10-4 were located in the WSCA to allow the Pond Siting Team to determine the suitability of the area for stormwater management. By consensus of the Pond Siting Team, Ponds 10-2 and 10-4 were considered fatally flawed because their construction and operation would destroy and degrade protected lands.

6 ICPR MODELING

The Advance Interconnected Pond Routing (ICPR) computer model (version 3.10) was used to analyze and design the existing and proposed conditions of this PD&E Study. The node-link schematics depicting the existing and proposed drainage systems are included in **Appendix G**.

6.1 Basin Parameters

6.1.1 Basin Area

The basin area is any area of land where precipitation collects and drains off into a common outlet. Based on a Desktop Analysis and Field Review, existing offsite properties are draining into the County's Right-of-Way. The offsite contributing area was estimated using the Regional Watershed shapefile, obtained from County’s website. For the eastbound and westbound portion of CR-510, it was estimated that all areas within 600 feet north of the roadway and 300 feet south of the roadway are draining into the County’s right of way. For the northbound and southbound portion of CR-510, it was estimated that all areas within 2600 feet west of the roadway is draining into the County’s right-of-way. The drainage basin areas are outlined in **Tables 6-1** and **6-2** for the existing and proposed conditions, respectively.

6.1.2 Runoff Curve Number (CN)

The Curve Number (CN) was determined for the impervious areas and pervious areas, separately, using the NRCS Runoff Curve Number Table. The impervious and pervious areas for each basin were estimated using the provided roadway typical sections and CADD files. To obtain the most accurate results, a single weighted CN for each basin was calculated using the formula below:

$$Weighted\ CN = \frac{(A_{impervious} * CN_{impervious}) + (A_{pervious} * CN_{pervious})}{A_{impervious} + A_{pervious}}$$

The existing and proposed condition curve number summary for each basin are shown in **Tables 6-1** and **6-2**, respectively.

Table 6-1: Existing Conditions								
Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	ac	ac	ac		ac	ac	ac	
Basin 1	3.17	2.09	2.62	93.0	73.46	0.00	73.46	89.00
Basin 2	6.58	3.41	6.34	92.15	158.41	0.00	158.41	89.00
Basin 3	7.65	3.12	4.25	92.81	184.20	92.10	92.10	93.50
Basin 4	6.69	2.73	3.72	92.81	161.16	0.00	161.16	89.00

Table 6-1: Existing Conditions

Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	ac	ac	ac		ac	ac	ac	
Basin 5	10.14	1.93	7.91	90.77	54.34	0.28	54.06	89.05
Basin 6	10.03	1.91	7.82	90.77	53.72	0.28	53.44	89.05
Basin 7	10.22	1.95	7.97	90.77	54.75	4.56	50.19	89.75
Basin 8	20.63	3.93	16.09	90.77	110.54	5.53	105.01	89.45
Basin 9	6.30	1.94	4.36	91.77	54.55	10.91	43.64	90.80
Basin 10	6.47	2.49	3.98	92.46	18.66	4.67	14.00	91.25
Total	**87.88**	**25.49**	**62.39**		**923.78**	**118.31**	**805.47**	

Table 6-2: Proposed Conditions

Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	ac	ac	ac		ac	ac	ac	
Basin 1	3.17	2.35	2.35	93.50	73.46	0.00	73.46	89.00
Basin 2	6.58	4.87	4.88	93.50	158.41	0.00	158.41	89.00
Basin 3	7.65	5.67	1.70	95.93	184.20	92.10	92.10	93.50
Basin 4	6.69	5.45	1.00	96.61	161.16	0.00	161.16	89.00
Basin 5	10.14	5.31	4.53	93.86	54.34	0.28	54.06	89.05
Basin 6	10.03	5.25	4.48	93.86	53.72	0.28	53.44	89.05
Basin 7	10.22	5.35	4.57	93.86	54.75	4.56	50.19	89.75
Basin 8	20.63	10.81	9.21	93.86	110.54	5.53	105.01	89.45

Table 6-2: Proposed Conditions								
Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	ac	ac	ac		ac	ac	ac	
Basin 9	6.30	4.85	1.45	95.93	54.55	10.91	43.64	90.80
Basin 10	6.47	4.98	1.49	95.93	18.66	4.67	14.00	91.25
Total	**87.88**	**54.89**	**32.99**		**923.78**	**118.31**	**805.47**	

6.2 Model Setup

6.2.1 Nodes

In ICPR, nodes or junctions are used to simulate lakes, retention and detention ponds, swales, and model boundary conditions. For this PD&E Study, the model was simplified to only show a representative node for the following:

- The onsite contribution
- The offsite contribution
- The proposed pond
- The outfall at canals, ditches, or ponds.

The onsite stage-area node ICPR input were developed using typical sections and the stages were estimated using the survey elevations.

The stage-area for offsite was estimated using the Regional Watershed shapefile, obtained from County's website. For the eastbound and westbound portion of CR-510, it was estimated that all areas within 600 feet north of the roadway and 300 feet south of the roadway are draining into the County's right of way. For the northbound and southbound portion of CR-510, it was estimated that all areas within 2600 feet west of the roadway is draining into the County's right-of-way. The offsite node elevations were estimated using GIS topography map.

The proposed pond stage-area node ICPR input were developed using the water quality calculations. Refer to **Appendix B** for the water quality calculations.

The outfall time-stage node ICPR input were established to be the design control elevation.

6.2.2 Links

Links or reaches define physical characteristics of the drainage or conveyance system. This PD&E Study ICPR model includes:

- Pipes (circular, oval, arch, and rectangular)
- Channels (trapezoidal)
- Weirs (Fread equation for overtopping berms)

For pipes, a 0.5 entrance loss coefficient was assumed for all conduits connecting to manholes, inlets and headwalls. An exit loss coefficient of 0.1 was assumed except for conduits discharging to a body of water such as canals or lakes. For this condition, an exit loss coefficient of 1.0 was used. A Manning's roughness coefficient of 0.024 was used for corrugated metal pipes (CMP) and 0.012 was used for reinforced concrete pipes (RCP). For all weirs, the weir and orifice coefficients were assumed as 3.2 and 0.6, respectively.

Channels links were used to simulate conveyance of stormwater runoff in a swale. The *Count* was given a value of 2 to consider the north and south swale. The channel geometry is defined by the average bottom width of the north swale and the south swale. The slope was 1H:4V.

For weirs, the *Type* field were defined as Vertical: Fread Equation to simulate overtopping of berms. A *Weir Discharge Coefficient* of *3.08 and Orifice Discharge Coefficient* of *0.6 was* used.

6.3 Result

The simulation for the 25 year- 24 hr storm event was ran. See **Table 6-3**. The Pre-Post discharge criteria was met for all basins, where the post-development discharge was less than the pre-development discharge.

Table 6-3: ICPR Results Summary

System	Water Body	25 Year- 24 Hour		
		Pre Dev (cfs)	Post Dev (cfs)	Diff (cfs)
Basin 1	Pond	3.98	3.82	(-) 0.16
Basin 2	Lateral Canal D	7.44	5.56	(-) 1.88
Basin 3	Lake	12.89	5.06	(-) 7.83
Basin 4	Ponds	8.93	4.03	(-) 4.90
Basin 5	Lateral Canal C	7.28	4.87	(-) 2.41
Basin 6	Lateral Canal C Lateral Canal L	8.35	5.06	(-) 3.29
Basin 7	Lateral Canal L	12.15	4.72	(-) 7.43
Basin 8	Lateral Canal L	16.36	6.07	(-) 10.29
Basin 9	Lateral Canal L	5.04	3.68	(-) 1.36
Basin 10	Lateral Canal G	4.30	3.98	(-) 0.32

7 FLOODPLAIN IMPACTS

A review of the Flood Insurance Rate Map published by Federal Emergency Management Agency (FEMA), indicates that a portion of the study area is located in Special Flood Zones A, AE, X and X-500. See **Figure 7-1** below. The portion of the study area located in Zone A has a 1% annual chance of being flooded by the base flood (100-year storm) with no base flood elevation determined. Areas located in Zone AE also has a 1% annual chance of being flooded by the 100-year storm with base flood elevations determined. Areas identified in zone X or zone X-500 are estimated to have less than one foot or no flooding at all during the Base Flood. Refer to the FIRMET in **Appendix A** and the Location Hydraulics Report.

The northbound/southbound portion of CR-510, between CR-512 and 85th Place, is located in flood zone AE. Based on a desktop review of the FEMA Flood Insurance Rate Map (FIRM), the base elevation for the 100-yr storm event ranges from 18.5 - 20.0-ft. NAVD (20.0 – 21.5-ft. NGVD). As such, the elevation for the northbound/southbound portion of CR-510 must range from a minimum of 18.5 - 20.0-ft NAVD. This will ensure that CR-510 northbound/southbound corridor can be used as an evacuation route during the 100-year base flood. The eastbound/westbound portion of CR-510, located between 90th Avenue and 58th Avenue, is mainly located in flood zone X. A negligible portion of the eastbound/westbound corridor is located in flood zone A and AE. Zone AE has a base flood elevation of 17-ft NGVD. It was assumed that the roadway in these areas were designed with elevations similar to the portion of the eastbound/westbound corridor that is located in Flood Zone X. As such, the eastbound/westbound corridor will provide an evacuation route during the 100-yr base flood.

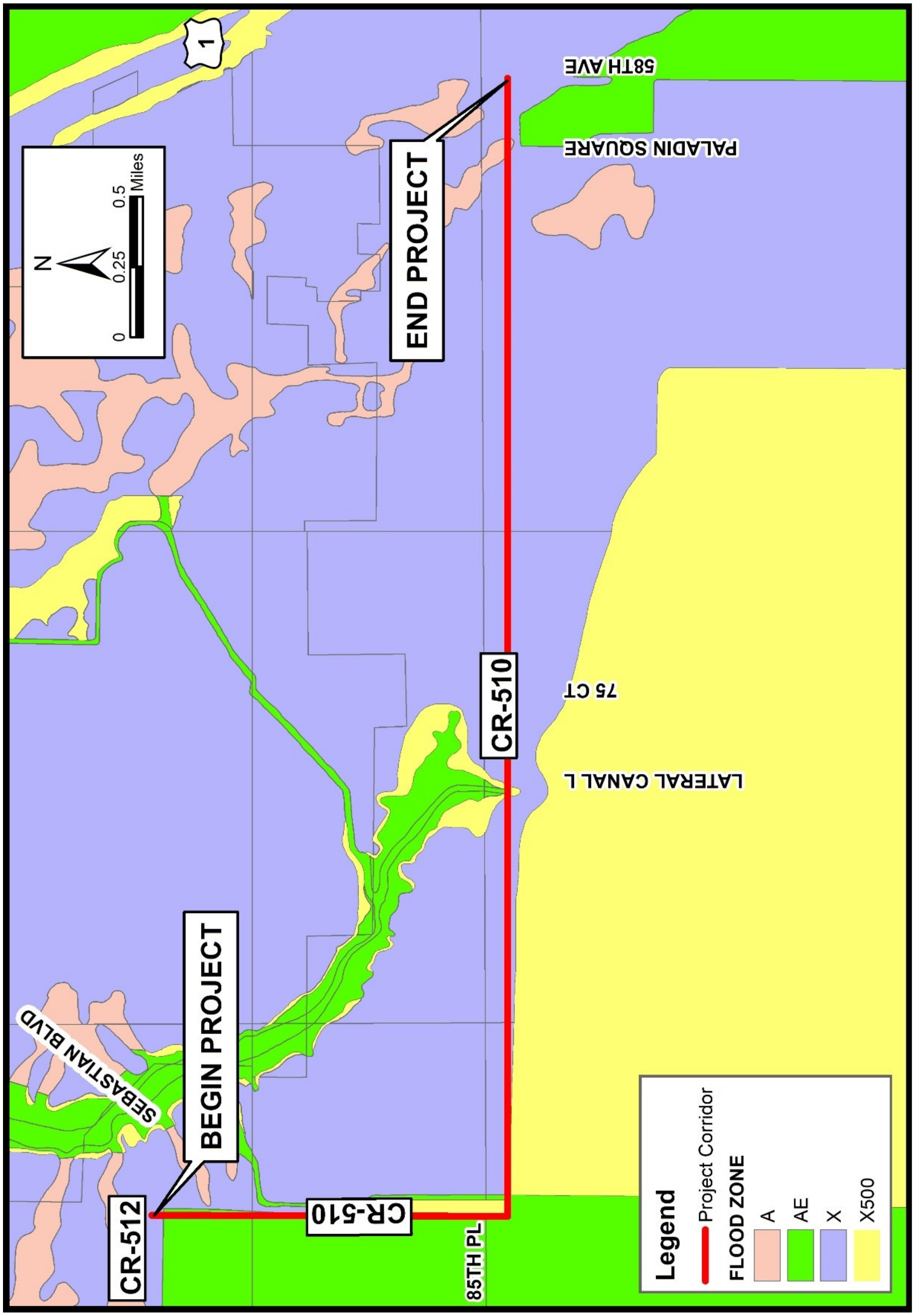


Figure 7-1: FEMA Flood Zone Map

8 CROSS DRAINS AND WATERBODY CROSSINGS

There are four (4) identified cross drains and three (3) water crossings in this project. See **Sections 8.1** and **8.2** for a description of each cross drain and water crossing, respectively. Roadway improvements will involve work within the jurisdiction of St John River Florida Water Management District (SJRWMD), Sebastian River Water Improvement District (SRID) and Indian River Farms Water Control District (IRFWCD). Refer to **Figure 8-1** below for a map of the cross drains and water crossings within the project area.

8.1 Cross Drains (CD)

8.1.1 Culvert 1 (CD 1)

Culvert 1 (CD 1) is a 48” Reinforced Concrete Pipe (RCP), with a length of 102-ft., that runs under CR-510 approximately 600 ft. south of Stony Point Drive. This culvert is used to connect Lateral D Canal Watershed to Sebastian River Watershed. Proposed conditions, under the recommended alternative, include the widening of CR-510 on both sides of the roadway. To maintain the regional drainage pattern, an extension of CD 1 on both sides will be needed. CD 1 will should be extended 15-ft towards the west and 2-ft toward the east.

8.1.2 Culvert 2 (CD 2) - Box Culvert

Culvert 2 (CD 2) is a box culvert that is located at the intersection of CR-510 and 89th Street. It has a length of 106-ft., depth of 10-ft., and a width of 18-ft. to the west and 14-ft. to the east. This culvert was designed to connect Lateral D Canal Watershed to Sebastian River Watershed. Proposed conditions, under the recommended alternative, involve realignment and widening of CR-510 towards the east. To maintain the regional drainage pattern, a culvert replacement will be needed. A box culvert of length 121-ft. will be required.

8.1.3 Culvert 3 (CD 3)

Culvert 3 (CD 3) is a 36” Corrugated Metal Pipe (CMP) with a length of 42-ft. This culvert runs under CR-510 and is located approximately 977 ft. east of 75th Ct. Culvert 3 (CD 3) was designed to connect the Lateral L Canal Watershed to the Sebastian River Watershed. The proposed roadway alignment and widening is towards the north. To maintain the regional drainage pattern, a culvert replacement will be needed. A culvert of length 134-ft will be required for the recommended alternative.

8.1.4 Culvert 4 (CD 4)

Culvert 4 (CD 4) has a north pipe of 24” Reinforced Concrete Pipe (RCP) with a length of 42-ft and a south pipe of 24” Corrugated Metal Pipe (CMP) with a length of 41-ft. This culvert runs under CR-510 and is located approximately 960 ft. west of 58th Ave. Culvert 4 (CD 4) was designed to connect the Lateral G Canal Watershed to the Sebastian River Watershed. For the recommended alternative, the proposed roadway alignment and widening is towards the south. To maintain the regional drainage pattern, a culvert replacement will be needed. A culvert of length 104-ft will be required.

8.2 Waterbody Crossings (WC)

8.2.1 WC 1 (Bridge No. 880047)

Existing Bridge 12-880047 is located at the intersection of CR-510 and approximately 233 ft. east of 90th Avenue. This bridge carries CR-510 eastbound and westbound traffic over Lateral D Canal. FDOT is proposing to place a culvert crossing at Lateral Canal-D to accommodate the proposed roadway alignment, with a wider horizontal curve. The new curve will improve the turning radius for traffic safety. Existing Bridge 12-880047 will be removed for the recommended alternative and a triple-box culvert will be installed at Lateral D Canal where realigned CR-510 crosses the canal. Preliminary calculations indicate that a triple box culvert and the existing bridge will provide a similar hydraulic flow capacity since required hydraulic capacity with the allowable backwater increment of 0.1-ft., a triple box culvert is being proposed to address potential clogging and maintenance concerns. The proposed culvert provides a minimum drift clearance of 1-ft. above the 100-Year FEMA elevation.

8.2.2 WC 2 (Bridge No. 880063)

Existing Bridge 12-880063 is located at the intersection of CR-510 and approximately 79 ft. west of 82nd Avenue. This bridge carries CR-510 eastbound and westbound traffic over Lateral C Canal. Existing Bridge 12-880063 will be removed for the recommended alternative and a new bridge will be installed over Lateral C Canal to accommodate the proposed widening of CR-510. Existing plans show that the bridge at this location consists of timber and steel piles with an overall length of 75-ft. The bridge proposed for this location will have an overall length of 85-ft.

8.2.3 WC 3 (Bridge No. 880044)

Existing Bridge 12-880044 located at the intersection of CR-510 and approximately 433 ft. east of 79th Terrace. carries CR-510 eastbound and westbound traffic over the Lateral L Canal. Existing Bridge 12-880044 will be removed for the recommended alternative and a new bridge will be installed over Lateral L Canal to accommodate the proposed widening of CR-510.

8.2.4 WC 4 (Culvert Replaced with Bridge Structure)

The existing 106” x 60” CMP culvert is currently a cross drain that is used to connect Lateral L Canal to the Sebastian River Watersheds. The existing 106” x 60” CMP culvert will be removed for the recommended alternative and replaced with a bridge structure. For more information, refer to the Bridge Hydraulics Report.

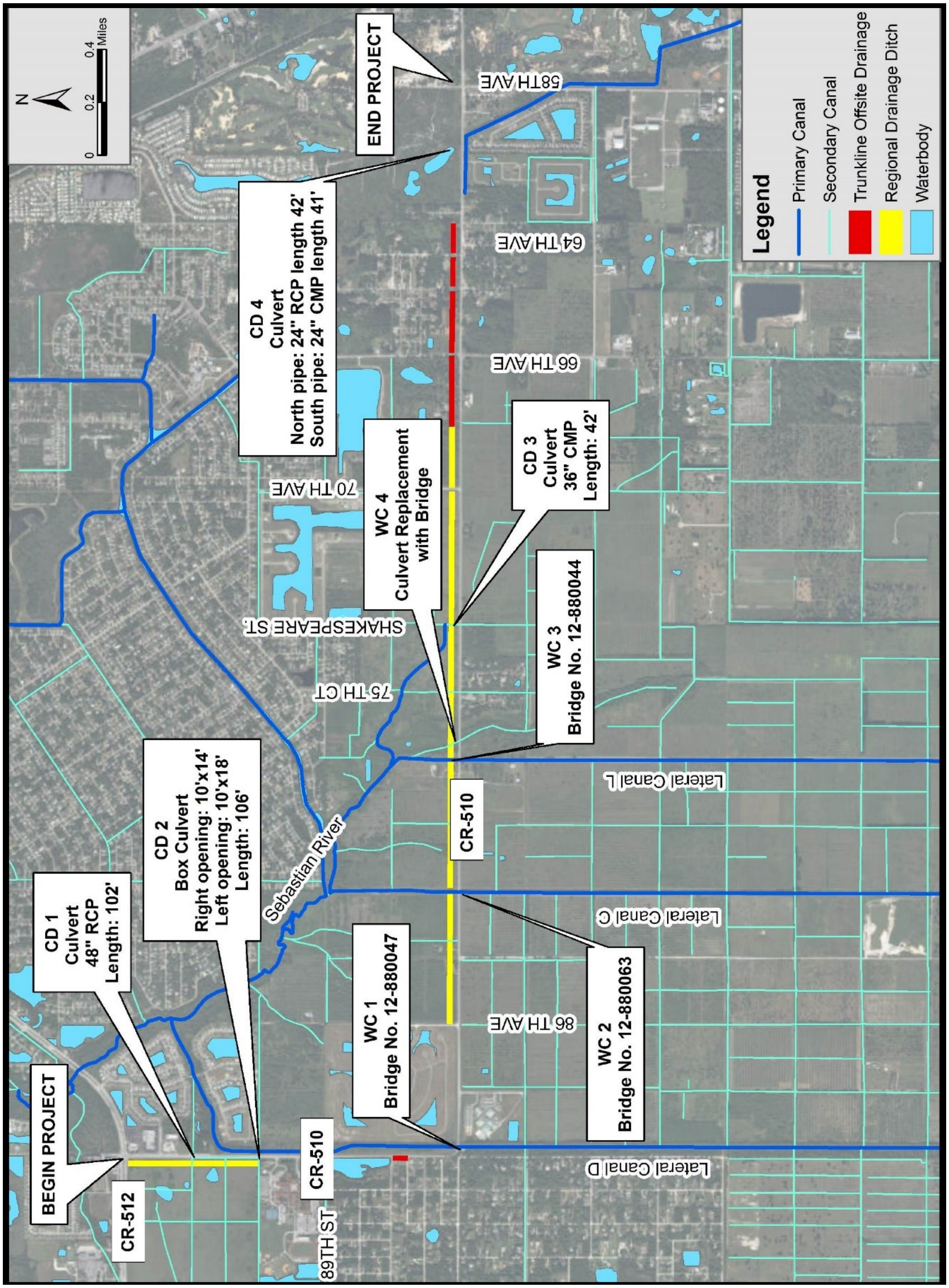


Figure 8-1: Waterbody Crossing

9 PERMITTING

9.1 Existing Permits

This project is located in the St John's River Water Management District (SJRWMD), Sebastian River Water Control District (SRWCD) and the Indian River Farms Water Control District. Existing Permits from St John's River Water Management District (SJRWMD), and Sebastian River Water Control District (SRWCD) in the study area were obtained. Relevant permits are summarized below. Refer to **Figure 9-1** for a map of the permits and **Appendix F** for permit excerpts.

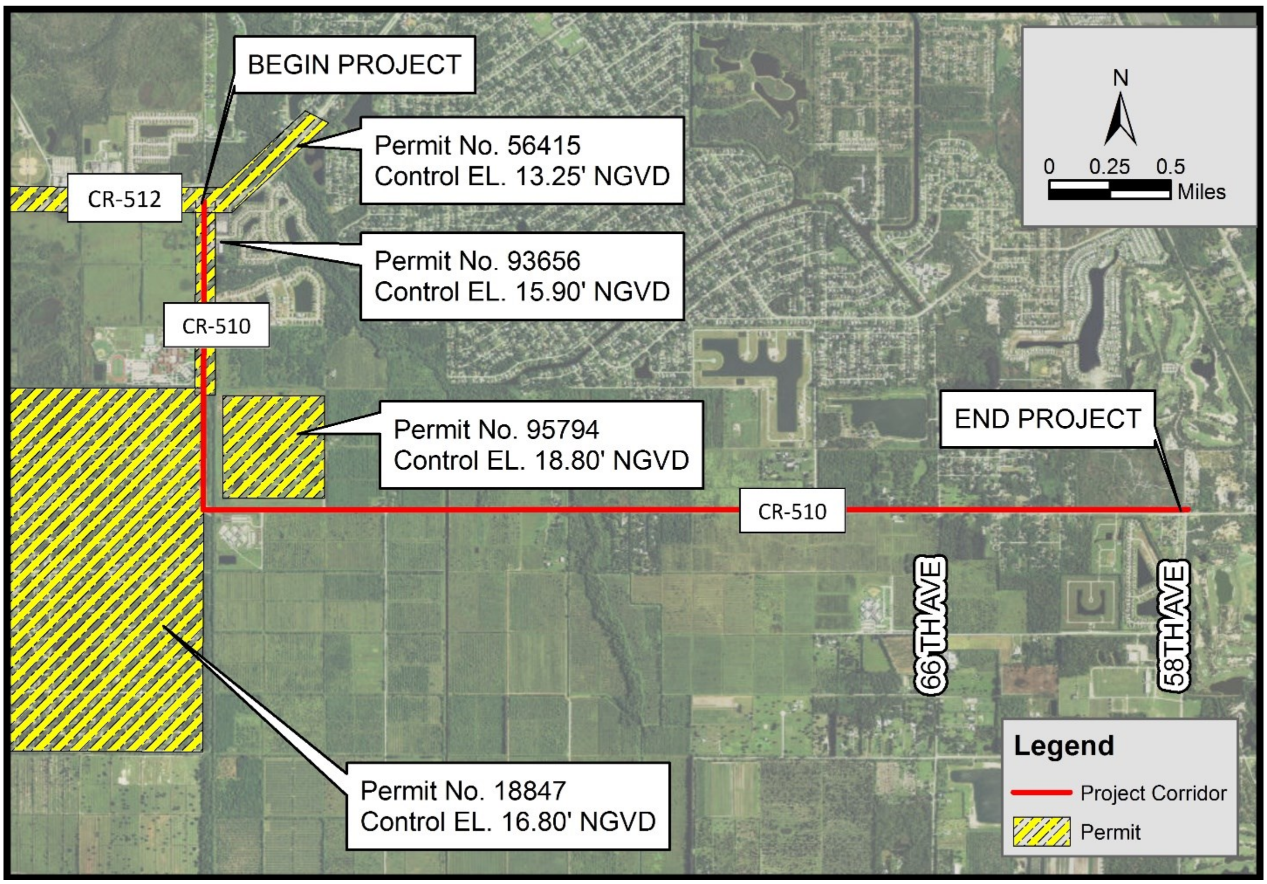


Figure 9-1: Permit Map

SJRWMD Permit 4-061-56415, Application 56415-8

- Issued 2016
- Construction and operation of a stormwater management system to serve improvements to the CR-512 roadway system from a two (2) lane undivided roadway to a four (4) lane divided roadway. The project begins approximately 1000 ft. east of the 1-95 Interchange and extends east to Roseland Road. System "D" provides treatment of runoff from the CR-512/CR-510 intersection to the new bridge planned at the South Prong of the

Sebastian River. Main sources of water quality treatment include a detention pond to attenuate or mitigate the impact expected by adding paving to the existing roadway. All discharge within the project area outfalls into the South Prong of the Sebastian River. The total site area for system “D” is 7.71 Acres.

- Documented required water treatment for system “D” (1.29 ac-ft.).
- Documented available water treatment for system “D” (4.23 ac-ft.).
- Documented peak discharge for system “D” (14.6 cfs).

SJRWMD Permit 4-061-95794, Application 95794-5

- Issued 2011
- Construction and operation of a stormwater management system for Bluewater Bay, a single family residential development located in Indian River County, FL. The project is located along the northwest corner of the intersection of CR-510 and 86th Ave. Pretreatment will be provided for one half of the public right-of-way for 89th St. and the entire right-of-way for CR-510 and 86th Ave. Main sources of water quality treatment includes a temporary swale located along the north side of 89th St. to serve as a dry retention area. The development will consist of the onsite drainage system of roadside inlets and underground piping to convey runoff to a wet detention system. All discharge within the project area outfalls to Sebastian River. The total site area is 15.26 Acres.
- Documented required water treatment for CR-510 (3.18 ac-ft.).
- Documented peak discharge (48.3 cfs).

SJRWMD Permit 40-061-18847, Application 18847-3

- Issued 2008
- Construction and operation of a stormwater management system to serve improvements to the existing Vero Lake Estates Subdivision. Main sources of water quality treatment include swale drainage that serves as a dry detention system. Additional conveyance ditches will be constructed, and a total of five (5) lakes will be connected to the conveyance ditches and utilized as storage and water quality treatment facilities. Lake A provides treatment of runoff from the CR-510 roadway. All discharge within the project area outfalls to the Lateral D Canal which eventually drains into the South Fork of the Sebastian River.

- No documented water treatment information are available.
- Documented available peak discharge for Lake A (34.1 cfs).

SJRWMD Permit 40-061-93656, Application 93656-1

- Issued 2004
- Construction and operation of a stormwater management system to serve improvements to the widening of CR-510 from Shark Blvd to CR-512. Main sources of water quality treatment include a storage basin for the new widening of CR-510. All discharge within the project area outfalls to the Lateral D Canal that runs along the east side of CR-510 and roadside swales which run along the west side of CR-510 which route the stormwater to the Lateral D Canal. The total site area is 8.59 Acres.
- Documented required water treatment (0.17 ac-ft.).
- Documented peak discharge (59.4 cfs).

9.2 Proposed Permits

The drainage approach is to meet the water quality permitting requirements for St. John's River Water Management District (SJRWMD) and meet the water quantity permitting requirements for Sebastian River Improvement District (SRID) and Indian River Farms Water Control District (IRFWCD).

St. John River Water Management District (SJRWMD)

- Permit number 93656 should be modified to accommodate the CR-510 project since it is an existing permit along the corridor.

Sebastian River Improvement District (SRID)

- FDOT requested a Right of Way permit, from SRID, during the PD&E study phase of this project to replace the existing CR-510 bridge over Lateral Canal D with a triple-box culvert crossing. This permit was submitted to SRID in August 2017 and conceptual approval was given by SRID in January 2018. Refer to **Appendix C** for meeting notes and **Appendix F** for the Conceptual Permit Approval letter.

Indian River Farms Water Control District (IRFWCD)

- Based on the proposed roadway improvements, IRFWCD recommended that FDOT acquire the following permits:

- A use permit is required to construct a road on district property. The fee for the use permit is $100.
- A connection permit is required to connect Sub Lateral Canal G with the roadway drainage system. For maintenance purposes, the urban curb is required to have cuts and Sub Lateral Canal G must have an asphalt perimeter berm with a minimum width of 15 feet. The fee for the connection permit is $100.
- A discharge permit is required to discharge into Sub Lateral Canal G. A fee of $1000 is charged for the discharge permit; which includes the consultant review.

10 CONCLUSION

Based on preliminary calculations, the stormwater management systems proposed by this study meet existing water quality standards as set forth in Chapter 62-302 of the Florida Administrative Code. Additionally, the treatment/storage quantity provided exceeds the required amount for the recommended Proposed Build Alternative. The approach for meeting both water quality and attenuation requirements was to provide for the greater of the two. Right-of-Way acquisition is needed for Basins 2, 5, 6, 8, and 9 to meet current permitting requirements. The total Right of Way acquisition needed for the recommended alternative was estimated to be 17.40 Acres. See **Table 10-1** below. Based on the hydraulic modeling results, the Pre-Post discharge criteria was met for all basins, where the post-development discharge was determined to be less than the pre-development discharge.

Table 10-1: Water Treatment Summary

DRAINAGE SYSTEM	RECOMMENDED ALTERNATIVE			
	WQ (ac-ft.)	PRV (ac-ft.)	R/W Area (ac)	R/W Acquisition (ac)
Basin 1	0.77	2.94	1.50	0.00
Basin 2	1.61	1.65	2.60	2.60
Basin 3	1.73	1.80	2.70	0.00
Basin 4	1.70	3.18	1.90	0.00
Basin 5	1.66	1.70	2.70	2.70
Basin 6	1.64	1.70	2.70	2.70
Basin 7	1.67	1.70	2.70	2.70
Basin 8	3.38	3.40	4.80	4.80
Basin 9	1.03	1.05	1.90	1.90
Basin 10	1.06	1.10	1.90	0.00
TOTAL				17.40

NOTES:

1. WQ = Required treatment volume to meet water quality and attenuation requirements (ac-ft.).
2. PRV = treatment/storage volume provided by proposed design (ac-ft.).
3. R/W Area = Right-of-Way area needed for storage volume (ac)
4. R/W Acquisition = Right-of-Way area to be acquired for storage volume (ac)

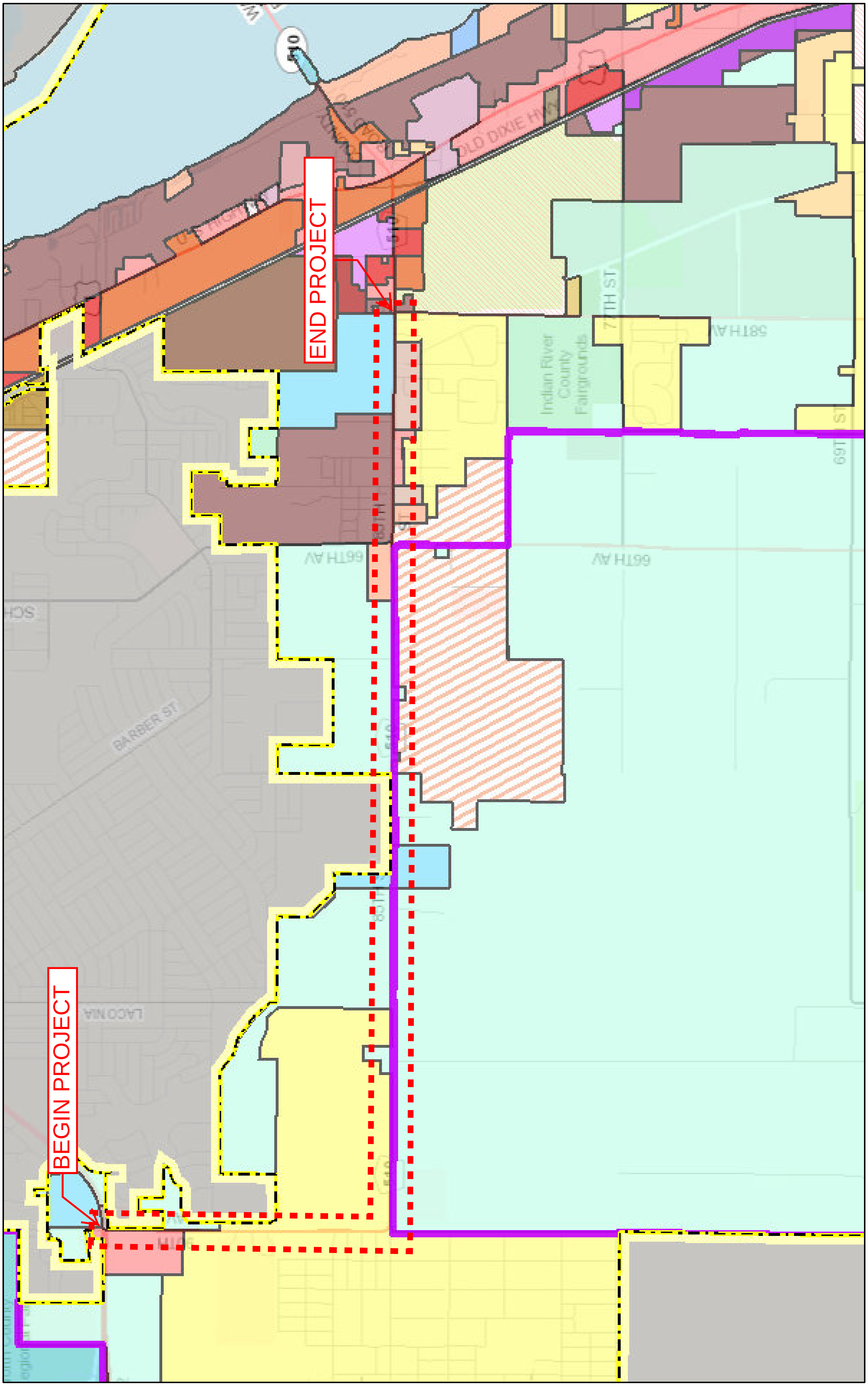
11 REFERENCES

1. FDOT 2017 Drainage Manual
2. FDOT 2017 Drainage Design Guide
3. FDOT 2017 Plans Preparation Manual
4. SJRWMD Permit Information Manual Volume II; 2013

APPENDIX A

(Figures and Maps)

IRC Planning & Zoning



November 7, 2016

Municipal Boundaries

Urban Services Area

1:38,400

0 0.325 0.65 1.3 mi

0 0.5 1 2 km

IRCGIS, IRCPA
IRC Planning Department

IndianRiverCounty

INDIAN RIVER COUNTY ZONING LEGEND

Zoning

	A-1	*Agricultural-1 District (up to 1 unit/5 acres)*
	A-2	*Agricultural-2 District (up to 1 unit/10 acres)*
	A-3	*Agricultural-3 District (up to 1 unit/20 acres)*
	AIR-1	*Airfield/Residential District*
	CG	*General Commercial District*
	CH	*Heavy Commercial District*
	CL	*Limited Commercial District*
	CN	*Neighborhood Commercial District*
	CON-1	*Public Lands Conservation District (Zero (0) Density)*
	CON-2	*Estuarine Wetlands Conservation District (up to 1 unit/40 acres)*
	CON-3	*St. Sebastian River Xeric Scrub Conservation District (up to 1 unit/2.5 acres)*
	CRVP	*Commercial Recreational Vehicle Park District (up to 14 units/acre)*
	IG	*General Industrial District*
	IL	*Light Industrial District*
	MED	*Medical District*
	MUNI	*Incorporated Municipality*
	OCR	*Office, Commercial, & Residential District*
	PD	*Planned Development District*
	PDMXD	*Planned Development Mixed Use District*
	PDTND	*Planned Development Traditional Neighborhood Design*
	PRO	*Professional Office District*
	R-BCID	*Blue Cypress Improvement District (up to 10 units/acre)*
	RFD	*Rural Fringe Development District (up to 1 unit/2.5 acres)*
	RM-3	*Multiple-Family Residential District (up to 3 units/acre)*
	RM-4	*Multiple-Family Residential District (up to 4 units/acre)*
	RM-6	*Multiple-Family Residential District (up to 6 units/acre)*
	RM-8	*Multiple-Family Residential District (up to 8 units/acre)*
	RM-10	*Multiple-Family Residential District (up to 10 units/acre)*
	RM-10 ex	*FLUE Policy 10.4 allowed L-1 designation (exception to Zoning Ordinance)*
	RMH-6	*Mobile Home Residential District (up to 6 units/acre)*
	RMH-8	*Mobile Home Residential District (up to 8 units/acre)*
	RS-1	*Single-Family Residential District (up to 1 unit/acre)*
	RS-2	*Single-Family Residential District (up to 2 unit/acre)*
	RS-3	*Single-Family Residential District (up to 3 unit/acre)*
	RS-6	*Single-Family Residential District (up to 6 unit/acre)*
	RT-6	*Two-Family Residential District (up to 6 units/acre)*
	Rose-4	*Roseland Residential District (up to 4 units/acre)*

Document Path: U:\Commdev\ZoningMaps\Zoning_Legend.mxd
last update: 10/18/16

Questions concerning the VERTCON process may be mailed to [NGS]

Latitude: 27 44 55.580

Longitude: 080 29 19.270

NGVD 29 height: 0020.00 FT

Datum shift(NAVD 88 minus NGVD 29): -1.463 feet

Converted to NAVD 88 height: 18.537 feet

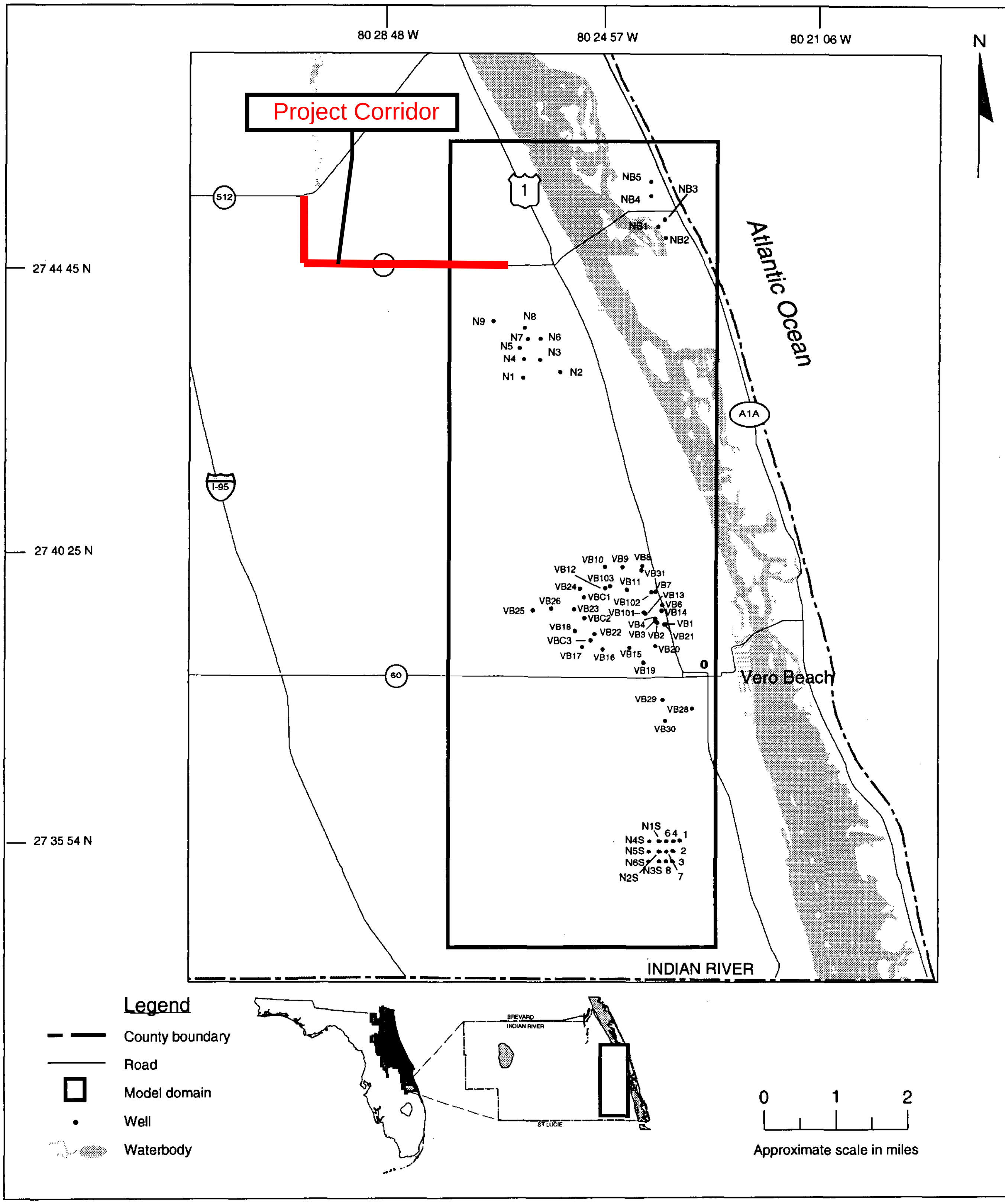


Figure 2. **Model domain and well locations.** *Wells with the "VB" prefix are located in the City of Vero Beach wellfield. All other wells are part of the Indian River County wellfield.*

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

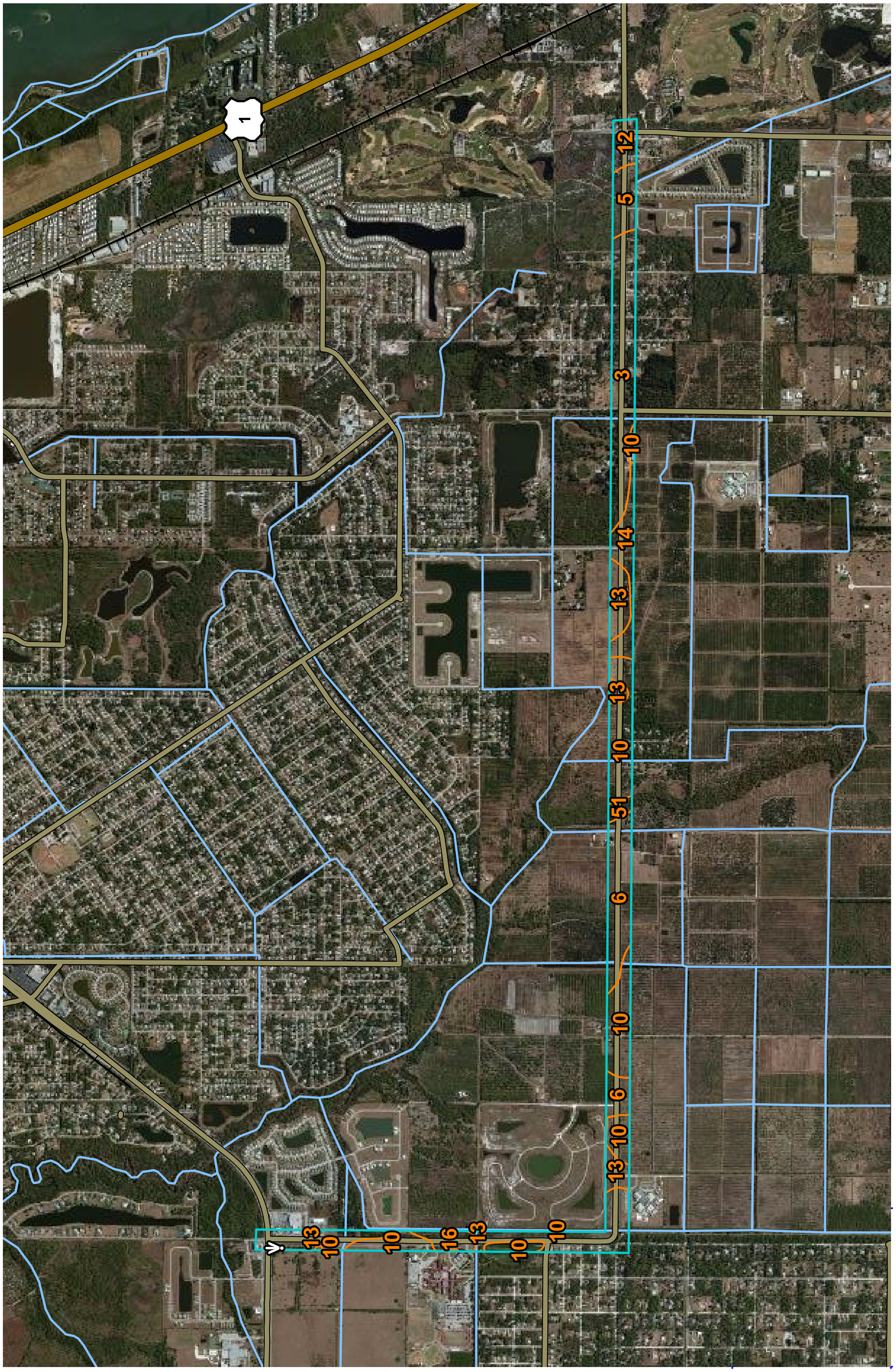
Soil Map—Indian River County, Florida

27° 46' 51'' N

27° 44' 4'' N

80° 26' 16'' W

80° 26' 16'' W



80° 31' 7'' W

80° 31' 7'' W

27° 46' 51'' N

27° 44' 4'' N

Map Scale: 1:36,400 if printed on A landscape (11" x 8.5") sheet.

Meters
0 500 1000 2000 3000

Feet
0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84

N

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/4/2016
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Indian River County, Florida
Survey Area Data: Version 14, Nov 19, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 15, 2010—Mar 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table: Soil Types in Project Area		
Map Unit Symbol	**Map Unit Name**	**Description**
3	EauGallie fine sand	▪ Hydrologic Soil Group A/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 5 inches consist of fine sand 5 to 26 inches consist of fine sand 26 to 42 inches consist of fine sand 42 to 47 inches consist of fine sand 47 to 62 inches consist of sandy clay loam 62 to 80 inches consist of loamy sand ▪ Permeability rate: 0.06 to 1.98 in/hr
5	Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	▪ Hydrologic Soil Group A/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 6 inches consist of fine sand 6 to 20 inches consist of fine sand 20 to 36 inches consist of fine sand 36 to 80 inches consist of fine sand ▪ Permeability rate: 0.57 to 5.95 in/hr
6	Oldsmar fine sand	▪ Hydrologic Soil Group A/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 5 inches consist of fine sand 5 to 32 inches consist of fine sand 32 to 50 inches consist of fine sand 50 to 62 inches consist of sandy clay loam 62 to 80 inches consist of loamy fine sand ▪ Permeability rate: 0.06 to 0.20 in/hr

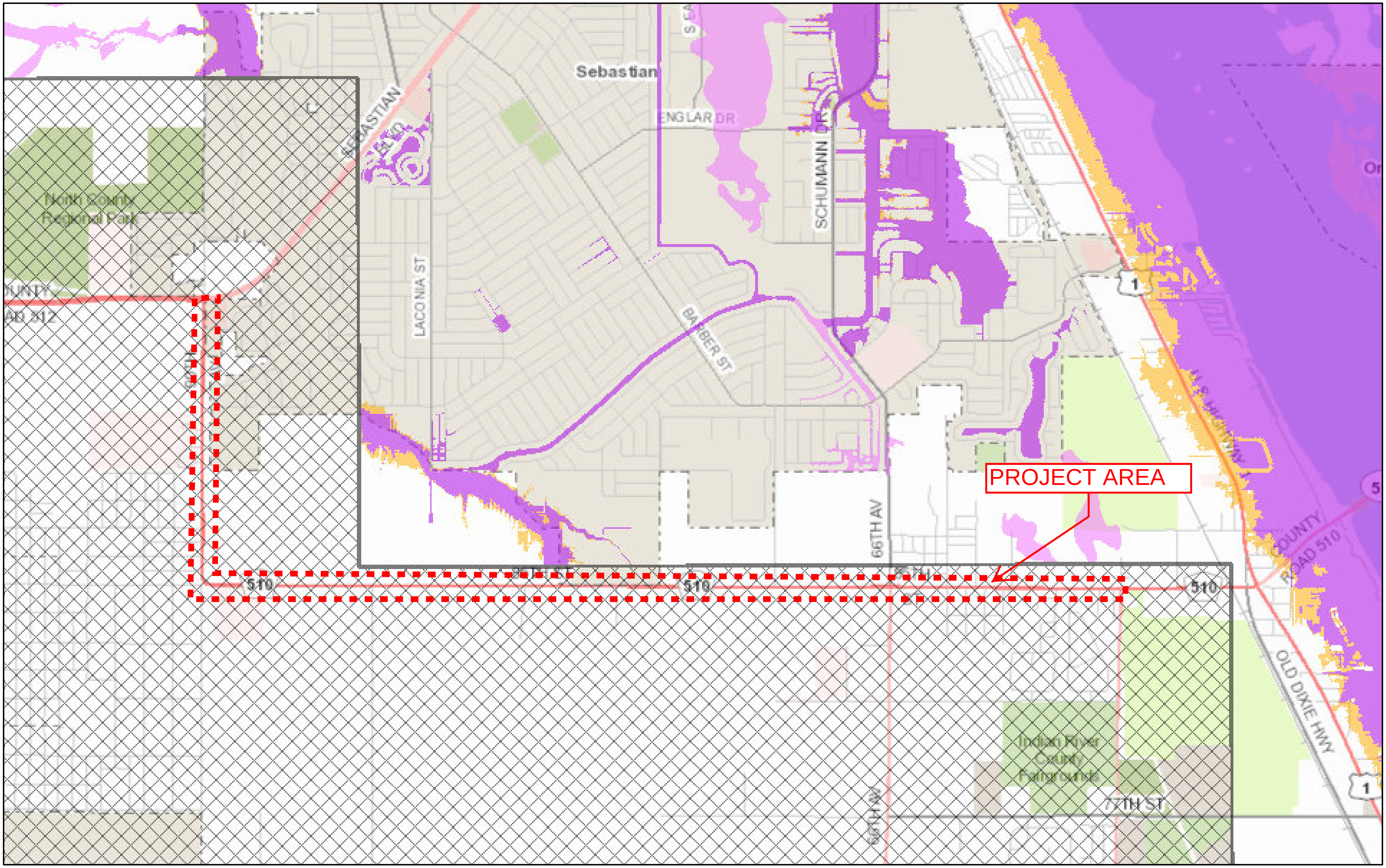
Table: Soil Types in Project Area		
Map Unit Symbol	**Map Unit Name**	**Description**
10	Riviera fine sand, 0 to 2 percent slopes	▪ Hydrologic Soil Group A/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 6 inches consist of fine sand 6 to 28 inches consist of fine sand 28 to 36 inches consist of sandy loam 36 to 42 inches consist of sandy clay loam 42 to 80 inches consist of fine sand ▪ Permeability rate: 0.60 to 6.00 in/hr
12	Archbold sand, 0 to 5 percent slopes	▪ Hydrologic Soil Group A ▪ Drainage Class: moderately well drained ▪ Profile: 0 to 2 inches consist of sand 2 to 80 inches consist of sand ▪ Permeability rate: 20.00 to 50.02 in/hr
13	Wabasso fine sand	▪ Hydrologic Soil Group C/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 7 inches consist of fine sand 7 to 24 inches consist of fine sand 24 to 35 inches consist of fine sand 35 to 48 inches consist of sandy clay loam 48 to 80 inches consist of loamy sand ▪ Permeability rate: 0.06 to 0.20 in/hr

Table: Soil Types in Project Area		
Map Unit Symbol	**Map Unit Name**	**Description**
14	Winder fine sand, 0 to 2 percent slopes	▪ Hydrologic Soil Group C/D ▪ Drainage Class: poorly drained ▪ Profile: 0 to 7 inches consist of fine sand 7 to 17 inches consist of fine sand 17 to 23 inches consist of sandy loam 23 to 34 inches consist of sandy loam 34 to 48 inches consist of sandy loam 48 to 65 inches consist of sandy loam 65 to 80 inches consist of loamy sand ▪ Permeability rate: 0.06 to 0.20 in/hr
16	Pineda fine sand	Hydrologic Soil Group C/D Drainage Class: poorly drained Profile: 0 to 4 inches consist of fine sand 4 to 9 inches consist of fine sand 9 to 23 inches consist of fine sand 23 to 40 inches consist of sandy loam 40 to 80 inches consist of loamy sand Permeability rate: 0.06 to 0.20 in/hr
51	Riviera fine sand, depressional, 0 to 1 percent slopes	Hydrologic Soil Group A/D Drainage Class: very poorly drained Profile: 0 to 4 inches consist of fine sand 4 to 36 inches consist of fine sand 36 to 42 inches consist of fine sandy loam 42 to 56 inches consist of fine sand 56 to 80 inches consist of fine sand Permeability rate: 0.60 to 2.00 in/hr

Map Unit Legend

Indian River County, Florida (FL061)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	EauGallie fine sand	52.5	18.5%
5	Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	13.1	4.6%
6	Oldsmar fine sand	38.6	13.6%
10	Riviera fine sand, 0 to 2 percent slopes	95.8	33.8%
12	Archbold sand, 0 to 5 percent slopes	9.3	3.3%
13	Wabasso fine sand	40.5	14.3%
14	Winder fine sand, 0 to 2 percent slopes	17.9	6.3%
16	Pineda fine sand	8.0	2.8%
51	Riviera fine sand, depressional, 0 to 1 percent slopes	3.4	1.2%
99	Water	4.5	1.6%
Totals for Area of Interest		**283.6**	**100.0%**

FEMA Flood Zones for Indian River County, FL



October 12, 2016

FEMA Special Flood Hazard Areas

- Zone A
- Zone AE
- Zone AO
- Zone VE
- 0.2 PCT Chance Flood Area
- Zone X
- Area in Dispute

1:38,400

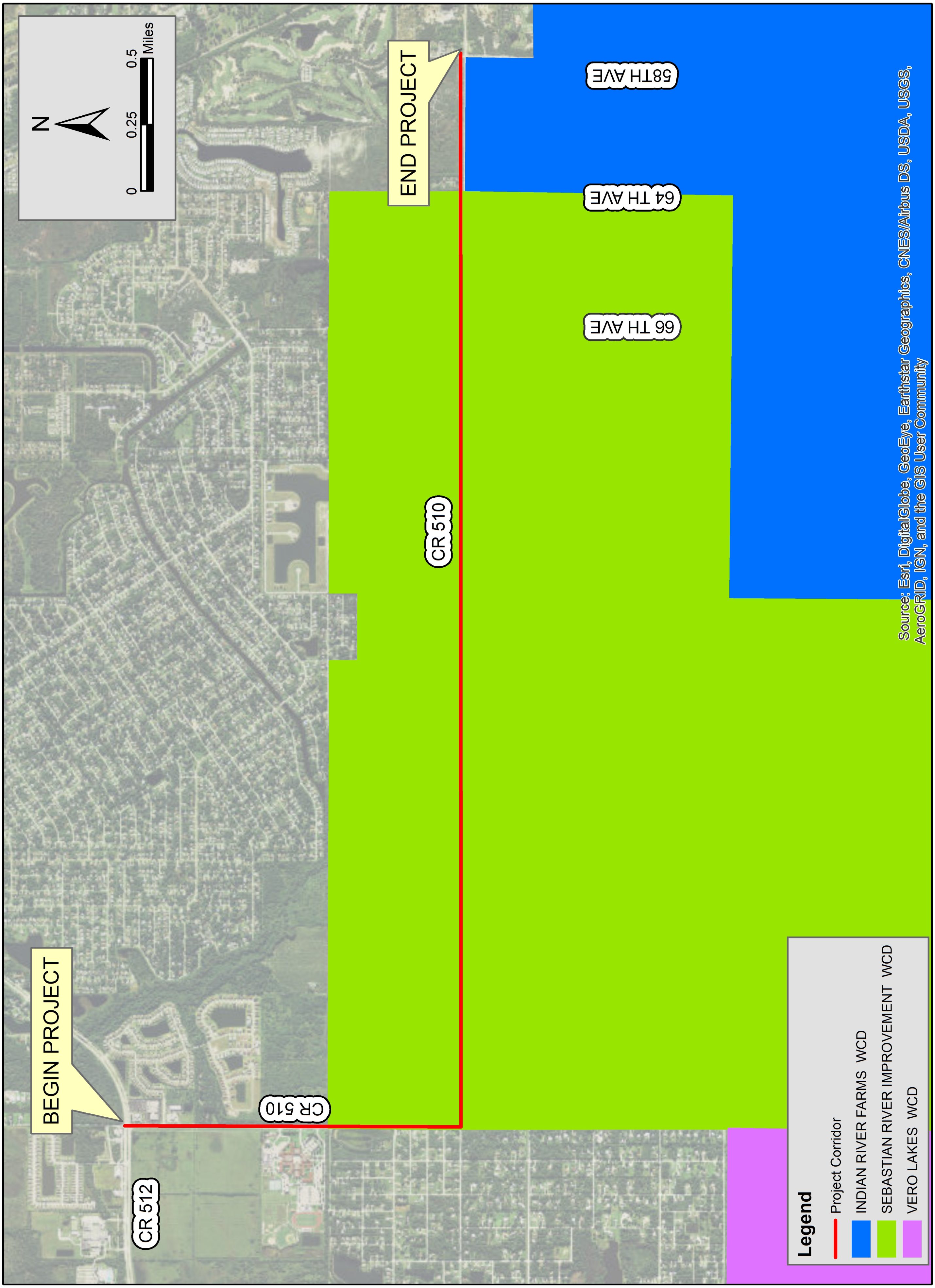
0 0.3 0.6 1.2 mi

0 0.375 0.75 1.5 km

IRCGIS, IRCPA
FEMA

IndianRiverCounty

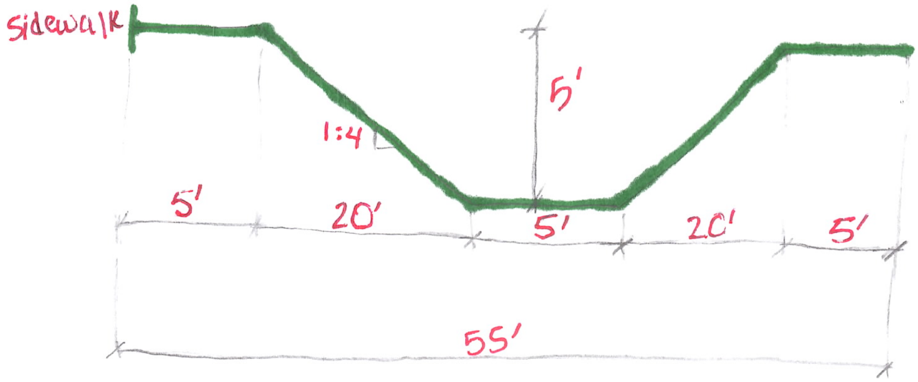
WATER CONTROL DISTRICTS (WCD)



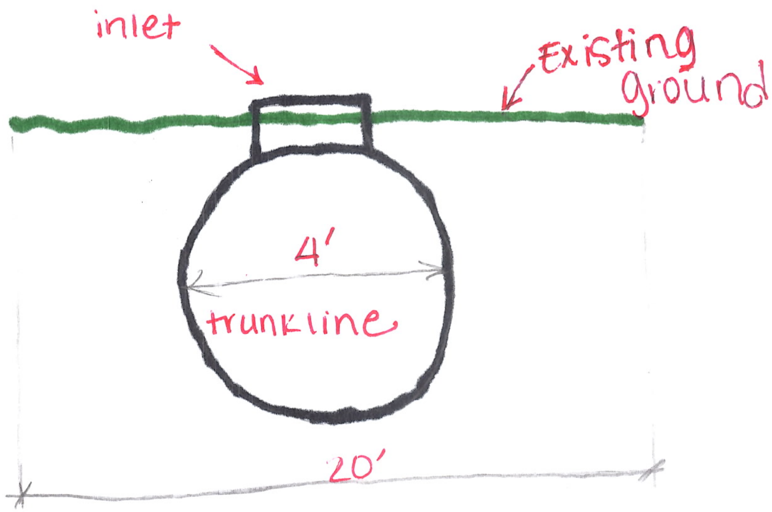
Date:11/3/2016

Prepared by: Snubbs Consulting Inc.

Open swale offsite drainage



Trunkline offsite drainage

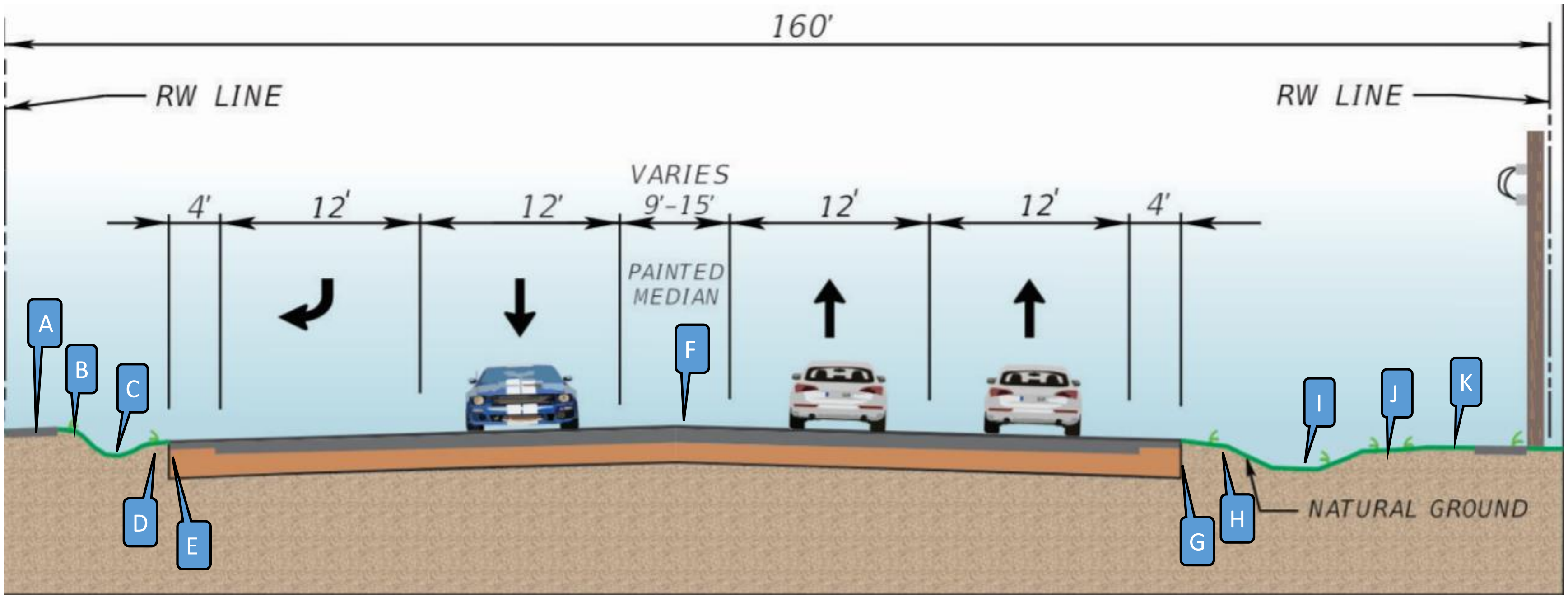


APPENDIX B

(Calculations)

Basin 1 Existing Typical Section

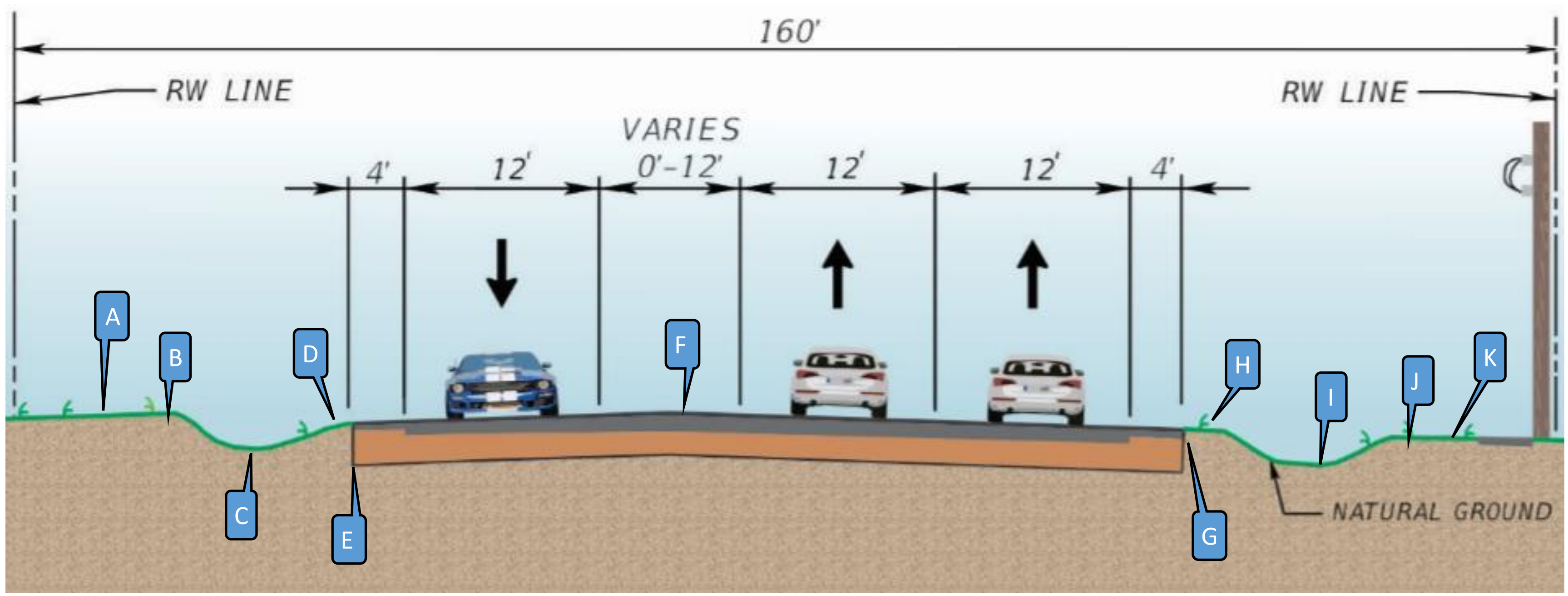
Total Impervious Width = 71-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	19.00	G	Edge of Pavement (West)	18.39
B	Top of swale high side (East)	19.00	H	Top of swale high side (West)	18.31
C	Swale bottom (East)	18.50	I	Swale bottom (West)	17.40
D	Top of swale low side (East)	18.36	J	Top of swale low side (West)	18.31
E	Edge of Pavement (East)	18.39	K	Existing Ground (West)	18.31
F	Crown	19.10			

Basin 2 Existing Typical Section

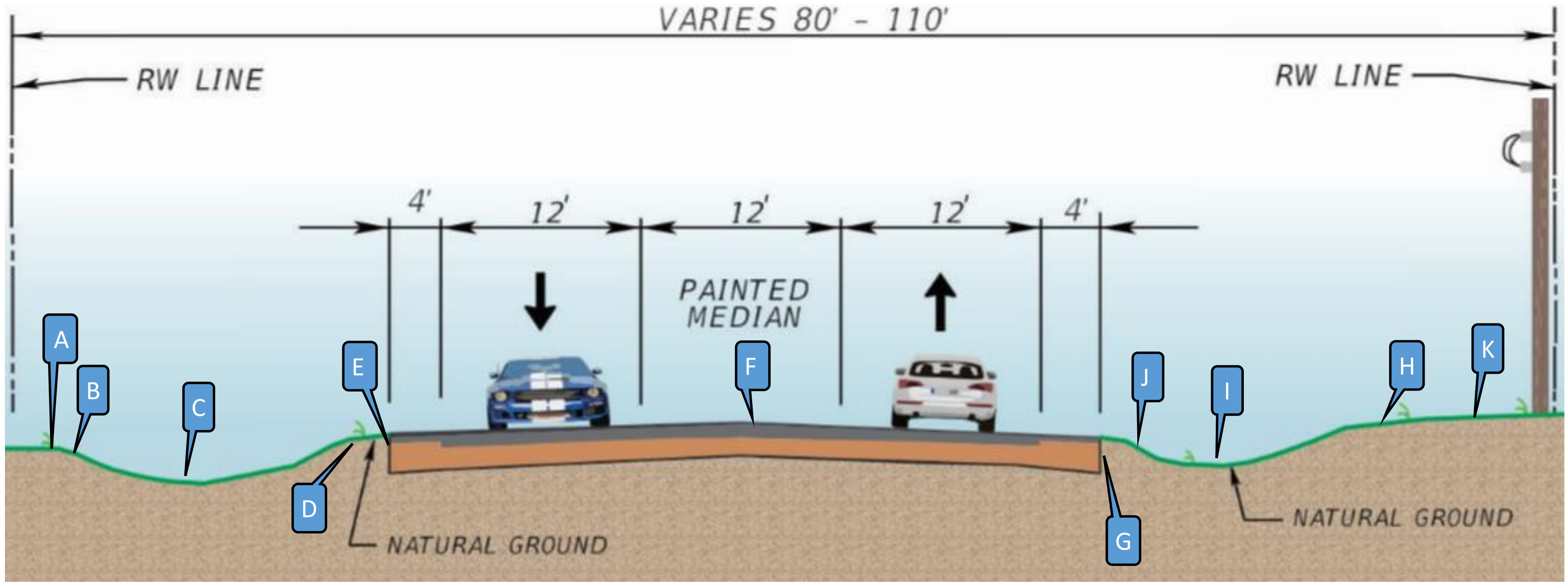
Total Impervious = 56-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	17.73	G	Edge of Pavement (West)	18.44
B	Top of swale high side (East)	17.73	H	Top of swale high side (West)	18.37
C	Swale bottom (East)	16.60	I	Swale bottom (West)	16.90
D	Top of swale low side (East)	18.66	J	Top of swale low side (West)	18.37
E	Edge of Pavement (East)	18.44	K	Existing Ground (West)	18.37
F	Crown	19.12			

Basin 3 Existing Typical Section

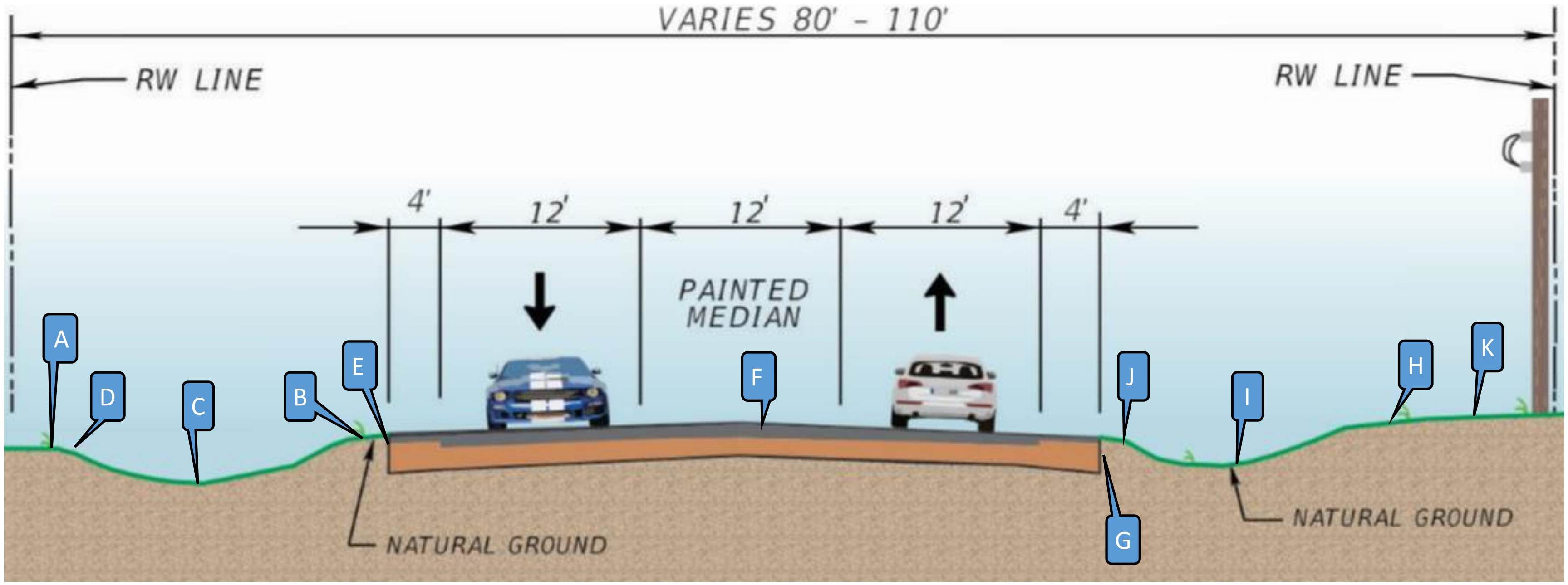
Total Impervious Width = 44-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	19.04	G	Edge of Pavement (West)	20.06
B	Top of swale high side (East)	19.04	H	Top of swale high side (West)	20.02
C	Swale bottom (East)	18.54	I	Swale bottom (West)	18.90
D	Top of swale low side (East)	19.99	J	Top of swale low side (West)	20.02
E	Edge of Pavement (East)	20.06	K	Existing Ground (West)	20.02
F	Crown	20.50			

Basin 4 Existing Typical Section

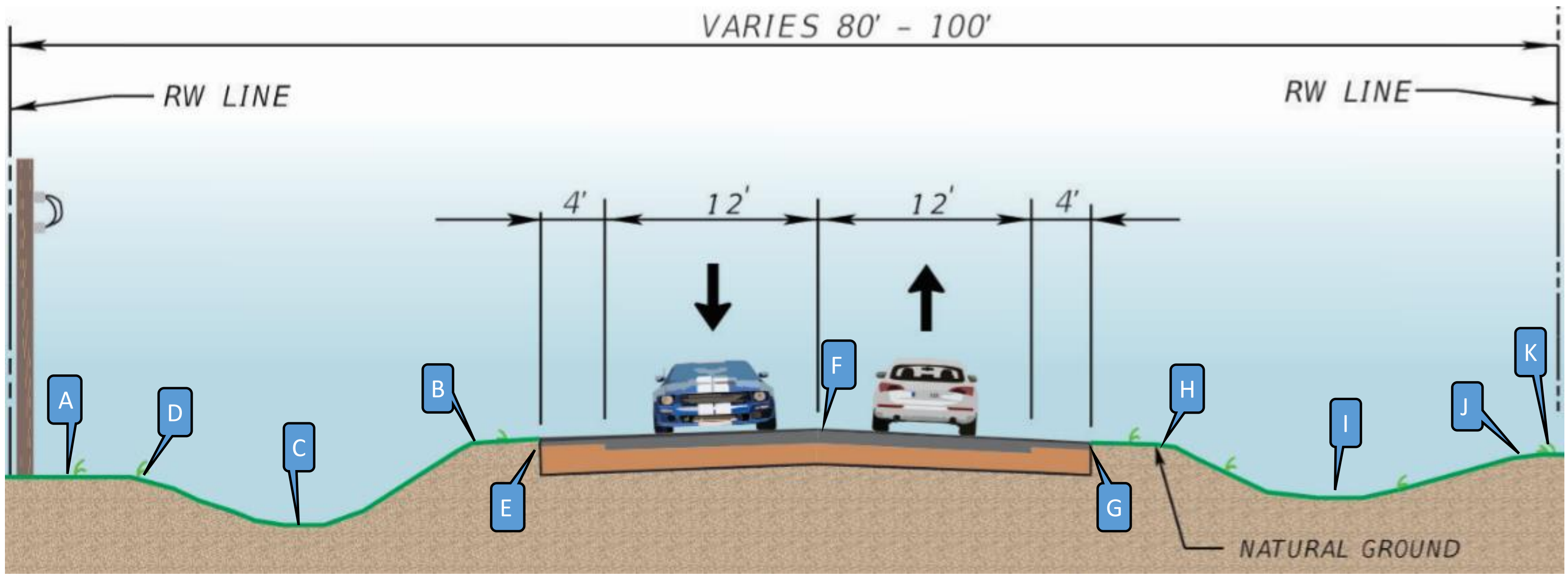
Total Impervious Width = 44-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	19.93	G	Edge of Pavement (South)	19.91
B	Top of swale high side (North)	19.93	H	Top of swale high side (South)	19.86
C	Swale bottom (North)	18.30	I	Swale bottom (South)	18.45
D	Top of swale low side (North)	19.84	J	Top of swale low side (South)	19.86
E	Edge of Pavement (North)	19.91	K	Existing Ground (South)	19.86
F	Crown	20.35			

Basin 5 Existing Typical Section

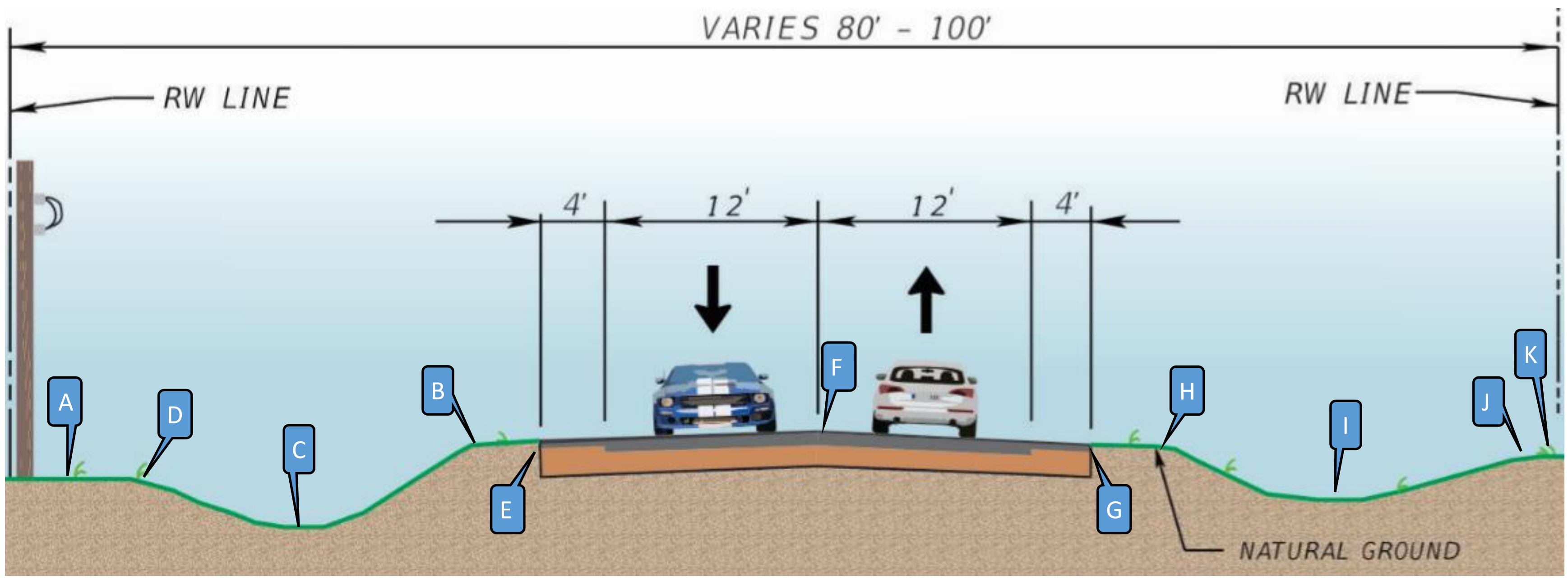
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	18.54	G	Edge of Pavement (South)	18.63
B	Top of swale high side (North)	18.54	H	Top of swale high side (South)	18.54
C	Swale bottom (North)	18.05	I	Swale bottom (South)	17.45
D	Top of swale low side (North)	18.55	J	Top of swale low side (South)	18.54
E	Edge of Pavement (North)	18.63	K	Existing Ground (South)	18.54
F	Crown	18.95			

Basin 6 Existing Typical Section

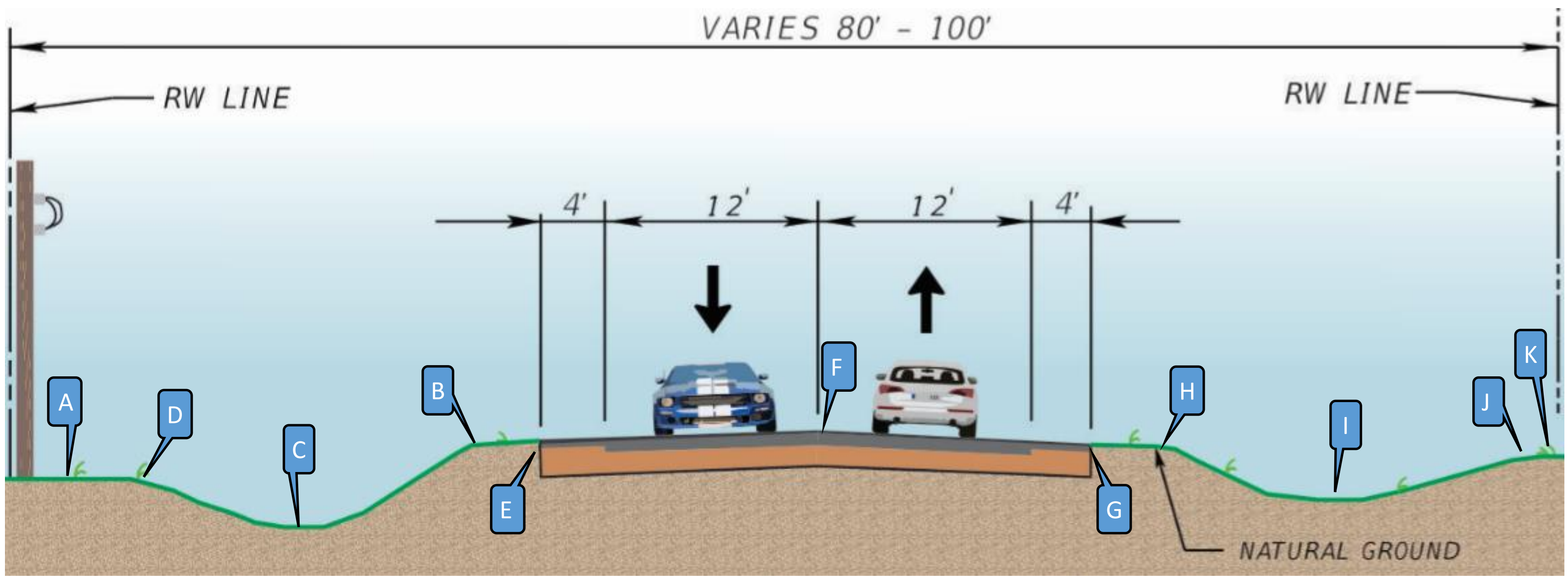
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	17.71	G	Edge of Pavement (South)	18.37
B	Top of swale high side (North)	17.71	H	Top of swale high side (South)	18.28
C	Swale bottom (North)	16.35	I	Swale bottom (South)	16.42
D	Top of swale low side (North)	18.29	J	Top of swale low side (South)	18.28
E	Edge of Pavement (North)	18.37	K	Existing Ground (South)	18.28
F	Crown	18.69			

Basin 7 Existing Typical Section

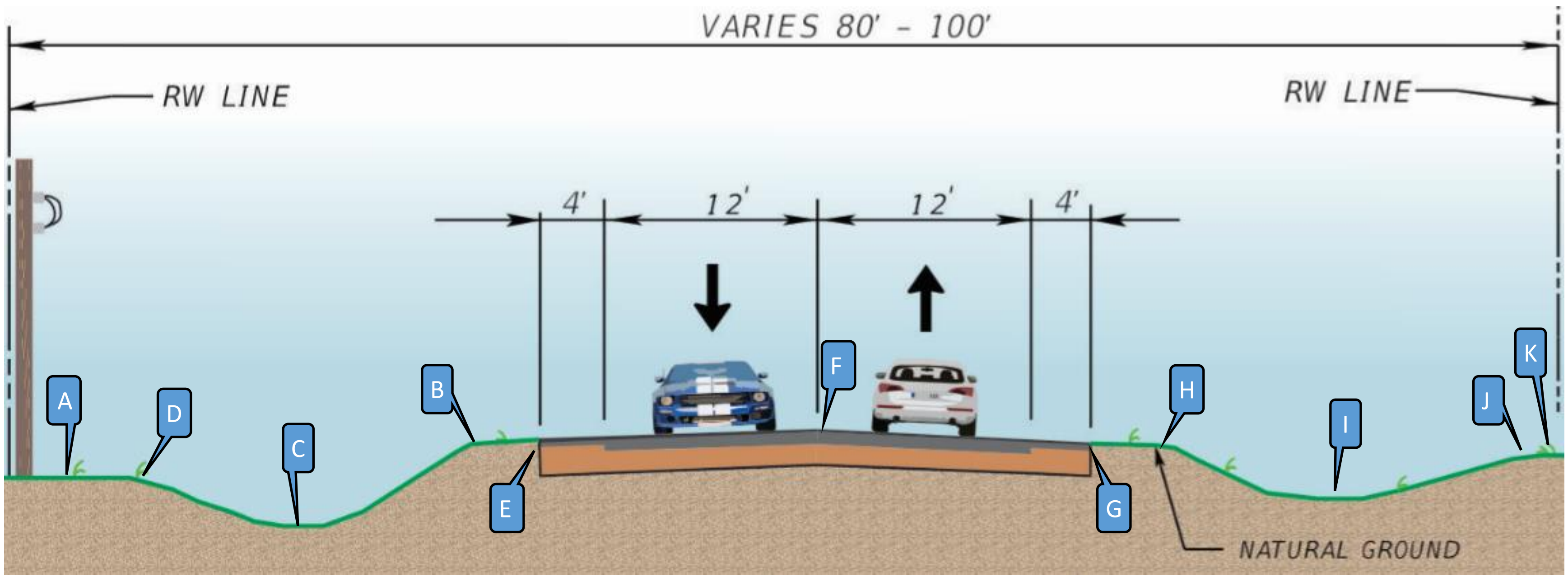
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	13.91	G	Edge of Pavement (South)	17.00
B	Top of swale high side (North)	13.91	H	Top of swale high side (South)	16.91
C	Swale bottom (North)	12.55	I	Swale bottom (South)	15.34
D	Top of swale low side (North)	16.92	J	Top of swale low side (South)	16.91
E	Edge of Pavement (North)	17.00	K	Existing Ground (South)	16.91
F	Crown	17.32			

Basin 8 Existing Typical Section

Total Impervious Width = 40-ft*

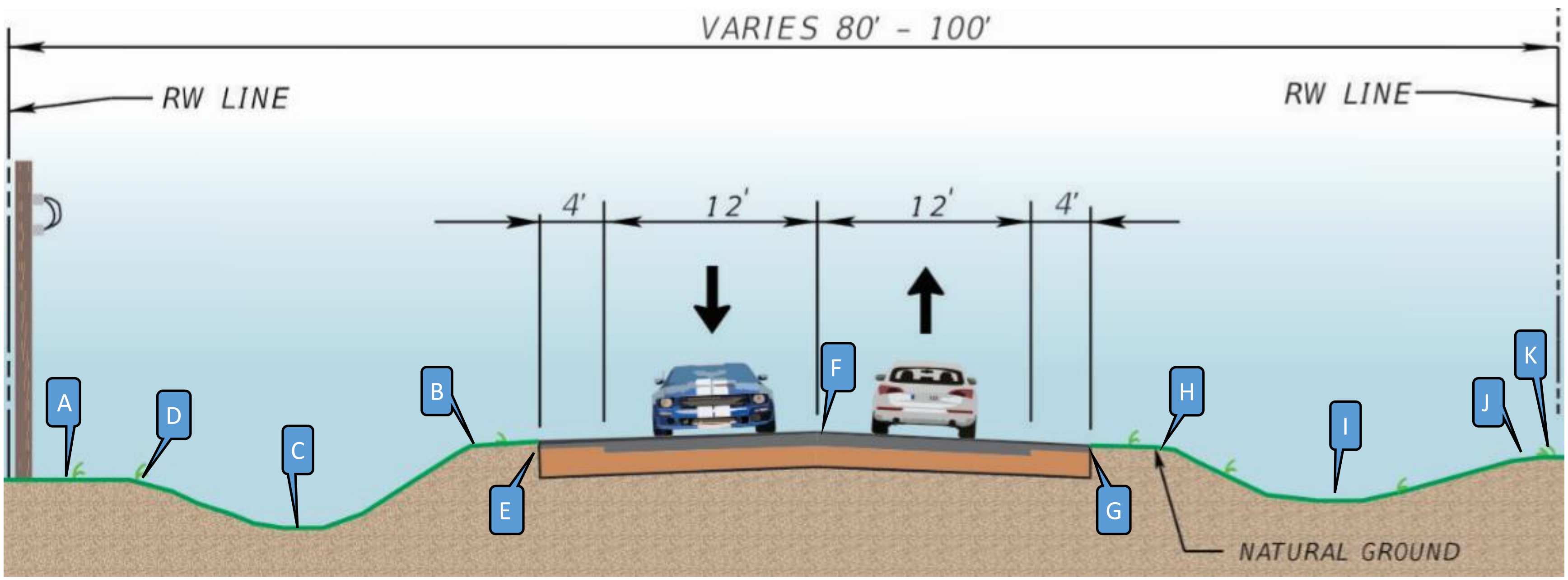


ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	16.71	G	Edge of Pavement (South)	20.00
B	Top of swale high side (North)	16.71	H	Top of swale high side (South)	19.91
C	Swale bottom (North)	15.35	I	Swale bottom (South)	18.23
D	Top of swale low side (North)	19.92	J	Top of swale low side (South)	19.91
E	Edge of Pavement (North)	20.00	K	Existing Ground (South)	19.91
F	Crown	20.32			

* This basin lies within two design alternatives, therefore the total impervious width was prorated to represent both alternatives.

Basin 9 Existing Typical Section

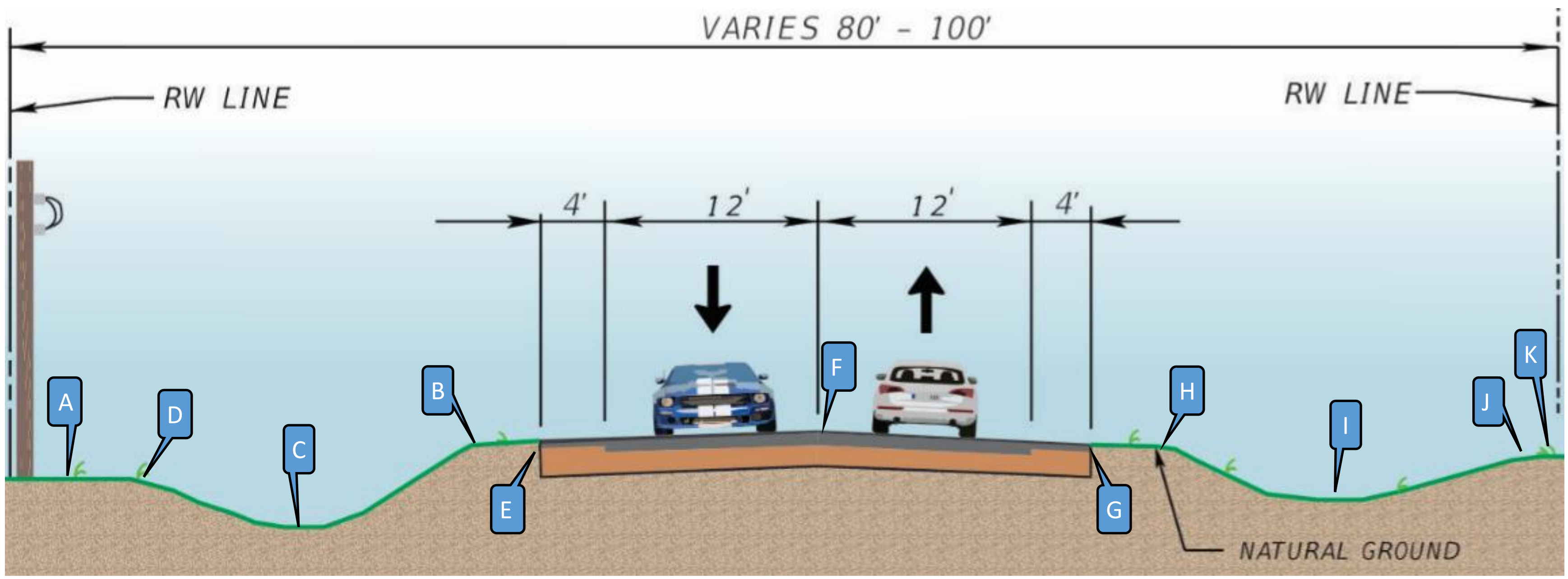
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	20.02	G	Edge of Pavement (South)	21.99
B	Top of swale high side (North)	20.02	H	Top of swale high side (South)	21.90
C	Swale bottom (North)	18.66	I	Swale bottom (South)	21.32
D	Top of swale low side (North)	21.91	J	Top of swale low side (South)	21.90
E	Edge of Pavement (North)	21.99	K	Existing Ground (South)	21.90
F	Crown	22.31			

Basin 10 Existing Typical Section

Total Impervious Width = 40-ft*

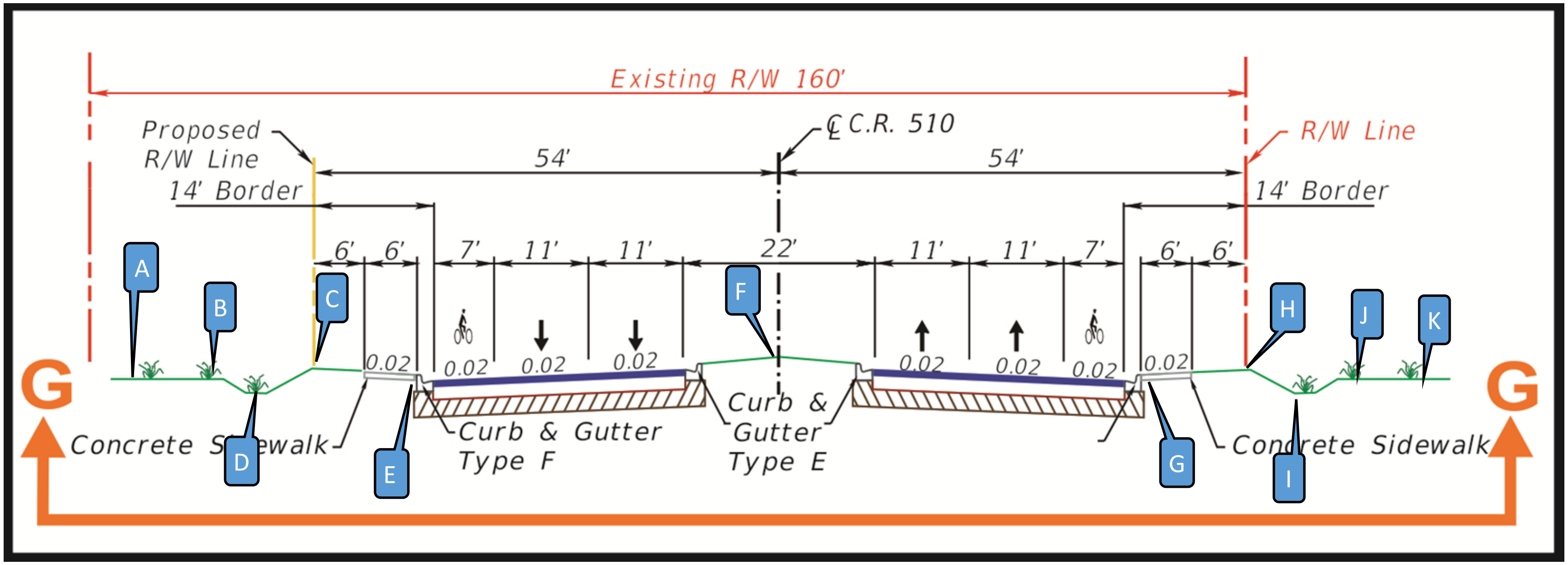


ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	21.76	G	Edge of Pavement (South)	22.78
B	Top of swale high side (North)	21.76	H	Top of swale high side (South)	22.69
C	Swale bottom (North)	19.76	I	Swale bottom (South)	18.80
D	Top of swale low side (North)	22.70	J	Top of swale low side (South)	22.69
E	Edge of Pavement (North)	22.78	K	Existing Ground (South)	22.69
F	Crown	23.10			

* This basin lies within two design alternatives, therefore the total impervious width was prorated to represent both alternatives.

Basin 1 Proposed Typical Section

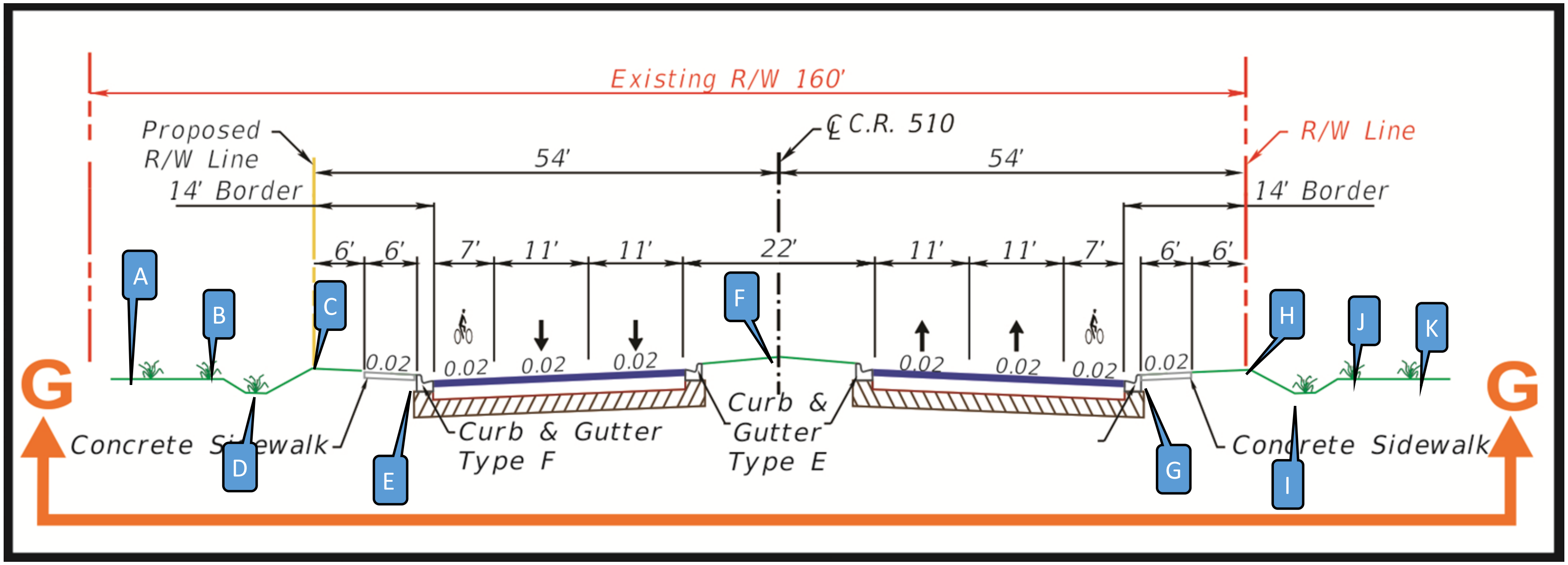
Total Impervious Width = 71-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	17.55	G	Edge of Pavement (West)	18.10
B	Top of swale high side (East)	17.55	H	Top of swale high side (West)	18.30
C	Swale bottom (East)	16.80	I	Swale bottom (West)	16.80
D	Top of swale low side (East)	18.30	J	Top of swale low side (West)	17.55
E	Edge of Pavement (East)	18.10	K	Existing Ground (West)	17.55
F	Crown	18.90			

Basin 2 Proposed Typical Section

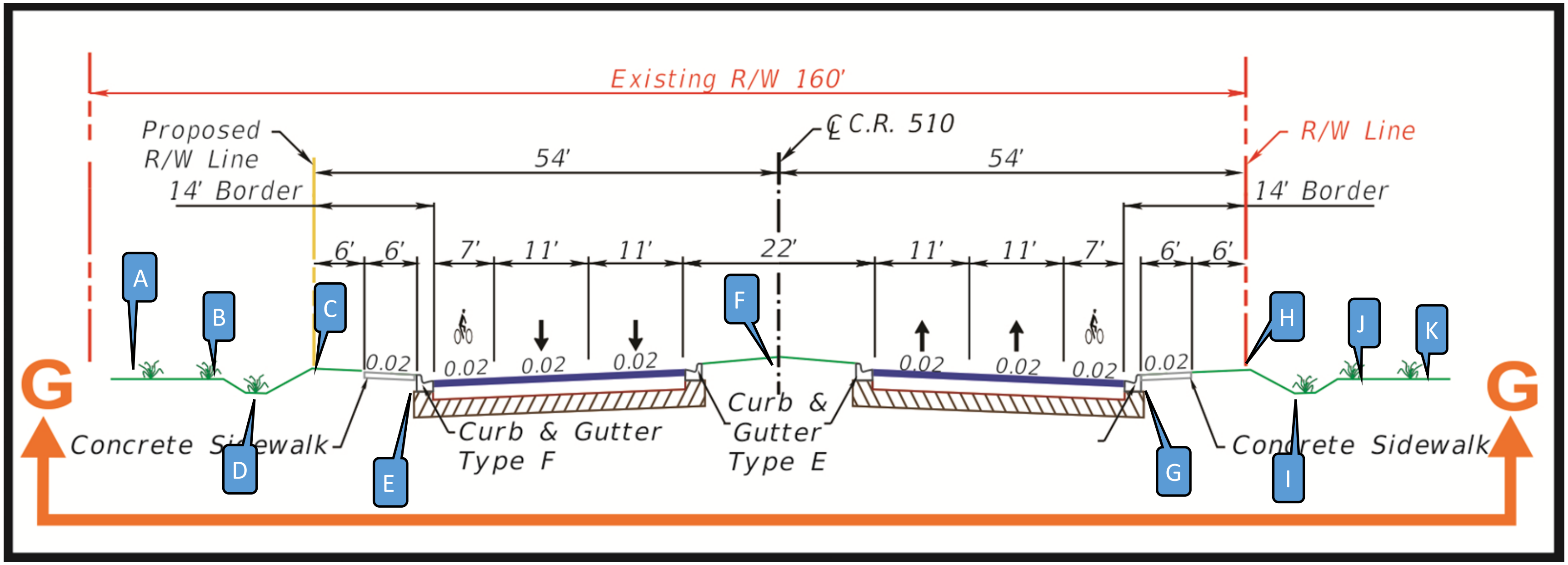
Total Impervious = 56-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	17.95	G	Edge of Pavement (West)	18.50
B	Top of swale high side (East)	17.95	H	Top of swale high side (West)	18.70
C	Swale bottom (East)	17.20	I	Swale bottom (West)	17.20
D	Top of swale low side (East)	18.70	J	Top of swale low side (West)	17.95
E	Edge of Pavement (East)	18.50	K	Existing Ground (West)	17.95
F	Crown	19.30			

Basin 3 Proposed Typical Section

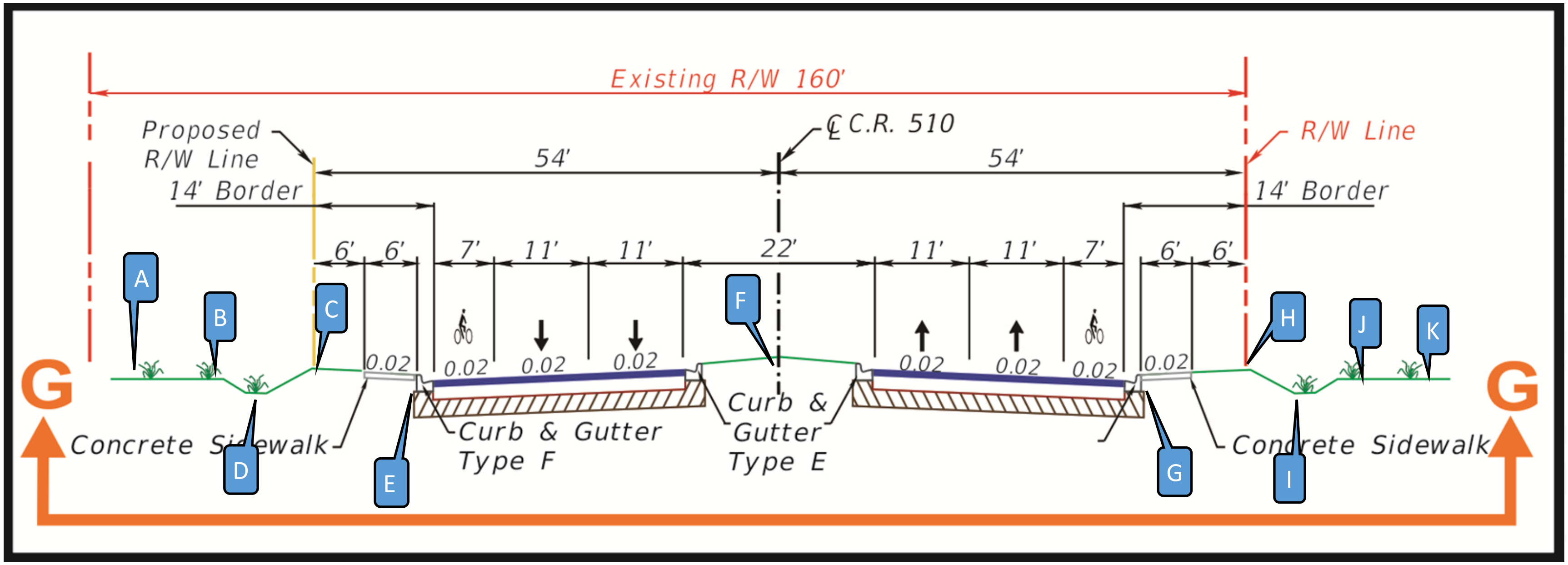
Total Impervious Width = 44-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (East)	19.95	G	Edge of Pavement (West)	20.50
B	Top of swale high side (East)	19.95	H	Top of swale high side (West)	20.70
C	Swale bottom (East)	19.20	I	Swale bottom (West)	19.20
D	Top of swale low side (East)	20.70	J	Top of swale low side (West)	19.95
E	Edge of Pavement (East)	20.50	K	Existing Ground (West)	19.95
F	Crown	21.30			

Basin 4 Proposed Typical Section

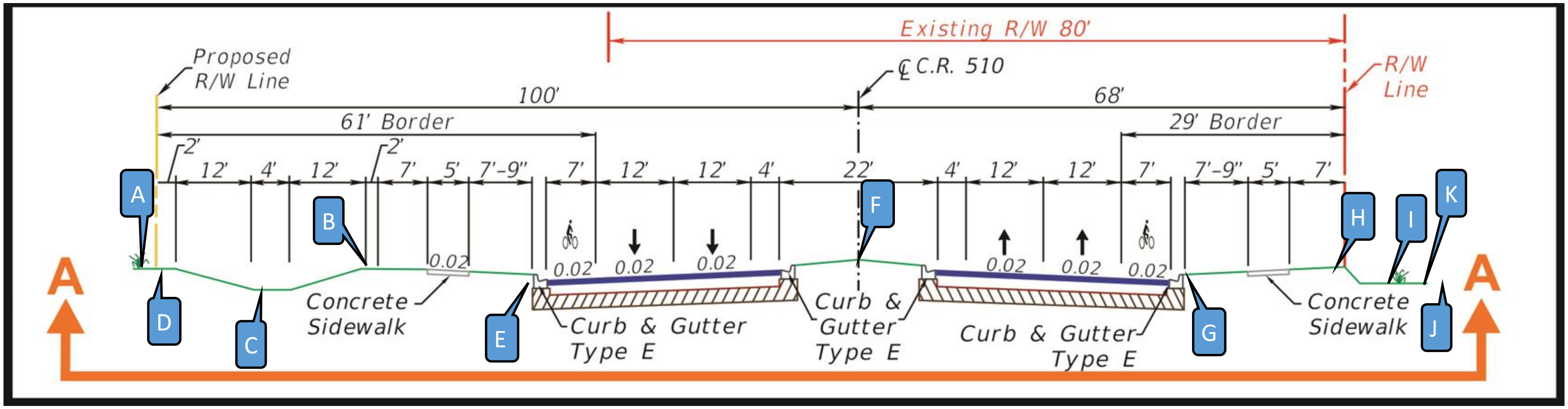
Total Impervious Width = 44-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	19.35	G	Edge of Pavement (South)	19.90
B	Top of swale high side (North)	19.35	H	Top of swale high side (South)	20.10
C	Swale bottom (North)	18.60	I	Swale bottom (South)	18.60
D	Top of swale low side (North)	20.10	J	Top of swale low side (South)	19.35
E	Edge of Pavement (North)	19.90	K	Existing Ground (South)	19.35
F	Crown	20.70			

Basin 5 Proposed Typical Section

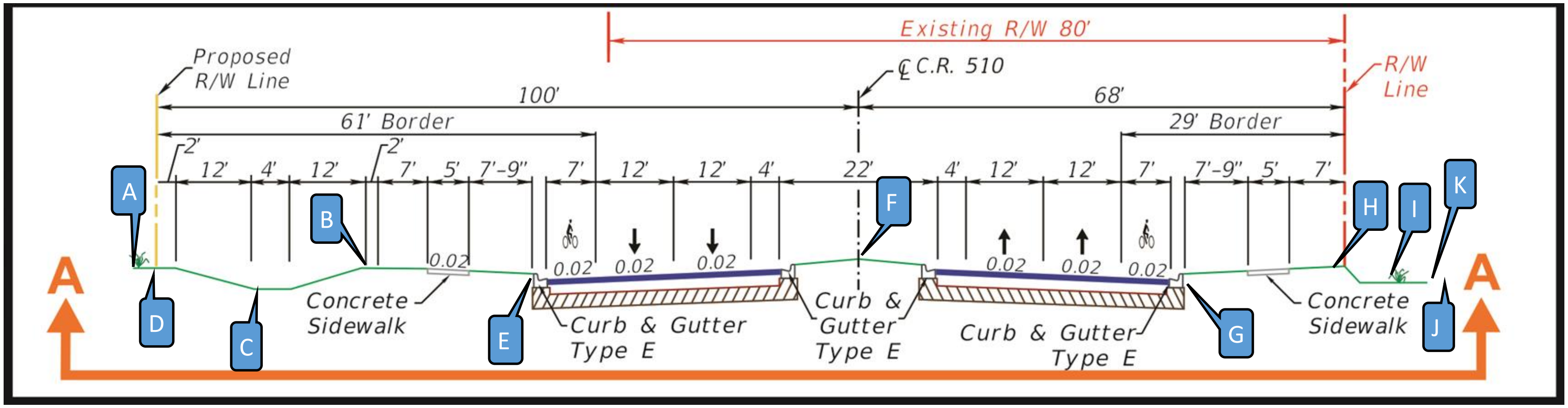
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	18.78	G	Edge of Pavement (South)	18.38
B	Top of swale high side (North)	18.78	H	Top of swale high side (South)	18.74
C	Swale bottom (North)	15.78	I	Swale bottom (South)	17.99
D	Top of swale low side (North)	18.78	J	Top of swale low side (South)	17.99
E	Edge of Pavement (North)	18.38	K	Existing Ground (South)	17.99
F	Crown	19.30			

Basin 6 Proposed Typical Section

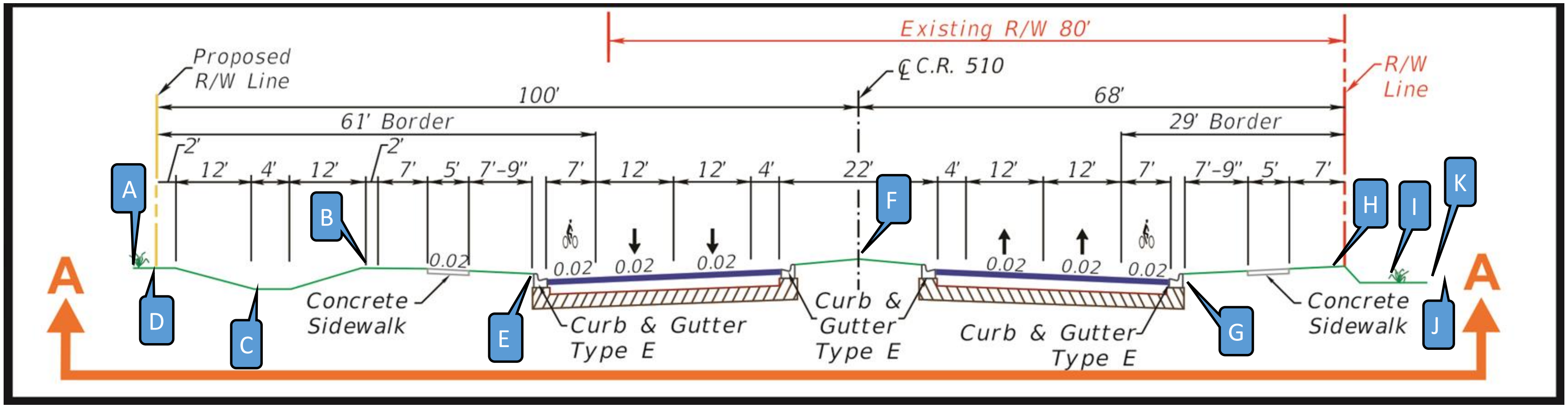
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	19.28	G	Edge of Pavement (South)	18.88
B	Top of swale high side (North)	19.28	H	Top of swale high side (South)	19.24
C	Swale bottom (North)	16.28	I	Swale bottom (South)	18.49
D	Top of swale low side (North)	19.28	J	Top of swale low side (South)	18.49
E	Edge of Pavement (North)	18.88	K	Existing Ground (South)	18.49
F	Crown	19.80			

Basin 7 Proposed Typical Section

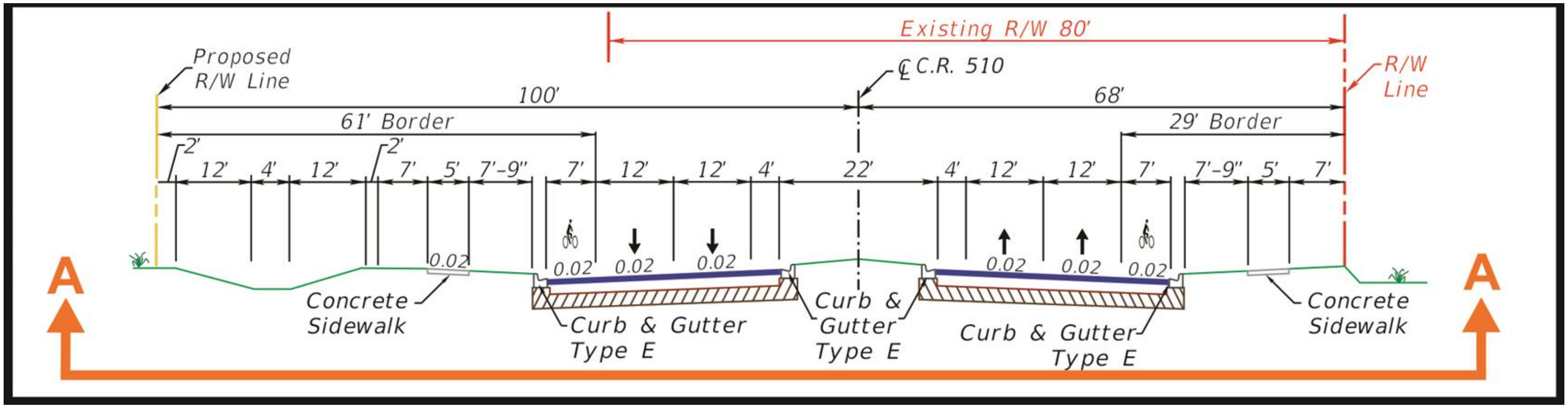
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	18.88	G	Edge of Pavement (South)	18.48
B	Top of swale high side (North)	18.88	H	Top of swale high side (South)	18.84
C	Swale bottom (North)	15.88	I	Swale bottom (South)	18.09
D	Top of swale low side (North)	18.88	J	Top of swale low side (South)	18.09
E	Edge of Pavement (North)	18.48	K	Existing Ground (South)	18.09
F	Crown	19.40			

Basin 8 Proposed Typical Section

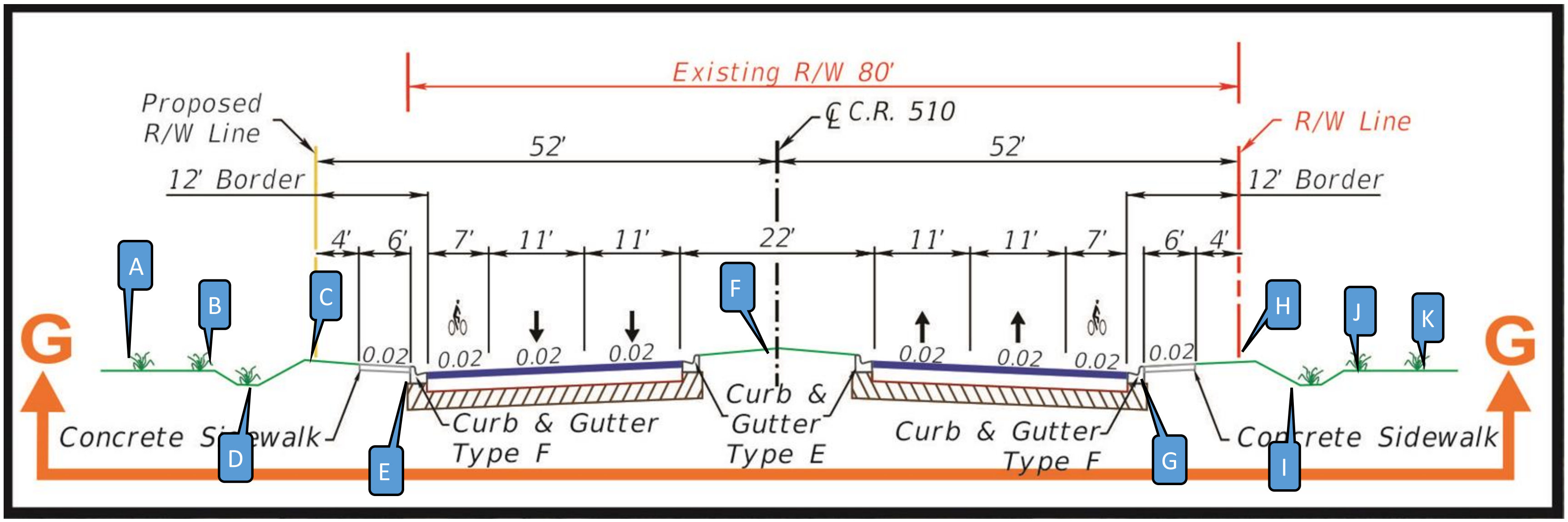
Total Impervious Width = 40-ft*



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	19.68	G	Edge of Pavement (South)	19.28
B	Top of swale high side (North)	19.68	H	Top of swale high side (South)	19.64
C	Swale bottom (North)	16.68	I	Swale bottom (South)	18.89
D	Top of swale low side (North)	19.68	J	Top of swale low side (South)	18.89
E	Edge of Pavement (North)	19.28	K	Existing Ground (South)	18.89
F	Crown	20.20			

Basin 9 Proposed Typical Section

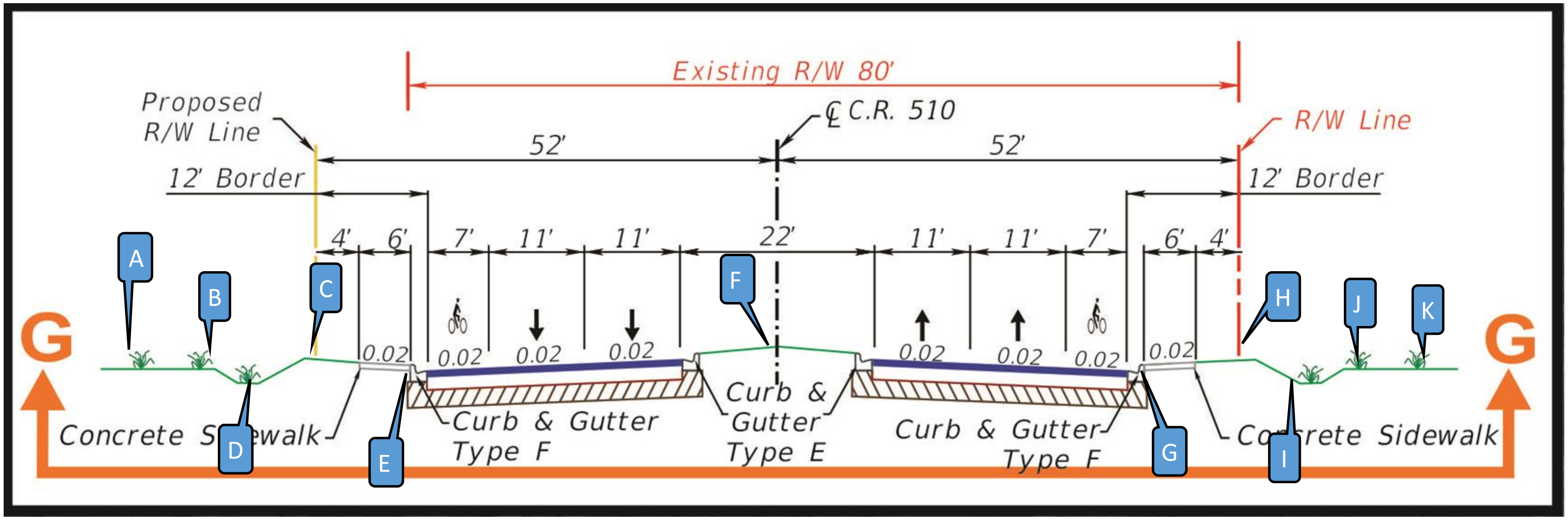
Total Impervious Width = 32-ft



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	20.91	G	Edge of Pavement (South)	21.50
B	Top of swale high side (North)	20.91	H	Top of swale high side (South)	21.66
C	Swale bottom (North)	20.16	I	Swale bottom (South)	20.16
D	Top of swale low side (North)	21.66	J	Top of swale low side (South)	20.91
E	Edge of Pavement (North)	21.50	K	Existing Ground (South)	20.91
F	Crown	22.30			

Basin 10 Proposed Typical Section

Total Impervious Width = 40-ft*



ID	Description	Elevation (ft.)	ID	Description	Elevation (ft.)
A	Existing Ground (North)	23.41	G	Edge of Pavement (South)	24.00
B	Top of swale high side (North)	23.41	H	Top of swale high side (South)	24.16
C	Swale bottom (North)	22.66	I	Swale bottom (South)	22.66
D	Top of swale low side (North)	24.16	J	Top of swale low side (South)	23.41
E	Edge of Pavement (North)	24.00	K	Existing Ground (South)	23.41
F	Crown	24.80			

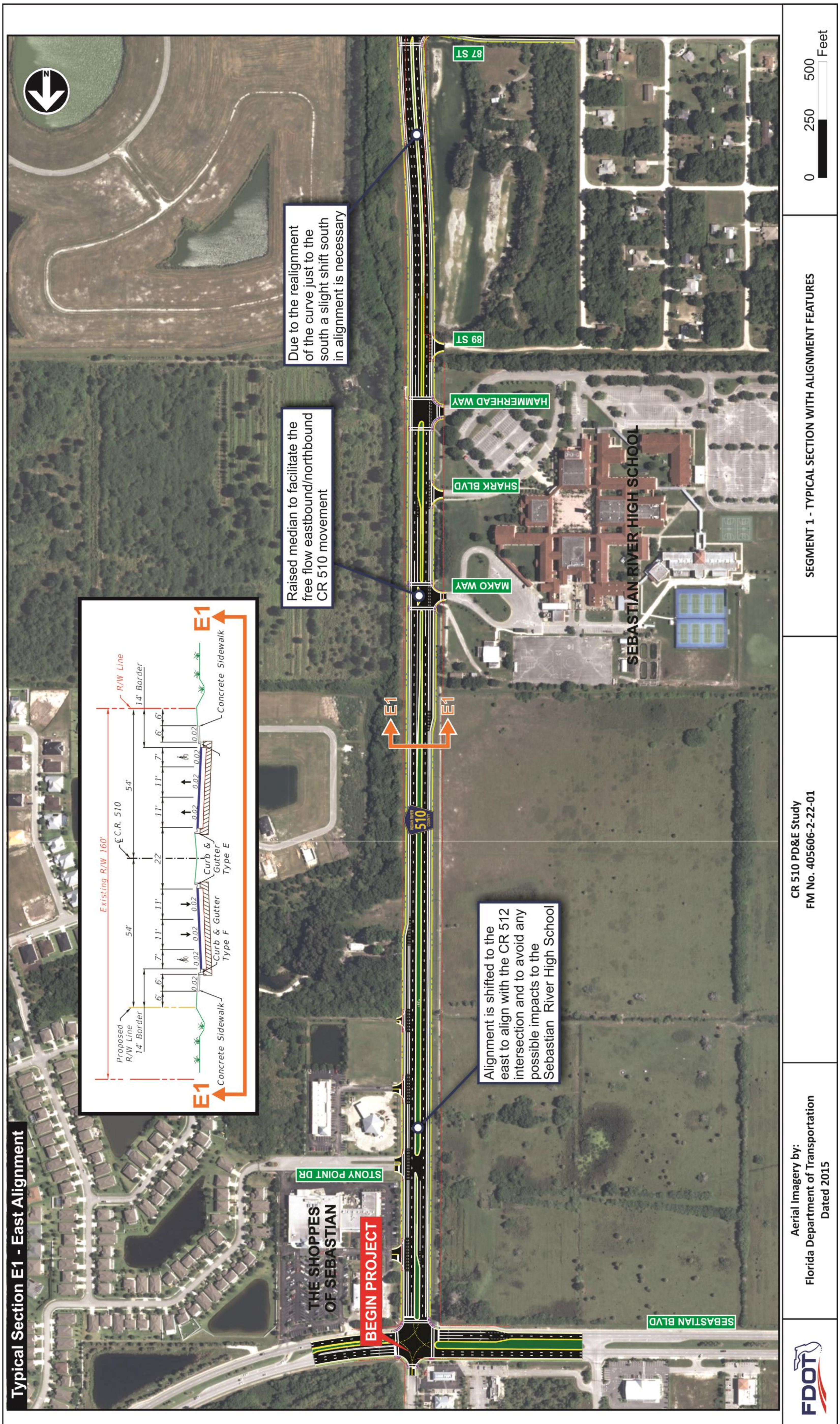


Figure 3 – Segment 1 Typical Section with Alignment Features

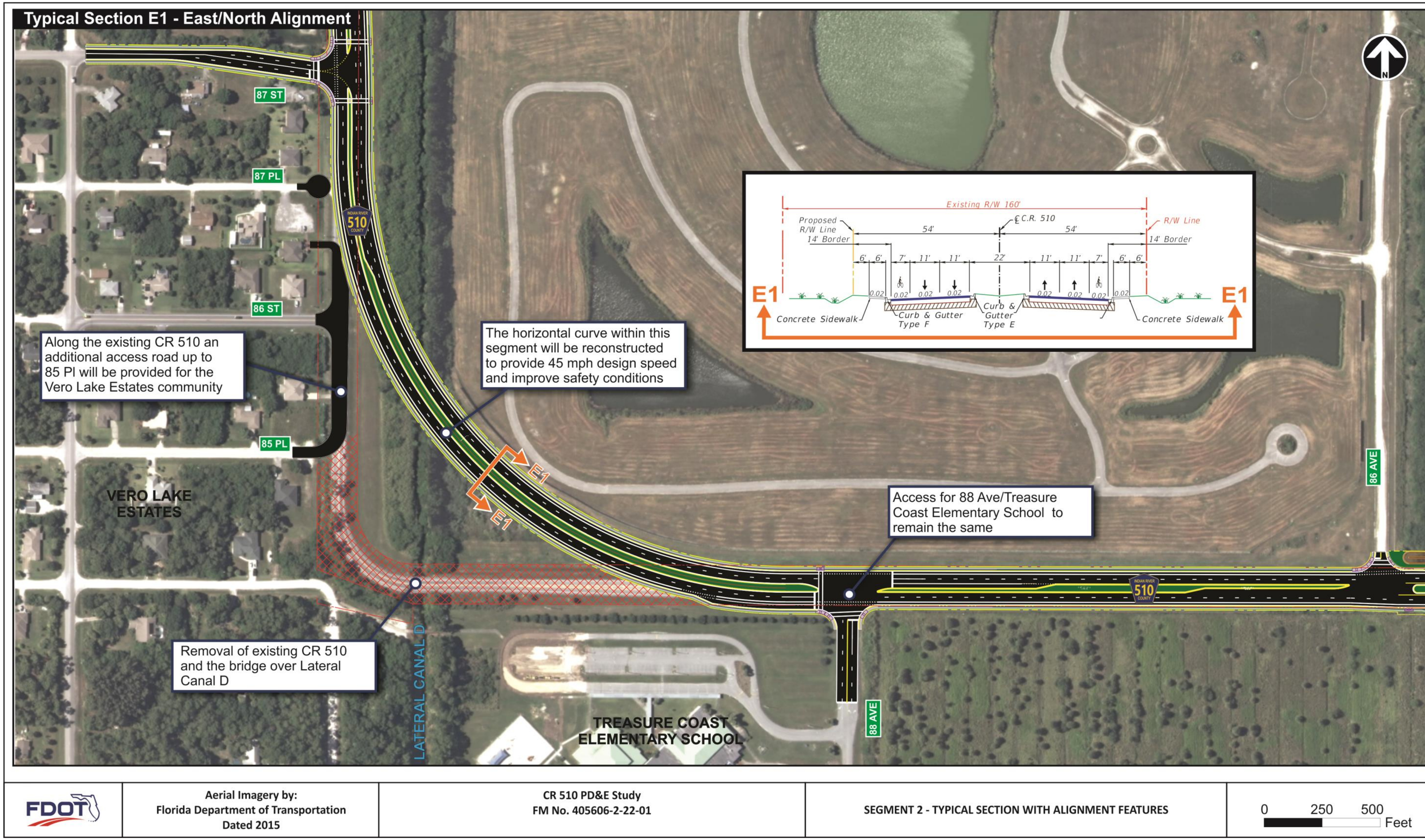


Figure 4 - Segment 2 Typical Section with Alignment Features

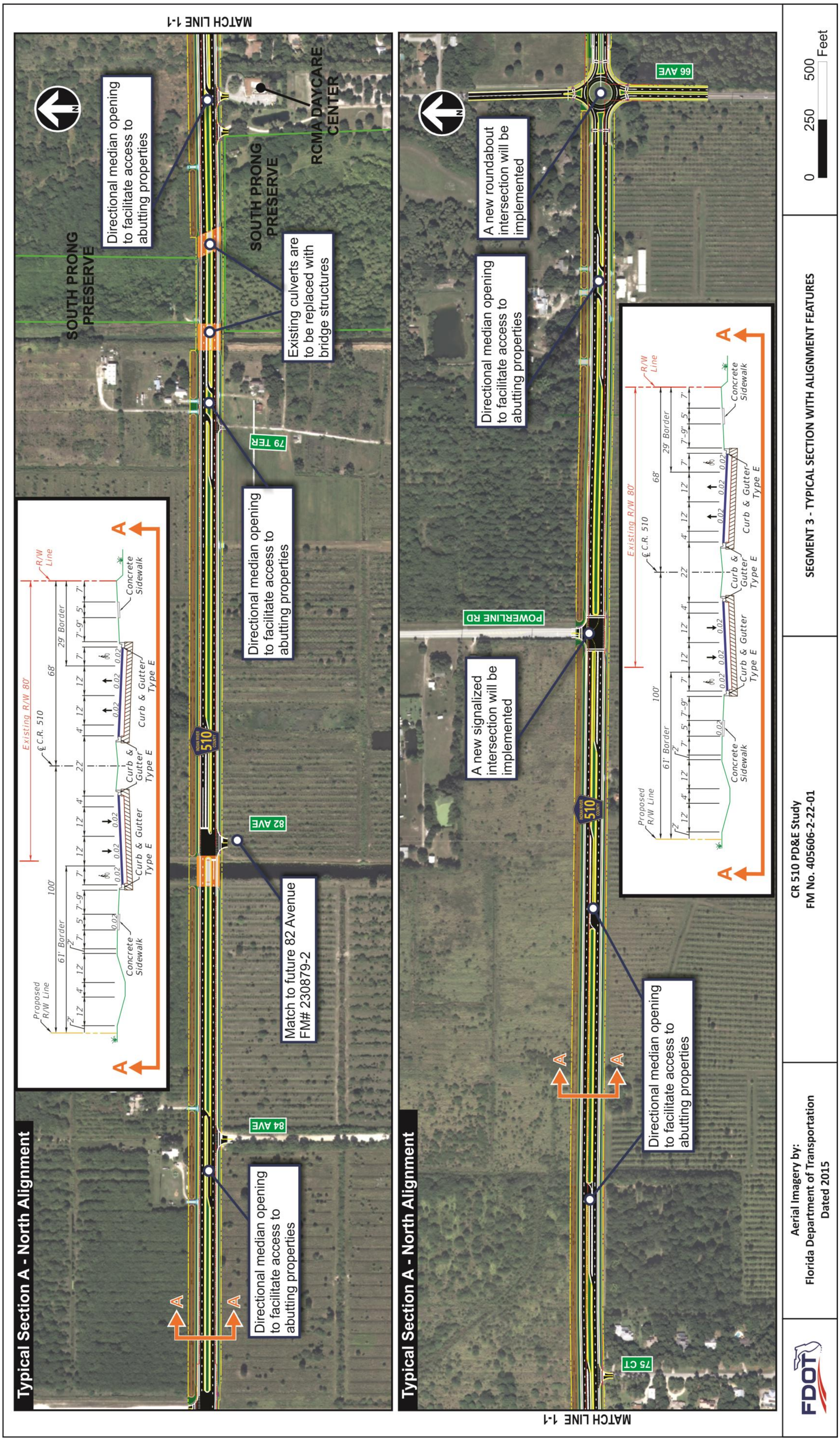


Figure 5 - Segment 3 Typical Section with Alignment Features

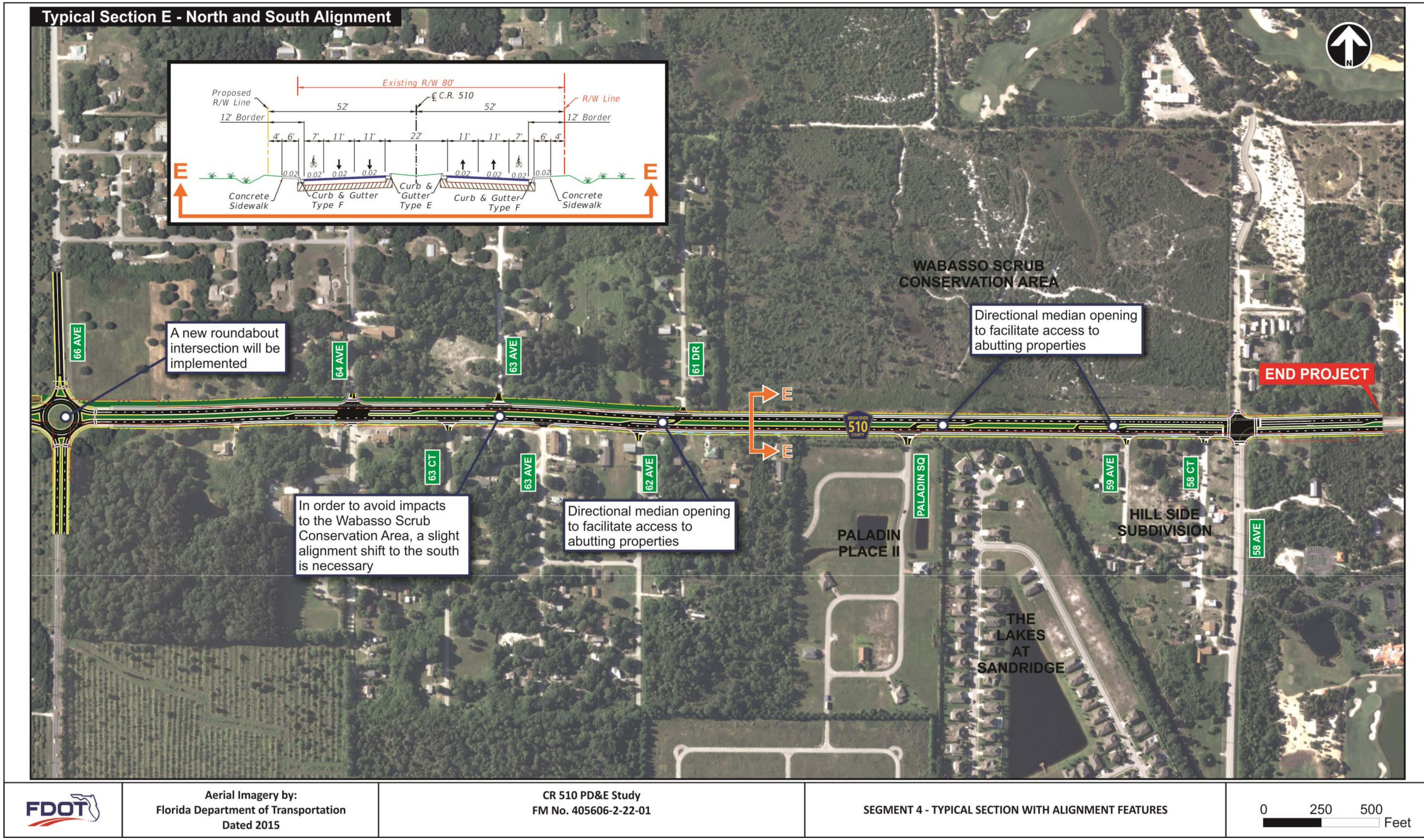
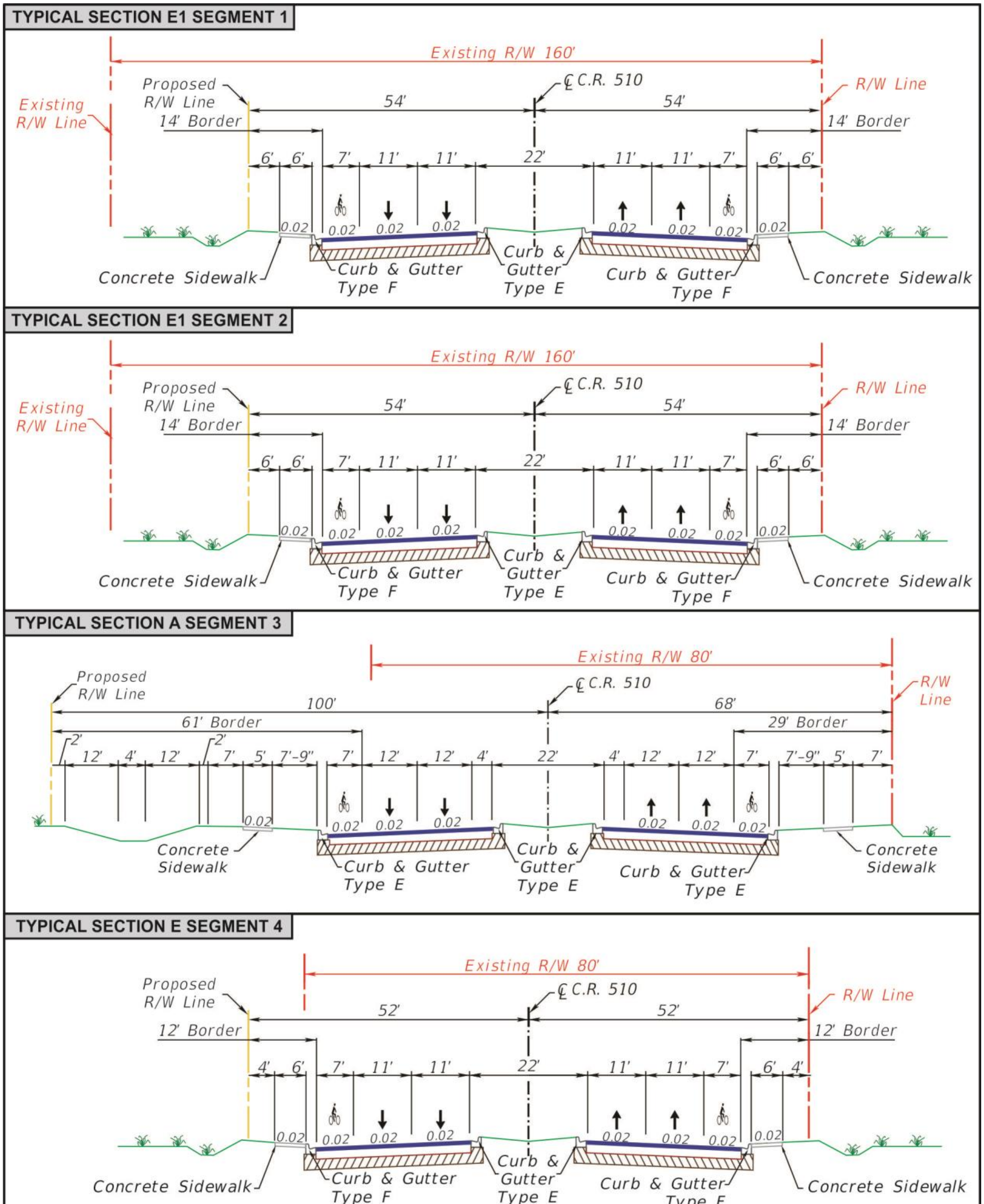


Figure 6 – Segment 4 Typical Section with Alignment Features



FDOT

CR 510 PD&E Study
FM No. 405606-2-22-01

Figure 7 – Typical Section Details

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 1 Preferred Alternative**
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

		AREAS	
DATA:		**PRE-DEV.**	**POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	1280.00	1280.00
LENGTH	ft	1280.00	1280.00
R. OF WAY WIDTH	ft	108.00	108.00
AVE. PAV. WIDTH	ft	71.00	78.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	3.17	3.17
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	3.17	3.17
IMPERVIOUS AREA			
PAVED AREAS	Ac	2.09	2.29
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	2.09	2.29

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	78

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.13	Ac-ft
1.25 on imperv.		0.24	Ac-ft
Greater of Above		0.24	Ac-ft
50 % addtional (OFW)		0.36	Ac-ft
Offsite Contribution		0.05	Ac-ft
Total		0.41	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.26	Ac-ft
1.75 on imperv.		0.33	Ac-ft
Greater of Above		0.33	Ac-ft
50 % addtional (OFW)		0.50	Ac-ft
Offsite Contribution		0.05	Ac-ft
Total		0.55	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.26	Ac-ft
2.5 on imperv.		0.48	Ac-ft
Greater of Above		0.48	Ac-ft
50 % addtional (OFW)		0.72	Ac-ft
Offsite Contribution		0.05	Ac-ft
Total		0.77	Ac-ft

WATER QUALITY SUMMARY

Pond Type	Value	
Retention Offline	0.41	Ac-ft
Retention Online	0.55	Ac-ft
Detention	0.77	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E — **Project No.** 1602

DRAINAGE AREA: Basin 1 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP. CN	PRE-DEVELOP. Area (Ac)	POST-DEVELOP. CN	POST-DEVELOP. Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	2.09	98	2.29
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		2.09		2.29
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	1.09	89	0.88
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		1.09		0.88
TOTAL AREA (At= Ai+Ap)	**Check =>**	**3.17**	**<===>**	**3.17**
CNw=Σ(A CN)/At	94.9		95.5	

	Units	PRE-DEV.	PRE-POST	POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.54		0.47
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	8.88		8.96
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.35		2.37
PRE-POST DEVELOPMENT RUNOFF			**0.02**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	11.38		11.45
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	3.01		3.03
PRE-POST DEVELOPMENT RUNOFF			**0.02**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	4.21		4.28
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	1.11		1.13
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.02**	

ATTENUATION SUMMARY		
Greater of three storm events:	0.02	Ac-ft

TREATMENT REQUIRED SUMMARY			
Pond Type	**WQ**	**ATT**	**REQ**
Retention	0.55	0.02	0.55
OR			
Detention	0.77	0.02	0.77

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 1 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	18.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	112	ft (Wet)
POND LENGTH: L = R W	L =	224	ft
RETENTION VOLUME		**0.55**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.000 Ac-ft

Control Area: Ao = L W - ΔAo = **0.58** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	289	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	177	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 1.20**	**Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	132	ft (Wet)
POND LENGTH: L = R W	L =	264	ft
DETENTION VOLUME		**0.77**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.000 Ac-ft

Control Area: Ao = L W - ΔAo = **0.80** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	329	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	197	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 1.50**	**Acres**

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 1
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 1 Alternative 1	Dry Retention	0.55	0.02	0.55	0.55	224	112	1.00	1.20
	Wet Detention	0.77	0.02	0.77	0.77	264	132	1.00	1.50

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E — **Project No.** 1602

DRAINAGE AREA: Basin 2 Preferred Alternative

POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

		AREAS	
DATA:		**PRE-DEV.**	**POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	2654.00	2654.00
LENGTH	ft	2654.00	2654.00
R. OF WAY WIDTH	ft	108.00	108.00
AVE. PAV. WIDTH	ft	56.00	78.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	6.58	6.58
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	6.58	6.58
IMPERVIOUS AREA			
PAVED AREAS	Ac	3.41	4.75
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	3.41	4.75

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	78

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.27	Ac-ft
1.25 on imperv.		0.50	Ac-ft
Greater of Above		0.50	Ac-ft
50 % addtional (OFW)		0.74	Ac-ft
Offsite Contribution		0.12	Ac-ft
Total		0.86	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.55	Ac-ft
1.75 on imperv.		0.69	Ac-ft
Greater of Above		0.69	Ac-ft
50 % addtional (OFW)		1.04	Ac-ft
Offsite Contribution		0.12	Ac-ft
Total		1.16	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.55	Ac-ft
2.5 on imperv.		0.99	Ac-ft
Greater of Above		0.99	Ac-ft
50 % addtional (OFW)		1.49	Ac-ft
Offsite Contribution		0.12	Ac-ft
Total		1.61	Ac-ft

WATER QUALITY SUMMARY		
Pond Type	Value	
Retention Offline	0.86	Ac-ft
Retention Online	1.16	Ac-ft
Detention	1.61	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 2 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP. CN	PRE-DEVELOP. Area (Ac)	POST-DEVELOP. CN	POST-DEVELOP. Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	3.41	98	4.75
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		3.41		4.75
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	3.17	89	1.83
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		3.17		1.83
TOTAL AREA (At= Ai+Ap)	**Check =>**	**6.58**	**<===>**	**6.58**
CNw=Σ(A CN)/At	93.7		95.5	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.67		0.47
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	8.74		8.96
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	4.79		4.91
PRE-POST DEVELOPMENT RUNOFF			**0.12**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	11.23		11.45
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	6.16		6.28
PRE-POST DEVELOPMENT RUNOFF			**0.12**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	4.08		4.28
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.24		2.35
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.11**	

ATTENUATION SUMMARY

Greater of three storm events: 0.12 Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.16	0.12	1.16
	OR		
Detention	1.61	0.12	1.61

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 2 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond: OFFSITE

TOP OF BERM ELEVATION:	TOB=	20.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	18.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.50	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	136	ft (Wet)
POND LENGTH: L = R W	L =	272	ft
RETENTION VOLUME		**1.20**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.001 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **0.85** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	337	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	201	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 1.60 Acres**

Proposed Wet Detention Pond: OFFSITE

TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	192	ft (Wet)
POND LENGTH: L = R W	L =	384	ft
DETENTION VOLUME		**1.65**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **1.69** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	449	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	257	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 2.60 Acres**

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 2**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 2 Alternative 1	Dry Retention	1.16	0.12	1.16	1.20	272	136	1.50	1.60
	Wet Detention	1.61	0.12	1.61	1.65	384	192	1.00	2.60

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 3 Preferred Alternative

POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

DATA:		AREAS PRE-DEV.	AREAS POST-D.
FROM STATION	ft	0.00	0.00
TO STATION	ft	3086.00	3086.00
LENGTH	ft	3086.00	3086.00
R. OF WAY WIDTH	ft	108.00	108.00
AVE. PAV. WIDTH	ft	44.00	78.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	7.65	7.65
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	7.65	7.65
IMPERVIOUS AREA			
PAVED AREAS	Ac	3.12	5.53
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	3.12	5.53

<=Check
Check=>

Areas Out of Corridor (Ac)

DESCR.	PRE-DEV.	POST-D.
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	78

Additional Paved Areas

ITEM	AMOUNT (EA)	UNIT A. (Ac)
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

WATER QUALITY SUMMARY

Pond Type	Value	
Retention Offline	0.86	Ac-ft
Retention Online	1.21	Ac-ft
Detention	1.73	Ac-ft

RETENTION OFFLINE	PRE-DEV.	POST-D.	
0.5" of Total Runoff		0.32	Ac-ft
1.25 on imperv.		0.58	Ac-ft
Greater of Above		0.58	Ac-ft
50 % addtional (OFW)		0.86	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.86	Ac-ft

RETENTION ONLINE	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.64	Ac-ft
1.75 on imperv.		0.81	Ac-ft
Greater of Above		0.81	Ac-ft
50 % addtional (OFW)		1.21	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.21	Ac-ft

DETENTION	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.64	Ac-ft
2.5 on imperv.		1.15	Ac-ft
Greater of Above		1.15	Ac-ft
50 % addtional (OFW)		1.73	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.73	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 3 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP. CN	PRE-DEVELOP. Area (Ac)	POST-DEVELOP. CN	POST-DEVELOP. Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	3.12	98	5.53
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		3.12		5.53
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	4.53	89	2.13
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		4.53		2.13
TOTAL AREA (At= Ai+Ap)	**Check =>**	**7.65**	**<===>**	**7.65**
CNw=Σ(A CN)/At	92.7		95.5	

	Unit	PRE-DEV.	PRE-POST	POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.79		0.47
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	8.62		8.96
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	5.49		5.71
PRE-POST DEVELOPMENT RUNOFF			**0.22**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	11.10		11.45
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	7.08		7.30
PRE-POST DEVELOPMENT RUNOFF			**0.22**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	3.97		4.28
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.53		2.73
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.20**	

ATTENUATION SUMMARY

Greater of three storm events: 0.22 Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.21	0.22	1.21
	OR		
Detention	1.73	0.22	1.73

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 3** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	18.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	168	ft (Wet)
POND LENGTH: L = R W	L =	335	ft
RETENTION VOLUME		**1.25**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\ \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\ W - \Delta Ao =$ **1.29** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	400	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	233	ft

R/W Area = Lt Wt/43560 ==> $\boldsymbol{A_{R/W}} =$ **2.10** **Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	201	ft (Wet)
POND LENGTH: L = R W	L =	401	ft
DETENTION VOLUME		**1.80**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\ \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\ W - \Delta Ao =$ **1.85** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	466	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	266	ft

R/W Area = Lt Wt/43560 ==> $\boldsymbol{A_{R/W}} =$ **2.80** **Acres**

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 3**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 3 Alternative 1	Dry Retention	1.21	0.22	1.21	1.25	335	168	1.00	2.10
	Wet Detention	1.73	0.22	1.73	1.80	401	201	1.00	2.80

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E — **Project No.** 1602

DRAINAGE AREA: Basin 4 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

DATA:		AREAS PRE-DEV.	AREAS POST-D.
FROM STATION	ft	0.00	0.00
TO STATION	ft	2700.00	2700.00
LENGTH	ft	2700.00	2700.00
R. OF WAY WIDTH	ft	108.00	108.00
AVE. PAV. WIDTH	ft	44.00	88.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	6.69	6.69
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	6.69	6.69
IMPERVIOUS AREA			
PAVED AREAS	Ac	2.73	5.45
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	2.73	5.45

<=Check
Check=>

Areas Out of Corridor (Ac)

DESCR.	PRE-DEV.	POST-D.
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	88

Additional Paved Areas

ITEM	AMOUNT (EA)	UNIT A. (Ac)
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	PRE-DEV.	POST-D.	
0.5" of Total Runoff		0.28	Ac-ft
1.25 on imperv.		0.57	Ac-ft
Greater of Above		0.57	Ac-ft
50 % addtional (OFW)		0.85	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.85	Ac-ft

RETENTION ONLINE	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.56	Ac-ft
1.75 on imperv.		0.80	Ac-ft
Greater of Above		0.80	Ac-ft
50 % addtional (OFW)		1.19	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.19	Ac-ft

DETENTION	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.56	Ac-ft
2.5 on imperv.		1.14	Ac-ft
Greater of Above		1.14	Ac-ft
50 % addtional (OFW)		1.70	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.70	Ac-ft

WATER QUALITY SUMMARY

Pond Type	Value	
Retention Offline	0.85	Ac-ft
Retention Online	1.19	Ac-ft
Detention	1.70	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 4 Preferred Alternative

POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP.		POST-DEVELOP.	
	CN	Area (Ac)	CN	Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	2.73	98	5.45
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		2.73		5.45
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	3.97	89	1.24
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		3.97		1.24
TOTAL AREA (At= Ai+Ap)	**Check =>**	**6.69**	**<===>**	**6.69**
CNw=Σ(A CN)/At	92.7		96.3	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.79		0.38
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	8.62		9.05
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	4.81		5.05
PRE-POST DEVELOPMENT RUNOFF			**0.24**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	11.10		11.55
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	6.19		6.44
PRE-POST DEVELOPMENT RUNOFF			**0.25**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	3.97		4.37
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.21		2.44
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.23**	

ATTENUATION SUMMARY

Greater of three storm events: 0.25 Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.19	0.25	1.19
	OR		
Detention	1.70	0.25	1.70

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E — **Project No.** 1602

DRAINAGE AREA: Basin 4 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	20.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	18.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	6	(front + back)/2
STORAGE DEPTH:	H=	1.50	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	139	ft (Wet)
POND LENGTH: L = R W	L =	279	ft
RETENTION VOLUME		**1.25**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.001 Ac-ft

Control Area: Ao = L W - ΔAo = **0.89 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	15.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	6.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	339	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	199	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 1.50 Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	6	(front + back)/2
STORAGE DEPTH:	H=	1.50	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	164	ft (Wet)
POND LENGTH: L = R W	L =	328	ft
DETENTION VOLUME		**1.75**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.001 Ac-ft

Control Area: Ao = L W - ΔAo = **1.23 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	15.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	6.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	382	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	218	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 1.90 Acres**

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 4**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 4 Alternative 1	Dry Retention	1.19	0.25	1.19	1.25	279	139	1.50	1.50
	Wet Detention	1.70	0.25	1.70	1.75	328	164	1.50	1.90

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E

Project No. 1602

DRAINAGE AREA: Basin 5 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

DATA:	Unit	AREAS PRE-DEV.	AREAS POST-D.
FROM STATION	ft	0.00	0.00
TO STATION	ft	2630.00	2630.00
LENGTH	ft	2630.00	2630.00
R. OF WAY WIDTH	ft	168.00	168.00
AVE. PAV. WIDTH	ft	32.00	88.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	10.14	10.14
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	10.14	10.14
IMPERVIOUS AREA			
PAVED AREAS	Ac	1.93	5.31
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	1.93	5.31

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	88

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	PRE-DEV.	POST-D.	
0.5" of Total Runoff		0.42	Ac-ft
1.25 on imperv.		0.55	Ac-ft
Greater of Above		0.55	Ac-ft
50 % addtional (OFW)		0.83	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.83	Ac-ft

RETENTION ONLINE	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.85	Ac-ft
1.75 on imperv.		0.77	Ac-ft
Greater of Above		0.85	Ac-ft
50 % addtional (OFW)		1.27	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.27	Ac-ft

DETENTION	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.85	Ac-ft
2.5 on imperv.		1.11	Ac-ft
Greater of Above		1.11	Ac-ft
50 % addtional (OFW)		1.66	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.66	Ac-ft

WATER QUALITY SUMMARY

Pond Type	Value	
Retention Offline	0.83	Ac-ft
Retention Online	1.27	Ac-ft
Detention	1.66	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 5 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP.		POST-DEVELOP.	
	CN	Area (Ac)	CN	Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	1.93	98	5.31
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		1.93		5.31
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	8.21	89	4.83
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		8.21		4.83
TOTAL AREA (At= Ai+Ap)	**Check =>**	**10.14**	**<===>**	**10.14**
CNw=Σ(A CN)/At	90.7		93.7	

			PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10			1.03		0.67
DESIGN RAINFALL (25-yr 24-hr) (P)	in		9.5		9.5
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in		8.37		8.74
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft		7.08		7.39
PRE-POST DEVELOPMENT RUNOFF				**0.31**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in		12		12
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in		10.85		11.23
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft		9.17		9.49
PRE-POST DEVELOPMENT RUNOFF				**0.32**	
DESIGN RAINFALL (mean 24-hr) (P)	in		4.8		4.8
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in		3.76		4.08
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft		3.18		3.45
PRE-POST DEVELOPMENT RUNOFF			Ac-ft	**0.27**	

ATTENUATION SUMMARY		
Greater of three storm events:	0.32	Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.27	0.32	1.27
	OR		
Detention	1.66	0.32	1.66

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 5** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	18.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	171	ft (Wet)
POND LENGTH: L = R W	L =	342	ft
RETENTION VOLUME		**1.30**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L W - \Delta Ao =$ **1.34** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	407	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	236	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 2.20 Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	195	ft (Wet)
POND LENGTH: L = R W	L =	390	ft
DETENTION VOLUME		**1.70**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L W - \Delta Ao =$ **1.74** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	455	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	260	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 2.70 Acres**

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 5**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 5 Alternative 1	Dry Retention	1.27	0.32	1.27	1.30	342	171	1.00	2.20
	Wet Detention	1.66	0.32	1.66	1.70	390	195	1.00	2.70

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** | **Project No.** **1602**

DRAINAGE AREA: **Basin 6** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

		AREAS	
DATA:		**PRE-DEV.**	**POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	2600.00	2600.00
LENGTH	ft	2600.00	2600.00
R. OF WAY WIDTH	ft	168.00	168.00
AVE. PAV. WIDTH	ft	32.00	88.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	10.03	10.03
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	10.03	10.03
IMPERVIOUS AREA			
PAVED AREAS	Ac	1.91	5.25
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	1.91	5.25

3.34

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	88

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

WATER QUALITY SUMMARY		
Pond Type	Value	
Retention Offline	0.82	Ac-ft
Retention Online	1.25	Ac-ft
Detention	1.64	Ac-ft

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.42	Ac-ft
1.25 on imperv.		0.55	Ac-ft
Greater of Above		0.55	Ac-ft
50 % addtional (OFW)		0.82	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.82	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.84	Ac-ft
1.75 on imperv.		0.77	Ac-ft
Greater of Above		0.84	Ac-ft
50 % addtional (OFW)		1.25	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.25	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.84	Ac-ft
2.5 on imperv.		1.09	Ac-ft
Greater of Above		1.09	Ac-ft
50 % addtional (OFW)		1.64	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.64	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 6 **Preferred Alternative**
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP.		POST-DEVELOP.	
	CN	Area (Ac)	CN	Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	1.91	98	5.25
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		1.91		5.25
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	8.12	89	4.78
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		8.12		4.78
TOTAL AREA (At= Ai+Ap)	**Check =>**	**10.03**	**<===>**	**10.03**
CNw=Σ(A CN)/At	90.7		93.7	

	Units	PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		1.03		0.67
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	8.37		8.74
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	7.00		7.30
PRE-POST DEVELOPMENT RUNOFF			**0.30**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	10.85		11.23
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	9.07		9.38
PRE-POST DEVELOPMENT RUNOFF			**0.31**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	3.76		4.08
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	3.14		3.41
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.27**	

ATTENUATION SUMMARY

Greater of three storm events: 0.31 Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.25	0.31	1.25
	OR		
Detention	1.64	0.31	1.64

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 6 Preferred Alternative **Pond Design Spreadsheet** Designed By: TAR
POND No. Composite **(Shaded cells require input data)** Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	18.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	171	ft (Wet)
POND LENGTH: L = R W	L =	342	ft
RETENTION VOLUME		**1.30**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.000 Ac-ft

Control Area: Ao = L W - ΔAo = **1.34 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	407	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	236	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 2.20**	**Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	195	ft (Wet)
POND LENGTH: L = R W	L =	390	ft
DETENTION VOLUME		**1.70**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

ΔAo = [(2r)^2 - π r^2]/43560

ΔAo = 0.000 Ac

ΔV =H ΔA

ΔV = 0.000 Ac-ft

Control Area: Ao = L W - ΔAo = **1.74 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	455	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	260	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 2.70**	**Acres**

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E | **Project No.** 1602

DRAINAGE AREA: Basin 6
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 6 Alternative 1	Dry Retention	1.25	0.31	1.25	1.30	342	171	1.00	2.20
	Wet Detention	1.64	0.31	1.64	1.70	390	195	1.00	2.70

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E
Project No. 1602

DRAINAGE AREA: Basin 7 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

DATA:		PRE-DEV.	POST-D.
FROM STATION	ft	0.00	0.00
TO STATION	ft	2650.00	2650.00
LENGTH	ft	2650.00	2650.00
R. OF WAY WIDTH	ft	168.00	168.00
AVE. PAV. WIDTH	ft	32.00	88.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	10.22	10.22
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	10.22	10.22
IMPERVIOUS AREA			
PAVED AREAS	Ac	1.95	5.35
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	1.95	5.35

<=Check
Check=>

Areas Out of Corridor (Ac)

DESCR.	PRE-DEV.	POST-D.
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	88

Additional Paved Areas

ITEM	AMOUNT (EA)	UNIT A. (Ac)
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	PRE-DEV.	POST-D.	
0.5" of Total Runoff		0.43	Ac-ft
1.25 on imperv.		0.56	Ac-ft
Greater of Above		0.56	Ac-ft
50 % addtional (OFW)		0.84	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.84	Ac-ft

RETENTION ONLINE	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.85	Ac-ft
1.75 on imperv.		0.78	Ac-ft
Greater of Above		0.85	Ac-ft
50 % addtional (OFW)		1.28	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.28	Ac-ft

DETENTION	PRE-DEV.	POST-D.	
1.0" of Total Runoff		0.85	Ac-ft
2.5 on imperv.		1.12	Ac-ft
Greater of Above		1.12	Ac-ft
50 % addtional (OFW)		1.67	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.67	Ac-ft

WATER QUALITY SUMMARY

Pond Type	Value	
Retention Offline	0.84	Ac-ft
Retention Online	1.28	Ac-ft
Detention	1.67	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 7 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP. CN	PRE-DEVELOP. Area (Ac)	POST-DEVELOP. CN	POST-DEVELOP. Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	1.95	98	5.35
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		1.95		5.35
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	8.27	89	4.87
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		8.27		4.87
TOTAL AREA (At= Ai+Ap)	**Check =>**	**10.22**	**<===>**	**10.22**
CNw=Σ(A CN)/At	90.7		93.7	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		1.03		0.67
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	8.37		8.74
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	7.13		7.44
PRE-POST DEVELOPMENT RUNOFF			**0.31**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	10.85		11.23
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	9.24		9.56
PRE-POST DEVELOPMENT RUNOFF			**0.32**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	3.76		4.08
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	3.20		3.47
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.27**	

ATTENUATION SUMMARY		
Greater of three storm events:	0.32	Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.28	0.32	1.28
	OR		
Detention	1.67	0.32	1.67

NOTES:
1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 7** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	18.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		17.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	171	ft (Wet)
POND LENGTH: L = R W	L =	342	ft
RETENTION VOLUME		**1.30**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **1.34** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	407	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	236	ft
R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ =**	**2.20**	**Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	18.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	17.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		16.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	195	ft (Wet)
POND LENGTH: L = R W	L =	390	ft
DETENTION VOLUME		**1.70**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **1.74** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	455	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	260	ft
R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ =**	**2.70**	**Acres**

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 7**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 7 Alternative 1	Dry Retention	1.28	0.32	1.28	1.30	342	171	1.00	2.20
	Wet Detention	1.67	0.32	1.67	1.70	390	195	1.00	2.70

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 8 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

		AREAS	
DATA:		**PRE-DEV.**	**POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	5350.00	5350.00
LENGTH	ft	5350.00	5350.00
R. OF WAY WIDTH	ft	168.00	168.00
AVE. PAV. WIDTH	ft	32.00	88.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	20.63	20.63
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	20.63	20.63
IMPERVIOUS AREA			
PAVED AREAS	Ac	3.93	10.81
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	3.93	10.81

6.88

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	88

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

WATER QUALITY SUMMARY		
Pond Type	Value	
Retention Offline	1.69	Ac-ft
Retention Online	2.58	Ac-ft
Detention	3.38	Ac-ft

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.86	Ac-ft
1.25 on imperv.		1.13	Ac-ft
Greater of Above		1.13	Ac-ft
50 % addtional (OFW)		1.69	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.69	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		1.72	Ac-ft
1.75 on imperv.		1.58	Ac-ft
Greater of Above		1.72	Ac-ft
50 % addtional (OFW)		2.58	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		2.58	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		1.72	Ac-ft
2.5 on imperv.		2.25	Ac-ft
Greater of Above		2.25	Ac-ft
50 % addtional (OFW)		3.38	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		3.38	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 8 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP.		POST-DEVELOP.	
	CN	Area (Ac)	CN	Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	3.93	98	10.81
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		3.93		10.81
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	16.70	89	9.83
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		16.70		9.83
TOTAL AREA (At= Ai+Ap)	**Check =>**	**20.63**	**<===>**	**20.63**
CNw=Σ(A CN)/At	90.7		93.7	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		1.03		0.67
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	8.37		8.74
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	14.39		15.03
PRE-POST DEVELOPMENT RUNOFF			**0.64**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	10.85		11.23
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	18.66		19.31
PRE-POST DEVELOPMENT RUNOFF			**0.65**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	3.76		4.08
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	6.46		7.01
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.55**	

ATTENUATION SUMMARY		
Greater of three storm events:	0.65	Ac-ft

TREATMENT REQUIRED SUMMARY			
Pond Type	**WQ**	**ATT**	**REQ**
Retention	2.58	0.65	2.58
	OR		
Detention	3.38	0.65	3.38

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 8 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	20.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	18.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		17.50	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	238	ft (Wet)
POND LENGTH: L = R W	L =	476	ft
RETENTION VOLUME		**2.55**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **2.60 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	541	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	303	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 3.80**	**Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	19.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR: H' =		0.50	ft
WEIR ELEVATION:	Wel=	17.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:NWL=		16.50	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS:

		OFFSITE	
	Top W =	275	ft (Wet)
POND LENGTH: L = R W	L =	549	ft
DETENTION VOLUME		**3.40**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\,\Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **3.46 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	614	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	340	ft
R/W Area = Lt Wt/43560 ==>	**$A_{R/W}$ = 4.80**	**Acres**

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 8
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 8 Alternative 1	Dry Retention	2.58	0.65	2.58	2.55	476	238	1.00	3.80
	Wet Detention	3.38	0.65	3.38	3.40	549	275	1.00	4.80

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 9 Preferred Alternative

POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

		AREAS	
DATA:		**PRE-DEV.**	**POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	2640.00	2640.00
LENGTH	ft	2640.00	2640.00
R. OF WAY WIDTH	ft	104.00	104.00
AVE. PAV. WIDTH	ft	32.00	78.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	6.30	6.30
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	6.30	6.30
IMPERVIOUS AREA			
PAVED AREAS	Ac	1.94	4.73
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	1.94	4.73
		2.79	

<=Check

Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	78

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.26	Ac-ft
1.25 on imperv.		0.49	Ac-ft
Greater of Above		0.49	Ac-ft
50 % addtional (OFW)		0.74	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.74	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.53	Ac-ft
1.75 on imperv.		0.69	Ac-ft
Greater of Above		0.69	Ac-ft
50 % addtional (OFW)		1.03	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.03	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.53	Ac-ft
2.5 on imperv.		0.98	Ac-ft
Greater of Above		0.98	Ac-ft
50 % addtional (OFW)		1.48	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.48	Ac-ft

WATER QUALITY SUMMARY		
Pond Type	Value	
Retention Offline	0.74	Ac-ft
Retention Online	1.03	Ac-ft
Detention	1.48	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 9 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP.		POST-DEVELOP.	
	CN	Area (Ac)	CN	Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	1.94	98	4.73
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		1.94		4.73
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	4.36	89	1.58
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		4.36		1.58
TOTAL AREA (At= Ai+Ap)	**Check =>**	**6.30**	**<===>**	**6.30**
CNw=Σ(A CN)/At	91.8		95.8	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.89		0.44
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	8.51		8.99
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	4.47		4.72
PRE-POST DEVELOPMENT RUNOFF			**0.25**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	10.99		11.49
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	5.77		6.03
PRE-POST DEVELOPMENT RUNOFF			**0.26**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = (P-0.2S)^2/(P+0.8S)	in	3.87		4.31
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.03		2.26
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.23**	

ATTENUATION SUMMARY		
Greater of three storm events:	0.26	Ac-ft

TREATMENT REQUIRED SUMMARY			
Pond Type	**WQ**	**ATT**	**REQ**
Retention	1.03	0.26	1.03
OR			
Detention	1.48	0.26	1.48

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 9 Preferred Alternative — **Pond Design Spreadsheet** — Designed By: TAR
POND No. Composite — **(Shaded cells require input data)** — Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond: OFFSITE

TOP OF BERM ELEVATION:	TOB=	21.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	19.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	18.50	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	154	ft (Wet)
POND LENGTH: L = R W	L =	307	ft
RETENTION VOLUME		**1.05**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - p\ r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\ DA$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **1.08 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	372	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	219	ft
R/W Area = Lt Wt/43560 ==> $A_{R/W}$ =	**1.90**	**Acres**

Proposed Wet Detention Pond: OFFSITE

TOP OF BERM ELEVATION:	TOB=	20.00	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	18.50	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	17.50	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	183	ft (Wet)
POND LENGTH: L = R W	L =	367	ft
DETENTION VOLUME		**1.50**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - p\ r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H\ DA$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L\,W - \Delta Ao =$ **1.54 Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	432	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	248	ft
R/W Area = Lt Wt/43560 ==> $A_{R/W}$ =	**2.50**	**Acres**

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 9
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS Length (ft)	POND DIMENSIONS Width (ft)	POND DIMENSIONS Depth (ft)	R/W AREA (Ac)
Basin 9 Alternative 1	Dry Retention	1.03	0.26	1.03	1.05	307	154	1.00	1.90
	Wet Detention	1.48	0.26	1.48	1.50	367	183	1.00	2.50

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

DRAINAGE AREA: **Basin 10** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

WATER QUALITY CRITERIA FROM SJRWMD

DATA:		**AREAS PRE-DEV.**	**AREAS POST-D.**
FROM STATION	ft	0.00	0.00
TO STATION	ft	2710.00	2710.00
LENGTH	ft	2710.00	2710.00
R. OF WAY WIDTH	ft	104.00	104.00
AVE. PAV. WIDTH	ft	40.00	78.00
TOTAL AREA			
INSIDE R. OF WAY	Ac	6.47	6.47
OUTSIDE R. OF W.	Ac	0.00	0.00
TOTAL (At)	Ac	6.47	6.47
IMPERVIOUS AREA			
PAVED AREAS	Ac	2.49	4.85
Wet Out A.(0.6Ao)	Ac	0.00	0.00
OTHER IMP. AREAS	Ac	0.00	0.00
TOTAL (Ai)	Ac	2.49	4.85

<=Check
Check=>

Areas Out of Corridor (Ac)		
DESCR.	**PRE-DEV.**	**POST-D.**
Pond	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
	0.00	0.00
Ao=	**0.00**	**0.00**

Prop.Pav. Wth. (ft)	78

Additional Paved Areas		
ITEM	**AMOUNT (EA)**	**UNIT A. (Ac)**
Med. Op.	0	0.07
Turn Lane	0	0.14
Turn Out	0	0.07
TOTAL AREAS		0.00

RETENTION OFFLINE	**PRE-DEV.**	**POST-D.**	
0.5" of Total Runoff		0.27	Ac-ft
1.25 on imperv.		0.51	Ac-ft
Greater of Above		0.51	Ac-ft
50 % addtional (OFW)		0.76	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		0.76	Ac-ft

RETENTION ONLINE	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.54	Ac-ft
1.75 on imperv.		0.71	Ac-ft
Greater of Above		0.71	Ac-ft
50 % addtional (OFW)		1.06	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.06	Ac-ft

DETENTION	**PRE-DEV.**	**POST-D.**	
1.0" of Total Runoff		0.54	Ac-ft
2.5 on imperv.		1.01	Ac-ft
Greater of Above		1.01	Ac-ft
50 % addtional (OFW)		1.52	Ac-ft
Offsite Contribution		0.00	Ac-ft
Total		1.52	Ac-ft

WATER QUALITY SUMMARY		
Pond Type	Value	
Retention Offline	0.76	Ac-ft
Retention Online	1.06	Ac-ft
Detention	1.52	Ac-ft

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E — Project No. 1602

DRAINAGE AREA: Basin 10 Preferred Alternative
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

PEAK ATTENUATION: SCS METHOD

SOIL TYPE D	PRE-DEVELOP. CN	PRE-DEVELOP. Area (Ac)	POST-DEVELOP. CN	POST-DEVELOP. Area (Ac.)
IMPERVIOUS AREA				
Paved Areas	98	2.49	98	4.85
Lakes and wet areas	98	0.00	98	0.00
Other	98	0.00	98	0.00
SUB-TOTAL (Ai)		2.49		4.85
PERVIOUS AREA				
Gravel roads	91	0.00	91	0.00
Dirt roads	89	0.00	89	0.00
Cultivated land	91	0.00	91	0.00
Pasture or range	89	3.98	89	1.62
Meadow, good cond.	78	0.00	78	0.00
Wood or forest land	83	0.00	83	0.00
Lawns/sod, fair cond.	84	0.00	84	0.00
Other	0	0.00	0	0.00
SUB-TOTAL (Ap)		3.98		1.62
TOTAL AREA (At= Ai+Ap)	**Check =>**	**6.47**	**<===>**	**6.47**
CNw=Σ(A CN)/At	92.5		95.8	

		PRE-DEV.		POST-D.
WATERSHED STORAGE: S=1000/CNw -10		0.81		0.44
DESIGN RAINFALL (25-yr 24-hr) (P)	in	9.5		9.5
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	8.59		8.99
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	4.63		4.85
PRE-POST DEVELOPMENT RUNOFF			**0.22**	
DESIGN RAINFALL (25-yr 96-hr) (P)	in	12		12
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	11.08		11.49
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	5.97		6.19
PRE-POST DEVELOPMENT RUNOFF			**0.22**	
DESIGN RAINFALL (mean 24-hr) (P)	in	4.8		4.8
DIRECT RUNOFF :R = $(P-0.2S)^2/(P+0.8S)$	in	3.95		4.31
TOTAL RUNOFF: (Rt=At R/12)	Ac-ft	2.13		2.32
PRE-POST DEVELOPMENT RUNOFF		Ac-ft	**0.19**	

ATTENUATION SUMMARY

Greater of three storm events: 0.22 Ac-ft

TREATMENT REQUIRED SUMMARY

Pond Type	WQ	ATT	REQ
Retention	1.06	0.22	1.06
	OR		
Detention	1.52	0.22	1.52

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** — **Project No.** **1602**

DRAINAGE AREA: **Basin 10** **Preferred Alternative**
POND No. **Composite**

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

POND DESIGN

Proposed Dry Retention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	22.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	21.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	20.00	ft (SHGWT + 1')
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	157	ft (Wet)
POND LENGTH: L = R W	L =	315	ft
RETENTION VOLUME		**1.10**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L W - \Delta Ao =$ **1.14** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	380	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	222	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 1.90 Acres**

Proposed Wet Detention Pond:

		OFFSITE	
TOP OF BERM ELEVATION:	TOB=	21.50	(NAVD)
FREEBOARD:	FB=	1.00	ft
OUTFALL DEPTH ABOVE WEIR:	H' =	0.50	ft
WEIR ELEVATION:	Wel=	20.00	ft (TOB - FB - H')
POND CONTROL ELEVATION:	NWL=	19.00	ft (SHGWT)
POND LENGTH/WIDTH RATIO:	R=	2	
POND SLOPES:	1 to X=	5	(front + back)/2
STORAGE DEPTH:	H=	1.00	ft (Wel - NWL)

CALCULATE POND DIMENSIONS: OFFSITE

	Top W =	186	ft (Wet)
POND LENGTH: L = R W	L =	373	ft
DETENTION VOLUME		**1.55**	Ac-ft

Note: A correction is necessary to consider the pond rounded corners:

r = 5 ft

$\Delta Ao = [(2r)^2 - \pi r^2]/43560$

$\Delta Ao =$ 0.000 Ac

$\Delta V = H \Delta A$

$\Delta V =$ 0.000 Ac-ft

Control Area: $Ao = L W - \Delta Ao =$ **1.59** **Acres**

Right of Way Area (Offsite Pond):

MAINTENANCE BERM WIDTH :BW =	20.00	ft
OUTSIDE SLOPE AND BUFFER: S&B=	5.00	ft
Lt = L + 2[X (TOB-NWL-H) + BW + S&B]=	438	ft
Wt = W + 2[X (TOB-NWL-H) + BW + S&B]=	251	ft

R/W Area = Lt Wt/43560 ==> **$A_{R/W}$ = 2.50 Acres**

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E **Project No.** 1602

DRAINAGE AREA: Basin 10
POND No. Composite

Pond Design Spreadsheet
(Shaded cells require input data)

Designed By: TAR
Date: 11/11/2016

TREATMENT SUMMARY

DRAINAGE SYSTEM	POND TYPE	WQ (Ac-ft)	ATT (Ac-ft)	REQ (Ac-ft)	PRV (Ac-ft)	POND DIMENSIONS			R/W AREA (Ac)
						Length (ft)	Width (ft)	Depth (ft)	
Basin 10 Alternative 1	Dry Retention	1.06	0.22	1.06	1.10	315	157	1.00	1.90
	Wet Detention	1.52	0.22	1.52	1.55	373	186	1.00	2.50

NOTES:

1. WQ = Required treatment volume to meet water quality requirements (Ac-ft).
2. ATT = Required storage volume to attenuate peak discharge (Ac-ft).
3. REQ = treatment/storage volume required for proposed design (Ac-ft).
4. PRV = treatment/storage volume provided by proposed design (Ac-ft).

APPENDIX C

(Project Correspondence and Meeting Notes)

MEETING NOTES **12/15/2016**

Subject: CR 510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

District 4 Attendees:
Olivia Bonilla, Drainage Engineer
Wilord Metellus, Drainage Engineer
Shandra Davis, PLEMO

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Shaq Samuel, EI, Drainage Engineer

Location: Conference Room 1 (3400 West Commercial Boulevard, Fort Lauderdale, Florida 33309)

Time: 9:00 AM

Background:

- A meeting was scheduled between FDOT, Metric and Snubbs to discuss the Drainage Approach, 30% Draft of the Preliminary Drainage Report, Pond Siting Schedule & Process, and Permitting Strategy.

Discussion:

30% Preliminary Drainage Report

1. Snubbs presented a 30% Draft of the Preliminary Drainage Report to FDOT. Ten (10) drainage systems/basins were identified within the project limits. Based on a preliminary drainage analysis, all 10 basins will require offsite ponds. Five (5) of these ponds can be accommodated by county-owned properties while the other 5 will require R/W acquisition.

2. Metric mentioned that GCME (Geotechnical consultants) will be providing a geotechnical report for this project in a month or later.

3. FDOT Drainage requested an electronic copy of the 30% Draft of the Preliminary Drainage Report.

Pond Siting Schedule & Process

1. Snubbs presented the Pond Siting Schedule and Process to FDOT.
2. FDOT approved the Pond Siting Schedule and Process in concept.
3. Metric requested that Snubbs suggest names of individuals to be on the Pond Siting team based on previous experiences.
4. Metric mentioned that the earliest date that Indian River County (IRC) can meet is **Jan-26-2017**.

Permitting Strategy

1. The approach is to permit through St. John's River Water Management District (SJRWMD) to satisfy both Sebastian River and Indian River Farms Water Control Districts discharge requirements. If a separate permit is required for the Water Control Districts, then the approach to meet the discharge requirements is to limit the post-development discharge to less than or equal to pre-development discharge.
2. FDOT Drainage would like to participate in the drainage permitting meetings.

<u>Action Items:</u>

- Snubbs will schedule meetings with IRC, SJRWMD and the Water Control Districts by **Dec-22-2016**.
- Snubbs will proposed a list of individuals to be on the Pond Siting team by **Dec-22-2016**.
- FDOT will send Hui Shi's, Permit Coordinator, contact information to Metric and Snubbs by **Dec-22-2016**.

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave

Date: 12/15/2016

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Shaquon Samuel, EI	Snubbs Consulting	Drainage Eng.	Shaquon.Samuel@snubbs.com	305.885.6400 ext. 205
Carlos Rodriguez	METRIC Engineering	PM	crodriguez@metriceng.com	305-235-5098
Olivia bonilla	FDOT	Drainage	olivia.bonilla@DOT.state.fl.us	954-777-4134
Wilord Metellus	FDOT	Drainage	Wilord.metellus@dot.state.fl.us	954-777-4467
SHANDRA DAVIS	FDOT	PLEM	Shandra.davis@dot.state.fl.us	9)677-7896

MEETING NOTES **1/10/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

SJRWMD Attendees:
Fariborz Zanganeh, Engineer
Nanette Church, Senior Regulatory Scientist

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager (teleconference)
Olivia Bonilla, Drainage Engineer
Wilord Metellus, Drainage Engineer
Hui Shi, Drainage Engineer
Shandra Davis, PLEMO (teleconference)

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager (teleconference)
Juan Venezula, Bridge Engineer (teleconference)
Rob Myers, Senior Wildlife and NEPA Specialist (teleconference)

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer

Location: Conference Room - PBSC - St. Johns (Community College Pkwy SE, Palm Bay, FL 32909)

Time: 1:30 PM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 To 58th Avenue.
- The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

Discussion:

Permitting requirements

- FDOT explained that the proposed roadway will increase the turning radius of the existing sharp turn along the CR-510 roadway, from 90th Avenue to 85th Street. To accommodate the new roadway, the existing bridge will be replaced with a culvert or Lateral Canal D will need to be realigned. A bridge may not be possible at this location due to the skew that would be needed from the bridge to accommodate the larger radius of the roadway.

- SJRWMD mentioned that replacing the bridge with a culvert should not be a problem but the hydraulic report needs to show similar hydraulic performance. Also, Sebastian River Improvement District (SRID) will need to be consulted.

- SJRWMD mentioned that realigning lateral canal D will cause some surface water impact, thus pre-developmental and post-developmental impact calculations must be provided and must meet the ultimate design of the canal.

- A regional drainage ditch located west of 66th Avenue, which extends to Lateral Canal L, is providing treatment for offsite runoff.

- Water quality calculations will need to consider the complete roadway including existing pavement since the corridor has existing swales that provide some level of water quality and attenuation.

OFW status

- The Outstanding Florida Water (OFW) areas begin north of the bridge, located on CR-512, and includes all areas that directly discharges into the Sebastian River. Each drainage basin will need to be evaluated to see if it qualifies as a direct discharge. 50% additional treatment will be needed.

Nutrient Loading

- The calculations for nutrient loading will not be required if a comparison of nutrient loading for pre and post conditions show that there is less than 64.5% of nutrient removal. Otherwise, treatment must be provided for the greater of the two:
    - a.) An additional 50% of the treatment volume for OFW basins
    - b.) The nutrient loading volume

- Wet detention systems should include a device, that contains a filtered media, at the bottom to meet the requirements of the nutrients loading.

Restrictions on treatment methods

- SJRWMD mentioned that dry detention is the least preferred treatment method to treat runoff. This is because dry detention systems must treat a greater volume of stormwater than the other treatment practices, such as dry retention and wet detention, to achieve an equivalent level of pollutant removal.

- SJRWMD mentioned that impacts to the South Prong of the Sebastian River, such as wetlands, must have a buffer minimum of 15 feet or an average of 25 feet.

Discharge requirements

- The post-development peak discharge should be limited to the pre-development mean annual and the 25 year 24-hour storm events.

Permit modification or new application

- Permit number 93656 should be modified to accommodate the CR 510 project since it is an existing permit.

- The estimated construction permitting fee is approximately $5,610, however the price is subject to change after one year. The completed construction plans are required to purchase the construction permit.

- A conceptual permit is an option that can be considered since the construction plans are projected to be completed in 3-4 years. The conceptual permit will allow modifications to be made throughout the duration of the project with no change to the construction permitting fee. The fee for the conceptual plan is estimated to be $11,960 plus the construction permitting fee ($5,610).

Is separate permit from SRID required?

- Environmental Permits related to water quality and water quantity should be requested from SJRWMD.

- Right-of-Way Permits related to canals, such as stages, control level, or water level should be requested from the Water Control District.

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave

Date: 1/10/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
Olivia Bonilla	FDOT D4	Drainage	olivia.bonilla@dot.state.fl.us	954-777-4134
Wilord Metellus	FDOT	Drainage	Wilord.metellus@dot.state.fl.us	954-777-4467
Hui Shi	FDOT D4	Drainage	Hui.Shi@dot.state.fl.us	954-777-4557
Nanette Church	SJRWMD	RS	nchurch@sjrwmd.com	321-984-4902
Fariborz Zanganeh	SJRWMD	Engineer	fzanganeh@sjrwmd.com	321-676-6630
Rob Myers				
Chandra R.				
Juan Venezuela				

MEETING NOTES **1/19/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

SRID Attendees:
George Simmons, PE
Todd Wodraska, SRID Administration

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager (teleconference)
Olivia Bonilla, Drainage Engineer (teleconference)
Wilord Metellus, Drainage Engineer (teleconference)

Metric Attendees:
Juan Venezula, Bridge Engineer (teleconference)
Rob Myers, Senior Wildlife and NEPA Specialist (teleconference)
Shandra Raman, Engineer

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer
Shaquon Samuel, EI, Drainage Engineer (teleconference)

Location: Carter Associates, Inc. Conference Room (1708 21st Street Vero Beach, FL 32960)

Time: 10:30 AM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue.
- The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

Discussion:

Lateral Canal D

- Snubbs explained that the proposed roadway will increase the turning radius of the existing sharp turn along the CR-510 roadway, from 90th Avenue to 85th Street. A bridge may not be possible at this location due to the skew that would be needed from the bridge to accommodate the larger radius of the roadway. As a result, FDOT needs a right-of-way permit to acquire the corner area on the bend of CR-510 to convert the existing bridge with a culvert or realign Lateral Canal D.

- Sebastian River Improvement District (SRID) mentioned that there are some legal dispute about who regulates and maintain Lateral Canal D. SRID mentioned that landowners to the west of the canal may have legal rights. As such, there are uncertainties about future discharges into the canal.
- SRID believes Lateral Canal D canal has a minimum depth of 15 feet, thus a culvert may not be feasible at this location.

FEMA Map

- Snubbs mentioned that a review of the Flood Insurance Rate Map published by Federal Emergency Management Agency (FEMA), indicates that a portion of the study area is located in Special Flood Zones A, AE, VE, X and X-500. The northbound/southbound portion of CR-510, between CR-512 and 85th Place, is located in flood zone AE. The eastbound/westbound portion of CR-510, located between 90th Avenue and 58th Avenue, is mainly located in flood zone X.
- SRID mentioned that the FEMA map will be updated within 6-10 months. Also, SRID mentioned that the FEMA map took into account that Lateral Canal D was made as a flooding berm to collect runoff coming from the west. This caused the property to the east to have less flooding; even though there will be pockets of flooding areas to the east but not as deep as if the beam did not exist.
- Metric asked if the lateral canals have tidal influence. SRID informed Metric that the lateral canals are not tidally influence and FEMA has taken storm surges into account when preparing the FEMA maps.

Water Quantity

- SRID stated that stormwater system should be designed for the 25-year frequency, 24-hour duration storm and should maintain no more than 2 inches of discharge per day.
- In addition to analyzing the Pre-Post conditions, SRID requires that FDOT take into account the cut and fill that will occur in the floodplain.
- SRID stated that FDOT should acquire the Right-of-Way needed to comply with the District's discharge criteria. If FDOT has issues acquiring the land needed to meet the District's criteria, they will provide sufficient documentation to claim hardship.

Water Crossing Improvements

- Snubbs mentioned that all the existing culverts used as cross drains will be extended and the existing bridges will be replaced to accommodate the proposed roadway improvements.
- SRID requested that FDOT relocate the water main to attach it to the bridge and remove pile from the canal. However, Snubbs mentioned that FDOT does not replace utilities unless there is a conflict. As such, an evaluation to relocate the water main must be conducted before any commitments are made.
- Snubbs mentioned that FDOT will convert the existing culvert, located approximately 0.15 miles east of 79th Terrace, to a bridge to allow wildlife crossing.

Permit

- SRID advised FDOT to contact Indian River County (IRC) to request information for the existing permits.
- SRID needs FDOT to verify if the proposed roadway will encroach into an existing easement. The easement is located approximately 0.25 miles east of 75th Court and extends to Lateral Canal L.
- Snubbs is concerned about the regional drainage ditch, located west of 66th Avenue and extends to Lateral Canal L, because it is providing treatment for the road and offsite properties. The water control district may be held responsible for offsite properties being flooding. As such, Snubbs recommends that a bypass swale be constructed to separate the roadway runoff from the properties runoff. SRID stated that the ditch is maintained by the county.
- Snubbs asked if it is possible to acquire a conceptual permit for the culvert replacement during the PD&E phase of the project. Acquiring a conceptual permit will allow FDOT to receive comments regarding what the SRID will permit before the design phase begins. This will limit impact to the construction schedule during the design phase.
- SRID mentioned that the board will have to decide if a conceptual permit for the culvert replacement can be issued. SRID stated in order to present this case to the board they will require details such as full hydraulics and concept sketch including length, width and guardrails; parameters for the canal; and a formal request explaining the reason for this permit. The fee for the conceptual permit depends on the duration of the consultant review. The cost varies from $1,000-$5,000.
- SRID mentioned that the Board meeting will be held on March 1st. Furthermore, SRID requested that all documents regarding the conceptual permit be submitted a minimum of 10 days before the Board meeting to allow adequate time to review.

Action Items:

- SRID to provide a design flow model of the canals by **Feb-3-2017**.
- SRID to provide drawing to show encroachment into easements by **Feb-3-2017**.
- The conceptual permit request should be submitted to SRID by **Feb-15-2017**

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave SRID

Date: 1/19/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
GEORGE SIMONS	CARTER ASSOC.	PRINCIPAL/PE	GEORGES@CARTERASSOC.COM	(772) 562-4191
Todd Wodraska	Special District Services	SRID Administrator	twodraska@sdsinc.org	561.630.4922
Chandra Raman	Metric Eng	Drainage Eng	chandra.raman@metriceng.com	561-713 8977
Rob Myers (Phone)	Metric	senior wildlife	Rob.Myers@metrieng.com	
shaq samuel (Phone)	Snubbs	Drainage Eng	shaquon.samuel@snubbs.com	305 885 6400 ext 205
olivia (Phone)	FDOT	Drainage Eng	olivia.Bonilla@dot.state.fl.us	
willard (Phone)	FDOT	Drainage Eng	willard.Metellus@dot.state.fl.us	
Juan Venesula (Phone)	Metric	Bridge Eng		

MEETING NOTES **1/19/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

IRFWCD Attendees:
David Gunter, Superintendent

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager (teleconference)
Olivia Bonilla, Drainage Engineer (teleconference)

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager (teleconference)
Juan Venezula, Bridge Engineer (teleconference)
Rob Myers, Senior Wildlife and NEPA Specialist (teleconference)
Shandra Raman, Engineer

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer
Shaquon Samuel, EI, Drainage Engineer (teleconference)

Location: IRFWCD Office (7305 4th Street, Vero Beach, FL 32968)

Time: 2:00 PM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue.
- The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

Discussion:

Water Quantity

- Indian River Farms Water Control District (IRFWCD) informed FDOT that the south edge of pavement for CR-510 falls within their water control district. IRFWCD agreed to allow runoff from CR-510 Basin 10 to outfall to Lateral Canal G. However, no discharge north of the roadway is prohibited to enter the water control district.
- Snubbs mentioned that there is an existing culvert north of CR-510 that transfers runoff from the north into Lateral Canal G. IRFWCD stated that the culvert is not acceptable, as such the function of the culvert is not to be remained.
- Snubbs mentioned that the alignment of the new roadway (urban typical section) will extend towards the south. As such, FDOT will construct offsite ponds to attenuate and treat runoff from the roadway before discharging into Lateral Canal G.
- IRFWCD mentioned that all projects located in the jurisdiction of IRFWCD are required to meet the design criteria listed below:
    - Offsite discharge to the IRFWCD shall be limited to the 2 inches of runoff over the project area in a 24-hour period.
    - Post-development peak rate of discharge must not exceed pre-development peak rate of discharge for the 25-year frequency, 24-hour duration storm for systems in the District that do not discharge directly into certain tidal and coastal areas and are not located in the Upper St. Johns River Hydrologic Basin and the Oklawaha River Hydrologic Basin.

Permit

- Based on the proposed roadway improvements, IRFWCD recommended that FDOT acquire the following permits:
    - A use permit is required to construct a road on district property. The fee for the use permit is $100.
    - A connection permit is required to connect Lateral Canal G with the roadway drainage system. For maintenance purposes, the urban curb is required to have cuts and Lateral Canal G must have an asphalt perimeter berm with a minimum width of 15 feet. The fee for the connection permit is $100.

    - A discharge permit is required to discharge into Lateral Canal G. A fee of $1000 is charged for the discharge permit; which includes the consultant review.

- All permits are available on the IRFWCD website and must be signed by Indian River County (IRC)
- Snubbs asked if it is possible to acquire a conceptual permit during the PD&E phase of the project. Acquiring a conceptual permit will give FDOT an idea of what IRFWCD will allow before the design phase begins. This will limit impact to the schedule during the design phase.
- IRFWCD mentioned that the board will have to decide if a conceptual permit can be issued. IRFWCD stated in order to present this case to the board they will require details such as road cross section and footprint; and a formal request explaining the reason for this permit.

Action Items:

- The conceptual permit request should be submitted to IRFWCD by **Feb-15-2017**

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave IRFWCD

Date: 1/19/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE	
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201	
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206	
DAVID E. GUNTER	IRFWCD	SUPERINTENDENT	dgunter@flbb.net	772-562-2141	
Chandra Raman	Metric Eng	Drainage Eng	Chandra.raman@metriceng.com	561-713 8977	
Shaquon Samuel	Snubbs	Drainage Eng	shaquonsamuel@snubbs.com	305 885 6400 ext 205	teleconferen
Carlos Rodriguez	Metric	Project Eng	crodriguez@metrieng.com		teleconfer
Mariah Formoso	FDOT	Project Eng	Maria.Formoso@Dot.state.fl.us		teleconferen
Juan Venezula	Metric	Bridge Eng			teleconferen
Olivia Bonilla	FDOT	Draing Eng	Olivia.Bonilla@dot.state.fl.us		teleconferenc
Rob Myers	Metric	Senior wildlife	Rob.Myers@metrieng.com		teleconferen

MEETING NOTES **1/23/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

IRC Attendees:
Rich Szpyrka, Public Works Director
Andrew Sobczak, Senior Planner
Phil Matson, MPO Staff Director

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager
Wilord Metellus, Drainage Engineer
Olivia Bonilla, Drainage Engineer

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer
Shaquon Samuel, EI, Drainage Engineer (teleconference)

Location: IRD Office (1801 27th St, Vero Beach, FL 32960)

Time: 3:00 PM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue.
- The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

Discussion:

Design Criteria

- Snubbs explained the drainage approach is to meet the water quality permitting requirements for St. John's River Water Management District (SJRWMD) and meet the water quantity permitting requirements for Sebastian River Improvement District (SRID) and Indian River Farms Water Control District (IRFWCD).
- The Indian River County (IRC) design standards require all culverts to be made of concrete and have a minimum width of 18 inches.

Regional Drainage Ditch

- Snubbs explained that there is a concern with the existing Regional Drainage Ditch, located west of 66th Avenue and extends to Lateral Canal L, because it is providing treatment for both CR-510 and offsite properties. Since the roadway is providing drainage for the offsite properties, the county may be held responsible for offsite properties being flooding. Snubbs provided three recommendations, listed below, to resolve this issue:

  Option 1: The proposed roadway drainage system will take into account the roadway improvements and all the outside Right-of-Way. This will cause the proposed drainage system to be costly. Also, this would cause the County to become a water control district.

  Option 2: FDOT will build the new roadway and inform all properties along the corridor to provide drainage for their own property. This option may result in a lot of conflict with the property owners since they are currently draining into the road swale.

  Option 3: FDOT will construct a bypass (secondary) swale for private properties to drain. The private owners will be responsible to maintain the swale. (**FDOT preferred option)**

- IRC recommended that the county acquire Right-of-Way and construct the bypass swale on county property outside of the roadway project. In this case, the county will maintain the swale. IRC believes the third option, mentioned above, could cause some problems since the property owners will expect compensation for the swale since it will be collecting runoff from other properties.
- FDOT mentioned that the pond siting team will discuss the concern with the regional drainage ditch during the pond siting meeting to decide which option will be implemented.

Pond Siting

- Snubbs conducted a cursory review of the initial pond locations. The first approach is to use as many county-owned lands as possible to limit the amount of R/W acquisition. During the review, the following topics were discussed:

  Existing permits:
  There is an existing permit (Permit No. 93656) that will accommodate the CR-510 runoff in Basin 1 (from CR-512 to Shark Boulevard).

  Permit No. 95794 states that there are two ponds in Basin 4, located on the northwest corner on the intersection of 90th Ave and 85th Ave, that will provide treatment for CR-510.

  County Owned Parcels:
  There is a county-owned parcel located east of 75th Ct. that Snubbs is proposing to use to construct a pond for Basin 7.

  FDOT mentioned that the county-owned parcel, located approximately 150 feet west of 64th Ave, is near existing houses. Therefore, no ponds in Basin 9 should be place in that parcel. Also, IRC mentioned that properties northeast of Basin 9 may have discharge rights into the roadway.

  Metric informed the attendees that no ponds, in Basin 10, should be placed in the county-owned parcels, located north of CR-510 between 61st Dr. and 58th Ave, since this area is a Wabasso habitat preserve.

  The proposed typical section, from 66th Ave to 58th Ave, contains a median. As such, a roadway will be constructed to provide access from 58th Ave to the CR-510 westbound. This will require vacating the IRC owned parcels, which are located south of CR-510 between 59th Ave and 58th Ct. There are a few properties that are located within the IRC owned parcels that will be affected. This may cause complications since this area has some environmental justice issues. Also, the drainage team is proposing to use these parcels to construct a pond for Basin 10.

Water Crossing Improvements

- Snubbs mentioned that all existing culverts used as cross drains will be extended and the existing bridges will be replaced to accommodate the proposed roadway improvements.
- Snubbs explained that the proposed roadway will increase the turning radius of the existing sharp turn along the CR-510 roadway, from 90th Avenue to 85th

Street. A bridge may not be possible at this location due to the skew that would be needed from the bridge to accommodate the larger radius of the roadway. As a result, FDOT will need a Right-of-Way permit from Sebastian River Improvement District (SRID) to install a culvert instead of a bridge or realign Lateral Canal D. These options will prevent pile installation in the center of the canal to support the bridge. However, there are some legal dispute about who regulates and maintain Lateral Canal D. There are landowners to the west of the canal that may have legal rights.

- IRC believes that a culvert may not work at the bend of CR-510 because there is a large amount of volume traveling through the Lateral Canal D. The proposed culvert would have to be big enough to accommodate the cross section of the canal without expanding the canal.
- FDOT mentioned that they will investigate the size of the culvert that will be needed for this canal.

Right-of-Way Requirements

- The end of the project area, located between 64th Ave and 58th Ave, is just north of Indian River Farms Water Control District (IRFWCD). IRFWCD agreed to receive drainage from CR-510, but will not accept any runoff north of the roadway. As such, the drainage system must ensure no runoff enter IRFWCD from the north of CR-510.
- Snubbs informed IRC that FDOT is in the process of acquiring a conceptual right of way permit from SRID for the installation of the culvert and a right of way permit from IRFWCD to connect the roadway drainage to their water control district.

Action Items:

- IRC to provide FDOT with easement document to show that properties north east of Basin 9 may have discharge rights into the roadway

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave IRC

Date: 1/23/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
Olivia Bonilla	FDOT Drainage		olivia.bonilla@dot.state.fl.us	954 777 4134
Wilord Metellus	FDOT drainage	Drainage	Wilord.metellus@dot.state.fl.us	954-777-4467
Maria FORMOSO	FDOT	P.M.	maria.formoso@dot.state.fl.us	954 777 4677
Carlos Rodriguez	METRIC	Consultant PM	cdr@metriceng.com	305-235-5098
Rich Szpyrka	IRC	PW Director	rszpyrka@IRCGOV.com	772-226-1379
Amy Sob[illegible]	IRC MPO	Transportation plnr	ASOBCZAK@IRCGOV.com	772-226-1519
[illegible]	IRC MPO	[illegible]	[illegible] @ircg[illegible]	772 226-1455
Shaq Samuel	Snubbs	Drainage	Shaquon.samuel@snubbs.com	305 885 6400 ext. 205

MEETING NOTES **3/01/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

SRID Board Attendees:
Sean Sexton, Board Supervisor
Jeff Bass, Board Supervisor
Tom Hammond, Board Supervisor
Samuel Block, Staff member
George Simmons, PE
Todd Wodraska, SRID Administration

District 4 Attendees:
Maria Formoso, PE, PMP, FDOT Project Manager (teleconference)
Olivia Bonilla, Drainage Engineer (teleconference)
Wilord Metellus, Drainage Engineer (teleconference)

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager (teleconference)
Juan Venezula, Bridge Engineer (teleconference)
Rob Myers, Senior Wildlife and NEPA Specialist (teleconference)

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer (teleconference)
Shaquon Samuel, EI, Drainage Engineer (teleconference)

Location: 1555 Indian River Drive, Suite B-125, Vero Beach, FL 32960

Time: 10:00 AM

Background:

- During an agency meeting between Florida Department of Transportation (FDOT) and Sebastian River Improvement District (SRID) on 01/19/2017, FDOT requested a conceptual permit from SRID to replace an existing bridge in Lateral Canal D with a culvert.

- SRID mentioned that FDOT's conceptual permit request must be taken to the SRID Board to be reviewed in the **Mar-01-2017** SRID Board Meeting.

Discussion:

Permit Request Letter Overview

- Snubbs summarized the Permit Request letter submitted to SRID. The summary may include the following:
    - **Problem**: The proposed roadway near Treasure Coast Elementary School will cross Lateral Canal D at such a skew that a bridge crossing would not be feasible.
    - **Solution**: FDOT has proposed 2 alternative solutions. Alternative A is to replace the bridge with a culvert of similar hydraulic capacity. Alternative B is to realign the canal to flow under the bridge at a perpendicular angle.

Alternative A

- Snubbs mentioned that one of the major benefits of replacing the bridge with a culvert is the elimination of intermediate supports in the canal that will be needed for the skewed bridge.
- SRID mentioned that there is a lot of undeveloped land in the basin for Lateral Canal D and they are concerned with the accumulation of debris in the culvert will cause head loss in the canal. SRID asked if an emergency blowout can be provided for the culvert.
- Florida Bridge mentioned that 3 cells/barrels can be provided, instead of 2, to account for the accumulation of debris.
- SRID mentioned that the culvert must be designed with the same hydraulic capacity as the existing bridge and should be able to handle flow from the 100-year storm.
- Snubbs mentioned that the culvert will be designed for 1 feet above the peak stage for the 100-year storm.

Alternative B

- Alternative B was not considered since realigning the canal may require R/W acquisition, impact future developments and require substantial adjustments to the roadway profile.

Bridge Option

- SRID asked Florida Bridge and Transportation Inc (Florida Bridge) if overhead support for the bridge was considered.

- Florida Bridge mentioned that overhead support was not considered, however, it would not be meet standard requirements and may not be approved by FDOT.

- SRID inquired about the number of piles that will be needed to support the skewed bridge.

- Florida Bridge mentioned that the bridge will require 4 – 5 intermediate supports approximately 30 ft apart longitudinally and 12 – 15 ft apart from a cross sectional view point.

- SRID asked Florida Bridge for a schematic drawing of the structural supports needed for the skewed bridge.

- Florida Bridge agreed to send SRID a schematic drawing of the structural supports needed for the skewed bridge.

- Florida Bridge mentioned that there were many possible solutions to support the skewed nature of the bridge but they are not practical.

Public Workshop

SRID mentioned that more information will be needed in order for the Board to make a final decision about the culvert alternative. SRID decided that a Public Workshop should be held on **Apr-12-2017** at **10 AM** to demonstrate that the culvert will be able to handle flow from the 100-year storm and will not cause adverse impacts to the canal.

Action Items:

- Florida Bridge to send SRID a schematic drawing of the structural supports needed for the skewed bridge by **Mar-20-2017**.

- Snubbs to submit Workshop package to SRID by **Mar-20-2017**.

- Public Workshop to be held on **Apr-12-2017** at **10 AM** at the Law office of Samuel A. Block.

Florida Department of Transportation
RICK SCOTT
GOVERNOR
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309
RACHEL D. CONE
INTERIM SECRETARY

March 16th, 2017

Sebastian River Improvement District (SRID)
The Oaks Center
2501A Burns Rd.
Palm Beach Gardens, FL

Attn: SRID Board Members
RE: **CR 510 Crossing of Lateral Canal D**

Dear Board Members:

FDOT is proposing to replace the existing CR 510 bridge over Lateral Canal D with a culvert. Your input, during this phase of the project, is essential in determining critical design elements for CR 510.

Background
FDOT is currently conducting a Project Development and Environment (PD&E) Study for County Road CR-510 to investigate widening the roadway from two to four lanes for the 5.27 miles segment between CR-512 and 58th Avenue. The PD&E phase began in Feb 2016 and is estimated to end in May 2018. FDOT will be advertising the design phase of the project as soon as May 2017. The design phase will be completed within the next two (2) years. Lastly, the construction phase of this project will begin approximately 3 to 4 years from now.

Crossing of Lateral Canal D

The radius of the horizontal curve for CR-510, near Treasure Coast Elementary school, will be made flatter to enhance safety as part of the proposed improvements. Preliminary structural analysis indicates that the flatter curve will cause the roadway to cross Lateral Canal D at a significant skewed angle. A bridge will be unfeasible at this location without supporting piles in the center of the canal. FDOT understands that placing piles in the center of Lateral Canal D is not desired by Sebastian River Improvement District (SRID) as it may impede the free flow of water under the bridge and may increase the frequency of needed maintenance to clear debris from the crossing. As such, FDOT is considering the following 2 alternatives.

> **Alternative A**: Replaces the bridge with a culvert of similar hydraulic capacity. This alternative can be accommodated within the existing Right-of-Way (R/W). Nominal adjustments to the vertical roadway profile would be needed.
>
> **Alternative B:** Realigns Lateral Canal D so that it can cross under CR 510 at a near perpendicular angle and provides a bridge with no supporting piles in the center of the canal. This alternative will require acquisition of Right-of-Way (R/W) and may impact the development potential of adjacent properties. Substantial adjustments to the vertical roadway profile would also be needed.

After considering the pros and cons of each alternative, FDOT is in favor of Alternative A, which replaces the existing CR 510 bridge over Lateral Canal D with a culvert. This alternative is anticipated to have less impacts on the surrounding community and provide similar hydraulic performance to the existing bridge. See attached exhibit.

Board Request

FDOT is requesting that the Sebastian River Improvement District Board provide comments on whether they will support Alternative A, which replaces the existing CR 510 bridge over Lateral Canal D with a culvert.

R/W Permit Approach

In an effort to reduce the potential for delays during design and construction of roadway projects, FDOT is placing an emphasis on identifying unique permitting situations and securing advance permits for those situations during the PD&E study, where possible. As such, the Department would like to obtain a R/W permit, from SRID, for the replacement of the CR 510 bridge over Lateral Canal D with a culvert as shown in the attached exhibit. Since the R/W permit for this crossing will be sought during the PD&E study, full construction plans will not be available when the application is submitted. The Department asks that SRID accept a permit sketch of the culvert showing basic elements such as culvert dimensions and maintenance access points in lieu of full construction plans. The submittal would include a preliminary hydraulic model to demonstrate that the proposed culvert provides similar hydraulic performance to the existing bridge. SRID would have the option of placing a special condition on the permit requiring FDOT to submit final construction plans for approval prior to beginning construction to ensure that the culvert is constructed in substantial compliance with the approved R/W permit. Submittal of the R/W permit is anticipated to occur in April 2017.

Summary

FDOT is requesting that the Sebastian River Improvement District Board provide comments on whether they will support Alternative A, which replaces the existing CR 510 bridge over Lateral Canal D with a culvert. See attached exhibit. The Department would like to obtain a R/W permit, from SRID, during the PD&E study phase of this project. FDOT asks that SRID accept a permit sketch of the culvert showing basic elements such as culvert dimensions and maintenance access points in lieu of full construction plans. SRID would have the option of placing a special condition on the permit requiring FDOT to submit final construction plans for approval prior to beginning construction to ensure that the culvert is constructed in substantial compliance with the approved R/W permit. Submittal of the R/W permit is anticipated to occur in April 2017.

I look forward to hearing from you. Thank you very much for your assistance.

Sincerely,

Olivia Bonilla
Drainage Designer
FDOT – District 4
3400 Commercial Blvd
Fort Lauderdale, FL 33309
(954) 777-4134
wilord.metellus@dot.state.fl.us

Attachments:
Exhibit 1: CR 510 Proposed Culvert Location

MEETING NOTES **4/12/2017**

Subject: CR-510 PD&E from CR-512 to 58th Ave

FPID: 405606-2-22-02

SRID Attendees:
Sean Sexton, Board Supervisor
Jeff Bass, Board Supervisor
Todd Wodraska, SRID Administration
Len Lindahl, SRID Administration
George Simmons, PE, District Engineer
Samuel Block, Attorney

FDOT District 4 Attendees:
Maria Formoso, PE, PMP, FDOT Project Manager
Olivia Bonilla, EI Drainage Engineer
Carlos Rodriguez, PE, Consultant Project Manager (Metric)
Gabriela Garcia, PE, Roadway Engineer (Metric)
Chandra Raman, PE, Drainage Engineer (Metric)
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer (Snubbs)

Public Attendees:
Dan "Hugh" Corrigan (Corrigan Family)
Lisa Chivian (Corrigan Family)
Edward de la Porte (Corrigan Family Attorney)
Bob Sprinkle, PE (Corrigan Family Engineer)

Location: 1555 Indian River Drive, Suite B-125, Vero Beach, FL 32960

Time: 10:00 AM

Background:

FDOT is currently conducting a Project Development and Environment (PD&E) Study to evaluate widening CR 510 from CR 512 to 58th Avenue. One of the safety improvements being evaluated is to flatten the horizontal curve for CR-510, near Treasure Coast Elementary school. Preliminary structural analysis indicates that the flatter curve will cause the roadway to cross Lateral Canal D at a significant skewed angle, which will require an atypical and inefficient structural design if a bridge is selected to span Lateral Canal D. When the Bridge Development Report is prepared for Lateral Canal D as part of the final design, it is anticipated that the bridge crossing option will be identified as cost prohibitive when compared to the culvert crossing option.

In an effort to reduce the potential for delays during design and construction of roadway projects, FDOT is placing an emphasis on identifying unique permitting situations and securing advance permits or advance approval for those situations during the PD&E study. FDOT attended the March 1, 2017 SRID Board Meeting to discuss the feasibility of replacing the Lateral Canal D bridge with a culvert crossing. SRID and members of the public raised concerns with the hydraulic capacity of the culvert and its potential of clogging during major rain events due to the large amount of undeveloped land that drains through Lateral Canal D. SRID requested that FDOT participate in a topic specific workshop, hosted by SRID on April 12th, 2017, to further discuss the option of replacing the Lateral Canal D bridge with a culvert crossing. Notes of the April 12th, 2017 workshop follow.

Discussion:

FDOT provided project background information as summarized above. One item of clarification is that the existing CR 510 bridge may remain, depending on local preference, after the new CR 510 crossing is installed.

FDOT distributed a packet containing the preliminary hydraulic analysis conducted to evaluate placing a culvert crossing in Lateral Canal D for CR 510. A page-turn review of the packet was conducted. Options reviewed are summarized below.

- **Alternative-1**: Existing Bridge to remain with no new structure (No-build Alternative)
- **Alternative-2**: Existing Bridge to remain with new bridge with 4 piers at the proposed roadway crossing.
- **Alternative-3**: Existing Bridge to remain with 3-12′x15′ box culvert cells at the proposed crossing.
- **Alternative-4**: Existing Bridge to remain with 2-12′x15′ box culvert cells at the proposed crossing.

FDOT stated that a conservative approach was employed in the analysis by using both flow rate and peak stages as the tailwater condition for various design storms. Typically, only the flow rate is used as the boundary condition. By using a more conservative approach, the analysis has an inherent safety factor. The analysis demonstrates that a triple box culvert (Alternative-3) and bridge option (Alternative-2) provide similar hydraulic flow capacity since the peak stages for both alternatives are the same. Although a double box culvert (Alternative 4) would provide the required hydraulic capacity with the allowable backwater increment of 0.1′, a triple box culvert (Alternative-3) is being proposed to address potential clogging and maintenance concerns. In addition, the 100-year peak stages of the four alternatives are below the 100-year FEMA elevations at the proposed bridge location. All options evaluated provide a minimum drift clearance of 1 foot above the 100-Year FEMA elevation. Based on this analysis, FDOT feels that a triple box culvert (Alternative-3) meets flow capacity and clogging concerns raised by SRID and the public during the SRID Board Meeting held on March 1, 2017 SRID.

SRID requested clarification on how/why the triple box culvert (Alternative-3) was performing similar to the bridge option (Alternative-2).

FDOT responded that the similar performance was primarily due to the following two points.

1. The culvert option will require the channel to be widened so that a rectangular cross-sectional area is provided rather than a trapezoidal cross-sectional area as needed with a bridge.

2. The culvert option will have less friction along the wetted perimeter because it will have concrete sides rather than the heavily vegetated sided typical of the bridge option.

SRID asked why the culvert inverts were not being proposed at the channel bottom and if it would create any hydraulic impacts upstream. A request was made to lower the culvert inverts to match the channel bottom.

FDOT stated that the difference between culvert invert and channel bottom are negligible when compared to the channel depth and average flow. As such, upstream impacts are not anticipated due to this difference. Per SRID's request, FDOT will adjust the culvert design so that the invert matches the channel bottom.

SRID stated that flow capacity in the canal needed to be maintained and asked if the culverts were able to be constructed while meeting this requirement.

FDOT stated that one way to maintain canal flow is by constructing the culverts in phases while maintaining a diversion channel. The minimum flow capacity would need to be specified by SRID, in the Right of Way (R/W) permit, for the dry and wet season. FDOT will require its contractor to develop a construction sequence that maintains minimum flow requirements as specified by the SRID R/W permit.

FDOT asked if SRID has a minimum spacing distance between bridges and if this would require the existing CR 510 bridge to be removed after the proposed culvert crossing is installed. The County's preference is to remove the existing bridge once the proposed crossing is installed but local residents and Treasure Coast Elementary school may request that the existing bridge remain.

SRID stated that while they have a minimum bridge spacing requirement, they would consider a variation, if needed, to allow the existing bridge to remain if the County makes the request.

SRID asked public attendees if they had questions or comments concerning the triple culvert crossing being proposed by FDOT.

Corrigan Family stated that their engineer had reviewed submitted documentation and that their concerns with flow and clogging were adequately addressed. They reiterated the need to maintain flow capacity during construction to avoid flooding their property, which lies upstream of the crossing. No further concerns were identified by the Corrigan Family.

FDOT stated that they would be requesting a formal determination on whether or not a culvert crossing would be allowed at this location and that SRID's response would be included as a PD&E commitment and it would be followed during the design phase of the project.

SRID stated that sufficient information was provided in the workshop for them to feel comfortable with providing FDOT with a formal response. A suggestion was made to outline the request in a letter in time for the next SRID Board meeting, which is scheduled for Wednesday June 7th, 2017, at the Northern Trust Bank Community Room located on Beachland Boulevard in Vero Beach.

Action Items:

- FDOT to submit a request, by **May 24th 2017,** for formal determination on whether or not a culvert crossing would be allowed at this location.

Florida Department of Transportation
RICK SCOTT
GOVERNOR
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309
RACHEL D. CONE
INTERIM SECRETARY

May 19th, 2017

Sebastian River Improvement District (SRID)
The Oaks Center
2501A Burns Rd.
Palm Beach Gardens, FL

Attn: SRID Board Members
RE: **CR 510 Crossing of Lateral Canal D**

Dear Board Members:

FDOT is proposing a new culvert crossing of Lateral Canal D at CR 510. Your input, during this phase of the project, is essential in determining critical design elements for CR 510.

Background
FDOT is currently conducting a Project Development and Environment (PD&E) Study for CR 510 to investigate widening the roadway from two to four lanes for the 5.27 miles segment between CR-512 and 58th Avenue. The PD&E phase began in Feb 2016 and is scheduled to end in May 2018. FDOT will be advertising the design phase of the project in October 2017. The design phase will be completed within the next 4 years, with 2-3 years for right-of-way acquisition. Lastly, the construction phase of this project will begin once the right-of-way acquisition has been completed.

One of the safety improvements being evaluated is to flatten the existing horizontal curve for CR-510 near Treasure Coast Elementary school. Preliminary structural analysis indicates that the flatter curve will cause the roadway to cross Lateral Canal D at a significant skewed angle, which will require an atypical and inefficient structural design if a bridge is selected to span Lateral Canal D. When the Bridge Development Report is prepared for Lateral Canal D as part of the final design, it is anticipated that the bridge crossing option will be identified as cost prohibitive when compared to the culvert crossing option.

FDOT attended the March 1, 2017 SRID Board Meeting to discuss the feasibility of constructing a new culvert crossing of Lateral Canal D at CR 510. SRID and members of the public raised concerns with the hydraulic capacity of the culvert and its potential of clogging during major rain events due to the large amount of undeveloped land that drains through Lateral Canal D. SRID requested that FDOT participate in a topic specific workshop, hosted by SRID on April 12^{th}, 2017, to further discuss the culvert crossing.

During the April 12^{th} SRID workshop, FDOT presented results of the preliminary hydraulic modeling conducted to evaluate potential crossing alternatives. All alternatives conservatively assumed that the existing bridge will remain because the County has not made the final determination on whether or not the existing bridge will be needed after CR 510 is improved. A summary of the alternatives follows.

- Alternative-1: Existing Bridge to remain with no new structure (No-build Alternative)
- Alternative-2: Existing Bridge to remain with new bridge with 4 piers at the proposed roadway crossing.
- Alternative-3: Existing Bridge to remain with 3-12’x15’ box culvert cells at the proposed crossing.
- Alternative-4: Existing Bridge to remain with 2-12’x15’ box culvert cells at the proposed crossing.

The alternatives presented at the workshop were evaluated by employing a conservative approach in the analysis by using both flow rate and peak stages as the tailwater condition for various design storms. Typically, only the flow rate is used as the boundary condition. By using a more conservative approach, the analysis has an inherent safety factor. The analysis demonstrated that a triple box culvert (Alternative-3) and bridge option (Alternative-2) provide similar hydraulic flow capacity since the peak stages for both alternatives are the same. Although a double box culvert (Alternative 4) would provide the required hydraulic capacity with the allowable backwater increment of 0.1’, a triple box culvert (Alternative-3) is being proposed to address potential clogging and maintenance concerns. In addition, the 100-year peak stages of the four alternatives are below the 100-year FEMA elevations at the proposed bridge location. All options evaluated provide a minimum drift clearance of 1 foot above the 100-Year FEMA elevation.

SRID stated that sufficient information was provided in the workshop for them to feel comfortable with providing FDOT with a formal response regarding the proposed culvert crossing at CR 510 and provided the following Right of Way (R/W) permit requirements.

- Lower the invert of the center culvert barrel to match the canal bottom
- Flow capacity in the canal will need to be maintained during construction

Based on the analysis presented at the workshop and feedback provided by SRID, FDOT feels that a triple box culvert (Alternative-3) meets flow capacity, clogging concerns, and R/W permit requirements.

Crossing of Lateral Canal D

FDOT is proposing a new triple box culvert crossing of Lateral Canal D at CR 510. Preliminary hydraulic modeling shows that a double box culvert is capable of conveying the necessary flows. As such, the proposed triple box culvert has excess capacity with one spare culvert in case one culvert becomes clogged. Inverts for each of the three barrels will be placed at the canal bottom. Culvert barrels will have a width of 12-ft, height of 17-ft and approximate length of 185-ft. A minimum drift clearance of 1 foot above the 100-Year FEMA elevation is provided by this crossing. The triple box culvert configuration is such that it can be constructed in phases, while maintaining a bypass channel if needed, to ensure minimal flows are maintained for dry and wet seasons as specified by SRID.

Board Request

FDOT is requesting that the SRID Board provide a formal determination on whether or not a new triple box culvert crossing of Lateral Canal D at CR 510 will be allowed. SRID’s response will be included as a PD&E commitment and it will be followed during the design phase of the project.

R/W Permit Approach

In an effort to reduce the potential for delays during design and construction of roadway projects, FDOT is placing an emphasis on identifying unique permitting situations and securing advance permits for those situations during the PD&E study, where possible. As such, the Department would like to obtain a R/W permit, from SRID, for the replacement of the CR 510 bridge over Lateral Canal D with a culvert as shown in the attached exhibit. Since the R/W permit for this crossing will be sought during the PD&E study, full construction plans will not be available when the application is submitted. The Department asks that SRID accept a permit sketch of the culvert showing basic elements such as culvert dimensions and maintenance access points in lieu of full construction plans. The submittal would include a preliminary hydraulic model to demonstrate that the proposed culvert provides similar hydraulic performance to the existing bridge. SRID would have the option of placing a special condition on the permit requiring FDOT to submit final construction plans for approval prior to beginning construction to ensure that the culvert is constructed in substantial compliance with the approved R/W permit. Submittal of the R/W permit is anticipated to occur in July 2017.

Summary

FDOT is requesting that the SRID Board provide a formal determination on whether or not a new triple box culvert crossing of Lateral Canal D at CR 510 will be allowed. See attached exhibit. The Department would like to obtain a R/W permit, from SRID, during the PD&E study phase of this project. FDOT asks that SRID accept a permit sketch of the culvert showing basic elements such as culvert dimensions and maintenance access points in lieu of full construction plans. SRID would have the option of placing a special condition on the permit requiring FDOT to submit final construction plans for approval prior to beginning construction to ensure that the culvert is constructed in substantial compliance with the approved R/W permit. Submittal of the R/W permit is anticipated to occur in July 2017.

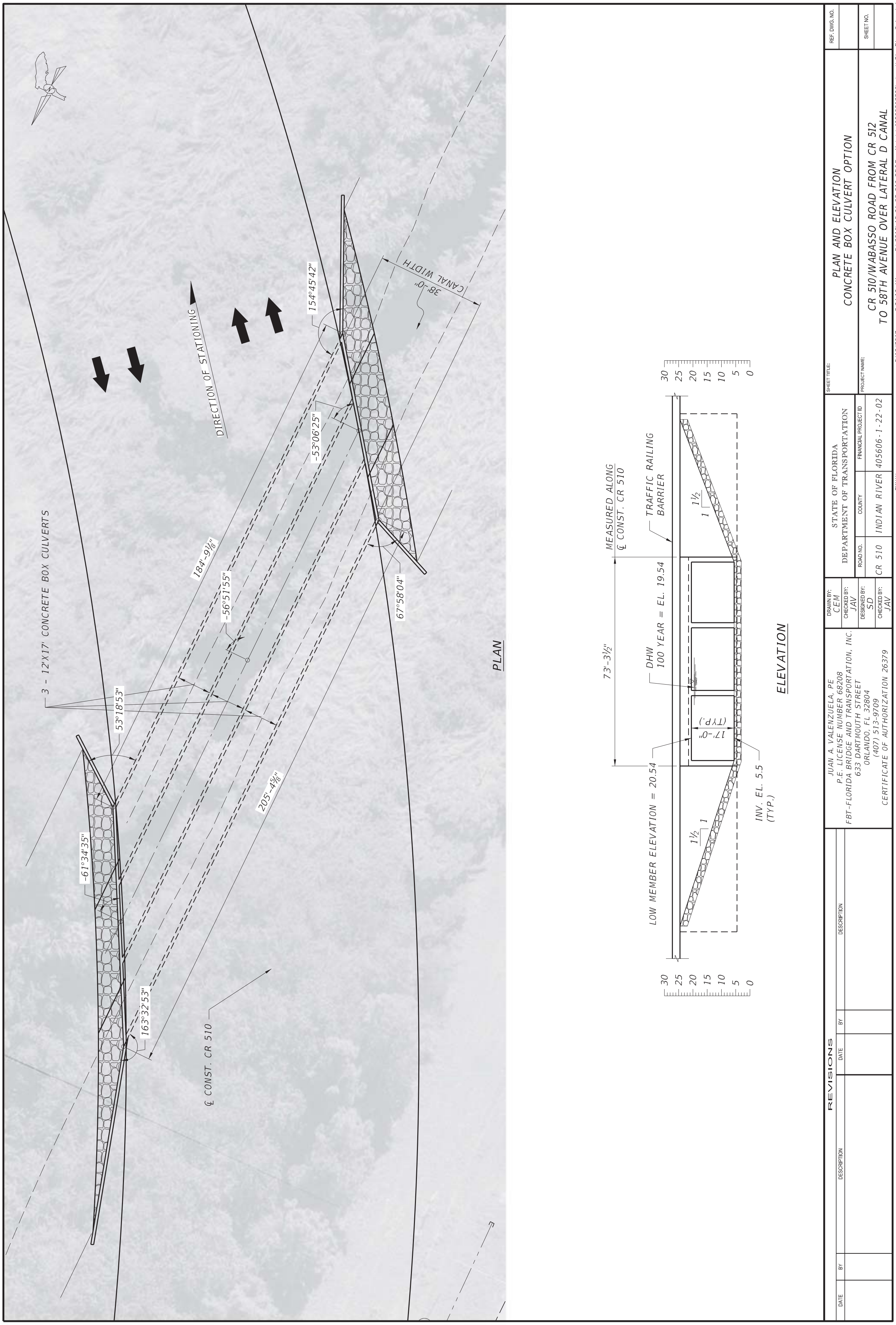
I look forward to hearing from you. Thank you very much for your assistance.

Sincerely,

Maria Formoso, P.E., P.M.P., Project Manager
Florida Department of Transportation - District 4 Design
3400 Commercial Blvd.
Ft. Lauderdale, FL., 33309
(954) 777-4677 Office (561) 452-8026 Cell
Email: Maria.Formoso@dot.state.fl.us

Attachments:
Exhibit 1: CR 510 Proposed Culvert Location

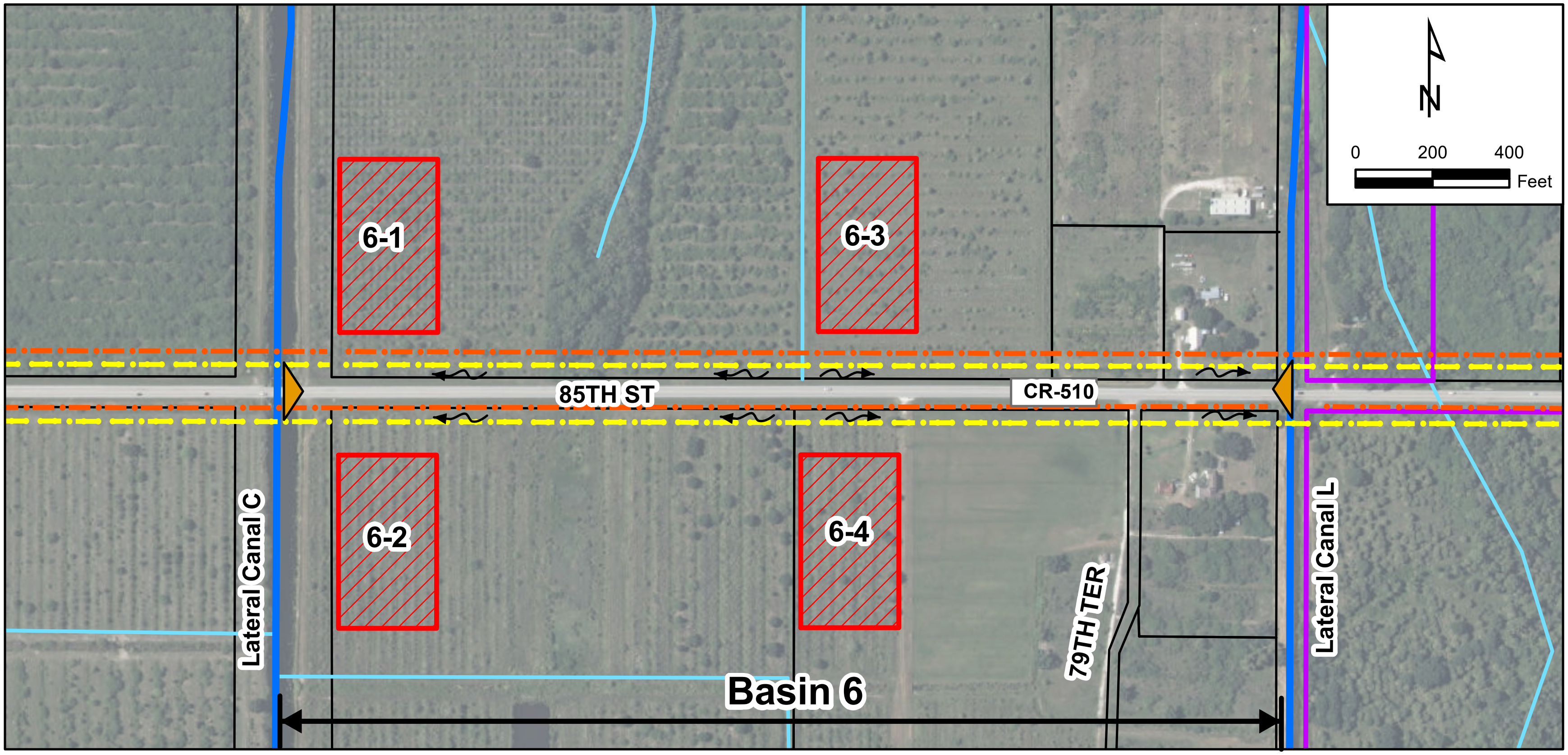

CANAL D WITH PROPOSED
BOX CULVERT
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
ROAD NO.
COUNTY
FINANCIAL PROJECT ID
SHEET NO.
REVISIONS
DATE
DESCRIPTION
DATE
DESCRIPTION
PROPOSED CANAL D
3-BOX CULVERT
EXISTING CANAL D
BRIDGE TO
REMAIN
0
50
200
Feet
885
890
895
900
905
910
4/10/2017
3:34:11 PM
scott.gamit
J:\Drainage\CR-510\Move to Miami Folder\DTDRDR01_canal_d.DGN


3 - 12'X17' CONCRETE BOX CULVERTS
DIRECTION OF STATIONING
CANAL WIDTH
38'-0"
154°45'42"
-53°06'25"
184'-9⅛"
-56°51'55"
67°58'04"
53°18'53"
-61°34'35"
205'-4⅝"
163°32'53"
℄ CONST. CR 510
PLAN
MEASURED ALONG ℄ CONST. CR 510
TRAFFIC RAILING BARRIER
73'-3½"
DHW
100 YEAR = EL. 19.54
LOW MEMBER ELEVATION = 20.54
17'-0" (TYP.)
INV. EL. 5.5 (TYP.)
1½
1
ELEVATION
REVISIONS
DATE
BY
DESCRIPTION
JUAN A. VALENZUELA, PE
P.E. LICENSE NUMBER 68208
FBT-FLORIDA BRIDGE AND TRANSPORTATION, INC.
633 DARTMOUTH STREET
ORLANDO, FL 32804
(407) 513-9709
CERTIFICATE OF AUTHORIZATION 26379
DRAWN BY: CEM
CHECKED BY: JAV
DESIGNED BY: SD
CHECKED BY: JAV
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
ROAD NO.
COUNTY
FINANCIAL PROJECT ID
CR 510
INDIAN RIVER
405606-1-22-02
SHEET TITLE:
PLAN AND ELEVATION
CONCRETE BOX CULVERT OPTION
PROJECT NAME:
CR 510/WABASSO ROAD FROM CR 512
TO 58TH AVENUE OVER LATERAL D CANAL
REF. DWG. NO.
SHEET NO.
5/19/2017
8:34:19 AM
BWilliams

APPENDIX D

(Pond Siting Process)

POND SITING EXHIBIT: BASIN 6



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

SUPERSEDED BY VERSION 2

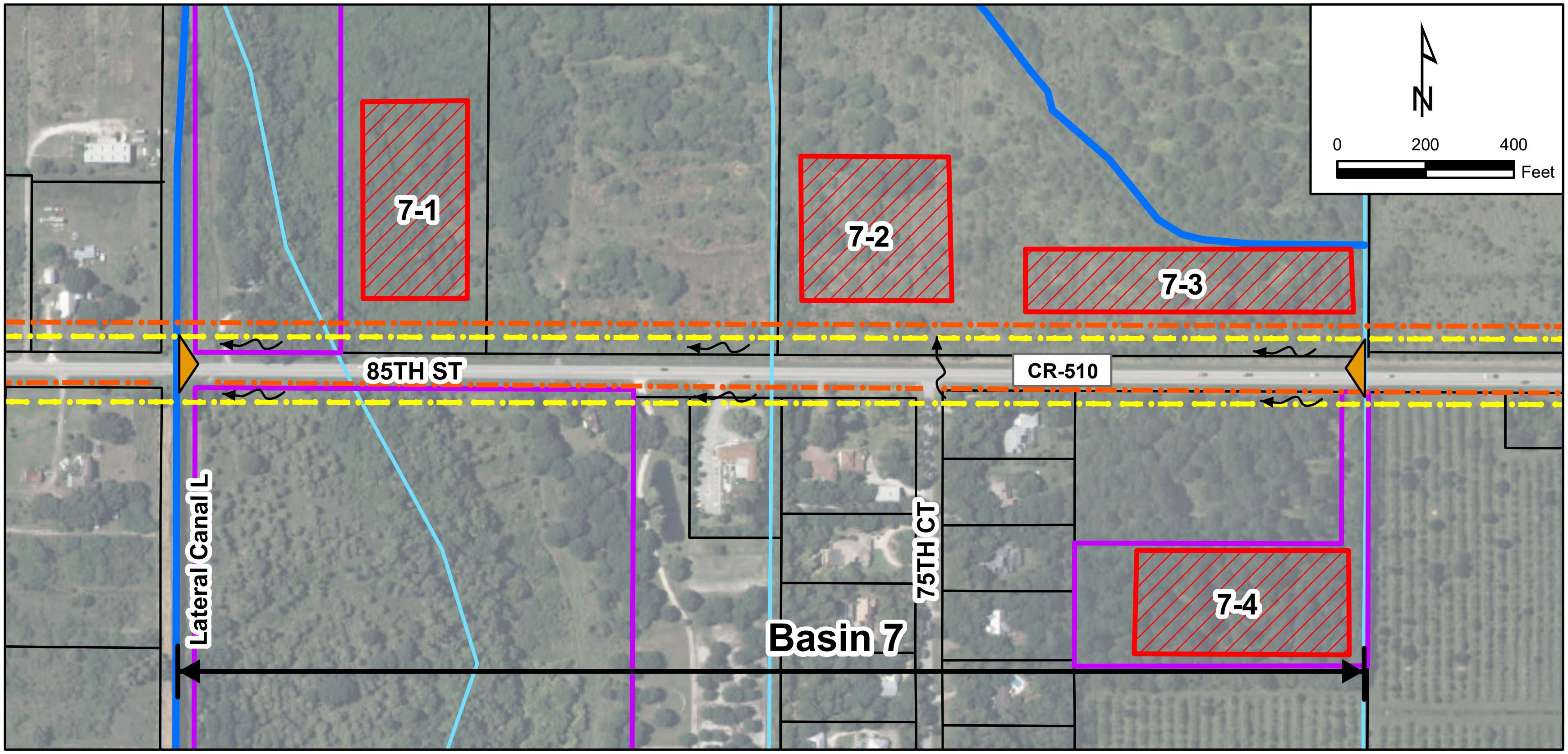
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- IRCParcel
- Primary Canal
- Secondary Canal
- Parcels
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
6-1	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-2	6	2.6	31383600000300000003	Parcel has an agricultural nursery. Partial Parcel
6-3	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-4	6	2.6	31383600000300000001	Parcel has one residential building. Parcial Parcel

snubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 1	1/30/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 6**

POND SITING EXHIBIT: BASIN 7



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

SUPERSEDED BY VERSION 2

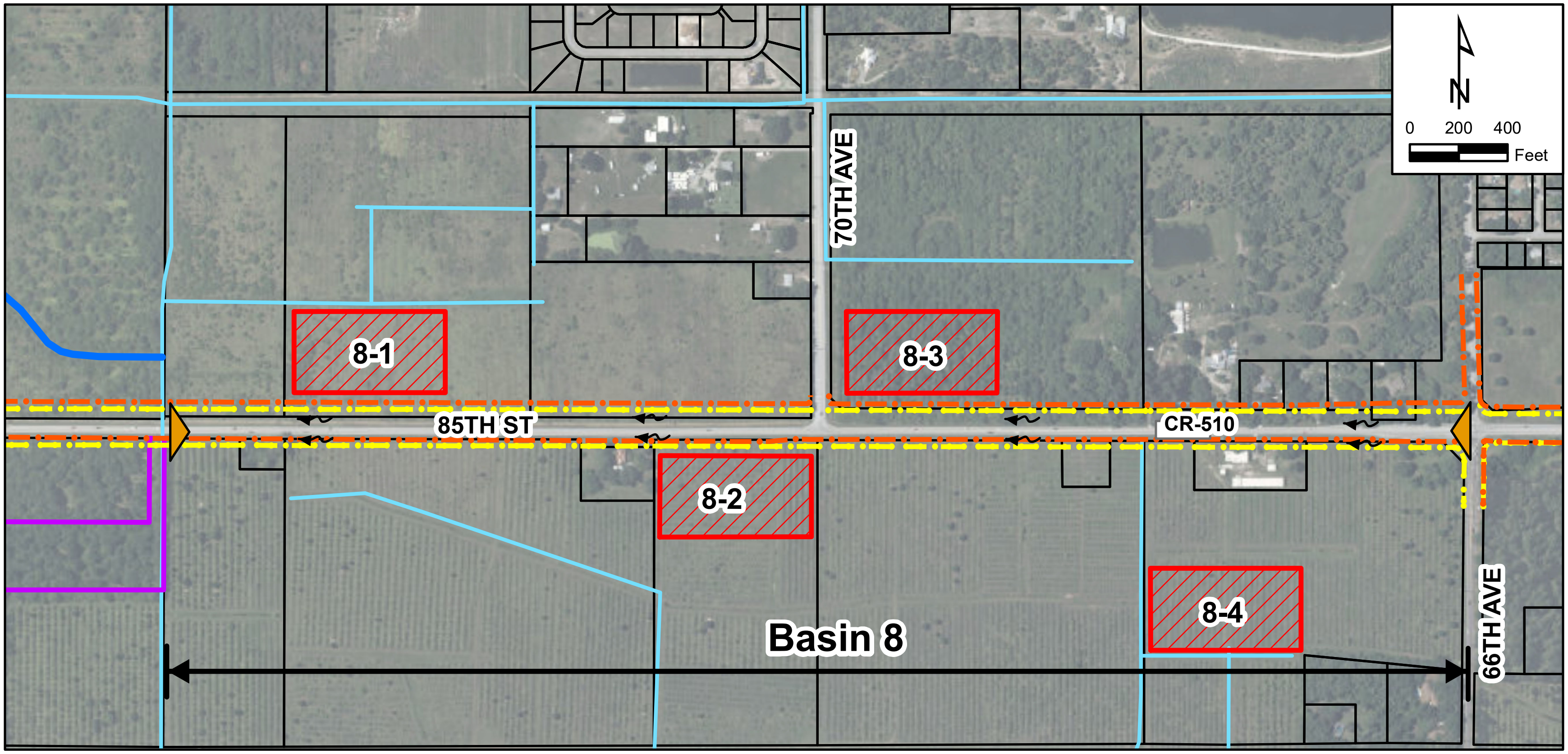
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
7-1	7	2.7	31382500000700000003	Vacant Property. Partial Parcel
7-2	7	2.7	31382500000700000002	Vacant Property. Partial Parcel
7-3	7	2.7	31383600000100000001	Vacant Property. Partial Parcel
7-4	7	2.7	31383600000100000001	Indian River County Parcel. Partial Partial.

snubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 1	1/30/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 7**

POND SITING EXHIBIT: BASIN 8



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

SUPERSEDED BY VERSION 2

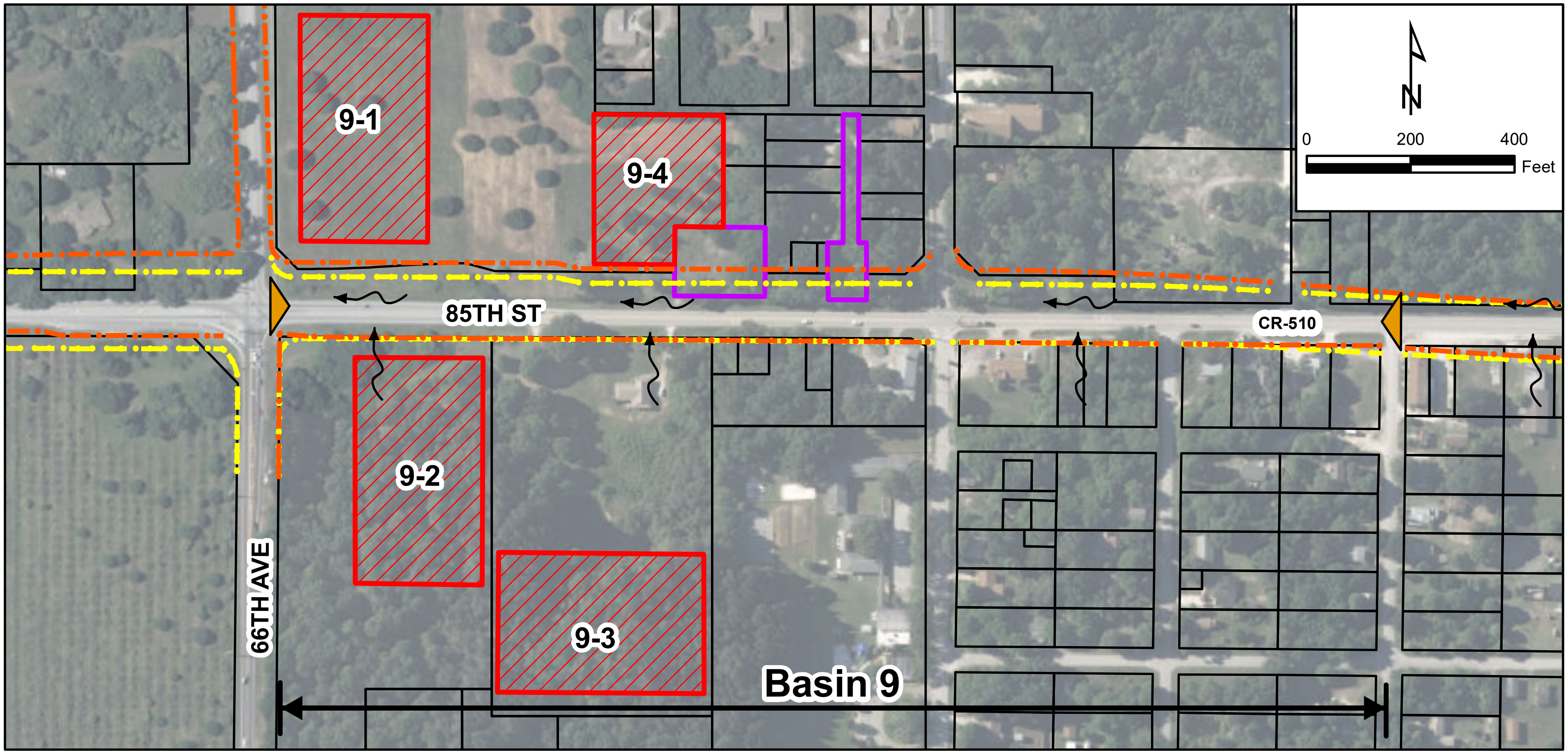
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
8-1	8	4.7	31393000000500000005 31393000000500000006	Vacant Property. Partial Parcel Vacant Property. Partial Parcel
8-2	8	4.7	31393100000300000005	Parcel has an agricultural nursery. Partial Parcel
8-3	8	4.7	31393000000700000002	Vacant Property. Partial Parcel
8-4	8	4.7	31393100000100000007	Parcel has an agricultural nursery. Partial Parcel

snubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 1	1/30/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 8**

POND SITING EXHIBIT: BASIN 9



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

SUPERSEDED BY VERSION 2

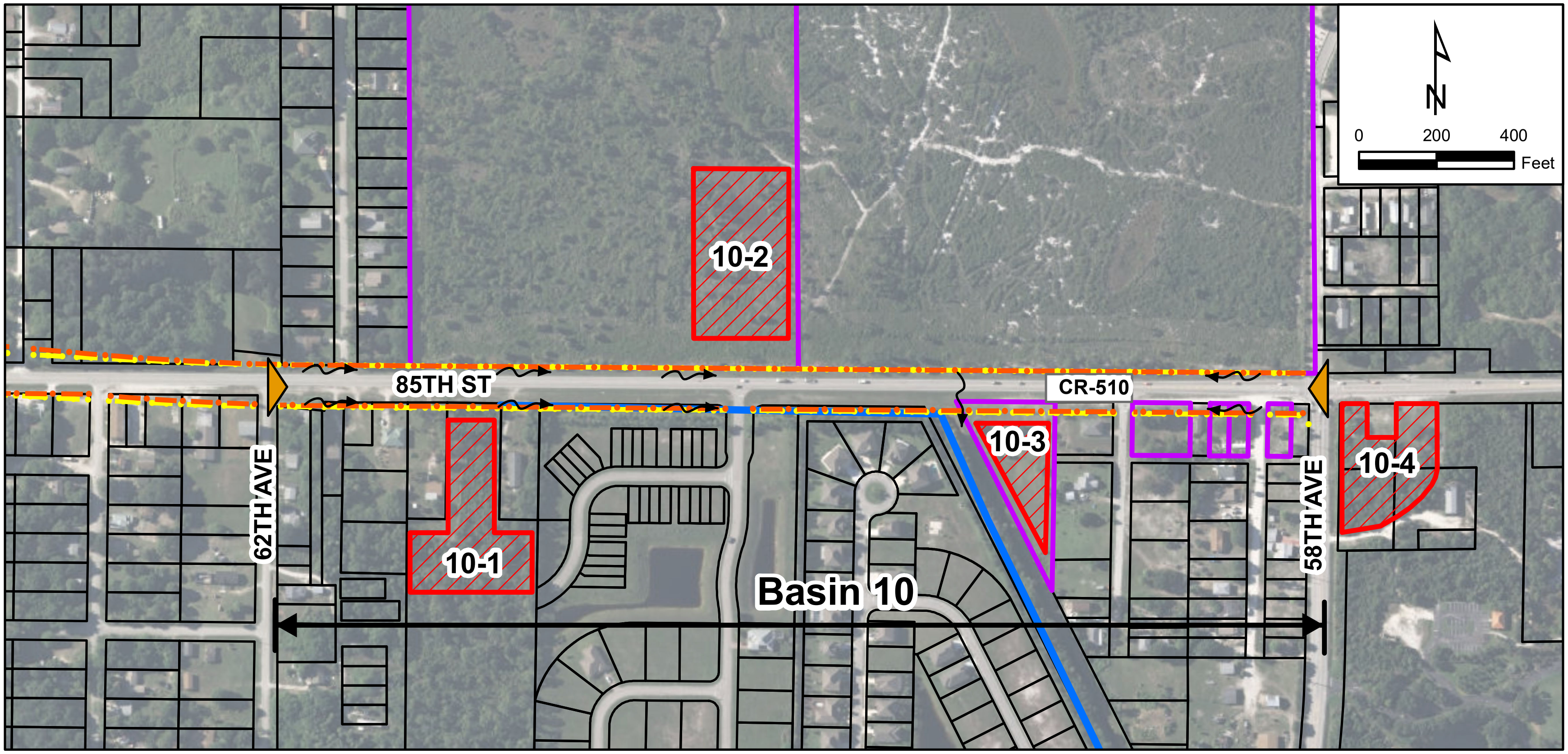
LEGEND:

Alt.1 R/W
Alt.2 R/W
Potential Ponds
Parcels
IRCParcel
Basin Limits
Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
9-1	9	2.5	31392900000500000080	Vacant Property. Partial Parcel
9-2	9	2.5	31393200000300000008	Vacant Property. Partial Parcel
9-3	9	2.5	31393200000300000007	Vacant Property. Partial Parcel
9-4	9	2.5	31392900000500000080 31392900000500000083 31392900000500000083.1 31392900000500000084 31392900000500000085 31392900000500000086 31392900000500000087 31392900000500000090 31392900000500000091 31392900000500000092	Vacant Property. Partial Parcel Vacant Property. Complete Parcel Indian River County Parcel. Partial Parcel Parcel has a residential building. Parcial parcel Parcel has a residential building. Complete parcel Indian River County Parcel. Complete Parcel Vacant Property. Complete Parcel Vacant Property. Complete Parcel Vacant Property. Complete Parcel Indian River County Parcel. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 1	1/30/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 9**

POND SITING EXHIBIT: BASIN 10



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

SUPERSEDED BY VERSION 2

LEGEND:

Alt.1 R/W
Alt.2 R/W
Potential Ponds
Primary Canal
Parcels
IRCParcel
Basin Limits
Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
10-1	10	2.5	31392900000700000004	Indian River County Parcel. Partial Parcel
10-2	10	2.5	31392900000700000004	Indian River County Parcel. Partial Parcel
10-3	10	2.5	31392900000700000001.1	Indian River County Parcel. Partial Parcel
10-4	10	2.5	31393200000100000006	Indian River County Parcel. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 1	1/30/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 10**

MEETING NOTES **1/30/2017**

Subject: Pond Siting Meeting #1 (CR-510 PD&E from CR-512 to 58th Ave)

FPID: 405606-2-22-02

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager
Olivia Bonilla, Drainage Engineer
Wilord Metellus, Drainage Engineer
James Poole, District Drainage Engineer
Georgi Celusnek, Project Development Engineer
Diego Velazquez, LAP Coordinator
Shelley ChinQuee, Construction Engineer
Victor Ramos, Deputy District R/W Manager
Donnie Webster, District R/W
John Rodemeyer, District R/W
Tom Stepp, District R/W
Morteza Alian, District Maintenance Engineer
Laurice Mayes, Attorney

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer
Shaquon Samuel, EI, Drainage Engineer

Location: FDOT District 4 (District Maintenance Conference Room- West)

Time: 8:30 AM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue. The project is approximately 5.3 miles long.
- The scope of the project includes reconstruction of CR-510 from an existing two lane roadway facility to one with four lanes. The proposed typical sections will include both urban and sub-urban sections. Also, the scope of the project involves the replacement of three (3) bridges and two (2) culverts.

Discussion:

Pond Siting Team Responsibilities

- The team consists of individuals from various FDOT departments and consultant classifications, which were assigned during the pond siting process. The team responsibilities are listed in the FDOT-D4 Pond Siting Procedures. This document was included in the invite for the first pond siting meeting.
- During the pond siting meeting, the team collectively agreed that a representative from Indian River County should participate in future pond sitting meetings.
- James Poole suggested that the landscape architect, Elizabeth Hasset, be invited to future pond siting meetings for her inputs on aesthetics.

Pond Siting Schedule

- Tommy Ruiz presented an overview of the Pond Siting Schedule as described in the meeting agenda.
- After discussing the team's individual availability, it was determined that the pond siting meeting will not be held on Mondays, Wednesday afternoons, or Fridays. Wednesday mornings is the preferred meeting time.

Cursory Review of Basins Needing Offsite Ponds

- Snubbs presented a cursory overview of the initial pond locations to insure proper coordination for potential pond site locations and to document fatal flaws. The team performed a general review to narrow down potential alternatives. During the review the following topics were discussed:
    - **Identified Potential NEPA Impacts and Issues**
      No ponds can be constructed in the Wabasso Habitat Land, which is located north of CR-510 between 61st Dr. and 58th Ave, unless there are no other options available.
    - **Identified Potential Relocations**
      A Right-of-Way team member suggested ponds to be placed in different parcels if possible since the impacts for ponds in the same parcel will be equivalent.
    - **Identified Potential Construction Issues**
      Indian River County (IRC) purchased land, south of CR-510 located approximately 310 feet east of 75th Ct., to serve the CR-510 runoff, however a drainage easement may be needed to convey runoff from the pond to the canal.

      There is a concern that the configuration of the proposed ponds may impact the remainder parcel and its viability for development. A suggestion was made to consider configuring the ponds thinner and longer to minimize frontage impacts.
    - **Identified Potential R/W Requirements**
      The end of the project area, located between 64th Ave and 58th Ave, is just north of Indian River Farms Water Control District (IRFWCD). IRFWCD agreed to receive drainage from CR-510, but will not accept any runoff north of the roadway. As such, the drainage system must ensure no runoff from the north can enter IRFWCD.

- **<u>Identified Potential Environmental Justice Concerns</u>**
  The team was advised that there may be a concern with environmental justice along the eastern end of the corridor.

- **<u>Dual Swale System Needed for Offsite Contributing Area</u>**
  Currently the roadway swales, in the more rural segment (86th Ave to 66th Ave), are receiving runoff from undeveloped offsite areas. This issue was discussed with the County and their preference is to create a dual swale system to separate the offsite runoff from roadway runoff to avoid having large ponds to service private properties. The outside swale will be an in-kind replacement to the existing swale but will be for offsite use only. This will increase the needed R/W acquisition and future maintenance of the corridor. The Pond Siting Team determined that it was in the best interest of the Department and County to provide a dual swale system because it provides the following main advantages:

  1. Reduces size of ponds needed for roadway
  2. Reduces drainage impacts on roadway from developments occurring offsite
  3. Eliminates obligation of roadway drainage system to service drainage needs of offsite private property

Establish Scoring Matrix Review

- The Pond Siting Matrix lists the factors to be considered during the pond siting procedure. The team was given an option to weigh all the factors evenly, or to adjust them as needed to better reflect the project's needs. They decided to adjust the weight of each factor according to their significance to the project. The team discussed the matrix and collectively agreed to the following weighted score for each design factor:

FACTOR	DESCRIPTION / ISSUES CONSIDERED	WEIGHTED VALUE
Zoning (Right of Way)	The project is located in a rural area, as such the Zoning will moderately impact the pond locations.	**5**
Land Use	The project is located in a rural area, as such the Land Use will moderately impact the pond locations.	**5**
Right of Way Costs	The Right-of-Way cost associated with the acquisition of the parcel is significant.	**10**
Drainage Considerations	Priority should be given to locations where the pond will have optimal drainage.	**10**
Flood Zone FEMA	Since CR-510 is an evacuation route, the existing elevation of the road is relatively high. As such, an evaluation of the floodplain impacts will not heavily impact the locations of the ponds.	**5**

FDOT
MEETING NOTES CONTINUED
Page 4

FACTOR	DESCRIPTION / ISSUES CONSIDERED	WEIGHTED VALUE
Contamination and Hazardous Materials	No parcels within the vicinity of the project area have been identified as contaminated.	**5**
Utilities	There is a gas main and a water main that runs near the project location. The utilities will have medium affect to the location of the ponds.	**6**
Threatened and Endangered Species and Associated Costs	There are habitat preservative lands surrounding the project area for endangered species, such as the Caracara.	**8**
Noise	Identifying noise impacts has medium impact to the location and placement of pond sites.	**5**
Wetlands and Protected Uplands and Associated Costs	There are wetlands surrounding the project area and will significantly impact the location of the ponds.	**8**
Cultural Resources Involvement and Associated Costs	There are highly sensitive lands surrounding the project area that will significantly impact the location of the ponds.	**9**
Section 4(f)	Identifying the presence of 4F properties, could significantly affect the suitability of the site in question.	**9**
Public Wellfield	There are no public wellfields within the project area. The closest Indian River County Wellfield (N29) is approximately 1 mile away. There may be individual houses that are still on well water.	**6**
Construction	The location of the ponds will have average impacts to the construction.	**5**
Maintenance	The cost of maintaining a pond at a given location is significant because it will be perpetual.	**9**
Aesthetics (Compatibility with local master plan)	The need for landscape buffers, fencing and variable pond shapes is average.	**5**
Public Opinion and Adjacent Residency Concerns	Identifying possible impacts to current or proposed land use is important.	**8**
Other:	No other factors deemed relevant for the pond siting matrix.	**1**

Action Items:

- Snubbs to email the Pond Siting Procedure report and the update Scoring Matrix to the pond siting team by **Feb-8-2016**.
- Snubbs to Contact IRC to request information regarding the potential pond near US-1 that may be available to accommodate the roadway runoff by **Feb-10-2016**.
- Maria Formoso to send an invite to Elizabeth Hasset and a representative of IRC to the next pond siting meeting by **Feb-6-2016**.
- Metric to provide the drainage plans for the proposed construction to connect 58^{th} Ct. to CR-510 westbound by **Feb-10-2016**.

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave Pond Siting Meeting # 1

Date: 1/30/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Shaquon Samuel, EI	Snubbs Consulting	Drainage Eng.	Shaquon.Samuel@snubbs.com	305.885.6400 ext. 205
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
Diego Velazquez	FDOT	LAP Coordinator	diego.velazquez@dot.state.fl.us	772-321-6627
Maria Formoso	FDOT	PM	maria.formoso@dot.state.fl.us	4077
Carlos Rodriguez	METRIC	PM Cons.	crodriguez@metriceng.com	3/968-2546
Shelley ChinQuee	FDOT	Const	shelley.chinquee@dot.	954-777-4418
VICTOR RAMOS	FDOT	R/W	VICTOR.RAMOS@DOT.STATE.FL.US	954-777-4257
Donnie Webster	FDOT	R/W	donald.webster@dot.state.FL.US	954-777-4235
JOHN Rodemeyer	FDOT	R/W	.	954 777 4250
Tom Stepp	FDOT	R/W	thomas.stepp@dot.state.fl.us	954-777-4230
Wilord Metellus	FDOT	Drainage	Wilord.metellus@dot.state.fl.us	954-777-4467
Olivia Bonilla	FDOT	Drainage	olivia.bonilla@dot.state.fl.us	954-777-4134
James Poole	FDOT	Drainage	james.poole@dot.state.fl.us	954 777.4204
Morteza Alian	FDOT	Maint	morteza.alian@dot.	954 777 4449

SIGN-IN SHEET

Project Title: CR-510 PD&E from CR-512 to 58th Ave Pond Siting Meeting # 1

Date: 1/30/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs Consulting	Drainage Eng.	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Shaquon Samuel, EI	Snubbs Consulting	Drainage Eng.	Shaquon.Samuel@snubbs.com	305.885.6400 ext. 205
Kathy Tabuteau, EI	Snubbs Consulting	Drainage Eng.	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
Georgi Celusnek	FDOT PLEMO		georgi.celusnek@dot.state.fl.us	954.777.4368
Launice Mayes	FDOT Legal		launice.mayes@dot.state.fl.us	954 777-4509

Pond Siting Meeting #1
CR 510 from CR 512 to 58th Avenue PD&E Study

Indian River County
FM 405606-2-22-02
January 30, 2017

Notes:

1. **Project Introduction**

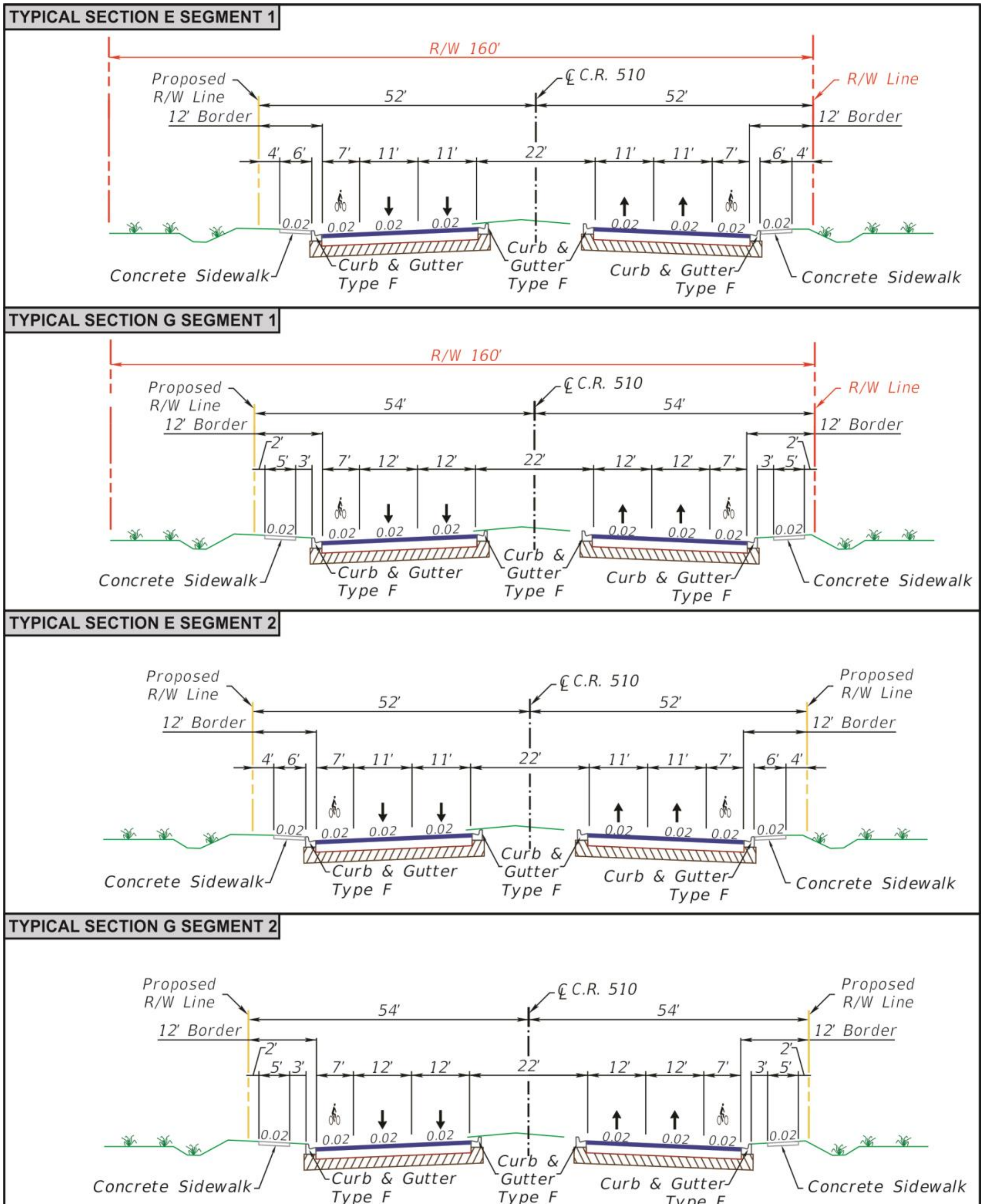
2. **Team Responsibilities**

3. **Pond Siting Schedule**

DATE RANGE	AGENCY	DURATION	DISCUSSION TOPICS
2/6 - 2/10 (2017)	Pond Siting Meeting #2	3 hrs	• Adopt scoring matrix • Identify site attributes, per discipline, that will effect scores • Identify multiple potential sites per basin • Work to be conducted before next meeting (individual discipline scoring)
2/27 - 3/3 (2017)	Pond Siting Meeting #3	3 hrs	• Scores for each discipline presented by pond siting members • Pond Siting Team provides feedback
3/13 - 3/17 (2017)	Pond Siting Meeting #4	2 hrs	• Pond Siting Team accepts scores for each potential pond site • Potential pond sites ranked
3/27 - 3/31 (2017)	Pond Siting Meeting #5	2 hrs	• Catch-all Meeting • Will be canceled if no agenda is identified during Pond Siting Meeting #4

4. **Cursory Review of Basins Needing Offsite Ponds**

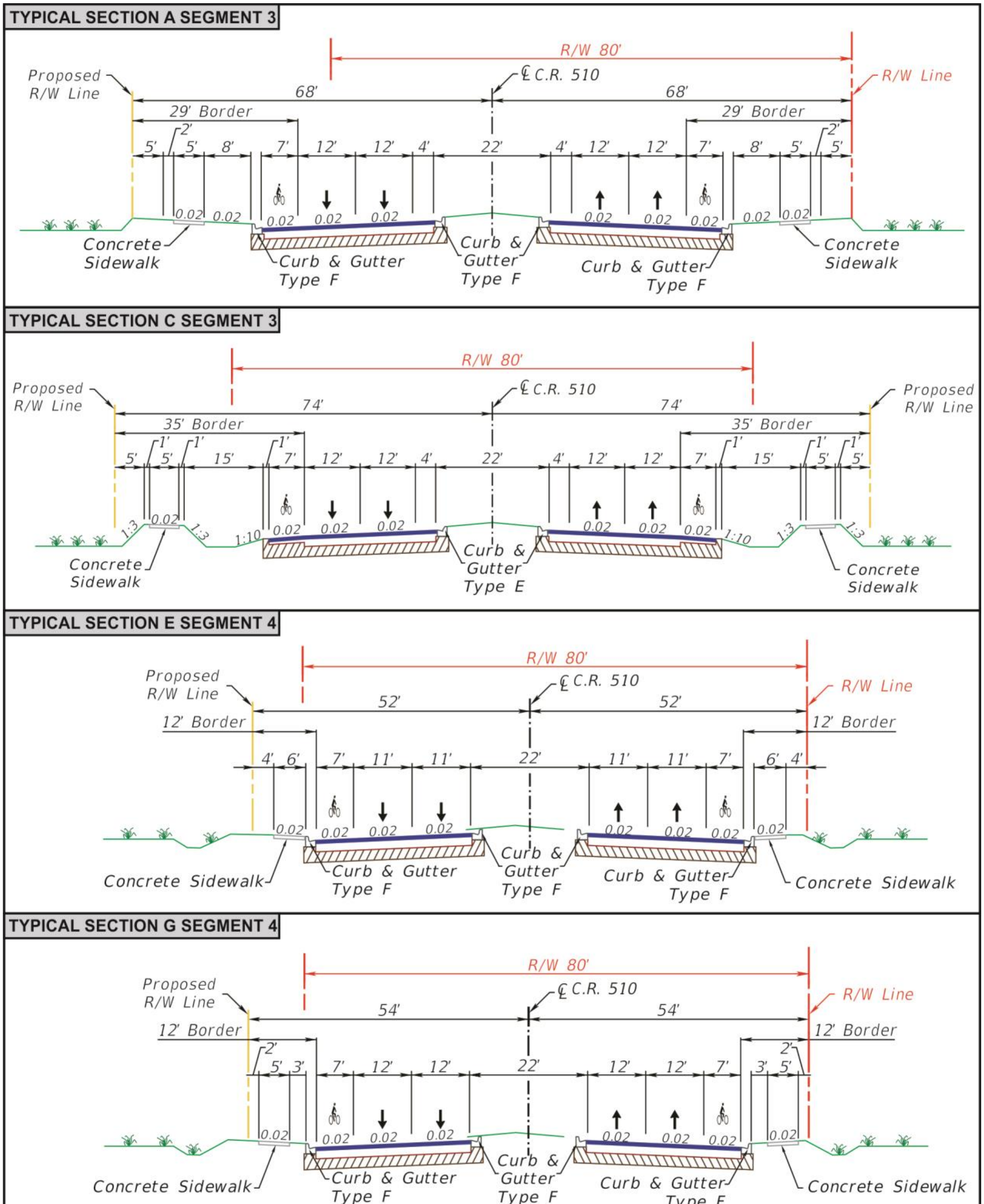
5. **Establish Scoring Matrix Review**



FDOT

CR 510 PD&E Study
FM No. 405606-2-22-01
ETDM No. 14233

Figure 8 – Typical Section Details



FDOT

CR 510 PD&E Study
FM No. 405606-2-22-01
ETDM No. 14233

Figure 9 – Typical Section Details Continued

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 2 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	2-1		2-2		2-3		2-4	
		Brief Description of Alternative	Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.	
		Parcel Number	313827000001000000001		313827000001000000001		313827000001000000001		313826000003000000007	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	10	50	3	15	10	50
2	5	Land Use	10	50	10	50	3	15	10	50
3	10	Right of Way Costs	7	70	9	90	3	30	5	50
4	10	Drainage Considerations	4	40	9	90	5	50	1	10
5	5	Flood Zone FEMA	6	30	6	30	6	30	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	2	12	2	12	2	12	6	36
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	8	48	8	48	5	30	5	30
14	5	Construction	1	5	9	45	5	25	2	10
15	9	Maintenance	2	18	8	72	7	63	2	18
16	5	Aesthetics (Compatibility with local master plan)	6	30	5	25	6	30	5	25
17	8	Public Opinion and Adjacent Residency Concerns	8	64	4	32	7	56	5	40
18	1	Other:	0		0		0		0	
		Comments								
		Score	769		896		708		706	
		Ranking	**2**		**1**		**3**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 5 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	5-1		5-2		5-3		5-4	
		Brief Description of Alternative	Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.	
		Parcel Number	31383500000100000001		31382600000700000001		31382600000700000001		31383500000100000001	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	8	40	8	40	10	50
2	5	Land Use	10	50	8	40	8	40	10	50
3	10	Right of Way Costs	6	60	3	30	4	40	6	60
4	10	Drainage Considerations	6	60	7	70	9	90	9	90
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	2	12	6	36	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	5	45	5	45	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	5	30	5	30	8	48	8	48
14	5	Construction	2	10	4	20	10	50	10	50
15	9	Maintenance	5	45	7	63	9	81	9	81
16	5	Aesthetics (Compatibility with local master plan)	5	25	5	25	7	35	7	35
17	8	Public Opinion and Adjacent Residency Concerns	5	40	5	40	7	56	7	56
18	1	Other:	0		0		0		0	
		Comments								
		Score	742		754		903		919	
		Ranking	**4**		**3**		**2**		**1**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 6 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	6-1		6-2		6-3		6-4	
		Brief Description of Alternative	Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.	
		Parcel Number	31382500000500000001		31383600000300000003		31382500000500000001		31383600000300000002	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	10	50	10	50	10	50
2	5	Land Use	10	50	10	50	10	50	10	50
3	10	Right of Way Costs	4	40	6	60	4	40	6	60
4	10	Drainage Considerations	8	80	8	80	4	40	5	50
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	6	36	2	12	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	5	40	8	64
11	9	Cultural Resources Involvement and Associated Costs	2	18	5	45	5	45	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	8	48	8	48	8	48	7	42
14	5	Construction	10	50	10	50	5	25	4	20
15	9	Maintenance	8	72	8	72	5	45	6	54
16	5	Aesthetics (Compatibility with local master plan)	6	30	6	30	5	25	8	40
17	8	Public Opinion and Adjacent Residency Concerns	8	64	8	64	8	64	8	64
18	1	Other:	0		0		0		0	
		Comments								
		Score	853		876		759		829	
		Ranking	**2**		**1**		**4**		**3**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 7 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	7-1		7-2		7-3		7-4	
		Brief Description of Alternative	Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.	
		Parcel Number	313825000007000000003		313825000007000000002		313825000007000000002		313836000001000000001.2	
		Parcel Size (Acres)	2.7	Acres	2.7	Acres	2.7	Acres	2.7	Acres
1	5	Zoning (Right of Way)	5	25	5	25	5	25	10	50
2	5	Land Use	5	25	5	25	5	25	10	50
3	10	Right of Way Costs	1	10	1	10	1	10	10	100
4	10	Drainage Considerations	8	80	7	70	5	50	4	40
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	6	36	6	36	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	5	30	5	30	5	30	5	30
14	5	Construction	6	30	5	25	3	15	2	10
15	9	Maintenance	8	72	7	63	6	54	7	63
16	5	Aesthetics (Compatibility with local master plan)	6	30	5	25	4	20	4	20
17	8	Public Opinion and Adjacent Residency Concerns	5	40	5	40	5	40	4	32
18	1	Other:								
		Comments								
		Score	765		736		692		794	
		Ranking	**2**		**3**		**4**		**1**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 8 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	8-1		8-2		8-3		8-4	
		Brief Description of Alternative	Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.	
		Parcel Number	31393000000500000007		31393100000100000001		31393000000700000002		31393100000100000007	
		Parcel Size (Acres)	4.7	Acres	4.7	Acres	4.7	Acres	4.7	Acres
1	5	Zoning (Right of Way)	10	50	5	25	10	50	5	25
2	5	Land Use	9	45	10	50	9	45	10	50
3	10	Right of Way Costs	5	50	5	50	5	50	5	50
4	10	Drainage Considerations	9	90	8	80	7	70	6	60
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	2	10	2	10
7	6	Utilities	6	36	2	12	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	5	45	8	72	5	45	5	45
12	9	Section 4(f)	5	45	8	72	5	45	5	45
13	6	Public Wellfield	5	30	8	48	5	30	5	30
14	5	Construction	8	40	5	25	5	25	2	10
15	9	Maintenance	6	54	8	72	8	72	6	54
16	5	Aesthetics (Compatibility with local master plan)	6	30	8	40	4	20	6	30
17	8	Public Opinion and Adjacent Residency Concerns	8	64	8	64	8	64	6	48
18	1	Other:	0		0		0		0	
		Comments								
		Score	822		853		765		672	
		Ranking	**2**		**1**		**3**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

DRAFT BASIN 9 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	9-1		9-2		9-3		9-4	
		Brief Description of Alternative	Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.	
		Parcel Number Parcel Size (Acres)	31392900000500000080 2.5 Acres		31393200000300000008 2.5 Acres		31393200000300000007 2.5 Acres		31392900000500000080 2.5 Acres	
1	5	Zoning (Right of Way)	5	25	5	25	8	40	5	25
2	5	Land Use	7	35	8	40	8	40	7	35
3	10	Right of Way Costs	1	10	5	50	10	100	4	40
4	10	Drainage Considerations	6	60	5	50	5	50	7	70
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	5	30	2	12	2	12	5	30
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	1	9	8	72	8	72	5	45
12	9	Section 4(f)	1	9	8	72	8	72	5	45
13	6	Public Wellfield	5	30	5	30	5	30	5	30
14	5	Construction	8	40	8	40	2	10	5	25
15	9	Maintenance	8	72	8	72	6	54	5	45
16	5	Aesthetics (Compatibility with local master plan)	8	40	4	20	5	25	6	30
17	8	Public Opinion and Adjacent Residency Concerns	4	32	4	32	6	48	4	32
18	1	Other:	0		0		0		0	
		Comments								
		Score	635		758		796		695	
		Ranking	**4**		**2**		**1**		**3**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

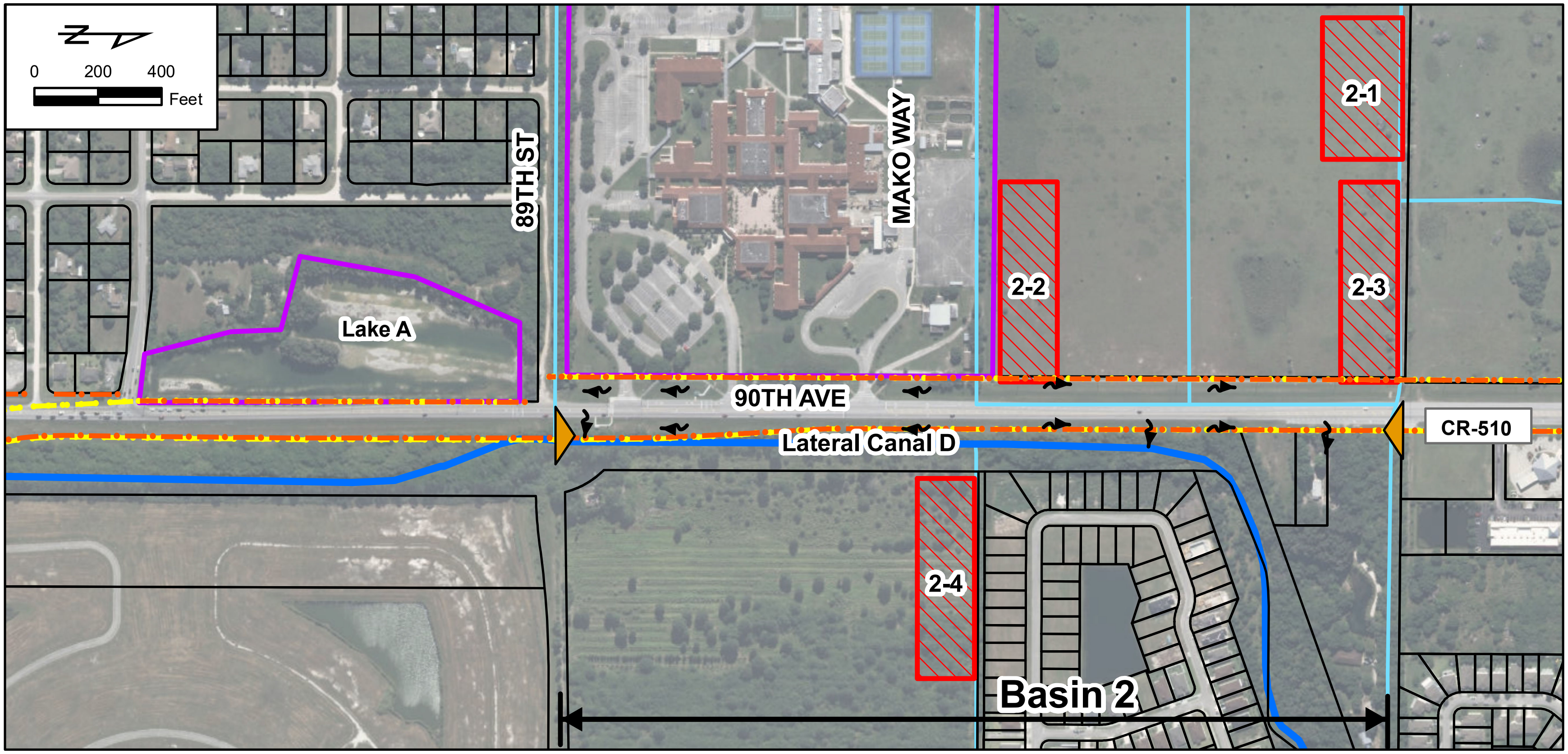
Date: 3/9/2017

DRAFT BASIN 10 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	10-1		10-2		10-3		10-4	
		Brief Description of Alternative	Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.	
		Parcel Number	313932000001000000011		313929000007000000004		313932000001000000006		313929000007000000001.1	
		Parcel Size (Acres)	1.9	Acres	1.9	Acres	0.9	Acres	1.9	Acres
1	5	Zoning (Right of Way)	5	25	10	50	5	25	10	50
2	5	Land Use	5	25	10	50	5	25	10	50
3	10	Right of Way Costs	1	10	10	100	10	100	10	100
4	10	Drainage Considerations	5	50	7	70	9	90	8	80
5	5	Flood Zone FEMA	7	35	6	30	6	30	7	35
6	5	Contamination and Hazardous Materials	4	20	4	20	4	20	4	20
7	6	Utilities	10	60	10	60	10	60	10	60
8	8	Threatened and Endangered Species and Associated Costs	8	64	1	8	8	64	1	8
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	1	8	8	64	1	8
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	2	18
12	9	Section 4(f)	8	72	1	9	8	72	1	9
13	6	Public Wellfield	5	30	8	48	5	30	5	30
14	5	Construction	2	10	8	40	10	50	6	30
15	9	Maintenance	4	36	6	54	8	72	6	54
16	5	Aesthetics (Compatibility with local master plan)	7	35	2	10	7	35	1	5
17	8	Public Opinion and Adjacent Residency Concerns	6	48	3	24	5	40	3	24
18	1	Other:	0		0		0		0	
		Comments								
		Score	696		693		889		621	
		Ranking	**2**		**3**		**1**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

POND SITING EXHIBIT: BASIN 2



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

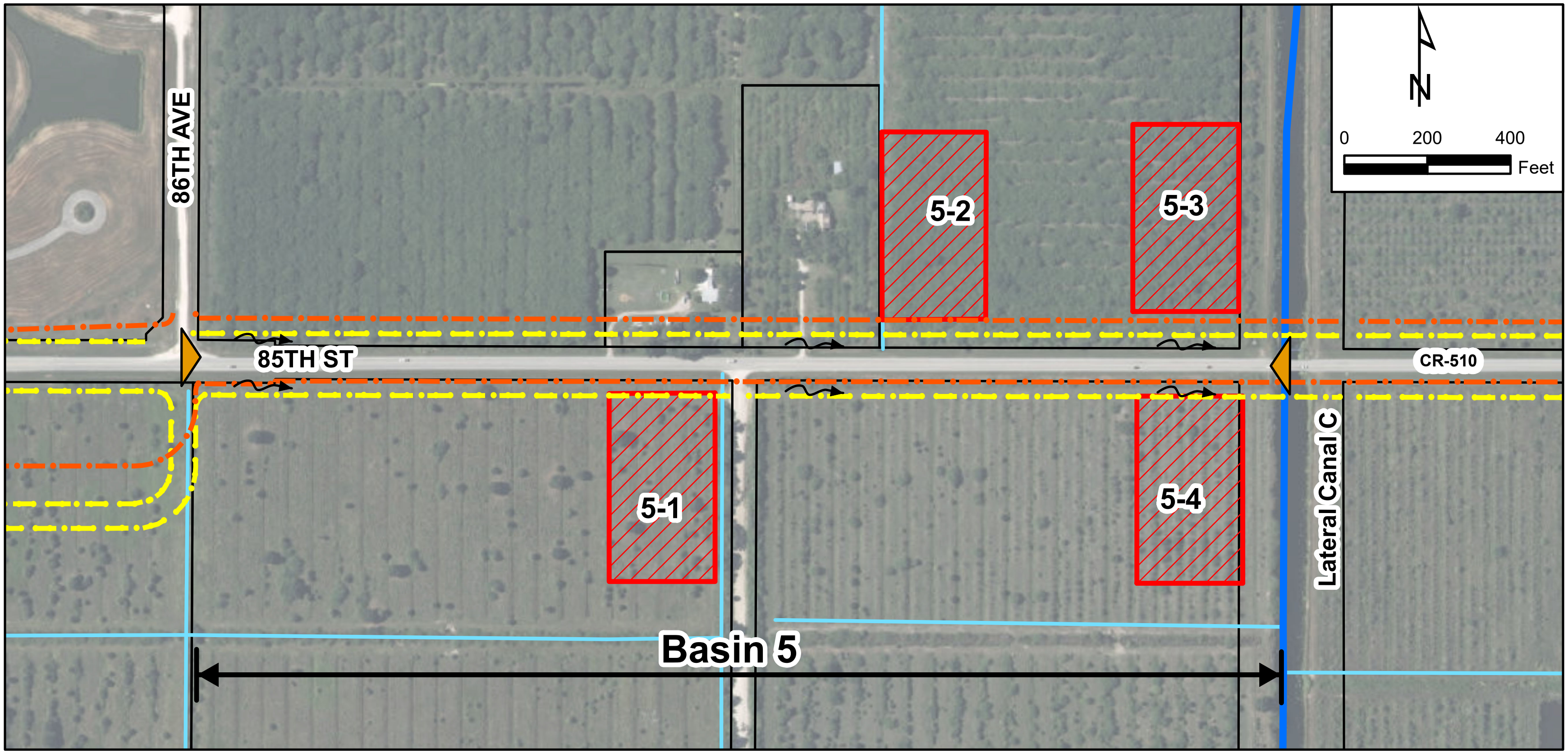
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
2-1	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-2	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-3	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-4	2	2.6	31382600000300000007	Parcel is a vacant property. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 2**

POND SITING EXHIBIT: BASIN 5



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

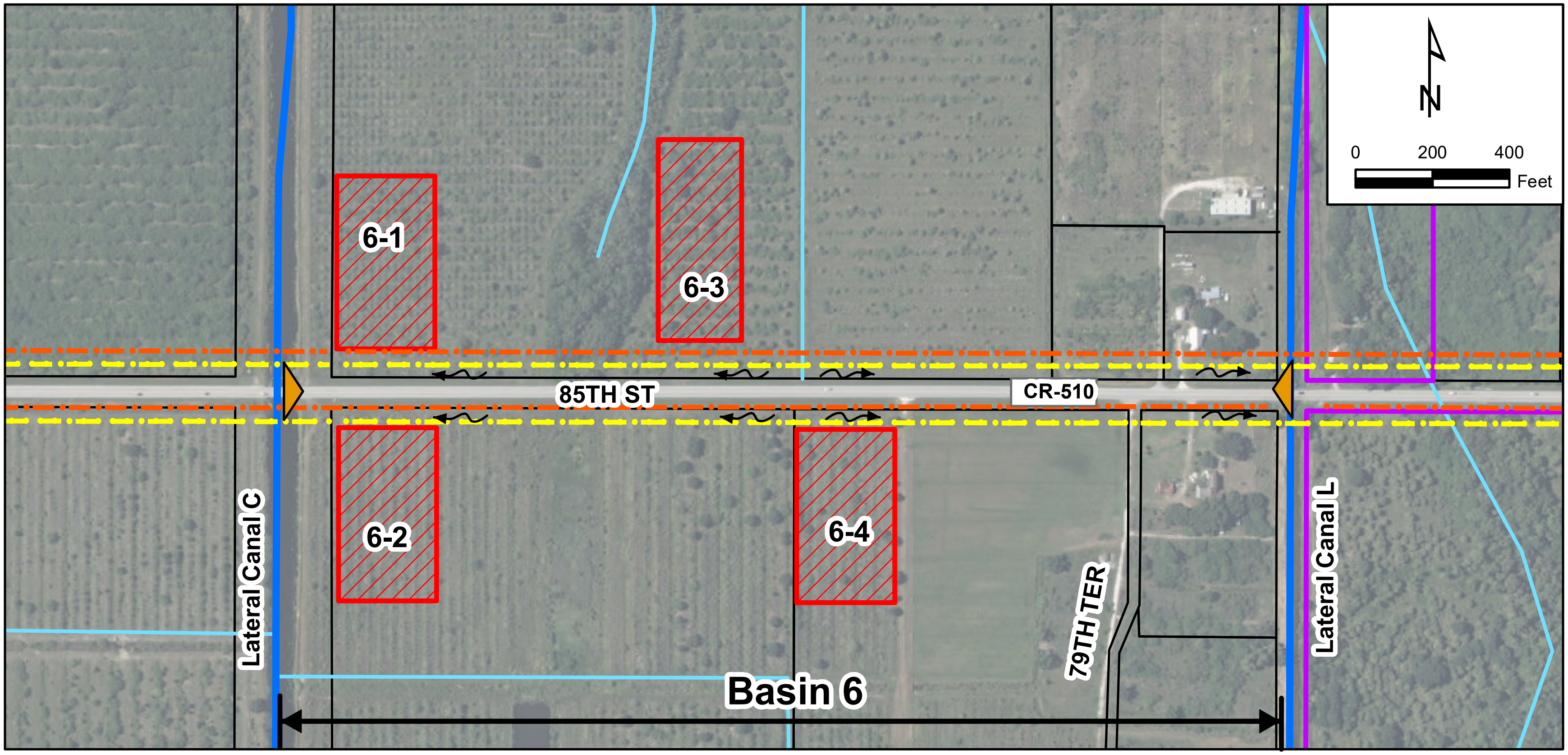
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Basin	Pond Size (Ac)	Parcel ID	Comment
5	2.6	31383500000100000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31382600000700000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31382600000700000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31383500000100000001	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 5

POND SITING EXHIBIT: BASIN 6



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

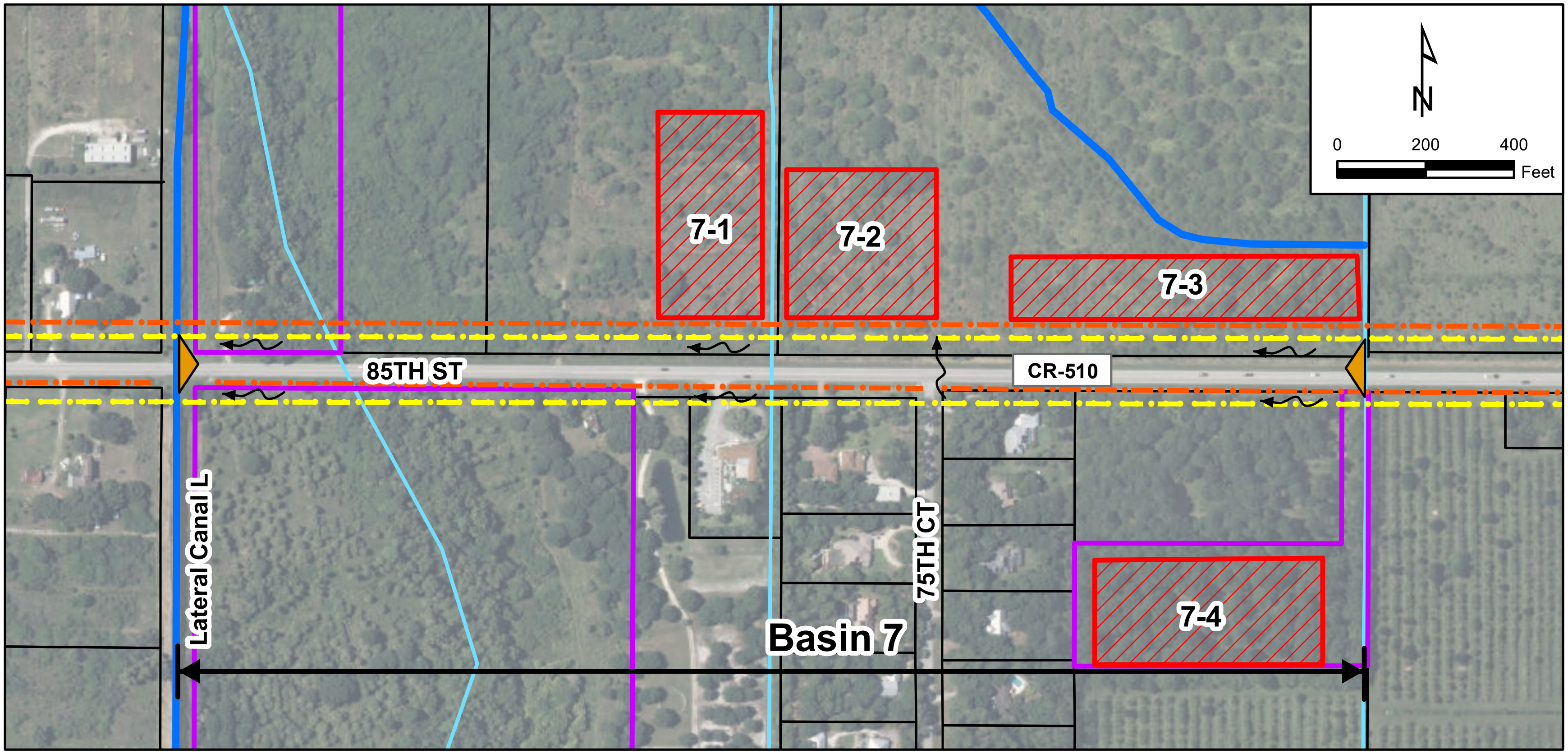
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
6-1	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-2	6	2.6	31383600000300000003	Parcel has an agricultural nursery. Partial Parcel
6-3	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-4	6	2.6	31383600000300000002	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 6**

POND SITING EXHIBIT: BASIN 7



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

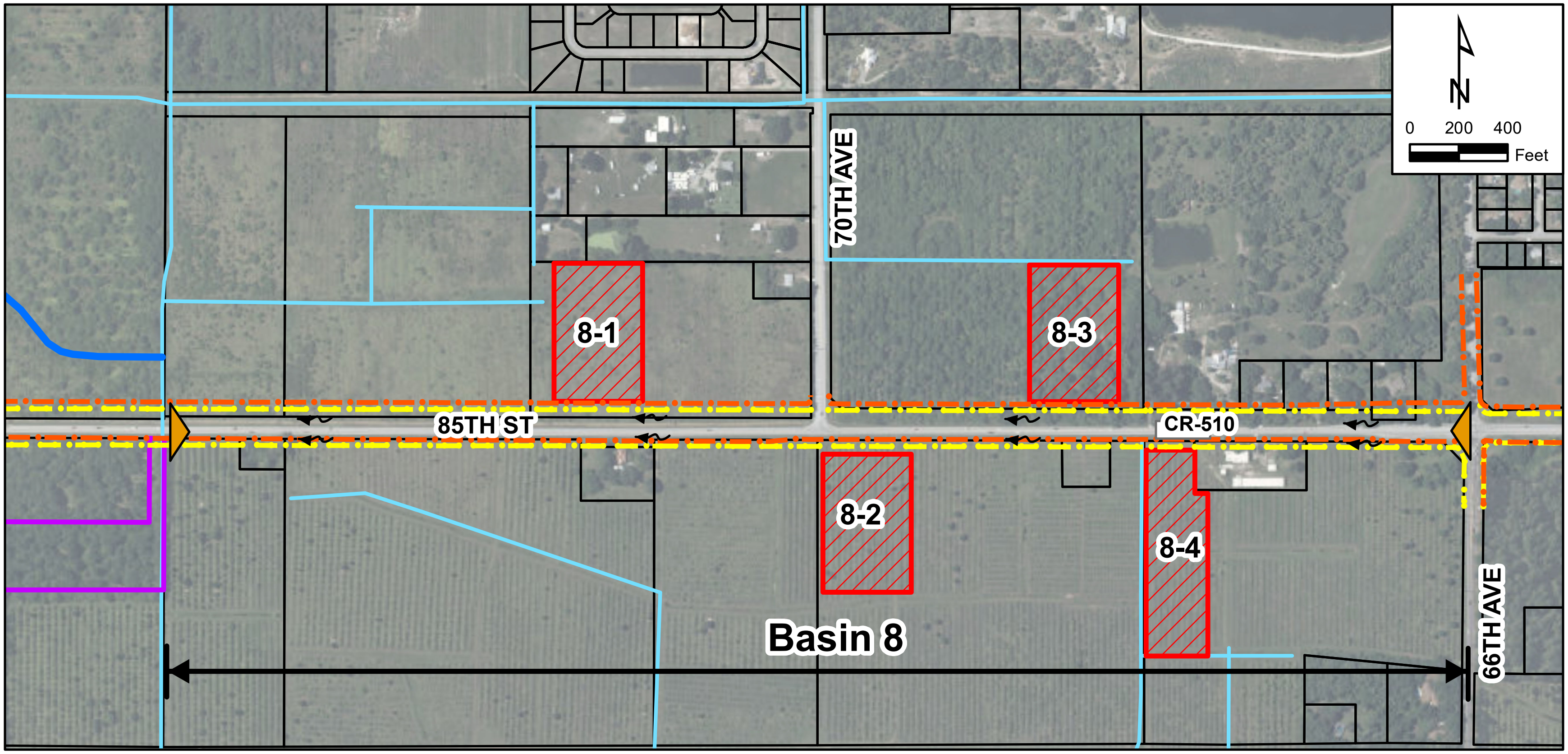
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
7-1	7	2.7	31382500000700000003	Vacant Property. Partial Parcel
7-2	7	2.7	31382500000700000002	Vacant Property. Partial Parcel
7-3	7	2.7	31382500000700000002	Vacant Property. Partial Parcel
7-4	7	2.7	31383600000100000001.2	Indian River County Parcel. Partial Partial.

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 7

POND SITING EXHIBIT: BASIN 8



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

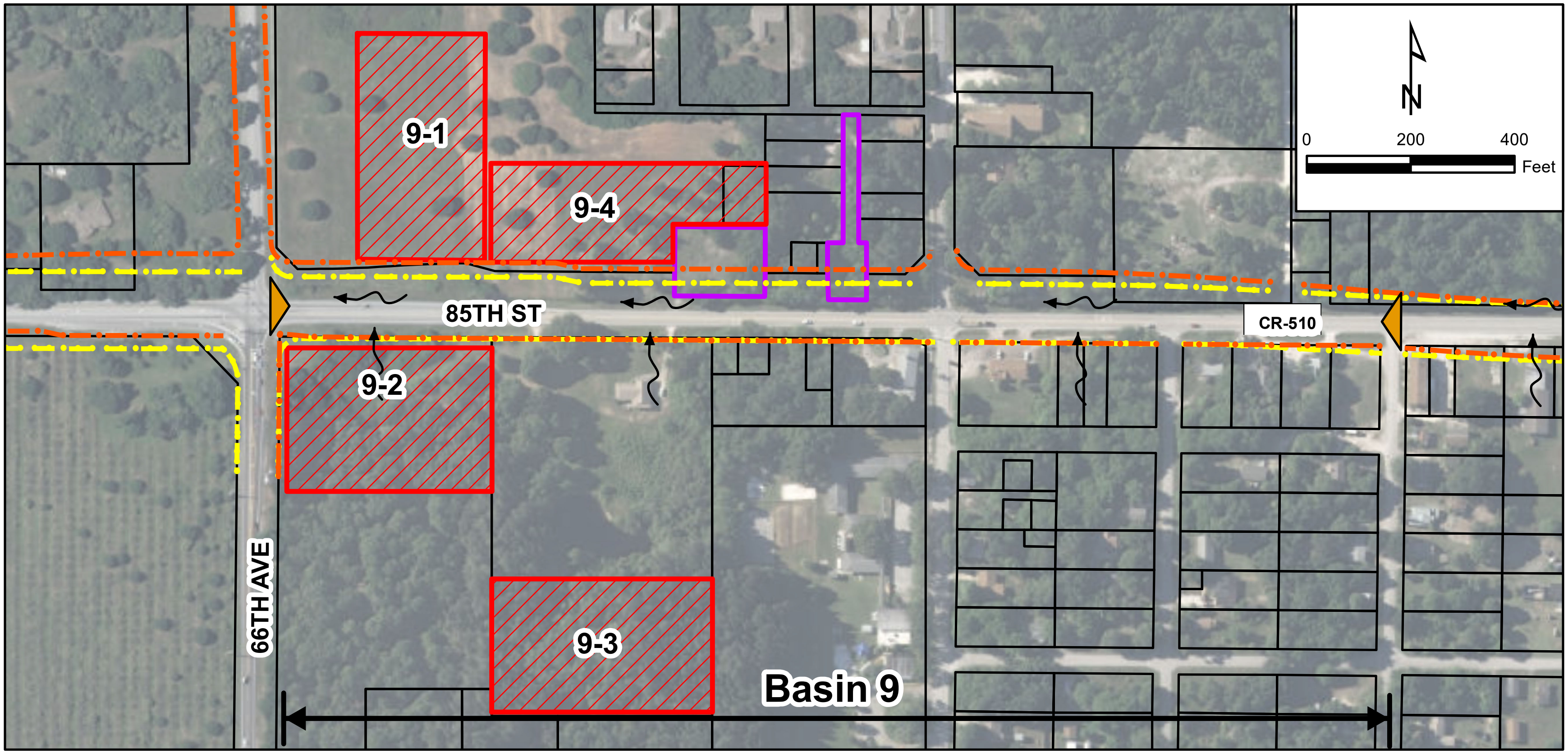
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
8-1	8	4.7	31393000000500000007	Vacant Property. Partial Parcel
8-2	8	4.7	31393100000100000001	Parcel has an agricultural nursery. Partial Parcel
8-3	8	4.7	31393000000700000002	Vacant Property. Partial Parcel
8-4	8	4.7	31393100000100000007	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 8**

POND SITING EXHIBIT: BASIN 9



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

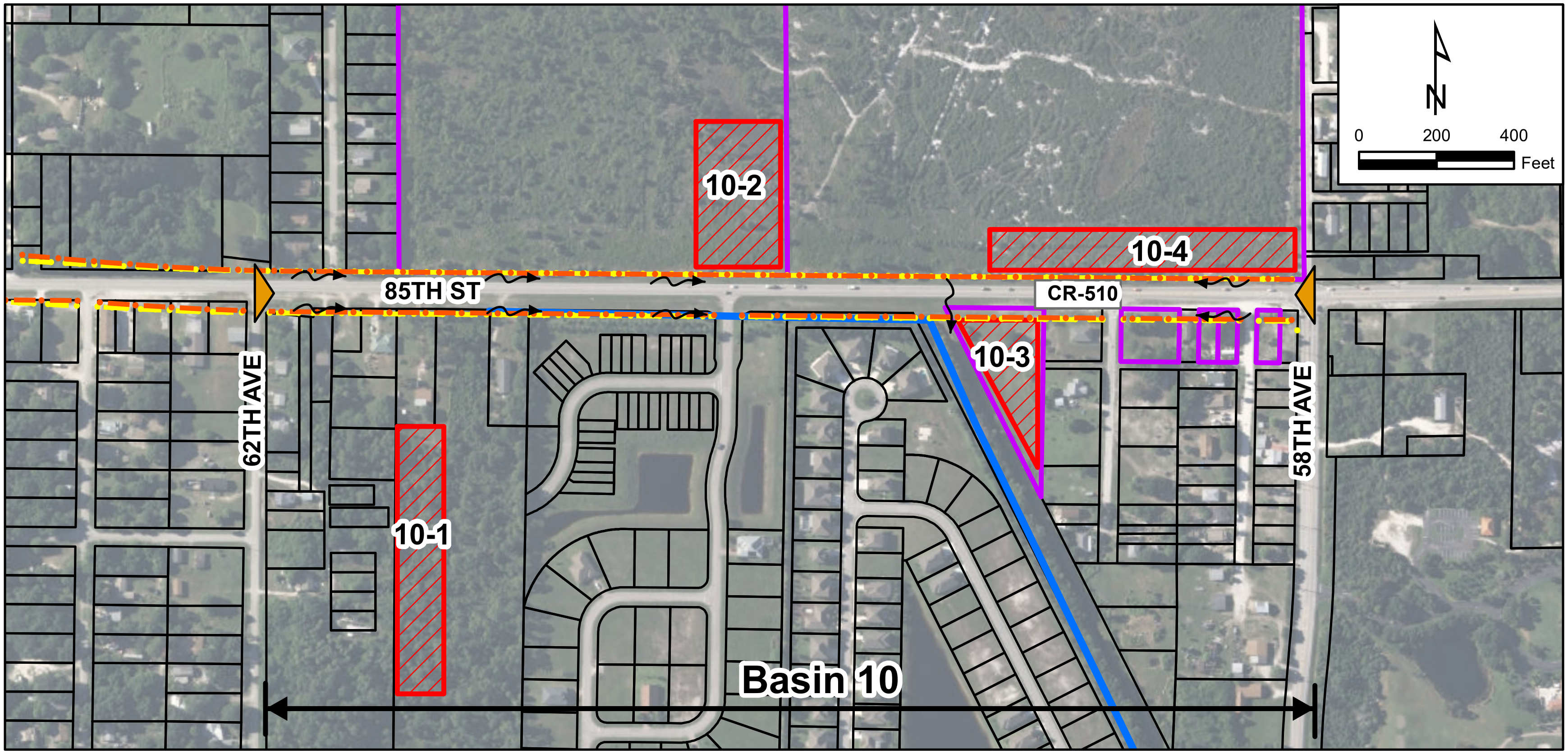
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
9-1	9	2.5	31392900000500000080	Vacant Property. Partial Parcel
9-2	9	2.5	31393200000300000008	Vacant Property. Partial Parcel
9-3	9	2.5	31393200000300000007	Vacant Property. Partial Parcel
9-4	9	2.5	31392900000500000080 31392900000500000083 31392900000500000083.1	Vacant Property. Partial Parcel Vacant Property. Complete Parcel Indian River County Parcel. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 9**

POND SITING EXHIBIT: BASIN 10



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment
				SUPERSEDED BY VERSION 3

LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
10-1	10	1.9	31393200000100000011	Vacant Property. Partial Parcel
10-2	10	1.9	31392900000700000004	Indian River County Parcel. Partial Parcel
10-3	10	0.9	31393200000100000006	Indian River County Parcel. Complete Parcel
10-4	10	1.9	31392900000700000001.1	Indian River County Parcel. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 10

MEETING NOTES **2/9/2017**

Subject: Pond Siting Meeting #2 (CR-510 PD&E from CR-512 to 58th Ave)

FPID: 405606-2-22-02

IRC Attendees:
Rich Szpyrka, Public Works Director
James Ennis, County Engineer

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager
Wilord Metellus, Drainage Engineer
Diego Velazquez, LAP Coordinator
Donnie Webster, District R/W
John Rodemeyer, District R/W
Laurice Mayes, Legal Attorney
Robin Brisebois, R/W Project Manager
Kelley Hall, District Deputy Maintenance Engineer

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer

Location: FDOT District 4 (District Office Conference Room 3)

Time: 1:30 PM

Background:

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue. The project is approximately 5.3 miles long. The study will focus on identifying possible locations for stormwater treatment ponds and evaluating the Right-of-Way (R/W) needed to accommodate the stormwater management facilities.

- The pond siting team consists of individuals from various FDOT departments and consultant classifications, which were assigned during the pond siting process. The team responsibilities are listed in the FDOT-D4 Pond Siting Procedures.

- During the first pond siting meeting on **Jan-30-2017**, the pond siting team performed a general review to create Potential Pond Locations (Version 1). The team also discussed the pond siting matrix and collectively agreed to the weighted score for each design factor according to their significance to the project.

Discussion:
The first action of the meeting was to review the pond matrix, which was prepared during the first pond siting meeting. There no outstanding comments. By consensus, the team adopted the pond siting matrix. **See attachment**.

The pond siting team evaluated the Potential Pond Locations (Version 1) of all ten (10) basins using GIS and made the following adjustments to create new Potential Pond Locations (Version 2) (**Refer to attached Exhibits**):

Basin 1 (covers CR-510 from CR-512 to 600-ft. south of Stone Point Drive)

- Existing permit is providing sufficient treatment for Basin 1. Therefore, no ponds were proposed in Basin 1.

Basin 2 (covers CR-510 from 600-ft. south of Stone Point Drive to 89th Street)

- Pond 2-1 was relocated to the north edge of the parcel away from the roadway to prevent frontage impacts.
- Pond 2-2 was moved from the center of the parcel to the edge of the parcel, near the school, to limit frontage impacts. This pond is not a preferred option since the team prefers to not construct ponds next to the school.
- Pond 2-3 was relocated to the R/W line to allow runoff to flow directly into the pond.
- Pond 2-4 was placed in the parcel east of Basin 2 to document this as a fatal flaw. No ponds can be placed east of Basin 2 because the runoff will have to travel over Lateral Canal D to enter the pond.

Basin 3 (covers CR-510 from 89th Street to 85th Street)

- Existing permit is providing sufficient treatment for Basin 3. Therefore, no ponds were proposed in Basin 3.

Basin 4 (covers CR-510 from Lateral Canal D to 86th Avenue)

- Existing permit is providing sufficient treatment for Basin 4. Therefore, no ponds were proposed in Basin 4.

Basin 5 (covers CR-510 from 86th Avenue to Lateral Canal C)

- All ponds were relocated to the R/W line to allow runoff to flow directly into the ponds.
- Ponds 5-1 and 5-2 are located in the middle of Basin 5. This would allow the runoff to flow into the pond easier.
- Ponds 5-3 and 5-4 are preferred since they are near Lateral Canal C and will require less piping.

Basin 6 (covers CR-510 from Lateral Canal C to Lateral Canal L)

- All ponds were relocated to the R/W line to allow runoff to flow directly into the ponds.
- Pond 6-3 was moved closer to the existing slough and was reconfigured to take less frontage from the property.

Basin 7 (covers CR-510 from Lateral Canal L to approximately 2,500-ft. west of 70th Avenue)

- Pond 7-1 was moved, approximately 650 feet east, to prevent issues with endangered species since it was near a sub lateral.
- No modifications were made to Pond 7-2.
- Pond 7-3 is not preferred since it is too close to the South Prong Saint Sebastian River.
- Pond 7-4 is preferred since it is located in a parcel owned by Indian River County (IRC). However, a drainage easement will be needed to connect runoff from the pond to the South Prong Saint Sebastian River.

Basin 8 (covers CR-510 from approximately 2,500-ft. west of 70th Avenue to 66th Avenue)

- Pond 8-1 was relocated to a larger parcel and reconfigured to take less frontage.
- Pond 8-2 was relocated to a larger parcel and reconfigured to take less frontage.
- Pond 8-3 was placed on the corner of the parcel, near a sublateral, to take less frontage. The team want to avoid discharging into the sublateral since it will impact private properties' drainage.
- Pond 8-4 was moved closer to the roadway to allow the runoff to travel into the pond. It was also reconfigured in order to take less frontage from the property.

Basin 9 (covers CR-510 from 66th Avenue to 62nd Avenue)

- Pond 9-1 was moved, approximately 125 feet to the east, to avoid double frontage and the existing wetland.
- No modifications were made to Pond 9-2.
- Pond 9-3 is the least preferred pond in Basin 9 because it is far from the roadway, and a drainage easement will be required to connect runoff from roadway to the pond.
- Pond 9-4 was reconfigured to allow access to the area east of the parcel.

Basin 10 (covers CR-510 from 62th Avenue to 58th Avenue)

- Pond 10-1 was moved away from the roadway and reconfigured. This is the least preferred option since an easement will be required to provide access to the pond.
- Pond 10-2 is fatally flawed since it is in a Wabasso habitat preserve.
- Pond 10-3 was relocated to the R/W line to allow runoff to flow directly into the pond.
- Pond 10-4 was reconfigured and relocated to a Wabasso habitat preserve parcel owned by the IRC, located west of 58th Ave. The pond will be placed in an area where there are no trees to prevent impacting the endangered species.

Action Items:

- Pond siting team will score each pond prior to Pond Siting Meeting # 3, scheduled for **March-2-2017**.

- All future pond siting meetings will be open to the public and advertised accordingly.

SIGN-IN SHEET

Project Title: Pond Siting Meeting #2 (CR-510 PD&E from CR-512 to 58th Ave)

Date: 2/8/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE	INITIALS
Maria Formoso, P.E., P.M.P.	FDOT	Project Manager	Maria.Formoso@dot.state.fl.us	954-777-4677	
Carlos Rodriguez, PE	Metric	Consultant Project Manager	crodriguez@metriceng.com	305-968-2546	CR
Tommy Ruiz, PE, CFM, LEEP AP	Snubbs	Drainage Engineer	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201	TAR
Kathy Tabuteau, EI	Snubbs	Drainage Engineer	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206	KT
~~Georgi Celusnek~~	~~FDOT~~	~~District Drainage Engineer~~	~~georgi.celusnek@dot.state.fl.us~~	~~954-777-4368~~	
~~James Poole~~	~~FDOT~~	~~District Drainage Engineer~~	~~james.poole@dot.state.fl.us~~	~~954-777-4204~~	
~~Olivia Bonilla~~	~~FDOT~~	~~Drainage Engineer~~	~~olivia.bonilla@dot.state.fl.us~~	~~954-777-4134~~	
Wilord Metellus	FDOT	Drainage Engineer	wilord.metellus@dot.state.fl.us	954-777-4467	RW
~~Shelley ChinQuee~~	~~FDOT~~	~~Construction Engineer~~	~~shelley.chinquee@dot.state.fl.us~~	~~954-777-4418~~	
Diego Velazquez	FDOT	Construction Engineer	diego.velazquez@dot.state.fl.us	772-321-6627	DV
~~Victor Ramos~~	~~FDOT~~	~~District R/W~~	~~victor.ramos@dot.state.fl.us~~	~~954-777-4257~~	
John Rodemeyer	FDOT	District R/W	John.Rodemeyer@dot.state.fl.us	954-777-4250	JR
Donnie Webster	FDOT	District R/W	donald.webster@dot.state.fl.us	954-777-4235	DW
~~Tom Stepp~~	~~FDOT~~	~~District R/W~~	~~thomas.stepp@dot.state.fl.us~~	~~954-777-4230~~	
~~Morteza Alian~~	~~FDOT~~	~~District Maintenance Engineer~~	~~morteza.alian@dot.state.fl.us~~	~~954-777-4449~~	
Laurice Mayes	FDOT	Legal Attorney	laurice.mayes@dot.state.fl.us	954-777-4509	LM
Robin Brisebois	FDOT	R/W Project Mngr.	robin.brisebois.dot.state.fl.us	777-4249	RB
KELLEY HALL	FDOT	DIST DEPUTY MAINT ENGINEER	Kelley.hall@dot.state.fl.us	954-777-4205	KH

SIGN-IN SHEET

Project Title: Pond Siting Meeting #2 (CR-510 PD&E from CR-512 to 58th Ave)

Date: 2/8/2017

FPID: 405606-2-22-02

NAME	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE	INITIALS
James Ennis	IRC	County Engineer	JEnnis@IRCGOV.com	772 226 1221	
Rich Szpyrka	IRC	PW Director	rszpyrka@IRCGOV.com	772-226-1379	

Pond Siting Meeting #2
CR 510 from CR 512 to 58th Avenue PD&E Study

Indian River County
FM 405606-2-22-02
February 9, 2017

Notes:

1. **Adopt Scoring Matrix**

2. **Identify Site Attributes that Will Effect Scores**

3. **Identify Multiple Potential Sites per Basin**

4. **Work to be Conducted Before Next Meeting (individual discipline scoring)**

District: Four
Meeting Type: Meeting
Date: Thursday, March 2, 2017
Time: 9:00 a.m. to 12:00 p.m.
Location Name: D4-DO2, District Office Conference Room 2
Street Address: 3400 W Commercial Blvd
City: Fort Lauderdale, FL 33309
Purpose:
The Florida Department of Transportation (FDOT), District Four, will conduct a Pond Siting Meeting for the CR 510 Project Development and Environment (PD&E) Study, which is from CR 512 to 58th Ave, in Indian River County, Florida. The corridor is approximately 5.34 miles long. This project is based on expanding CR-510 from an existing two lane roadway facility to one with four lanes.

No formal presentation will be made. This is a working meeting to discuss and assign scores for factors that will be used to score potential off-site pond locations. Scores will be determined by the FDOT Pond Siting Team.

Public participation is solicited without regard to race, color, national origin, age, sex, religion, disability or family status.

If you need special accommodation under the Americans with Disabilities Act or require translation services (free of charge) please contact the FDOT Project Manager, Mrs. Maria Formoso, P.E., at (954) 777-4677 at least one (1) day prior to the meeting. Mrs. Formoso may also be contacted via email at Maria.Formoso@dot.state.fl.us.

Primary Contact: Maria Formoso, P.E.
Primary Phone: (954) 777-4677
Primary Email: Maria.Formoso@dot.state.fl.us
Additional Contact: FDOT District Four Public Information Office
Additional Phone: (954) 777-4090
Additional E-mail: FDOT-D4PIO@dot.state.fl.us
Expires: Friday, March 3, 2017

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 2 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	2-1		2-2		2-3		2-4	
		Brief Description of Alternative	Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.		Pond will satisfy Basin 2 requirements.	
		Parcel Number	313827000001000000001		313827000001000000001		313827000001000000001		313826000003000000007	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	10	50	3	15	10	50
2	5	Land Use	10	50	10	50	3	15	10	50
3	10	Right of Way Costs	7	70	9	90	3	30	5	50
4	10	Drainage Considerations	4	40	9	90	5	50	1	10
5	5	Flood Zone FEMA	6	30	6	30	6	30	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	2	12	2	12	2	12	6	36
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	8	48	8	48	5	30	5	30
14	5	Construction	1	5	9	45	5	25	2	10
15	9	Maintenance	2	18	8	72	7	63	2	18
16	5	Aesthetics (Compatibility with local master plan)	6	30	5	25	6	30	5	25
17	8	Public Opinion and Adjacent Residency Concerns	8	64	4	32	7	56	5	40
18	1	Other:	0		0		0		0	
		Comments								
		Score	769		896		708		706	
		Ranking	**2**		**1**		**3**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 5 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	5-1		5-2		5-3		5-4	
		Brief Description of Alternative	Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.		Pond will satisfy Basin 5 requirements.	
		Parcel Number	31383500000100000001		31382600000700000001		31382600000700000001		31383500000100000001	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	8	40	8	40	10	50
2	5	Land Use	10	50	8	40	8	40	10	50
3	10	Right of Way Costs	6	60	3	30	4	40	6	60
4	10	Drainage Considerations	6	60	7	70	9	90	9	90
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	2	12	6	36	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	5	45	5	45	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	5	30	5	30	8	48	8	48
14	5	Construction	2	10	4	20	10	50	10	50
15	9	Maintenance	5	45	7	63	9	81	9	81
16	5	Aesthetics (Compatibility with local master plan)	5	25	5	25	7	35	7	35
17	8	Public Opinion and Adjacent Residency Concerns	5	40	5	40	7	56	7	56
18	1	Other:	0		0		0		0	
		Comments								
		Score	742		754		903		919	
		Ranking	**4**		**3**		**2**		**1**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 6 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	6-1		6-2		6-3		6-4	
		Brief Description of Alternative	Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.		Pond will satisfy Basin 6 requirements.	
		Parcel Number	313825000005000000001		313836000003000000003		313825000005000000001		313836000003000000002	
		Parcel Size (Acres)	2.6	Acres	2.6	Acres	2.6	Acres	2.6	Acres
1	5	Zoning (Right of Way)	10	50	10	50	10	50	10	50
2	5	Land Use	10	50	10	50	10	50	10	50
3	10	Right of Way Costs	4	40	6	60	4	40	6	60
4	10	Drainage Considerations	8	80	8	80	4	40	5	50
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	6	36	2	12	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	5	40	8	64
11	9	Cultural Resources Involvement and Associated Costs	2	18	5	45	5	45	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	8	48	8	48	8	48	7	42
14	5	Construction	10	50	10	50	5	25	4	20
15	9	Maintenance	8	72	8	72	5	45	6	54
16	5	Aesthetics (Compatibility with local master plan)	6	30	6	30	5	25	8	40
17	8	Public Opinion and Adjacent Residency Concerns	8	64	8	64	8	64	8	64
18	1	Other:	0		0		0		0	
		Comments								
		Score	853		876		759		829	
		Ranking	**2**		**1**		**4**		**3**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 7 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	7-1		7-2		7-3		7-4	
		Brief Description of Alternative	Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.		Pond will satisfy Basin 7 requirements.	
		Parcel Number	31382500000700000003		31382500000700000002		31382500000700000002		31383600000100000001.2	
		Parcel Size (Acres)	2.7	Acres	2.7	Acres	2.7	Acres	2.7	Acres
1	5	Zoning (Right of Way)	5	25	5	25	5	25	10	50
2	5	Land Use	5	25	5	25	5	25	10	50
3	10	Right of Way Costs	1	10	1	10	1	10	10	100
4	10	Drainage Considerations	8	80	7	70	5	50	4	40
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	6	36	6	36	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	8	72
12	9	Section 4(f)	8	72	8	72	8	72	8	72
13	6	Public Wellfield	5	30	5	30	5	30	5	30
14	5	Construction	6	30	5	25	3	15	2	10
15	9	Maintenance	8	72	7	63	6	54	7	63
16	5	Aesthetics (Compatibility with local master plan)	6	30	5	25	4	20	4	20
17	8	Public Opinion and Adjacent Residency Concerns	5	40	5	40	5	40	4	32
18	1	Other:								
		Comments								
		Score	765		736		692		794	
		Ranking	**2**		**3**		**4**		**1**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 8 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	8-1		8-2		8-3		8-4	
		Brief Description of Alternative	Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.		Pond will satisfy Basin 8 requirements.	
		Parcel Number	31393000000500000007		31393100000100000001		31393000000700000002		31393100000100000007	
		Parcel Size (Acres)	4.7	Acres	4.7	Acres	4.7	Acres	4.7	Acres
1	5	Zoning (Right of Way)	10	50	5	25	10	50	5	25
2	5	Land Use	9	45	10	50	9	45	10	50
3	10	Right of Way Costs	5	50	5	50	5	50	5	50
4	10	Drainage Considerations	9	90	8	80	7	70	6	60
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	2	10	2	10
7	6	Utilities	6	36	2	12	6	36	2	12
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	5	45	8	72	5	45	5	45
12	9	Section 4(f)	5	45	8	72	5	45	5	45
13	6	Public Wellfield	5	30	8	48	5	30	5	30
14	5	Construction	8	40	5	25	5	25	2	10
15	9	Maintenance	6	54	8	72	8	72	6	54
16	5	Aesthetics (Compatibility with local master plan)	6	30	8	40	4	20	6	30
17	8	Public Opinion and Adjacent Residency Concerns	8	64	8	64	8	64	6	48
18	1	Other:	0		0		0		0	
		Comments								
		Score	822		853		765		672	
		Ranking	**2**		**1**		**3**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

Date: 3/9/2017

FINAL BASIN 9 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	9-1		9-2		9-3		9-4	
		Brief Description of Alternative	Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.		Pond will satisfy Basin 9 requirements.	
		Parcel Number	31392900000500000080		31393200000300000008		31393200000300000007		31392900000500000080	
		Parcel Size (Acres)	2.5	Acres	2.5	Acres	2.5	Acres	2.5	Acres
1	5	Zoning (Right of Way)	5	25	5	25	8	40	5	25
2	5	Land Use	7	35	8	40	8	40	7	35
3	10	Right of Way Costs	1	10	5	50	10	100	4	40
4	10	Drainage Considerations	6	60	5	50	5	50	7	70
5	5	Flood Zone FEMA	7	35	7	35	7	35	7	35
6	5	Contamination and Hazardous Materials	8	40	8	40	8	40	8	40
7	6	Utilities	5	30	2	12	2	12	5	30
8	8	Threatened and Endangered Species and Associated Costs	8	64	8	64	8	64	8	64
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	8	64	8	64	8	64
11	9	Cultural Resources Involvement and Associated Costs	1	9	8	72	8	72	5	45
12	9	Section 4(f)	1	9	8	72	8	72	5	45
13	6	Public Wellfield	5	30	5	30	5	30	5	30
14	5	Construction	8	40	8	40	2	10	5	25
15	9	Maintenance	8	72	8	72	6	54	5	45
16	5	Aesthetics (Compatibility with local master plan)	8	40	4	20	5	25	6	30
17	8	Public Opinion and Adjacent Residency Concerns	4	32	4	32	6	48	4	32
18	1	Other:	0		0		0		0	
		Comments								
		Score	635		758		796		695	
		Ranking	**4**		**2**		**1**		**3**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

Snubbs Consulting Inc.

Project Name: CR-510 PD&E From CR 512 to 58th Ave

FPID: 405606-2-22-02

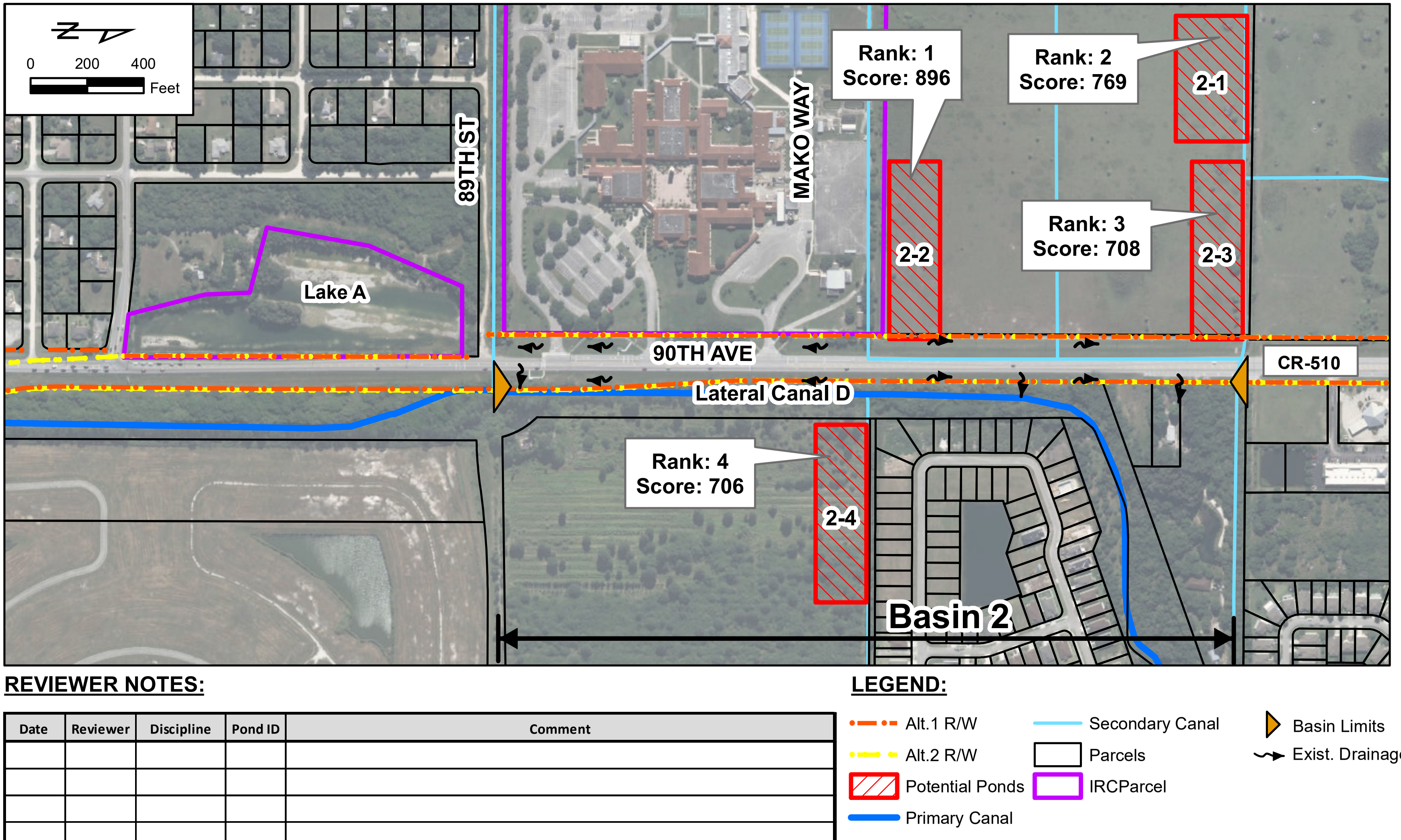
Date: 3/9/2017

FINAL BASIN 10 POND SITING MATRIX

	Weight of Factor	Factor	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
	1-10		1-10		1-10		1-10		1-10	
		Alternative Number (Pond ID)	10-1		10-2		10-3		10-4	
		Brief Description of Alternative	Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.		Pond will satisfy Basin 10 requirements.	
		Parcel Number	313932000001000000011		313929000007000000004		313932000001000000006		313929000007000000001.1	
		Parcel Size (Acres)	1.9	Acres	1.9	Acres	0.9	Acres	1.9	Acres
1	5	Zoning (Right of Way)	5	25	10	50	5	25	10	50
2	5	Land Use	5	25	10	50	5	25	10	50
3	10	Right of Way Costs	1	10	10	100	10	100	10	100
4	10	Drainage Considerations	5	50	7	70	9	90	8	80
5	5	Flood Zone FEMA	7	35	6	30	6	30	7	35
6	5	Contamination and Hazardous Materials	4	20	4	20	4	20	4	20
7	6	Utilities	10	60	10	60	10	60	10	60
8	8	Threatened and Endangered Species and Associated Costs	8	64	1	8	8	64	1	8
9	5	Noise	8	40	8	40	8	40	8	40
10	8	Wetlands and Protected Uplands and Associated Costs	8	64	1	8	8	64	1	8
11	9	Cultural Resources Involvement and Associated Costs	8	72	8	72	8	72	2	18
12	9	Section 4(f)	8	72	1	9	8	72	1	9
13	6	Public Wellfield	5	30	8	48	5	30	5	30
14	5	Construction	2	10	8	40	10	50	6	30
15	9	Maintenance	4	36	6	54	8	72	6	54
16	5	Aesthetics (Compatibility with local master plan)	7	35	2	10	7	35	1	5
17	8	Public Opinion and Adjacent Residency Concerns	6	48	3	24	5	40	3	24
18	1	Other:	0		0		0		0	
		Comments								
		Score	696		693		889		621	
		Ranking	**2**		**3**		**1**		**4**	

Comments: scores are given from 1 to 10. More points means better or more desired alternative. Weight of Factor determined by consensus of Pond Siting Team.

POND SITING EXHIBIT: BASIN 2



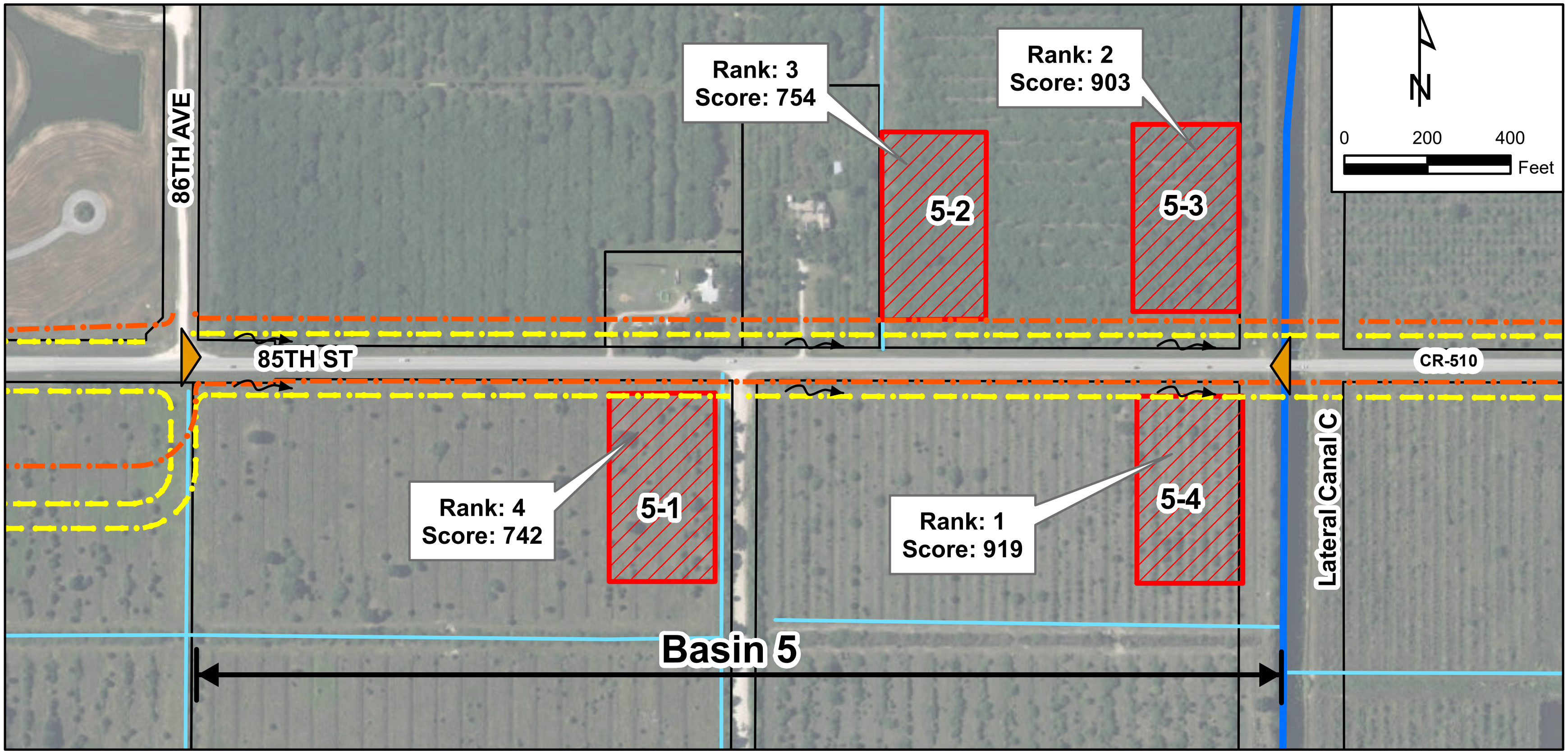
REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
2-1	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-2	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-3	2	2.6	31382700000100000001	Parcel is a vacant property. Partial Parcel
2-4	2	2.6	31382600000300000007	Parcel is a vacant property. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 2

POND SITING EXHIBIT: BASIN 5



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

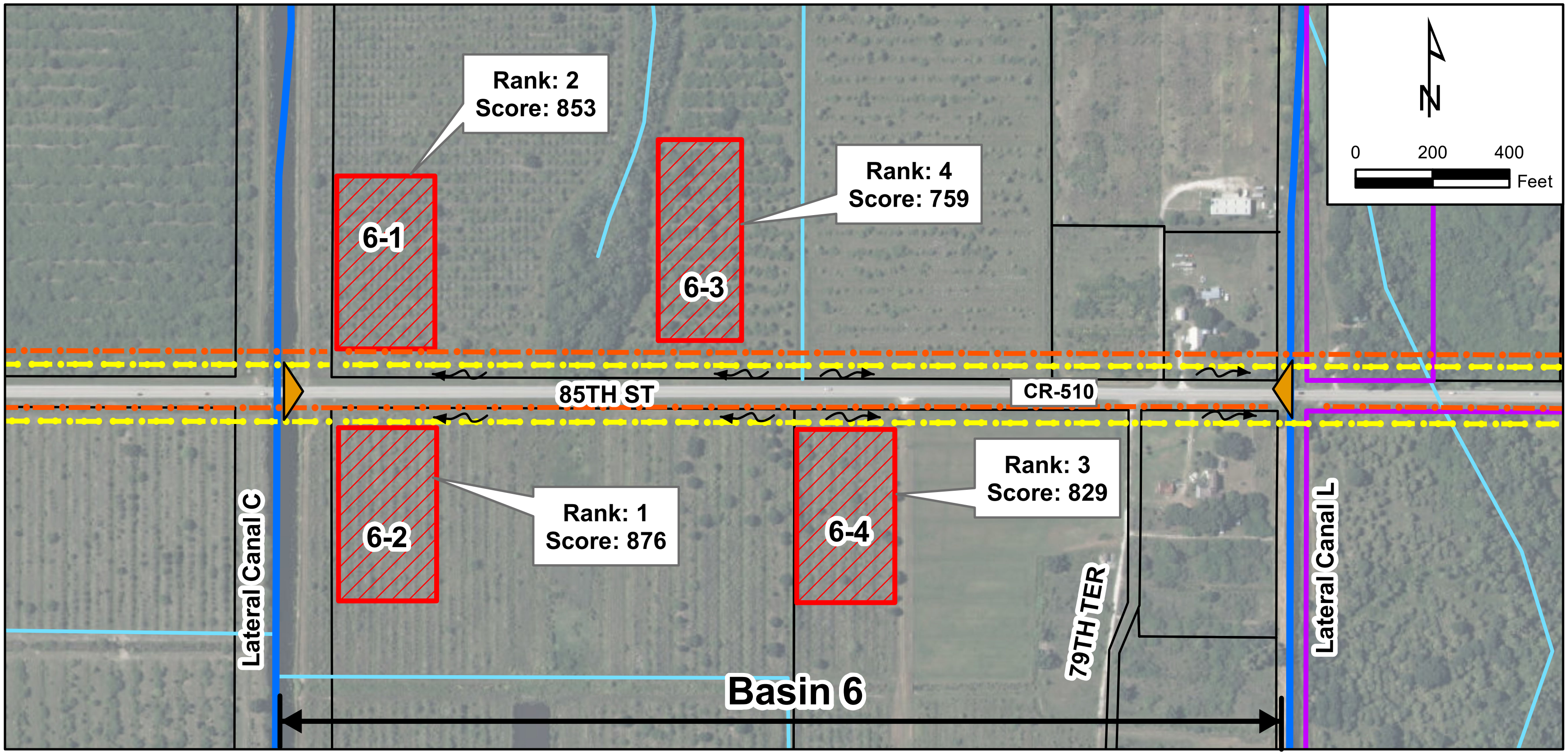
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Basin	Pond Size (Ac)	Parcel ID	Comment
5	2.6	31383500000100000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31382600000700000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31382600000700000001	Parcel has an agricultural nursery. Partial Parcel
5	2.6	31383500000100000001	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 5

POND SITING EXHIBIT: BASIN 6



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

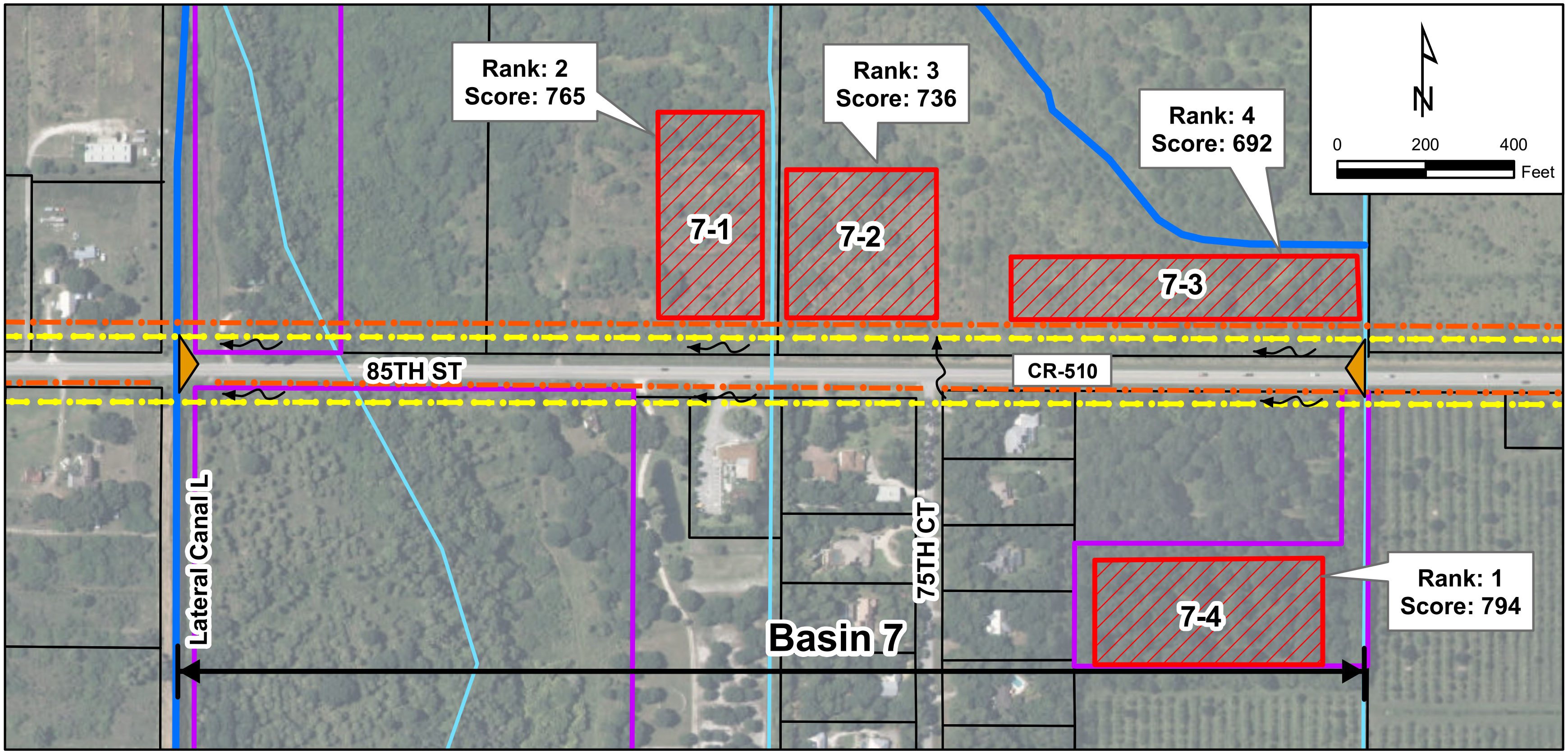
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
6-1	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-2	6	2.6	31383600000300000003	Parcel has an agricultural nursery. Partial Parcel
6-3	6	2.6	31382500000500000001	Parcel has an agricultural nursery. Partial Parcel
6-4	6	2.6	31383600000300000002	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 6**

POND SITING EXHIBIT: BASIN 7



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

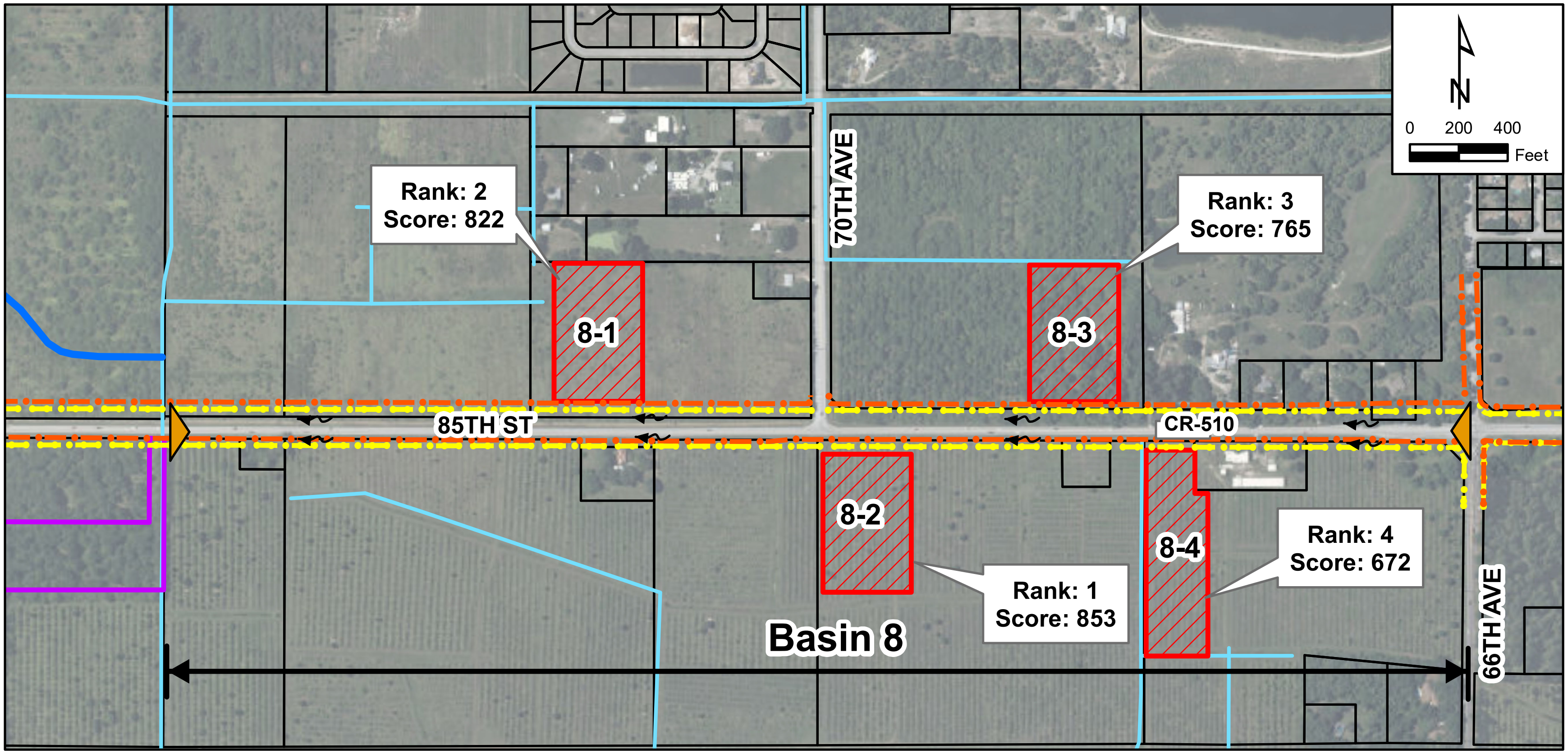
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
7-1	7	2.7	31382500000700000003	Vacant Property. Partial Parcel
7-2	7	2.7	31382500000700000002	Vacant Property. Partial Parcel
7-3	7	2.7	31382500000700000002	Vacant Property. Partial Parcel
7-4	7	2.7	31383600000100000001.2	Indian River County Parcel. Partial Partial.

stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 7**

POND SITING EXHIBIT: BASIN 8



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

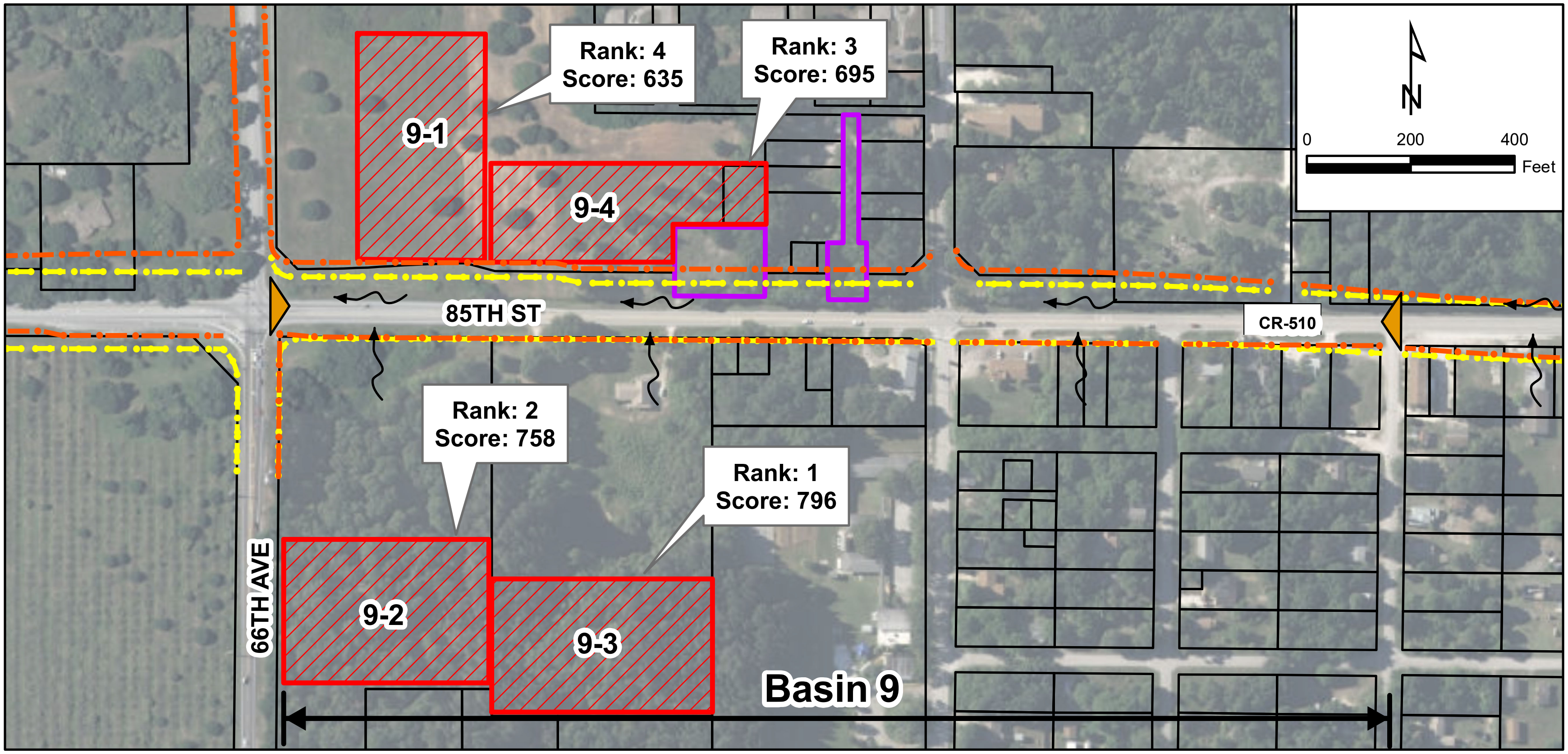
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
8-1	8	4.7	31393000000500000007	Vacant Property. Partial Parcel
8-2	8	4.7	31393100000100000001	Parcel has an agricultural nursery. Partial Parcel
8-3	8	4.7	31393000000700000002	Vacant Property. Partial Parcel
8-4	8	4.7	31393100000100000007	Parcel has an agricultural nursery. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 2	2/9/2017	PREPARED BY: KT REVIEWED BY: TAR	BASIN 8

POND SITING EXHIBIT: BASIN 9



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

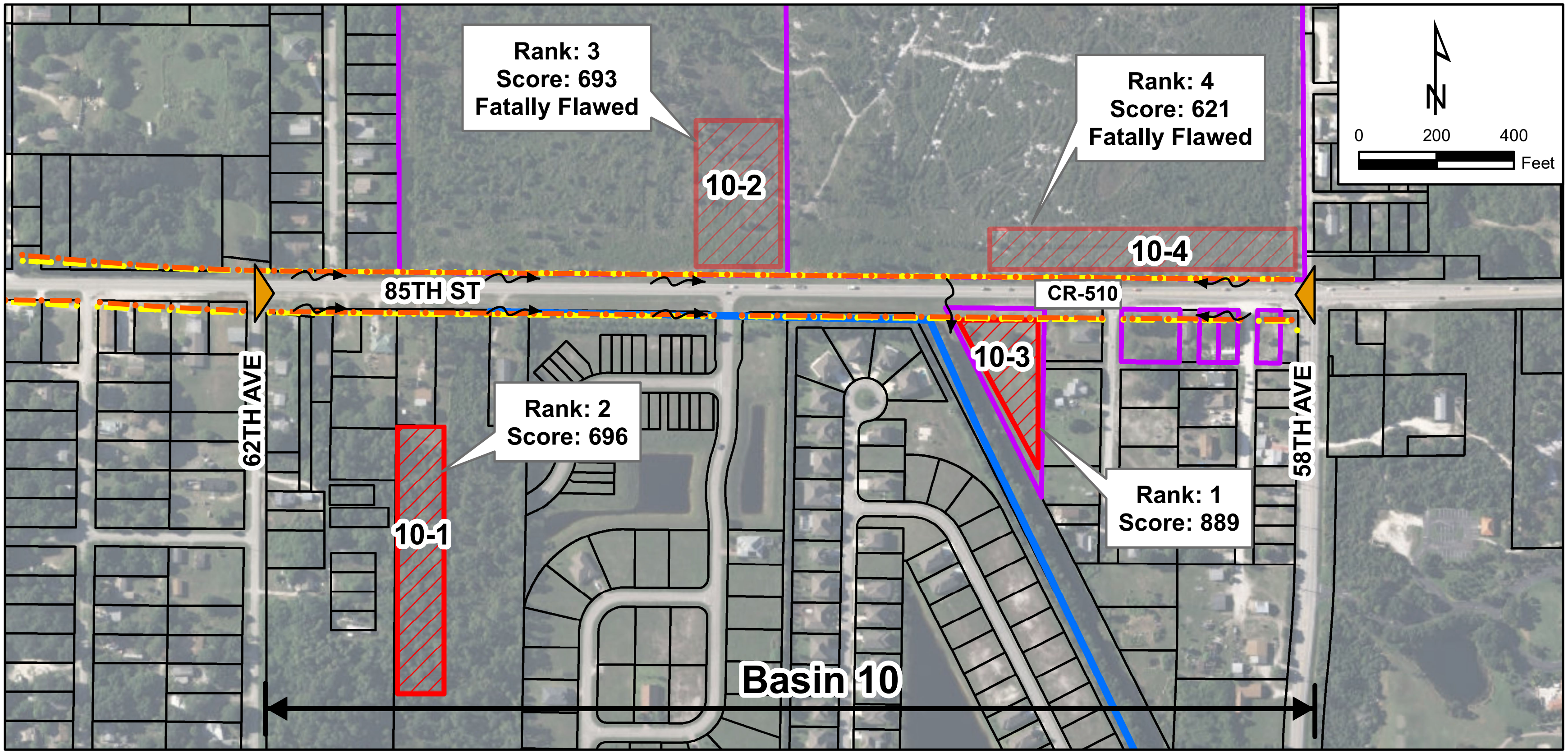
LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
9-1	9	2.5	31392900000500000080	Vacant Property. Partial Parcel
9-2	9	2.5	31393200000300000008	Vacant Property. Partial Parcel
9-3	9	2.5	31393200000300000007	Vacant Property. Partial Parcel
9-4	9	2.5	31392900000500000080 31392900000500000083 31392900000500000083.1	Vacant Property. Partial Parcel Vacant Property. Complete Parcel Indian River County Parcel. Partial Parcel

Stubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 9**

POND SITING EXHIBIT: BASIN 10



REVIEWER NOTES:

Date	Reviewer	Discipline	Pond ID	Comment

LEGEND:

- Alt.1 R/W
- Alt.2 R/W
- Potential Ponds
- Primary Canal
- Secondary Canal
- Parcels
- IRCParcel
- Basin Limits
- Exist. Drainage

Pond ID	Basin	Pond Size (Ac)	Parcel ID	Comment
10-1	10	1.9	31393200000100000011	Vacant Property. Partial Parcel
10-2	10	1.9	31392900000700000004	Indian River County Parcel. Partial Parcel
10-3	10	0.9	31393200000100000006	Indian River County Parcel. Complete Parcel
10-4	10	1.9	31392900000700000001.1	Indian River County Parcel. Partial Parcel

snubbs	CR-510 PD&E STUDY FROM CR-512 TO 58TH AVE	FPID: 405606-2-22-02	POTENTIAL POND SITES WORKING DRAFT VERSION 3	3/9/2017	PREPARED BY: KT REVIEWED BY: TAR	**BASIN 10**

Pond Siting Meeting #3
CR 510 from CR 512 to 58th Avenue PD&E Study

Indian River County
FM 405606-2-22-02
March 2, 2017

Notes:

1. **Scores for each discipline presented by pond siting members**

2. **Pond Siting Team provides feedback**

MEETING NOTES **3/2/2017**

Subject: Pond Siting Meeting #3 (CR-510 PD&E from CR-512 to 58th Ave)

FPID: 405606-2-22-02

District 4 Attendees:
Maria Formoso, P.E., P.M.P., Project Manager
Wilord Metellus, Drainage Engineer
Diego Velazquez, LAP Coordinator (teleconference)
Donnie Webster, District R/W
John Rodemeyer, District R/W
Laurice Mayes, Legal Attorney
Robin Brisebois, R/W Project Manager
Kelley Hall, District Deputy Maintenance Engineer

Metric Attendees:
Carlos Rodriguez, PE, Consultant Project Manager

Snubbs Consulting Attendees:
Tommy Ruiz, PE, CFM, LEED AP, Drainage Engineer
Kathy Tabuteau, EI, Drainage Engineer
Shaquon Samuel, EI, Drainage Engineer (teleconference)

Location: FDOT District 4 (District Office Conference Room 3)

Time: 9:00 AM

<u>Background:</u>

- FDOT is preparing a Project Development and Environment (PD&E) Study for CR-510 from CR-512 to 58th Avenue. The project is approximately 5.3 miles long. The study will focus on identifying possible locations for stormwater treatment ponds and evaluating the Right-of-Way (R/W) needed to accommodate the stormwater management facilities.

- The pond siting team consists of individuals from various FDOT departments and consultant classifications, which were assigned during the pond siting process. The team responsibilities are listed in the FDOT-D4 Pond Siting Procedures.

- During the first pond siting meeting on **Jan-30-2017**, the pond siting team performed a general review to create Potential Pond Locations (Version 1). The team also discussed the pond siting matrix and collectively agreed to the weighted score for each design factor according to their significance to the project.

- During the second pond siting meeting on **March-2-2017**, the team adopted the pond siting matrix. Also, the pond siting team evaluated the Potential Pond Locations (Version 1) of all ten (10) basins using GIS and made adjustments to create new Potential Pond Locations (Version 2).

Discussion:

Scores for each discipline were presented by pond siting members. Based on the pond siting team's feedback, the ponds were ranked to illustrate the preferred pond options. Below is a summary of the major contributing factors that resulted in the ranking number of each of the ponds. **See attachment for exhibits and pond siting matrix for all the basins.**

BASIN 2

POND	RANK	MAJOR CONTRIBUTING FACTOR
2-1	2	Pond was satisfactory for all the disciplines. However, it may cause issues during construction since it is located far from the R/W.
2-2	1	Pond was satisfactory for all the disciplines.
2-3	3	Pond scored poorly for R/W
2-4	4	Pond will cause drainage issues since roadway runoff must travel over Lateral Canal D to enter the pond.

BASIN 5

POND	RANK	MAJOR CONTRIBUTING FACTOR
5-1	4	Pond will require lots of piping to connect to outfall and will require lots of beautification since it is near existing homes.
5-2	3	Pond is in a residential area, which causes issues for R/W and construction.
5-3	2	Pond was satisfactory for all the disciplines. However, it is in a residential area, which causes issues for R/W and construction.
5-4	1	Pond was satisfactory for all the disciplines.

BASIN 6

POND	RANK	MAJOR CONTRIBUTING FACTOR
6-1	2	Pond was satisfactory for all the disciplines. However, it is near an archeological site.
6-2	1	Pond was satisfactory for all the disciplines.
6-3	4	Pond is near a wetland which causes issues with the environment, the drainage, and the aesthetic requirements.
6-4	3	Pond will require lots of piping which will affect drainage and construction.

BASIN 7

POND	RANK	MAJOR CONTRIBUTING FACTOR
7-1	2	Pond was satisfactory for all the discipline. However, it was scored poorly for R/W.
7-2	3	Pond scored poorly for R/W, drainage, and aesthetics.
7-3	4	Pond scored poorly for drainage, aesthetics, construction and utilites.
7-4	1	Pond was satisfactory for all the disciplines.

BASIN 8

POND	RANK	MAJOR CONTRIBUTING FACTOR
8-1	2	Pond was satisfactory for all the disciplines. However, it is near a historical house.
8-2	1	Pond was satisfactory for all the disciplines.
8-3	3	Pond is near a contaminated area.
8-4	4	Pond is near a historic structure.

BASIN 9

POND	RANK	MAJOR CONTRIBUTING FACTOR
9-1	4	Pond is near an archeological site and is the most costly of the 4 options.
9-2	2	Pond was satisfactory for all the disciplines. However, it causing double frontage issues. Team members collectively agreed to relocate pond to back of the parcel.
9-3	1	This pond was satisfactory for all the disciplines.
9-4	3	Pond is near houses, which will affect construction and will require lots of beautification.

BASIN 10

POND	RANK	MAJOR CONTRIBUTING FACTOR
10-1	2	Pond was satisfactory for all the disciplines. However, it is far from the R/W, which will affect drainage and construction.
10-2	3	Pond was fatally flawed since it is in a Habitat Preservative.
10-3	1	Pond was satisfactory for all the disciplines.
10-4	4	Pond was fatally flawed since it is in a Habitat Preservative.

Action Items:

- Pond siting team will accept scores for each pond prior to Pond Siting Meeting #4, scheduled for **March-8-2017**.

SIGN-IN SHEET

Project Title: Pond Siting Meeting #3 (CR-510 PD&E from CR-512 to 58th Ave)

Date: 3/2/2017

FPID: 405606-2-22-02

NAME	INITIALS	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Maria Formoso, P.E., P.M.P.	MF	FDOT	Project Manager	Maria.Formoso@dot.state.fl.us	954-777-4677
Carlos Rodriguez, PE	CR	Metric	Consultant Project Manager	crodriguez@metriceng.com	305-968-2546
Tommy Ruiz, PE, CFM, LEEP AP	TAR	Snubbs	Drainage Engineer	Tommy.Ruiz@snubbs.com	305.885.6400 ext. 201
Kathy Tabuteau, EI	KT	Snubbs	Drainage Engineer	Kathy.tabuteau@snubbs.com	305.885.6400 ext. 206
Georgi Celusnek GC	GC	FDOT	District Drainage Engineer	georgi.celusnek@dot.state.fl.us	954-777-4368
~~James Poole~~		~~FDOT~~	~~District Drainage Engineer~~	~~james.poole@dot.state.fl.us~~	~~954-777-4204~~
Olivia Bonilla	OB	FDOT	Drainage Engineer	olivia.bonilla@dot.state.fl.us	954-777-4134
Wilord Metellus	WM	FDOT	Drainage Engineer	wilord.metellus@dot.state.fl.us	954-777-4467
~~Shelley ChinQuee~~		~~FDOT~~	~~Construction Engineer~~	~~shelley.chinquee@dot.state.fl.us~~	~~954-777-4418~~
Diego Velazquez		FDOT	Construction Engineer	diego.velazquez@dot.state.fl.us	772-321-6627
~~Victor Ramos~~		~~FDOT~~	~~District R/W~~	~~victor.ramos@dot.state.fl.us~~	~~954-777-4257~~
John Rodemeyer	JR	FDOT	District R/W	John.Rodemeyer@dot.state.fl.us	954-777-4250
~~Donnie Webster~~		~~FDOT~~	~~District R/W~~	~~donald.webster@dot.state.fl.us~~	~~954-777-4235~~
~~Tom Stepp~~		~~FDOT~~	~~District R/W~~	~~thomas.stepp@dot.state.fl.us~~	~~954-777-4230~~
Morteza Alian	MA	FDOT	District Maintenance Engineer	morteza.alian@dot.state.fl.us	954-777-4449
Laurice Mayes	LM	FDOT	Legal Attorney	laurice.mayes@dot.state.fl.us	954-777-4509
~~Robin Brisebois~~		~~FDOT~~	~~R/W Project Manager~~	~~Robin.Brisebois@dot.state.fl.us~~	~~954-777-4249~~
~~Kelley Hall~~		~~FDOT~~	~~District Deputy manager~~	~~Kelley.Hall@dot.state.fl.us~~	~~954-777-4205~~

SIGN-IN SHEET

Project Title: Pond Siting Meeting #3 (CR-510 PD&E from CR-512 to 58th Ave)

Date: 3/2/2017

FPID: 405606-2-22-02

NAME	INITIALS	DEPT./COMPANY	TITLE/POSITION	EMAIL	PHONE
Millie Radzikhovsky	MR	BMA	In-house Support-PLEMO	mradzikhovsky@bma-ce.com	954-744-4691
Gabriela Garcia	GG	metric		ggarcia@metriceng	
Scott Clark	SWC	FDOT PLEMO	Environmental Specialist	Scott.clark@dot.state.fl.us	(954)777-4342
ELISABETH HASSETT	EH	FDOT DESIGN	DISTRICT LANDSCAPE ARCH	ELISABETH.HASSETT@DOT.STATE.FL.US	954 777-4219
~~MARSHA~~					

APPENDIX E

(Excerpts from Existing Projects)

STORMWATER MANAGEMENT REPORT

for

Indian River County Route 512 Roadway Improvements (I-95 to Roseland Road)

Indian River County, Florida

FOR SUBMITTAL TO THE

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

Prepared

by

MASTELLER & MOLER, Inc.
~ CONSULTING ENGINEERS ~
2205 14TH Avenue,
Vero Beach, Florida 32960
(561) 567-53300

56415-1

Engineers Project # 9649
Revised November 1998

Stephen E. Moler, P.E.
Executive Vice President

I. INTRODUCTION

A. Project Description

Masteller & Moler, Inc. has been engaged by Indian River County to develop construction plans to improve the County Road 512 Roadway System from a two (2) lane undivided roadway to a four (4) lane divided roadway. The project begins approximately 1000 feet east of the I-95 Interchange and extends east to Roseland Road, a distance of 3.5 miles as shown on the "**Project Location Map**" (Exhibit "A") included at the end of this Section.

The proposed roadway improvements will provide for the anticipated increase in traffic flow along the corridor. This report presents a description and discussion of existing drainage features along the project route; the manner in which existing drainage systems will be maintained; and the design of stormwater management systems that will be constructed to provide for treatment and attenuation of runoff from the proposed improvements.

It is worth noting to avoid confusion, that the project's construction stationing extends from approximately Station 41+00 (near Interstate 95) to approximately Station 342+00 (near Roseland Road). At station 131+53.28 the stationing abruptly increases to Station 248+02.83. Thus, the project length is approximately 3.5 miles.

4. System "D"

(a)Normal Water Level (NWL) System "D"

LJ Nodarse soils investigation and groundwater observations reveal that the Normal Water Level (NWL) for System "D" should be set at Elevation 13.25 NGVD.

(b) Treatment Volume "D"

The treatment volume or dynamic pool is the amount between the proposed control elevation 13.25 ft NGVD and the overflow elevation 14.75 ft NGVD. In contrast to the permanent pool, the dynamic pool is held temporarily. It is discharged at a slow rate through a bleed-down device, in this case an orifice.

Site Area "D" = 7.71 acres (STA. 268+00 to STA. 296+00)

Proposed Impervious Area = 6.17 acres

Drainage Area = 17.59 acres

Treatment Volume Required

$$(15.37 \text{ acres}) \times (1") \times (1/12) = 1.28 \text{ ac - ft}$$

or

$$[(6.17 \text{ ac}) \times (2.5") (1/12) = 1.29 \text{ ac - ft}$$

$$\underline{\text{Volume} = 1.29 \text{ ac - ft}}$$

The treatment volume proposed in System "D" is 4.23 acre-feet.

The drainage area for the new system "D" of proposed roadway is 16.92 acres. This area is larger than the right-of-way area which is 7.71 acres. Then, of course, the primary goal of the detention pond is to attenuate or mitigate the impact expected by adding paving to the existing roadway, which obviously increases the volume and rate of runoff. The pond serves as a buffer for the increased flows

(c) Proposed Stage - Storage Relationship for Pond "D"

Pond "D" has been designed to provide a stage-storage relationship to properly attenuate the post-development peak runoff to pre-development rates. The ICPR input data reflecting the Stage-Area relationship for Pond "D" is included herein this section.

(d) Permanent Pool Volume "D"

$$V_p = (A) \times (C) \times (P / 12) \times (t_r / t_w)$$

where,
V_p = permanent pool volume (ac - ft)
A = drainage area including the pond (ac)
C = runoff coefficient, 0.78
P = wet season rainfall (in), 31 per SJRWMD
t_r = required residence time (days)
t_w = duration of rainy season (days)

Thus,

$$Vp = [(15.37) x 0.78] x (31/12) x (21/153)$$

$$Vp = 4.25\ ac - ft$$

A permanent pool volume in excess of 23.4 ac - ft is provided below the control elevation. The permanent pool storage provides approximately 116 days of residence time.

(e) Orifice Design and Drawdown Calculations

A circular orifice is proposed to be used as a bleed-down device. The falling head equation will be used to calculate the orifice size, which is as follows:

$$Q = C \times A \times (2 \times g \times H)^{1/2}$$

where,
Q = flow (cfs)
C = orifice coefficient (0.62)
A = orifice section area (sf)
g = gravitational constant (ft/s^2)
H = falling head (ft)

The orifice has been designed to drawdown one-half of the treatment volume within 60 hours following a storm event but no more than one-half in the first 48 hours. The orifice computations have been based on the average head (h) which is the average depth between the top of the treatment volume and the stage at which one-half of the treatment volume has been released computed as follows:

$$h = .(h1+h2)/2$$

$$= (1.50+0.75)/2 = 1.13'$$

The flow rate to provide release of one-half of the treatment volume within 60 hours is computed as follows:

$$Q = TV/(2t3600)$$

$$= 184{,}258 \text{ cf} / (2)(60)(3600) = 0.43 \text{ cfs}$$

The Area (A) of the required orifice to obtain release of one-half of the treatment volume within 60 hours is computed as follows:

$$A = Q/C(2gh)1/2$$

$$= 0.43/(0.60)[(2)(32.2)(1.13)]1/2 = 0.08 \text{ SF}$$

The diameter (D) of the orifice is computed as follows:

$$D = [4A/3.14]1/2$$

$$= [(4)(0.08)/3.14]1/2 = 3.93'' \quad \underline{\text{(Use 4.0 inches)}}$$

(f) Pre-Post Rate Analysis

Pre-Development and Post-Development peak runoff rates have been developed for this project based on SCS Florida Modified Type II storm events. Pre-Development runoff rates have been prorated as necessary to reduce peak Pre-Development flow rates to reflect the estimated portions of Pre-Development drainage basins within the Post-Development systems.

Post-Development peak runoff rates delivered to Pond "D" have been attenuated to reduce discharges to levels below Pre-Development rates. The peak rates of Runoff for the 25 year / 24 hour event have been determined as follows:

Pre-Development Peak Rate	=	37.79 cfs
Post-Development Peak Rate (to Pond "D")	=	61.37 cfs
Post-Development Peak Discharge (Pond "D")	=	14.64 cfs

Excerpts from the ICPR computer modeling for the Pre-Development and Post-Development peak rates have been included on the following pages.

STORMWATER MANAGEMENT COMPUTATIONS

FOR

BLUEWATER BAY
INDIAN RIVER COUNTY, FLORIDA

JULY, 2004
REV 1: September, 2004
REV 2: March, 2005

Schulke, Bittle & Stoddard, L.L.C.
1717 Indian River Boulevard, Suite 301
Vero Beach, Florida 32960
Phone: (772) 770-9622
Fax: (772) 770-9496

JOSEPH WILLIAM SCHULKE
CERTIFICATE
NO. 47048
STATE OF FLORIDA
PROFESSIONAL ENGINEER

4/5/05
Joseph W. Schulke, P.E.
FL Reg. No. 47048

INTRODUCTION

The following are preliminary storm water management computations for Bluewater Bay, a single family residential development located in Indian River County, Florida. More specifically, the site is located along the northwest corner of the intersection of C.R. 510 (Wabasso Road) and 86 Avenue. The site is approximately 141.8± acres, of which 136.7± will be developed after public right-of-way dedication. The development consists of 379 single family homes and yields a density of 2.77 units per acre. This density is well below the zoned limit of three units per acre.

The site is currently a citrus grove with the usual drainage ditches. The ditches are used more for ground water control and irrigation than for drainage. The ditches do convey runoff, as a secondary purpose, to a ditch that drains to the South Prong of the Sebastian River. The site is connected to this ditch by an existing 48 inch metal culvert. This culvert will be replaced with a 30 inch pipe from the outlet structure of the site to the ditch. The existing ditch that conveys the site's discharge to the South Prong was assumed to be a trapezoidal channel with a bottom width of 5 feet, 4:1 side slopes, and a maximum flow depth of 2.5 feet. The channel is approximately 1900 feet long. The tailwater elevation in the South Prong was taken for the FEMA flood map. The 100-year flood elevation is approximately 11.00. This elevation is unlikely to produce significant backwater affects on the site and will be used for all storms events in the model. For purposes of modeling the existing site, the drainage ditches on site were assumed to be trapezoidal, with a bottom width of 5 feet and side slopes of 1.5:1. The stage/storage relationship of these ditches were modeled, and the outflow was routed through the existing 48 inch pipe. The receiving ditch leading to the Sebastian River was modeled as referenced above.

The development will consist of the usual onsite drainage system of roadside inlets and underground piping to convey runoff to a wet detention system. The development will include lakes that provide the necessary controls as required by St. Johns River Water Management District (SJRWMD) and include pretreatment for the greater of 1 inch of runoff from the entire site or 2 ½ inches of runoff from impervious areas. For discharges into the Indian River, the treatment volume will be increased by 50 percent. Flow attenuation will be provided using the pre versus post comparison or the discharge volume per 24 hours according to Sebastian River Water Control District (SRWCD). Although this site is located downstream of any control structure for SRWCD and is directly connected to the Sebastian River, the discharge volume requirement does not apply? We will however, provide for 2 inches of discharge per 24 hours for the onsite area and 4" of discharge per 24 hours for the offsite public roadways. In addition, pretreatment and flow attenuation will be provided for one half of the public right-of-way for 89th Street and the entire ultimate right-of-way for Wabasso Road (CR 510) (160 foot) and 86th Avenue. All of 86th Avenue and 89th Street will be constructed as part of this development. In order to provide for the treatment volume of the portions of the roadways that other developments will ultimately control, a temporary swale will be constructed along the north side of 89th Street. The temporary swale along the north side 89th Avenue will be constructed in areas for which the development to the north will ultimately provide drainage. The temporary swale will use dry retention as the temporary control. No routings for 89th Street will be provided as the site is only required to provide pre versus post flow attenuation. As mentioned above, the 2 inch and 4 inch rule is proposed for the site and provides much more attenuation than pre versus post which will more than make up for the slight increase in volume discharged by the temporary swale.

The existing soils consist of the Oldsmar, Riviera and Wabasso series of soils and range from type B soils to type D. For the existing runoff computations, type B soils will be used to determine the runoff curve number. Type D soils will be used for the proposed runoff curve number.

BLUEWATER BAY

STORMWATER MANAGEMENT COMPUTATIONS

SBS PROJECT NUMBER 00-003

ENG: DMF

DATE: JULY, 2004

REQUIRED TREATMENT VOLUME

ALL BASINS (INCLUDES OFFSITE ROADWAY AREA OF 15.26 AC)

1" OVER ENTIRE AREA
152.18 ACRES × (1 IN ÷ 12 IN/FT) = 12.682 ACFT

OR
2 1/2" OVER IMPERVIOUS AREA (EXCLUDING LAKE)
77.7 ACRES IMPERVIOUS × (2 1/2 IN ÷ 12 IN/FT) = 16.188 ACFT

USE 16.19 ACFT
PROVIDE 24.28 ACFT OF STORAGE FOR PRETREATMENT ADDING 50% OF ADDITIONAL STORAGE FOR DISCHARGE INTO SEBASTIAN RIVER

STAGE STORAGE CHART FOR OVERALL RETENTION

STAGE (FT)	AREA (AC)			STORAGE VOLUME (ACFT)	STAGE (FT)
	RET AREA	RET AREA BANK	TOTAL		
16.50	17.290	0.000	17.290	0.000	16.50
16.75	17.290	0.428	17.718	4.376	16.75
17.00	17.290	0.856	18.146	8.859	17.00
17.25	17.290	1.284	18.574	13.449	17.25
17.50	17.290	1.713	19.003	18.146	17.50
17.75	17.290	2.141	19.431	22.950	17.75
18.00	17.290	2.569	19.859	27.862	18.00
18.25	17.290	2.997	20.287	32.880	18.25
18.50	17.290	3.425	20.715	38.005	18.50
18.75	17.290	3.853	21.143	43.237	18.75
19.00	17.290	4.281	21.571	48.577	19.00
19.25	17.290	4.709	21.999	54.023	19.25
19.50	17.290	5.138	22.428	59.576	19.50

24.282 ACFT COORESPONDS TO AN ELEVATION OF 17.82

1/2 TREATMENT VOLUME =
12.141 ACFT & COORESPONDS TO AN ELEVATION OF 17.18

BLUEWATER BAY

STORMWATER MANAGEMENT COMPUTATIONS
SBS PROJECT NUMBER 00-003
ENG: DMF
DATE: JULY, 2004

TREATMENT VOLUME ORIFICE SIZING (BASIN #1)

TOTAL TREATMENT VOLUME FOR SITE (AT ELEV 17.82) =	24.28	ACFT
=	1,057,724	CF
RECOVERY TIME =	27.00	(AVERAGE TIME OF 24 TO 30 HOURS)
AVERAGE DISCHARGE RATE (Q) =	5.44	CFS
DEPTH OF WATER AT TREATMENT VOLUME (H1) =	1.32	FT
DEPTH OF WATER 1/2 OF TREATMENT VOLUME (H2) =	0.68	FT
HEAD (H) =	1.00	FT
ORIFICE EQUATION "C" =	0.60	
ORIFICE AREA =	1.13	SF
ORIFICE AREA =	162.86	SI
ORIFICE WIDTH =	16.29	INCHES
ORIFICE HEIGHT =	10.00	INCHES
ORIFICE AREA =	162.86	
ADJUSTED HEAD FOR FLOW LINE		
1/2 HEIGHT OF ORIFICE =	5.00	IN
=	0.42	FT
FLOW LINE ELEVATION =	16.92	FT
H1 =	0.90	FT
H2 =	0.26	FT
HEAD (H) =	0.58	FT
ORIFICE AREA =	1.48	SF
ORIFICE AREA =	213.37	SI
ORIFICE WIDTH =	24.00	INCHES
ORIFICE HEIGHT =	10.00	INCHES
ORIFICE AREA =	240.00	
DRAWDOWN TIME =	24.00	HOURS
	DESIGN IS ADEQUATE	

BLUEWATER BAY

STORMWATER MANAGEMENT COMPUTATIONS

SBS PROJECT NUMBER 00-003

ENG: DMF

DATE: JULY, 2004

REQUIRED TREATMENT VOLUME

TEMPORARY SWALE ALONG 89 ST (NORTH HALF ONLY)

TOTAL AREA = 1.79 AC

PAVEMENT AREA = 0.72 AC

USING DRY RETETNION PROVIDE
1" OVER ENTIRE AREA

1.79 ACRES × (1 IN ÷ 12 IN/FT) = 0.149 ACFT

OR ACFT

1 1/4" OVER IMPERVIOUS AREA + 1/2" OVER ENTIRE AREA

0.72 ACRES IMPERVIOUS × (1.25 IN ÷ 12 IN/FT) + 1.79 TOTAL AREA × (0.50 IN ÷ 12 IN/FT)= 0.150 ACFT

USE 0.15 ACFT

PROVIDE 0.225 ACFT OF STORAGE FOR PRETREATMENT ADDING 50% OF ADDITIONAL STORAGE FOR DISCHARGE INTO SEBASTIAN RIVER

STAGE STORAGE CHART FOR TEMPORARY SWALE

ELEVATION	AREA	AVG.	VOLUME	TOTAL VOLUME
18.80	9703	0	0	0.00
19.80	32455	21079	21079	0.48

0.225 ACFT COORESPONDS TO AN ELEVATION OF 19.26

SET TOP OF INLET @ ELEV 19.26

RECOVERY COMPUTATIONS DATA FOR MODRET INPUT

MODRET INPUT DATA FOR PROPOSED SWALE

WATER TABLE ELEVATION =	16.80	
BOTTOM OF AQUIFER =	11.00	
POND BOTTOM =	18.80	
VOLUME TO BE TREATED =	9801	CF
HYDRAULIC CONDUCTIVITY (VERTICAL) =	10.90	FT/DAY
HYDRAULIC CONDUCTIVITY (HORIZONTAL) =	13.50	FT/DAY
POND BOTTOM AREA =	9703	SF
AVERAGE LENGTH =	2,550	FT
AVERAGE WIDTH =	12.00	FT
LENGTH TO WIDTH RATIO	212.50	
ELEVATION OF STARING WATER LEVEL =	18.80	
DESIGN HIGH WATER ELEVATION =	19.80	
VOLUME BETWEEN BOTTOM & DESIGN HIGH =	21079	CF

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : Bluewater Bay Temporary Swale Recovery
POLLUTION VOLUME RUNOFF DATA USED
UNSATURATED ANALYSIS INCLUDED

Pond Bottom Area	9,703.00 ft^2
Pond Volume between Bottom & DHWL	21,079.00 ft^3
Pond Length to Width Ratio (L/W)	212.50
Elevation of Effective Aquifer Base	11.00 ft
Elevation of Seasonal High Groundwater Table	16.80 ft
Elevation of Starting Water Level	18.80 ft
Elevation of Pond Bottom	18.80 ft
Design High Water Level Elevation	19.80 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.11
Unsaturated Vertical Hydraulic Conductivity	10.90 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	13.50 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.15
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

Proposed Node Comparison Report

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Basin1	BASE	002yr	19.76	18.471	20.200	0.0028	124402	12.00	78.752	12.23	15.717
Basin1	BASE	010yr	17.83	19.436	20.200	0.0043	133441	12.00	122.421	12.27	21.348
Basin1	BASE	025yr	18.60	20.166	20.200	0.0053	143772	12.00	154.820	12.30	24.858
Basin1	BASE	100yr	40.83	20.163	20.200	0.0019	143700	36.00	67.162	36.26	17.345
Basin2	BASE	002yr	15.97	18.159	20.200	0.0018	39253	12.00	9.432	16.09	0.400
Basin2	BASE	010yr	13.14	18.626	20.200	0.0025	42184	12.00	14.662	13.73	1.911
Basin2	BASE	025yr	13.13	19.088	20.200	0.0029	45123	12.00	18.543	14.20	3.161
Basin2	BASE	100yr	37.00	19.136	20.200	0.0012	45429	36.00	8.044	38.20	3.302
Basin3	BASE	002yr	15.96	18.158	20.200	0.0021	24888	12.00	4.874	16.04	0.738
Basin3	BASE	010yr	12.98	18.614	20.200	0.0029	27179	12.00	8.423	13.54	3.408
Basin3	BASE	025yr	12.96	19.072	20.200	0.0034	29478	12.00	11.236	13.94	5.513
Basin3	BASE	100yr	36.91	19.115	20.200	0.0011	29689	36.37	4.986	37.96	5.684
Basin4	BASE	002yr	15.93	18.153	20.200	0.0027	86495	12.00	57.171	12.20	13.867
Basin4	BASE	010yr	12.42	18.647	20.200	0.0040	89680	12.00	89.593	12.26	38.051
Basin4	BASE	025yr	12.43	19.126	20.200	0.0042	92769	12.00	114.188	12.17	48.258
Basin4	BASE	100yr	36.65	19.024	20.200	0.0011	92109	36.00	50.444	36.15	31.635
Basin5	BASE	002yr	19.75	18.475	20.200	0.0031	151398	12.00	94.476	12.37	7.630
Basin5	BASE	010yr	13.76	19.491	20.200	0.0047	162913	12.00	147.736	12.43	10.882
Basin5	BASE	025yr	13.79	20.283	20.200	0.0057	185885	12.00	187.326	12.46	13.020
Basin5	BASE	100yr	37.69	20.306	20.200	0.0021	191901	36.00	78.798	36.52	10.873
Basin6	BASE	002yr	19.81	18.465	20.200	0.0028	118089	12.00	66.204	12.41	9.616
Basin6	BASE	010yr	15.57	19.429	20.200	0.0040	131941	12.00	101.971	12.48	13.179
Basin6	BASE	025yr	15.56	20.175	20.200	0.0048	146207	12.00	128.320	12.49	15.304
Basin6	BASE	100yr	38.62	20.189	20.200	0.0019	146692	36.00	61.112	36.67	14.111
Basin7	BASE	002yr	18.88	18.396	20.200	0.0024	65275	12.00	27.357	0.00	0.000
Basin7	BASE	010yr	15.60	19.236	20.200	0.0034	73135	12.00	41.792	0.00	0.000
Basin7	BASE	025yr	15.79	19.857	20.200	0.0039	78976	12.00	51.791	0.00	0.000
Basin7	BASE	100yr	39.00	19.864	20.200	0.0015	79042	36.00	21.409	0.00	0.000
Basin8	BASE	002yr	19.81	18.465	20.200	0.0019	284578	12.00	102.145	0.00	0.000
Basin8	BASE	010yr	17.94	19.418	20.200	0.0028	296408	12.00	152.481	0.00	0.000
Basin8	BASE	025yr	18.63	20.137	20.200	0.0033	308010	12.00	188.540	0.00	0.000
Basin8	BASE	100yr	41.00	20.135	20.200	0.0015	307945	36.00	88.944	0.00	0.000
BNDY	BASE	002yr	30.00	10.167	0.000	0.0002	29510	16.18	11.729	0.00	0.000
BNDY	BASE	010yr	30.00	10.167	0.000	0.0002	29852	14.36	38.696	0.00	0.000
BNDY	BASE	025yr	36.00	11.000	0.000	0.0002	34664	15.78	47.277	0.00	0.000
BNDY	BASE	100yr	36.00	11.000	0.000	0.0002	35416	36.84	41.394	0.00	0.000
Ditch	BASE	002yr	16.18	12.547	15.900	0.0008	20515	15.93	11.735	16.18	11.729
Ditch	BASE	010yr	12.67	12.865	15.900	0.0025	28076	12.42	33.805	14.36	38.696
Ditch	BASE	025yr	12.90	13.267	15.900	0.0034	33931	12.43	42.365	15.78	47.277
Ditch	BASE	100yr	36.84	13.171	15.900	-0.0012	38524	36.65	41.587	36.84	41.394

MAX STAGES

Proposed Site Outflow

RECEIVED
APR 25 1997
4-061-0163AGC-ERP
MELBOURNE SERVICE CENTER

CONCEPTUAL ENVIRONMENTAL RESOURCE PERMIT APPLICATION

STORMWATER MANAGEMENT CALCULATIONS FOR VERO LAKE ESTATES SUBDIVISION CONCEPTUAL MASTER DRAINAGE PLAN SECTIONS 20, 21, 27, 28, 29, 33 & 34 TOWNSHIP 31 S, RANGE 38E

PREPARED FOR

THE BOARD OF COUNTY COMMISSIONERS
OF INDIAN RIVER COUNTY
AND
THE VERO LAKE ESTATES AREA MUNICIPAL
SERVICE TAXING UNIT ADVISORY COMMITTEE

MARCH, 1997

PREPARED BY

CARTER ASSOCIATES, INC.
CONSULTING ENGINEERS AND LAND SURVEYORS

4/23/97
George A. Simons, Project Engineer
Florida Reg. No. 40437

INTRODUCTION

The applicant, Indian River County, is seeking a Conceptual Environmental Resource Permit to construct roadway and drainage improvements throughout the existing Vero Lake Estates Subdivision. The retrofit will be constructed by Indian River County over the next 20 years as funds are available.

Carter Associates, Inc. has been retained by Indian River County to prepare the permit application package for submittal.

The storm drainage retrofit plan is based on the Vero Lakes Estates Master Drainage Plan (dated Nov. 1992), prepared by Beindorf and Associates, a division of Kimley-Horn and Associates, Inc. for Indian River County. The plan was developed between 1986 and 1992. The preliminary plan was transmitted to St. Johns River Water Management District (SJRWMD) for review in 1990. (Ref: SJRWMD letter dated June 1990.)

The retrofit project includes improvements to the subdivision drainage as follows:

A. Individual Block Units - The swale drainage will be retrofitted with concrete control structures to simulate a dry detention system to provide water quality treatment and some attenuation.

B. Conveyance Ditches - Additional conveyance ditches will be constructed, existing ditches to be enlarged if right-of-way is available, and control structures will be installed in some locations to improve drainage and provide some attenuation.

C. Lakes - Two of the existing lakes (Oak Lake, Basin BLAKE 9) are to be expanded and a new lake (Basin B Lake 22) is to be constructed on vacant park property. A total of five (5) lakes will be connected to the conveyance ditches and utilized as storage and water quality treatment facilities.

The flood route model and the project plans are based on information compiled from the following sources: the Vero Lakes Estates Master Drainage Plan (noted above), FEMA Flood Insurance Aerial Surveys, Inc. dated May 4, 1989, Project Topographic Aerials by Bosworth Aerial Surveys, Inc. undated, Indian River County cross section information (Project #8226, sheet 1 through 19, undated), and Carter Associates, Inc. field survey work.

The subdivision flood route model consists of numerous basins. However, the results of the flood route for the pre versus post development conditions are based on the total subdivision area.

Based on the results of the computer modeling, the predevelopment peak discharge rate is 859.71 CFS and the post development peak discharge rate is 850.60 CFS.

91

Advanced Interconnected Channel & Pond Routing (adICPR Ver 1.40)
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V.L. ESTATES POST DEV REVISE LAKE NO. 20 (FINAL)
3/10/97

BASIN NAME	BL/W	BLAKE20	BLAKE22	BLAKE9	BLAKE9S
NODE NAME	NL/W	NLAKE20	NLAKE22	NLAKE9	NLAKE9S
UNIT HYDROGRAPH	UH323	UH256	UH323	UH323	UH323
PEAKING FACTOR	323.	256.	323.	323.	323.
RAINFALL FILE	SCSII-24	SCSII-24	SCSII-24	SCSII-24	SCSII-24
RAIN AMOUNT (in)	9.40	9.40	9.40	9.40	9.40
STORM DURATION (hrs)	24.00	24.00	24.00	24.00	24.00
AREA (ac)	40.00	70.00	10.00	53.00	20.00
CURVE NUMBER	79.00	76.00	92.00	87.00	81.00
DCIA (%)	.00	.00	.00	.00	.00
TC (mins)	26.89	46.26	10.00	81.78	36.48
LAG TIME (hrs)	.00	.00	.00	.00	.00
BASIN STATUS	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE

BASIN	QMX (cfs)	TMX (hrs)	VOL (in)	NOTES
BL/W	177.54	12.19	6.82	PST DEV UNIT L, WEST
BLAKE20	166.67	12.44	6.44	PST DEV LAKE 20 (SAME AS PRE DEV)
BLAKE22	84.92	12.02	8.44	PST DEV LAKE 22
BLAKE9	120.83	12.72	7.82	PST DEV UNIT B AND OAK LAKE ADD.
BLAKE9S	75.27	12.24	7.08	PST DEV UNIT C;LAKE SUSAN

BASIN NAME	BLAKEA	BM/E	BM/W	BN-O/E	BN-O/W
NODE NAME	NLAKEA	NM/E	NM/W	NN-O/E	NN-O/W
UNIT HYDROGRAPH	UH256	UH323	UH323	UH323	UH323
PEAKING FACTOR	256.	323.	323.	323.	323.
RAINFALL FILE	SCSII-24	SCSII-24	SCSII-24	SCSII-24	SCSII-24
RAIN AMOUNT (in)	9.40	9.40	9.40	9.40	9.40
STORM DURATION (hrs)	24.00	24.00	24.00	24.00	24.00
AREA (ac)	20.00	30.00	40.00	80.00	80.00
CURVE NUMBER	84.00	80.00	81.00	81.00	81.00
DCIA (%)	.00	.00	.00	.00	.00
TC (mins)	87.18	50.56	50.56	50.58	50.58
LAG TIME (hrs)	.00	.00	.00	.00	.00
BASIN STATUS	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE

BASIN	QMX (cfs)	TMX (hrs)	VOL (in)	NOTES
BLAKEA	34.11	12.79	7.43	PST DEV LAKE A
BM/E	87.50	12.36	6.95	PST DEV UNIT M, EAST
BM/W	118.61	12.36	7.07	PST DEV UNIT M, WEST
BN-O/E	237.25	12.36	7.07	PST DEV UNIT N & O;EAST SECTION
BN-O/W	237.25	12.36	7.07	PST DEV UNIT N & O;WEST SECTION

STORMWATER CALCULATIONS FOR C.R. 510 (TURN LANE) FROM SHARK BLVD. TO C.R. 512

ST. JOHN'S RIVER WATER MANAGEMENT DISTRICT

PREPARED BY THE INDIAN RIVER COUNTY ENGINEERING DIVISION

2-6-04

I.R.C. PROJECT #0001 FEBRUARY 2004

DESCRIPTIVE NARRATIVE

C.R. 510 Widening from Shark Boulevard to C.R. 512
IRC PROJECT NO. 0001

The attached Stormwater Calculations were prepared by the Indian River County Engineering Division for the widening of C.R. 510 from Shark Blvd to C.R. 512.

The existing conditions are as follows:

An existing asphalt road which is approximately 44' wide including 4' paved shoulders within the project area. There is an existing Lateral Ditch (Lateral D Canal) of the St Sebastian River Water Control District that runs along the east side of C.R. 510 and roadside swales which run along the west side of C.R. 510 which route the stormwater to the Lateral D Canal.

The proposed scope of work includes:

1. Widening the southbound lanes to provide right turn lanes into the Sebastian River High School.
2. Adding 6' concrete sidewalk along the west R/W line the entire length of the project.
3. Providing a treatment basin for the new widening.
4. Providing a swale to drain the property to the west of C.R. 510.

The total site area is 8.59 acres. We are providing a storage basin to accommodate the runoff of the existing pavement from the centerline of the road to the west. We will be providing treatment for the runoff from the proposed widening only. The F.D.O.T. Work Program 2004 is currently conducting a P.D.& E study in this area and eventually will be four laning C.R. 510 from C.R. 512 to U.S.#1. The proposed impervious area is 1.65 acres or 19% of the total site area.

The Soil Survey of Indian River County shows the site lies west of the Sand Ridge and is classified as Type C/D #10, Riviera and Type B/D #13 Wabasso Fine Sand.

BASIN 1 STATION 69+60 TO STATION 103+63

TOTAL AREA

STA. 69+60 TO 103+63 = 3,403 L.F.

3,403.00 L.F. x 110' R/W = 374,330 S.F.

$\boxed{\text{374,330.0 S.F. OR 8.59 AC.}}$

IMPERVIOUS AREA (PAV'T WIDENING) (*INCL. 4' PAVED SHLD)

STA. 69+60 TO STA. 103+63 = 3,403 L.F.

69+60 (50' RAD)	=	628 S.F.
70+11.3 TO 72+88.27 (16' WIDE)	=	4432 S.F.
73+20 (60' RAD)	=	754 S.F.
74+39 TO 76+60	=	3,536 S.F.
76+60 TO 79+15	=	2,040 S.F.
79+15 TO 95+50	=	26,160 S.F.
95+50 TO 102+30	=	10,200 S.F.
102+30 TO 103+09	=	2054 S.F.
510 + 512 INT. (45' R)	=	959 S.F.
6' SIDEWALK	=	20,933 S.F.
		71,696.00 S.F.

$\boxed{\text{71,696.00 S.F. OR 1.65 AC.}}$

CONT. NEXT SHT.

BASIN 1 CONT.

PERCENT OF IMPERVIOUS

$$\frac{71{,}696.00 \text{ S.F.}}{374{,}330.00 \text{ S.F.}} = \boxed{19\ \%}$$

STORMWATER TREATMENT VOLUME

$$1.25'' \times 1/12 \times 71{,}696.0 \text{ S.F.} = 7{,}468.33 \text{ C.F.}$$

BASIN 1

STAGE / STORAGE RELATIONSHIP

ELEV	AREA	STORAGE
18.05	10' WIDE × 2,958' LENGTH = 29,580	0
$\boxed{18.28}$		7468 C.F.
18.30	12' W × 2960' L = 35,520	8,138 C.F.
18.55	14' W × 2962' L = 41,468	17,762 C.F.
18.80	16' W × 2964' L = 47,424	28,874 C.F.
19.05	18' W × 2966' L = 53,388	41,476 C.F.
19.30	20' W × 2968' L = 59,360	55,570 C.F.
19.55	22' W × 2970' L = 65,340	71,158 C.F.
19.80	24' W × 2972' L = 71,328	88,242 C.F.
20.05	26' W × 2974' L = 77,324	106,824 C.F.
20.15	26.4' W × 2974.4' L = 78,524	114,616.4 C.F.

$\boxed{18.28}$ = DENOTES CONTROL ELEV.

DRAFT STORMWATER MANAGEMENT REPORT

For

COUNTY ROAD 510 (WABASSO ROAD)

From County Road 512
To approximately 500' East of 75th Court
Indian River County, Florida

Prepared for:

Prepared By:

Stanley Consultants INC.

January 2011

corridor; these include Sebastian Lakeview Estates, Blue Water Bay, Sebastian Park, Bridgetown Sebastian and Liberty Park. The runoff from the proposed CR 510 roadway project is designed to discharge to three of the PUDs. These include Blue Water Bay, Sebastian Park and Liberty Park; these PUDs will include a system of ponds which are designed to manage the runoff from the ultimate 6 lane CR 510 roadway. The permit number for Blue Water Bay is 4-061-95794. The permit number for Sebastian Park is 4-061-89112. The Liberty Park PUD has yet to submit a permit application.

Finally, the Lateral D Canal will be realigned to accommodate the CR 510 widening. The segment of the Canal to be realigned begins 1065 feet north of 89th Street and ends 385 feet south of 89th Street.

1.5 Soils Information

The soils within this area are predominately Riviera fine sand and Oldsmar fine sand with pockets of Wabasso fine sand. See Appendix C – Soils Map.

1.6 Seasonal High Ground Water Table

The seasonal high ground water table (SHGWT) varies along the project. The SHGWT outside of the Slough area varies between 1.0’-2.5’ below existing ground and is influenced by the Lateral Canals that bisect the corridor. This estimate is based on the GCME, Inc. soil survey and Environmental Resource Permits found for the PUDs along the corridor. See Figure 2 – Seasonal High Ground Water Table Map.

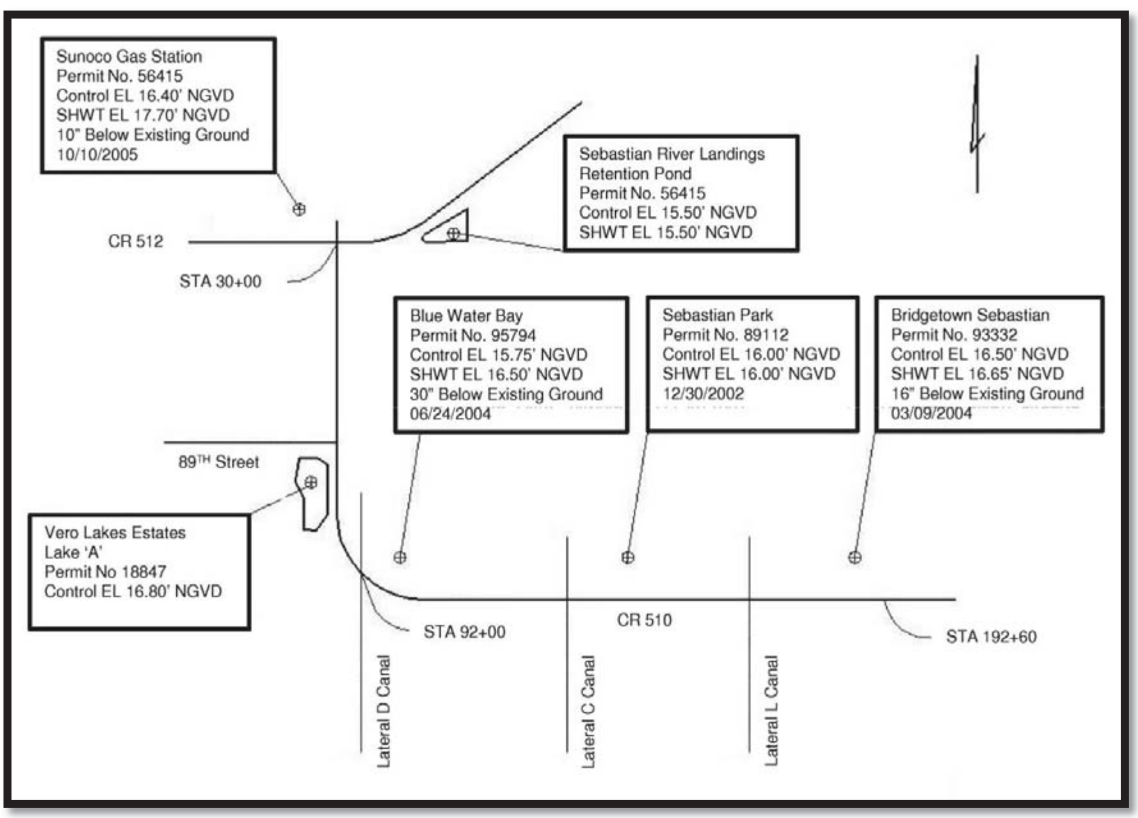


FIGURE 2 – Seasonal High Ground Water Table Map

In addition, the SHGWT of the Slough area was determined during a visit on January 27, 2009. The meeting included staff from St Johns River Water Management District and Stanley Consultants. The high water marks were identified at seven separate locations and subsequently surveyed by Burdette and Associates to determine the elevations. The results of the survey are indicated in Table 1.

Table 1-1 Seasonal High Ground Water Table at the Slough Area

Point Number	Elevation (ft) NGVD	Upstream distance from CR 510 (ft)	Remarks
1A	12.90	18.0	South side of CR 510
1B	12.68	18.0	South side of CR 510
2	14.06	59.8	South side of CR 510
3	14.78	132.1	South side of CR 510
4	13.35	275.8	South side of CR 510
5	14.34	296.8	South side of CR 510
6	12.74	285.9	South side of CR 510

Generally, the seasonal high ground water table in the vicinity of the Slough area averages to be approximately 13.5’ NGVD.

3.1 Existing Drainage System

The CR 510 roadway includes open roadside swales that capture and convey runoff to a system of larger Canals that are maintained by Sebastian River Improvement District. This canal system eventually connects to the South Prong of the St. Sebastian River. The canal system provides a source of irrigation to adjacent agricultural lands and provides flood protection.

<u>Basin 1</u>
Existing stormwater runoff for this area is collected in curb inlets and roadside swales where it is conveyed to a stormwater management pond located adjacent to CR 512; the Permit No. is 4-061-56415. The existing pond is located approximately 900 feet east of CR 510.

<u>Basin 2</u>
Existing stormwater runoff for this area collects in roadside swales and is conveyed to Lateral D Canal via inlet, pipe and roadside swales. The roadside swale on the west side of CR 510 is used for treatment of an additional turn lane that was constructed by Indian River County in 2007; the Permit No. is 40-061-93656.

<u>Basin 3</u>
Existing stormwater runoff within the CR 510 right of way collects in roadside swales and is conveyed to Lake ‘A’. This existing lake, Lake ‘A’, is 8.98 acres measured at the property line. The project area for this basin includes CR 510, 87th Street and 91st Avenue and Lake ‘A’. Lake ‘A’ is owned by Indian River County and is an old borrow pit that was retro-fitted with a control structure in the late 1990’s to provide stormwater treatment for Vero Lakes Estates and CR 510. Runoff generally reaches Lake ‘A’ by overland flow from CR 510 and by swales along 87th Street from Vero Lakes Estates.

<u>Basin 3 - Side Streets</u>
89th Street is an unpaved, unmaintained dirt road that parallels Vero Lakes Channel B. Existing stormwater runoff for this area collects in roadside swales on the south side of the road and conveyed to Channel B via cross drain pipes. These cross drain pipes are the most downstream connection of a large swale and culvert drainage system used to convey runoff from Vero Lakes Estates to Channel B.

91st Avenue is an unpaved dirt road that is maintained. Existing stormwater runoff for this area collects in roadside swales and is conveyed to Channel B or sheet flows east to an undeveloped parcel.

87th Street is a 2-lane paved road. Existing stormwater runoff for this area collects in roadside swales and is conveyed to Lake ‘A’.

86th Street is a 2-lane unpaved dirt road that is maintained. Existing stormwater runoff for this area collects in roadside swales and is conveyed toward the Lateral D Canal via the CR 510 ditch system.

85th Place is a 2-lane unpaved dirt road that is maintained. Existing stormwater runoff for this area collects in roadside swales and is conveyed toward the Lateral D Canal via the CR 510 ditch system.

The swale system within Vero Lakes Estates and Lake A provide stormwater treatment for CR 510, 87th Street and 91st Avenue; the Permit No. is 40-061-18847.

Basin 4

Existing stormwater runoff for this area collects in roadside swales and is conveyed to Lateral D Canal. The roadside swales are used for conveyance purposes. The Blue Water Bay PUD includes a permit to allow future connection from CR 510. The permit number is 4-061-95794-2.

Basin 5

Existing stormwater runoff for this area is collected in roadside swales and conveyed to Lateral C Canal. The roadside swales are used primarily for conveyance purposes. There are no existing permits for this segment of the project.

Basin 6

Existing stormwater runoff for this area is collected in roadside swales and conveyed to either Lateral C Canal or Lateral L Canal, dependent on project proximity to Canal. The roadside swales are used primarily for conveyance purposes. There are no existing permits for this segment of the project.

Basin 7

Existing stormwater runoff for this area is collected in roadside swales and conveyed to the Slough area, this is a wetland that runs parallel to Lateral L Canal. The roadside swales are used primarily for conveyance purposes. There are no existing permits for this segment of the project. CR 510 bisects the Slough area; a 106"x60" cross drain pipe provides hydraulic continuity under CR 510.

3.2 Proposed Drainage System

The proposed stormwater management system includes wet detention ponds, road side swales, and a closed drainage system of inlets and pipes. In general, all the roadway runoff will be captured and conveyed to a stormwater management area. The proposed stormwater management areas are generally wet detention ponds. There is also a dry detention pond proposed within Basin 3. Several basins will utilize the shared-use pond concept with adjacent developments; this concept will be utilized in Basin 4 (Blue Water Bay), Basin 5 (Sebastian Park) and Basin 7 (Liberty Park).

The proposed drainage basins are similar to the existing basins. All offsite runoff is conveyed through the project via canals and ditches; either a bridge structure or culvert structure is utilized to convey the offsite runoff under the roadway. Roadside ditches are utilized to mimic the existing roadside ditches which capture and convey offsite runoff to the nearest canal. Appendix L –Swale Design includes the swale design calculations.

Pre-development versus Post-development Total Phosphorus (TP) nutrient loading calculations were developed for Basin 2, Basin 3 and Basin 6. Criteria for the Lake Apopka Hydrologic Basin were used at the time of this writing, as suggested by St. Johns River Water Management District. *(Ref. St. Johns River Water Management District Applicant's Handbook: Management and Storage of Surface Waters, Chapter 11, July 2007).* The intent of these calculations is to demonstrate the post-development TP load discharged from the project will not exceed the pre-

Section 5

Drainage Information

5.1 Design Criteria

The design criteria used for the project are discussed below. Each of the basins used the same design criteria. The resources used for design include the St Johns River Water Management District Applicant's Handbook; other references are listed within this report.

5.1.1 Water Quality

Treatment volume is the greater of 1" over the entire drainage area or 2.5" times the percent impervious. The amount of treatment required and treatment provided is listed below.

Table 5-1 Water Quality

Basin Name	Treatment Volume Required (ac-ft)	Treatment Volume Provided (ac-ft)	Remarks
Basin 1	0.010	0.013	The required treatment volume is for the additional impervious area. CR 512 Permit No. 40-061-46415-1, 40-061-46415-3; Sunoco Gas Station & Crossroads Plaza Permit No. is 40-061-56415-5 provide remaining water quality.
Basin 2	3.30	3.99	None
Basin 3	4.34	9.32	Includes Basin 8 (89th Street) and Basin 9 (91st Avenue and 87th Street)
Basin 3b	0.20	0.14	Includes Vero Lakes Estates Access Road west of Lateral D Canal
Basin 3c,d,e	0.33	0.48	Includes Vero Lakes Estates Access Road east of Lateral D Canal
Basin 4	See Remark	See Remark	Per Blue Water Bay Permit No. 4-061-95794

Basin Name	Treatment Volume Required (ac-ft)	Treatment Volume Provided (ac-ft)	Remarks
Basin 5	See Remark	See Remark	Per Sebastian Park Permit No. 4-061-89112
Basin 6	2.00	2.76	None
Basin 7	See Remark	See Remark	Per Liberty Park Design, permit to be determined

Water quality calculations also includes an analysis to demonstrate the post-development Total Phosphorus (TP) load discharged from the project will not exceed the pre-development TP load discharged from the project. Appendix F – Total Phosphorus Calculation includes the TP load analysis for Pond 2, Pond 3 and Pond 6. The methodology for this project follows the Lake Apopka Hydrologic Basin methodology as found in the St Johns River Water Management District Applicant's Handbook: Management and Storage of Surface Waters.

5.1.2 Water Quantity

Discharge rates from Pond 2, Pond 3 and Pond 6 are designed so the post-development flow rate is less than or equal to the pre-development flow rate, as agreed upon with Sebastian River Improvement District. The pre-condition versus post-condition peak flow rates and volumes for the 25 year and mean annual 24 hour storm events are summarized in Table 5 and Table 6. These results are referenced from the ICPR results found in Appendix H – Drainage Calculations.

Table 5-2 Runoff Peak Rates and Volume Discharged – 25 Year Storm Event

Basin Name	PRE Runoff Peak Rates (cfs)	POST Runoff Peak Rates (cfs)	PRE Runoff Peak Volume (ac-ft)	POST Runoff Peak Volume (ac-ft)	Remarks
Basin 1	-	-	-	-	Per CR512 Permit No. 40-061-46415-1 &-3
Basin 2	28.3	19.0	9.1	10.4	Pond 2
Basin 3	101.7	36.2	29.2	35.7	Pond 3- CR510, 89th St., 87th St., & 91st Ave
Basin 3b	5.4	4.8	0.6	0.6	Dry Detention Swale 3b
Basin 3c, d, e	30.3	12.6	1.5	4.2	Dry Detention Swale 3c and Ponds 3d & 3e
Basin 4	-	-	-	-	Per Blue Water Bay Permit No. 4-061-95794
Basin 5	-	-	-	-	Per Sebastian Park Permit No. 4-061-89112
Basin 6	35.8	18.2	5.3	6.8	Pond 6
Basin 7	-	-	-	-	Per Liberty Park Design

Table 5-3 Runoff Peak Rates and Volume Discharged – Mean Annual 24 Hr. Storm Event

Basin Name	PRE Runoff Peak Rates (cfs)	POST Runoff Peak Rates (cfs)	PRE Runoff Peak Volume (ac-ft)	POST Runoff Peak Volume (ac-ft)	Remarks
Basin 1	-	-	-	-	Per CR512 Permit No. 40-061-46415-1 &-3
Basin 2	12.0	1.0	3.8	4.8	Pond 2
Basin 3	41.5	1.6	11.2	16.0	Pond 3- CR510, 89th St., 87th St., & 91st Ave
Basin 3b	2.3	1.9	0.2	0.2	Dry Detention Swale 3b
Basin 3c, d, e	11.4	5.1	0.5	1.5	Dry Detention Swale 3c and Ponds 3d & 3e
Basin 4	-	-	-	-	Per Blue Water Bay Permit No. 4-061-95794
Basin 5	-	-	-	-	Per Sebastian Park Permit No. 4-061-89112
Basin 6	13.3	0.7	2.0	6.1	Pond 6
Basin 7	-	-	-	-	Per Liberty Park Design

5.1.3 Pond Design

Pond side slopes are proposed to be sodded to the normal water level elevation. Littoral zones are proposed for Pond 2, Pond 3 and Pond 6 and landscaping is proposed along the perimeter of these ponds. The side slopes (horizontal:vertical) for the proposed ponds are as follows:

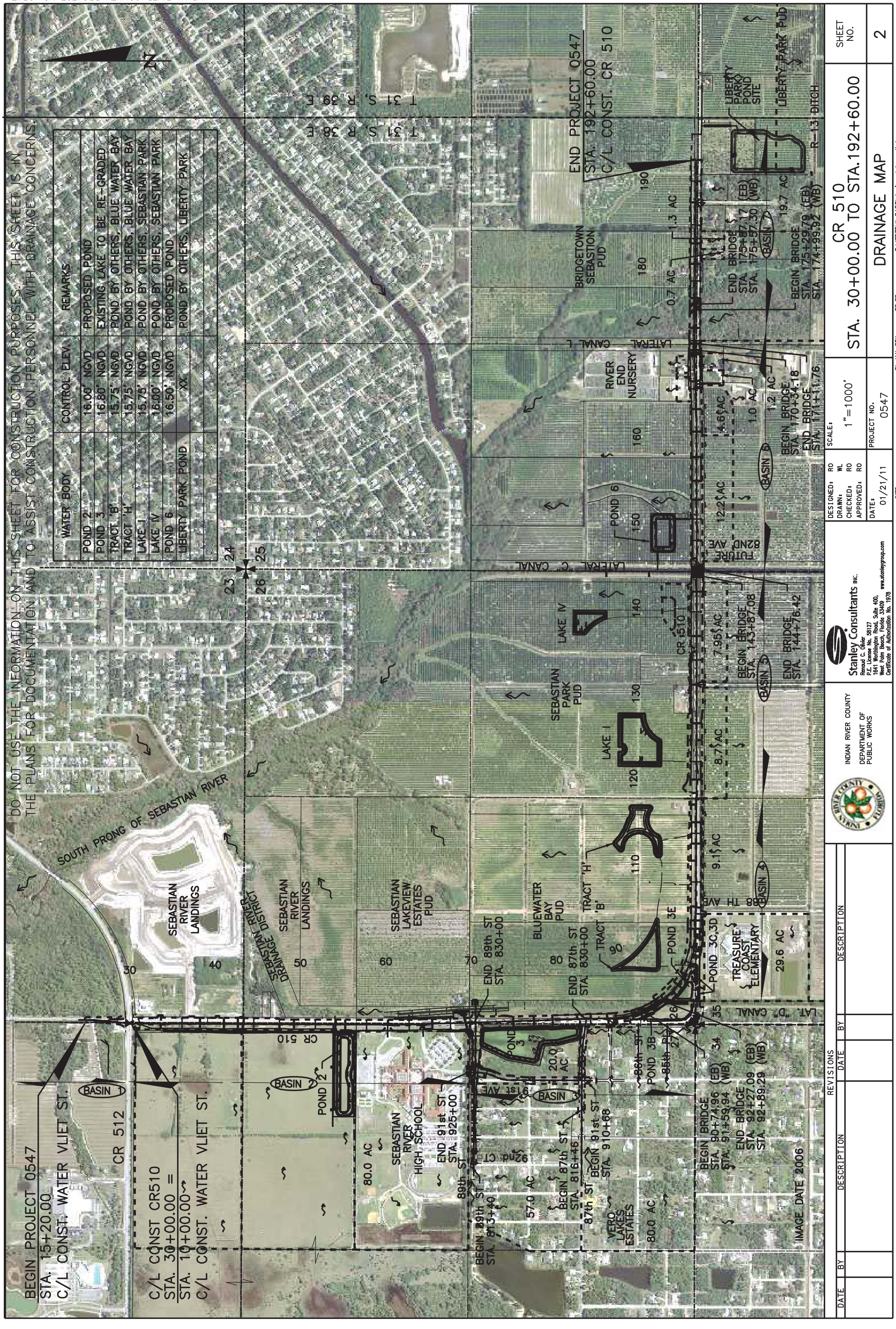
- 8:1 for maintenance berm
- 6:1 for littoral zone
- 4:1 and 2:1 beyond maintenance berm and littoral zone

Additional pond design criteria includes:

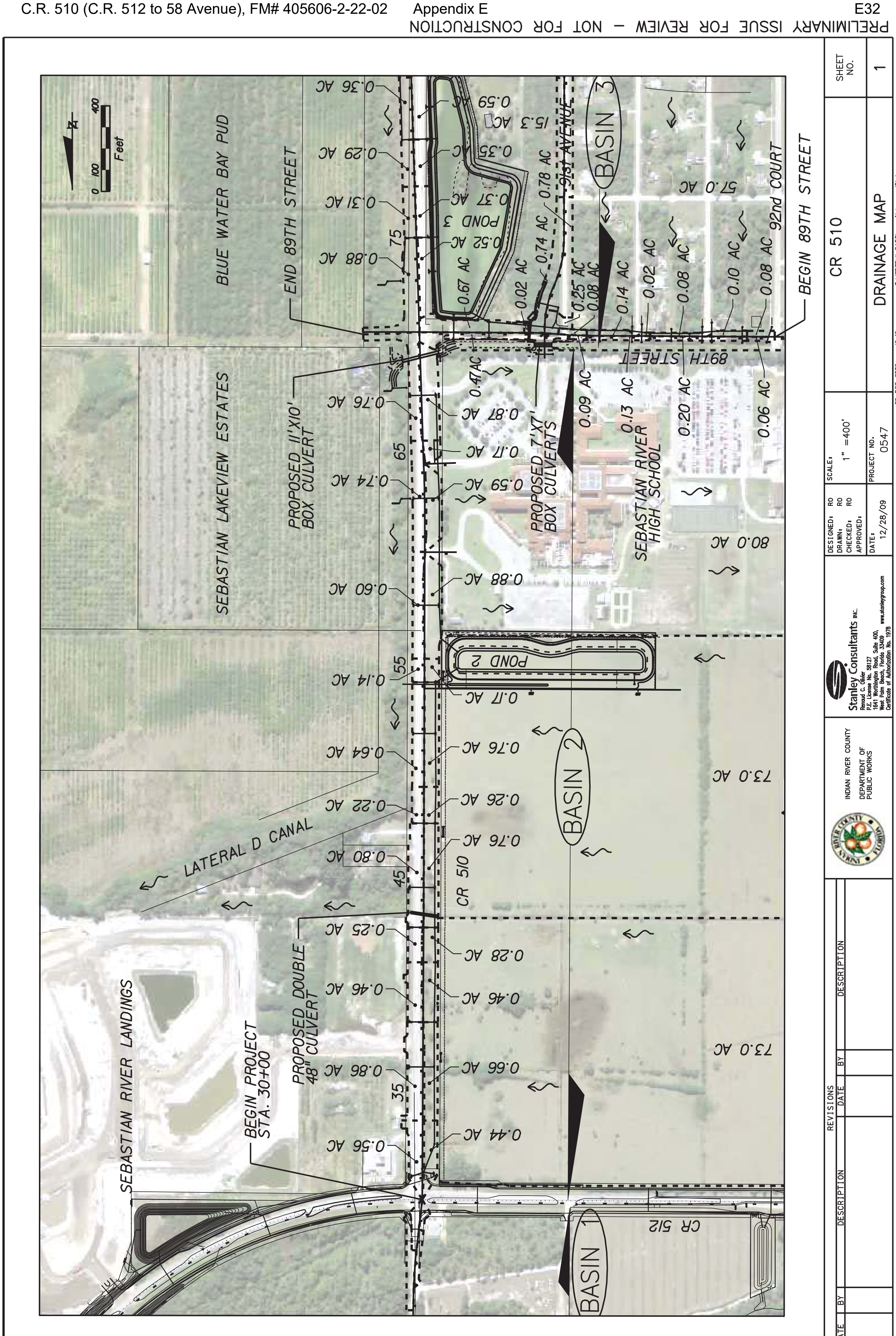
- Freeboard = One foot measured from 25year 24 hour storm to top of bank.
- Maintenance Berm = Minimum 15 foot wide.
- Control Structure = Modified FDOT ditch bottom inlets.
- Skimmers = Aluminum skimmer is proposed for all pond control structures.
- Fence = Chained link fence including gate access is proposed for Pond 2, Pond 3 and Pond 6.
- Depth = Mean depth is between 2 to 8 feet.
- Residence Time = 14 days.

PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION

INDIAN RIVER COUNTY PROJECT NO. 0547

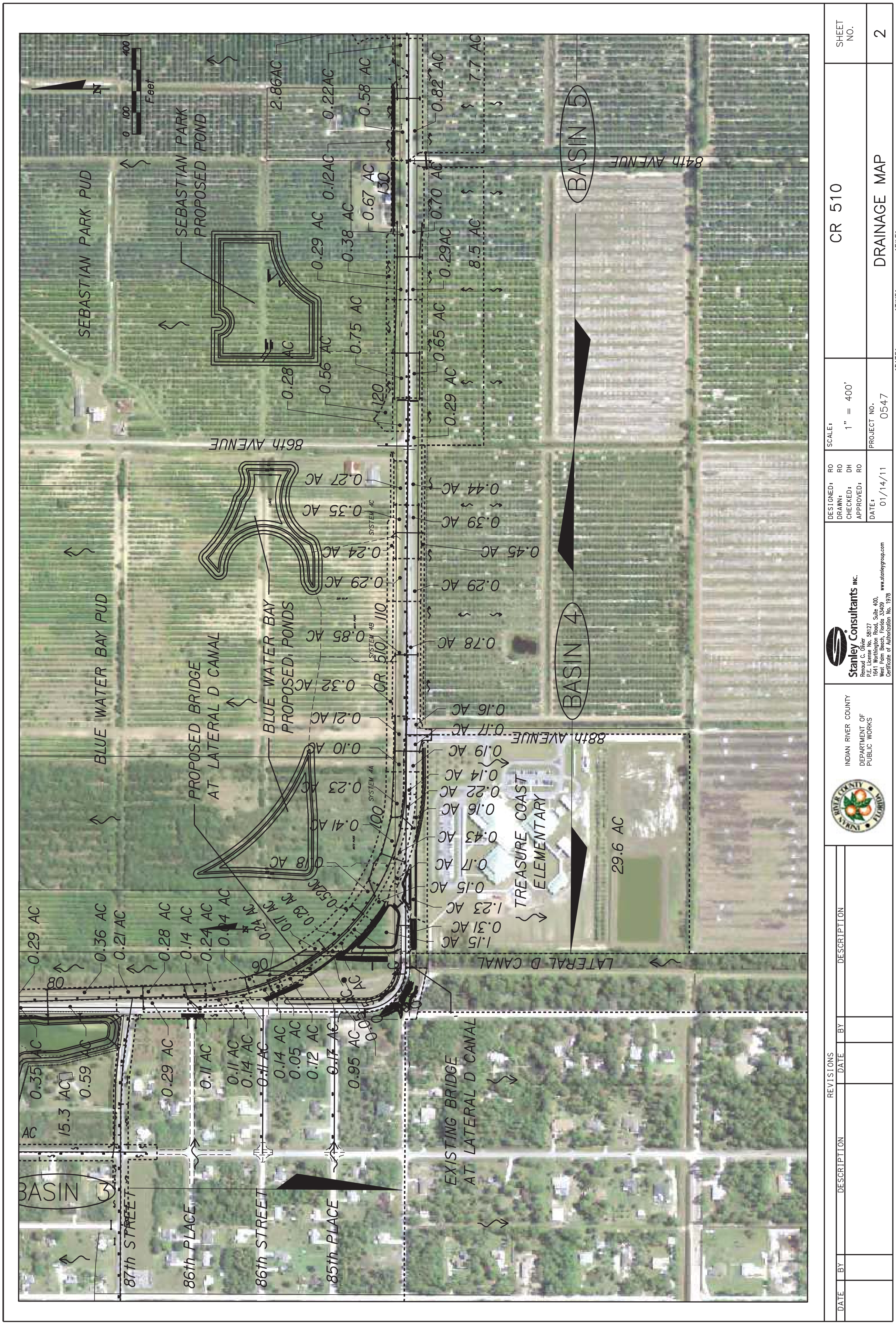


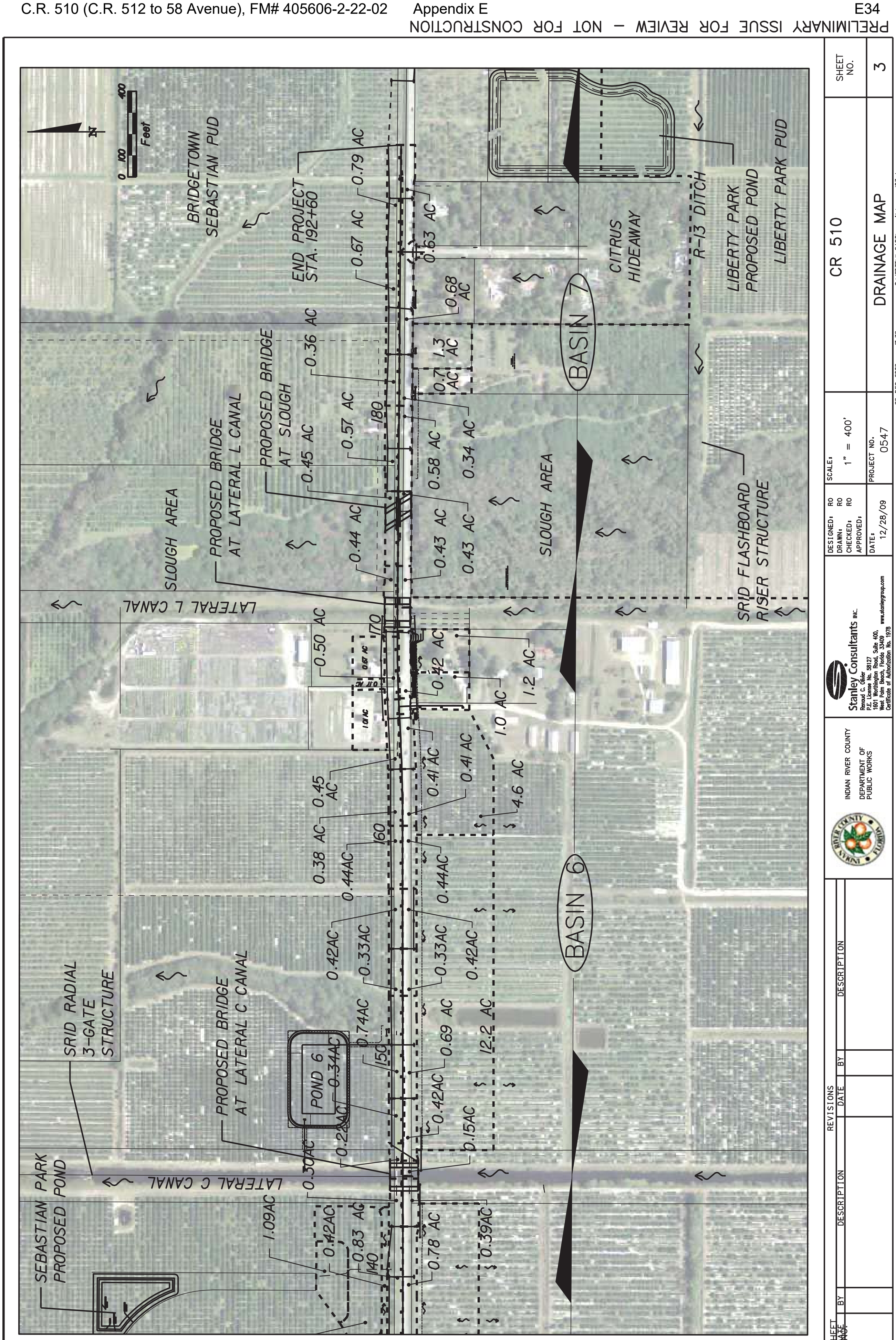
WATER BODY	CONTROL ELEV.	REMARKS
POND 2	16.00' NGVD	PROPOSED POND
POND 3	16.80' NGVD	EXISTING LAKE TO BE RE-GRADED
TRACT 'B'	15.75' NGVD	POND BY OTHERS, BLUE WATER BAY
TRACT 'H'	15.75' NGVD	POND BY OTHERS, BLUE WATER BAY
LAKE I	15.75' NGVD	POND BY OTHERS, SEBASTIAN PARK
LAKE IV	16.00' NGVD	POND BY OTHERS, SEBASTIAN PARK
POND 6	16.50' NGVD	PROPOSED POND
LIBERTY PARK POND	XX	POND BY OTHERS, LIBERTY PARK



PRELIMINARY ISSUE FOR REVIEW — NOT FOR CONSTRUCTION
DRAINAGE MAP
CR 510
SHEET NO. 1
SCALE: 1" =400'
PROJECT NO. 0547
DATE: 12/28/09
DESIGNED: RO
DRAWN: RO
CHECKED: RO
APPROVED:
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
Stanley Consultants INC.
REVISIONS
DATE
BY
DESCRIPTION
BASIN 1
BASIN 2
BASIN 3
POND 2
POND 3
BEGIN PROJECT STA. 30+00
PROPOSED DOUBLE 48" CULVERT
PROPOSED 11'X10' BOX CULVERT
PROPOSED 7'X7' BOX CULVERTS
END 89TH STREET
BEGIN 89TH STREET
89TH STREET
91st AVENUE
92nd COURT
CR 510
CR 512
LATERAL D CANAL
SEBASTIAN RIVER LANDINGS
SEBASTIAN LAKEVIEW ESTATES
BLUE WATER BAY PUD
SEBASTIAN RIVER HIGH SCHOOL
73.0 AC
80.0 AC
57.0 AC
15.3 AC
Feet
0 100 400

PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION




PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION
BRIDGETOWN SEBASTIAN PUD
END PROJECT STA. 192+60
CITRUS HIDEAWAY
R-13 DITCH
LIBERTY PARK PROPOSED POND
LIBERTY PARK PUD
BASIN 7
SLOUGH AREA
PROPOSED BRIDGE AT LATERAL L CANAL
PROPOSED BRIDGE AT SLOUGH
SRID FLASHBOARD RISER STRUCTURE
LATERAL L CANAL
BASIN 6
SRID RADIAL 3-GATE STRUCTURE
PROPOSED BRIDGE AT LATERAL C CANAL
POND 6
LATERAL C CANAL
SEBASTIAN PARK PROPOSED POND
CR 510
DRAINAGE MAP
SCALE: 1" = 400'
PROJECT NO. 0547
DATE: 12/28/09
INDIAN RIVER COUNTY DEPARTMENT OF PUBLIC WORKS
Stanley Consultants INC.
SHEET NO. 3

90% ISSUE FOR REVIEW – NOT FOR CONSTRUCTION

COMPONENTS OF CONTRACT PLANS SET

A DETAILED INDEX APPEARS ON THE KEY SHEET OF EACH COMPONENT

ROADWAY PLANS
SIGNING AND MARKING PLANS
SIGNALIZATION PLANS
LANDSCAPE AND IRRIGATION PLANS
STRUCTURES PLANS

INDIAN RIVER COUNTY

CR 510
ROADWAY IMPROVEMENT PLANS
FROM CR 512 TO 500' EAST OF 75TH COURT

PROJECT NUMBER 0547

100% SUBMITTAL
MARCH 2013

INDEX OF ROADWAY PLANS

SHEET NO.	SHEET DESCRIPTION
1	KEY SHEET
2	DRAINAGE MAP
3	SUMMARY OF PAY ITEMS
4 - 7	SUMMARY OF QUANTITIES
8	GENERAL NOTES & PAY ITEM FOOTNOTES
9 - 12	BOX CULVERT DATA SHEETS
13 - 14	TYPICAL SECTION, CR 510
15	TYPICAL SECTION, 89TH ST. AND 91ST AVE.
16	TYPICAL SECTION, 87TH STREET
17	TYPICAL SECTION, VERO LAKES ESTATES ACCESS ROAD & WATERVLIET ST.
18	TYPICAL SECTION, 86TH STREET AND 85TH PLACE
19	TYPICAL SECTION, REALIGNMENT - LATERAL 'D' CANAL
20 - 27	PROJECT NETWORK CONTROL
28	PROJECT LAYOUT
29 - 40	SUMMARY OF DRAINAGE STRUCTURES
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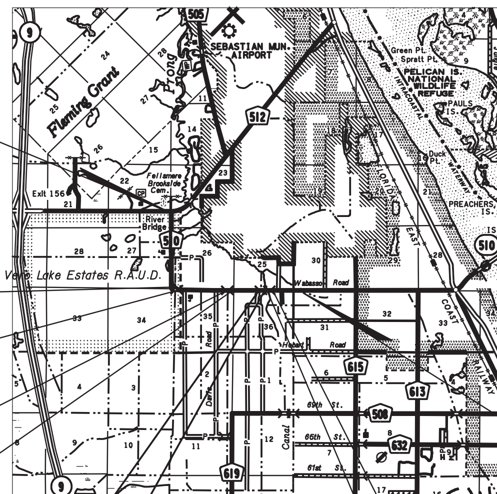
XS-128 - XS-131	CROSS SECTIONS, 85TH PLACE
XS-132 - XS-134	CROSS SECTIONS, WATERVLIET STREET
XS-135 - XS-139	CROSS SECTIONS, VERO LAKES ESTATES ACCESS ROAD
XS-140 - XS-147	CROSS SECTIONS, LATERAL 'D' CANAL
SW-1 - SW-9	STORMWATER POLLUTION PREVENTION PLAN
TC-1 - TC-12	TRAFFIC CONTROL PLANS
UT-1 - UT-3	SUMMARY OF UTILITY WORK
UT-4 - UT-5	Vvh SUMMARY TABLE



THESE PLANS HAVE BEEN PREPARED IN ACCORDANCE WITH AND ARE GOVERNED BY THE STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION, DESIGN STANDARDS DATED 2006, AND STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION DATED 2007 AS AMENDED BY CONTRACT DOCUMENTS.

PREPARED FOR

INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS

CHRISTOPHER R. MORA, P.E., DIRECTOR
ARJUNA WERAGODA, P.E. PROJECT MANAGER

ROADWAY SHOP DRAWINGS TO BE SUBMITTED TO:
RENAUD C. OLIVIER, P.E.
1641 WORTHINGTON ROAD, SUITE 400,
WEST PALM BEACH, FL 33409

PLANS PREPARED BY:

Stanley Consultants INC.
RENAUD C. OLIVIER
P.E. LICENSE NO. 58127
1641 WORTHINGTON ROAD, SUITE 400,
WEST PALM BEACH, FLORIDA 33409
CERTIFICATE OF AUTHORIZATION NO. 1978

NOTE: THE SCALE OF THESE PLANS MAY HAVE CHANGED DUE TO REPRODUCTION.

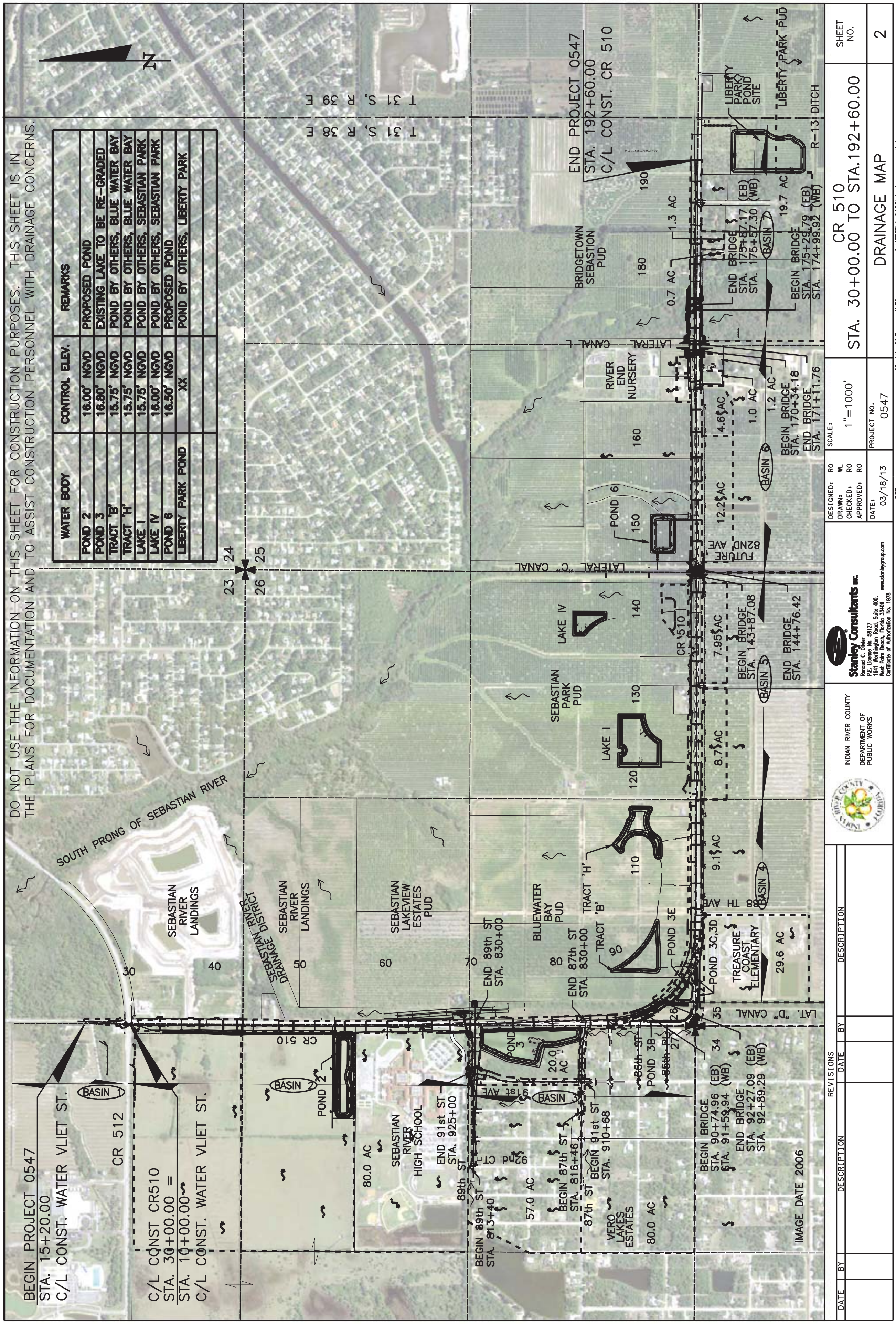
KEY SHEET REVISIONS		
DATE	BY	DESCRIPTION

ROADWAY PLANS
ENGINEER OF RECORD: RENAUD C. OLIVIER

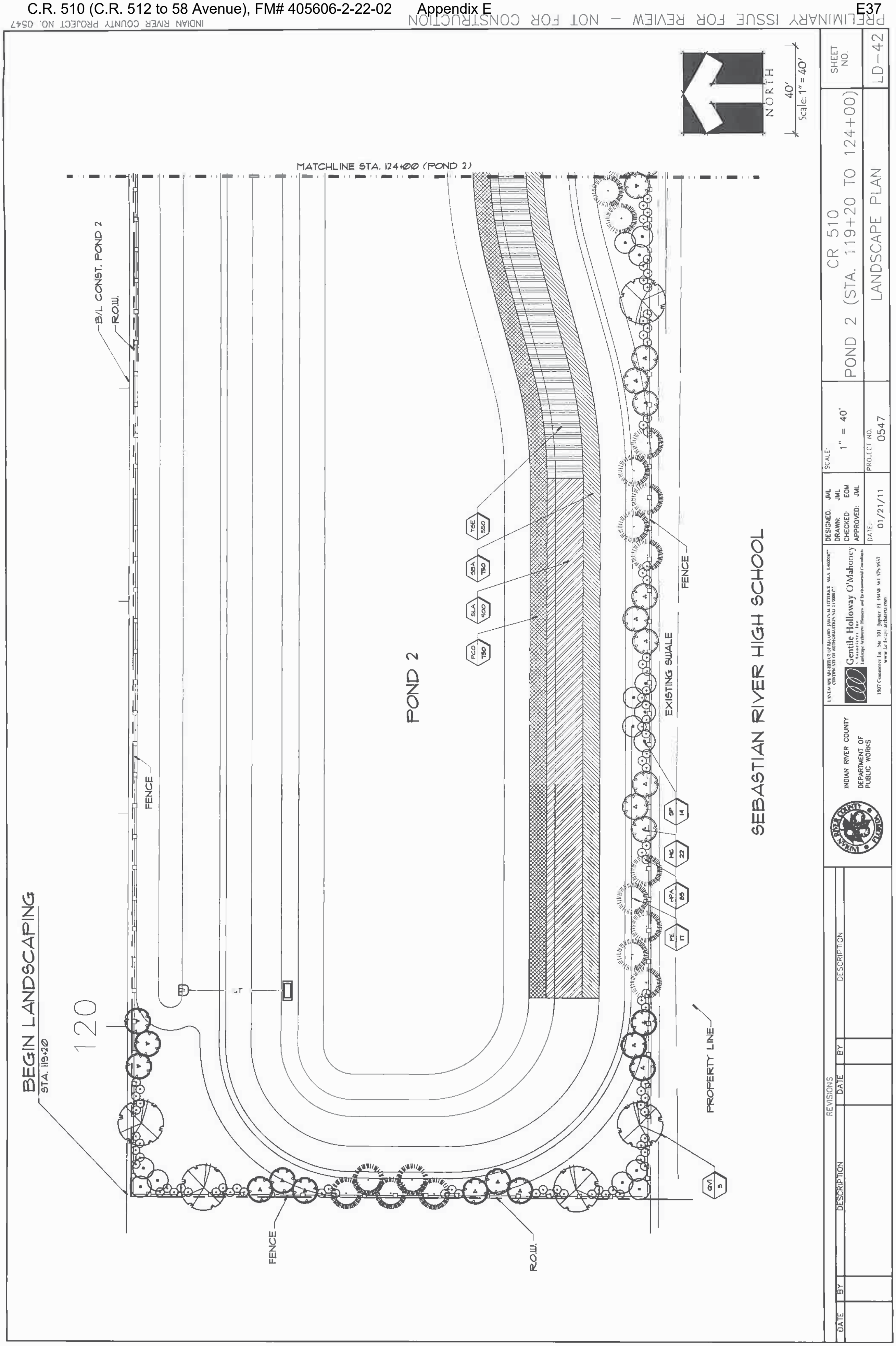
P.E. NO.: 58127

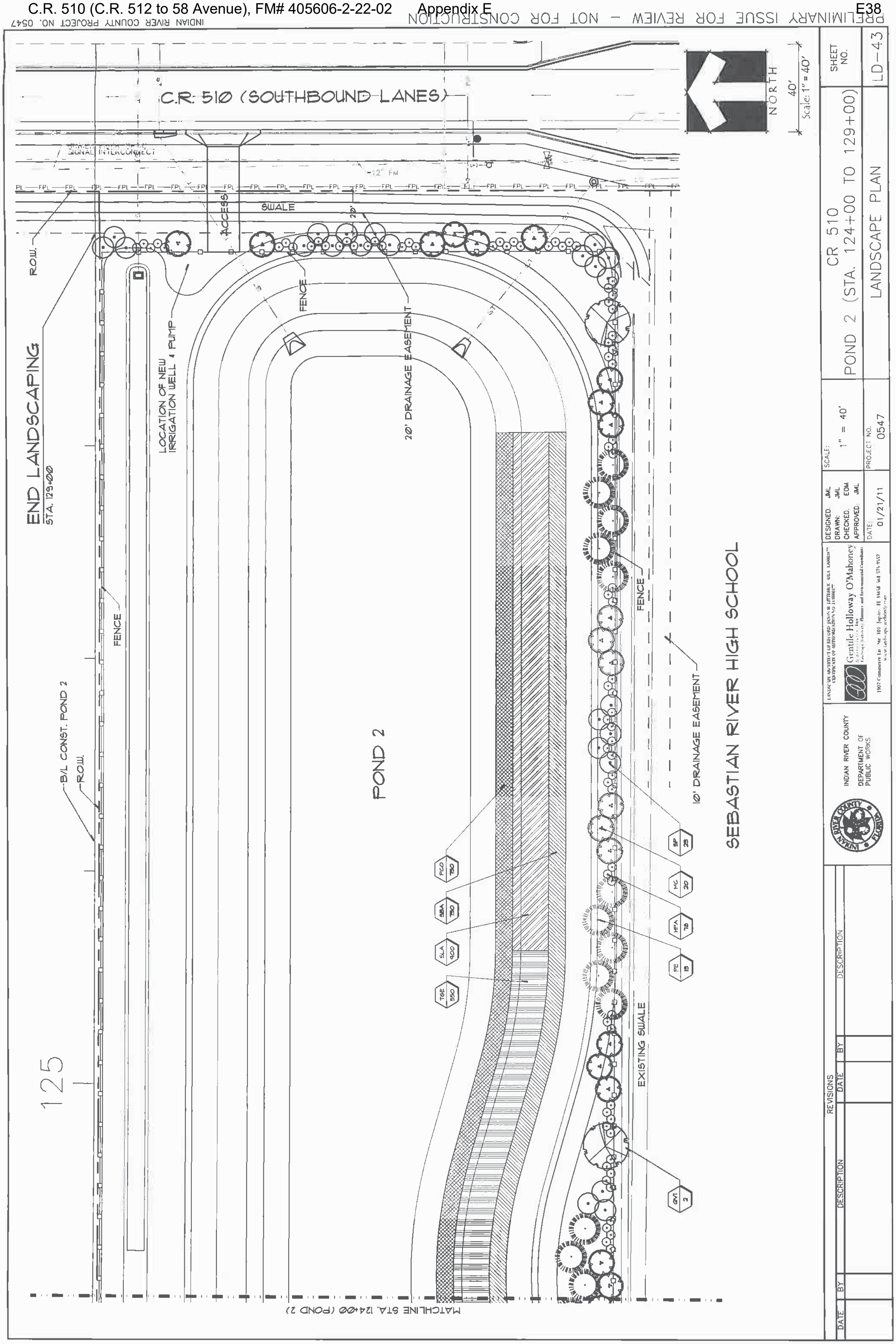
SHEET NO.
1

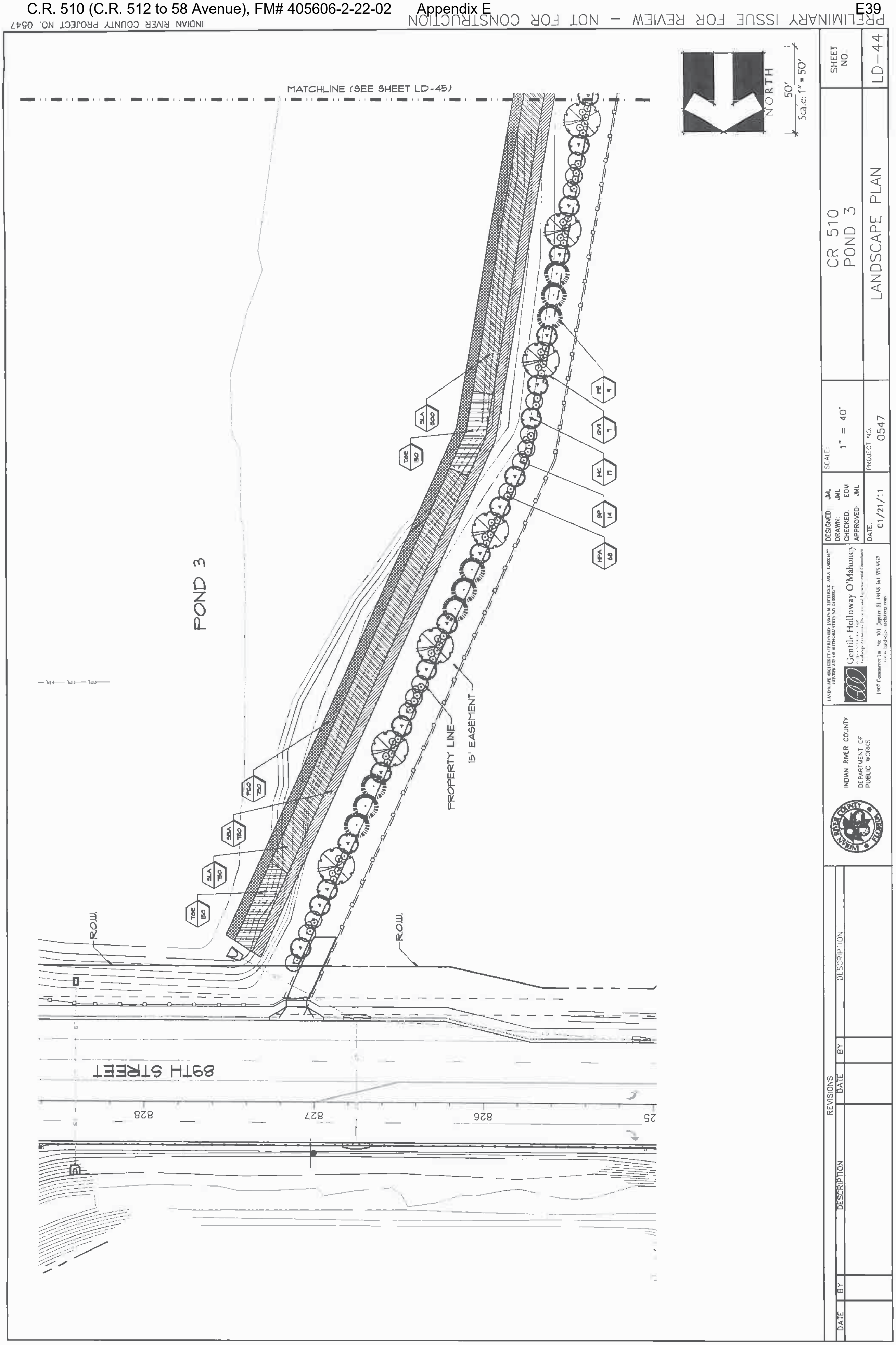
5177 08-JAN-2015 11:32 Q:\18737\I-CADD\roadway\keysrd01.dgn

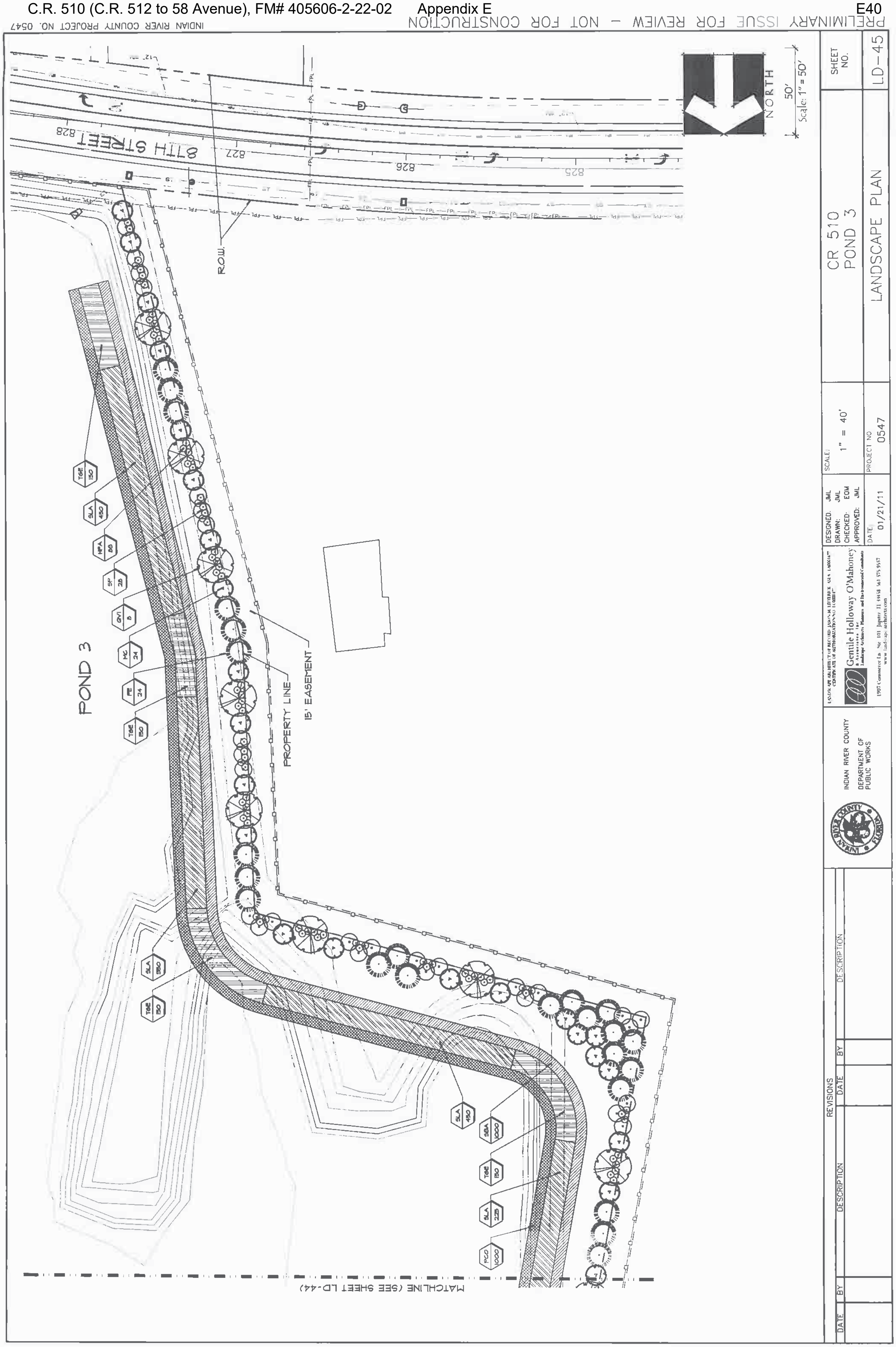


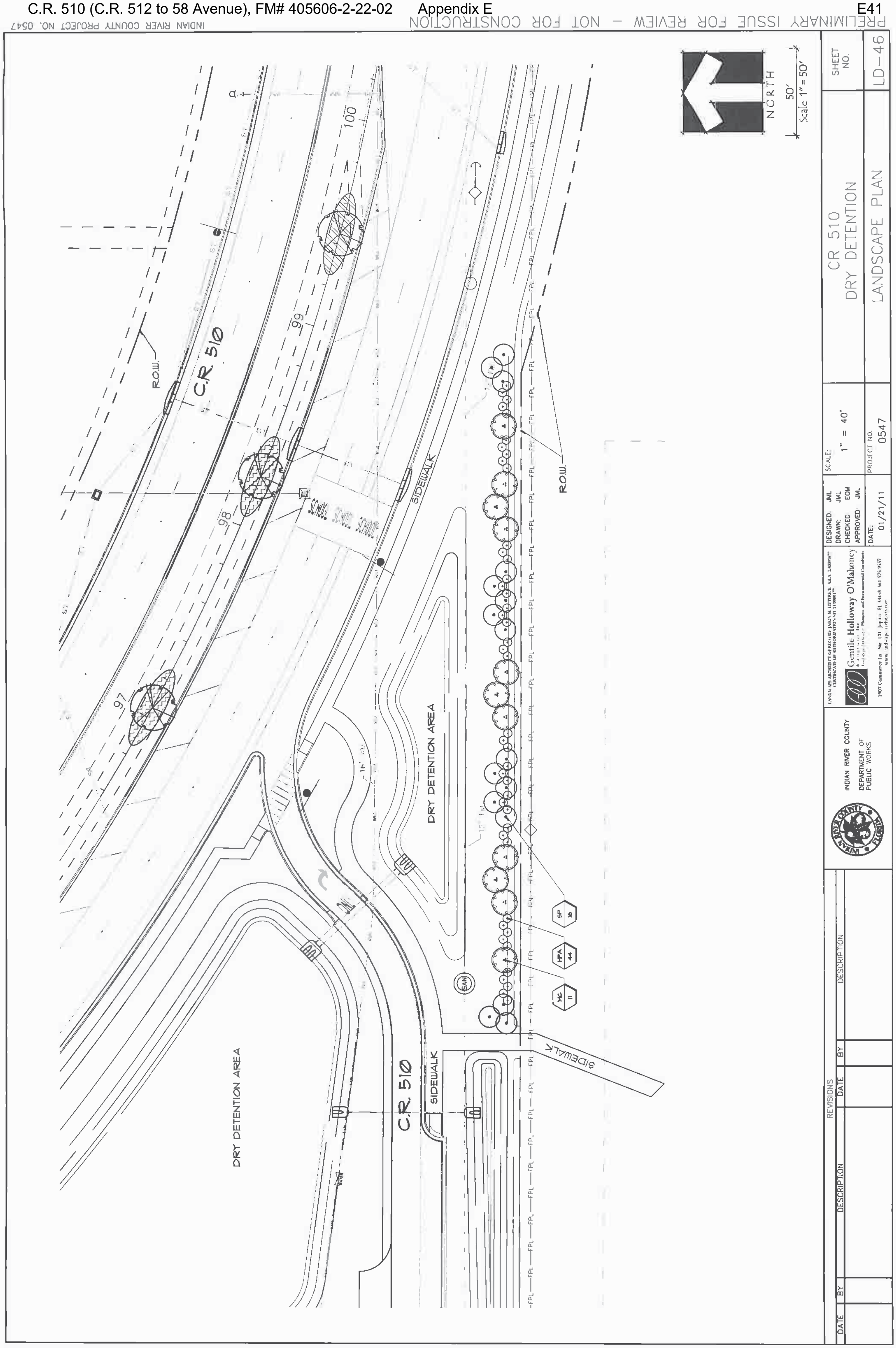
WATER BODY	CONTROL ELEV.	REMARKS
POND 2	16.00' NGVD	PROPOSED POND
POND 3	16.80' NGVD	EXISTING LAKE TO BE RE-GRADED
TRACT 'B'	15.75' NGVD	POND BY OTHERS, BLUE WATER BAY
TRACT 'H'	15.75' NGVD	POND BY OTHERS, BLUE WATER BAY
LAKE I	15.75' NGVD	POND BY OTHERS, SEBASTIAN PARK
LAKE IV	16.00' NGVD	POND BY OTHERS, SEBASTIAN PARK
POND 6	16.50' NGVD	PROPOSED POND
LIBERTY PARK POND	XX	POND BY OTHERS, LIBERTY PARK

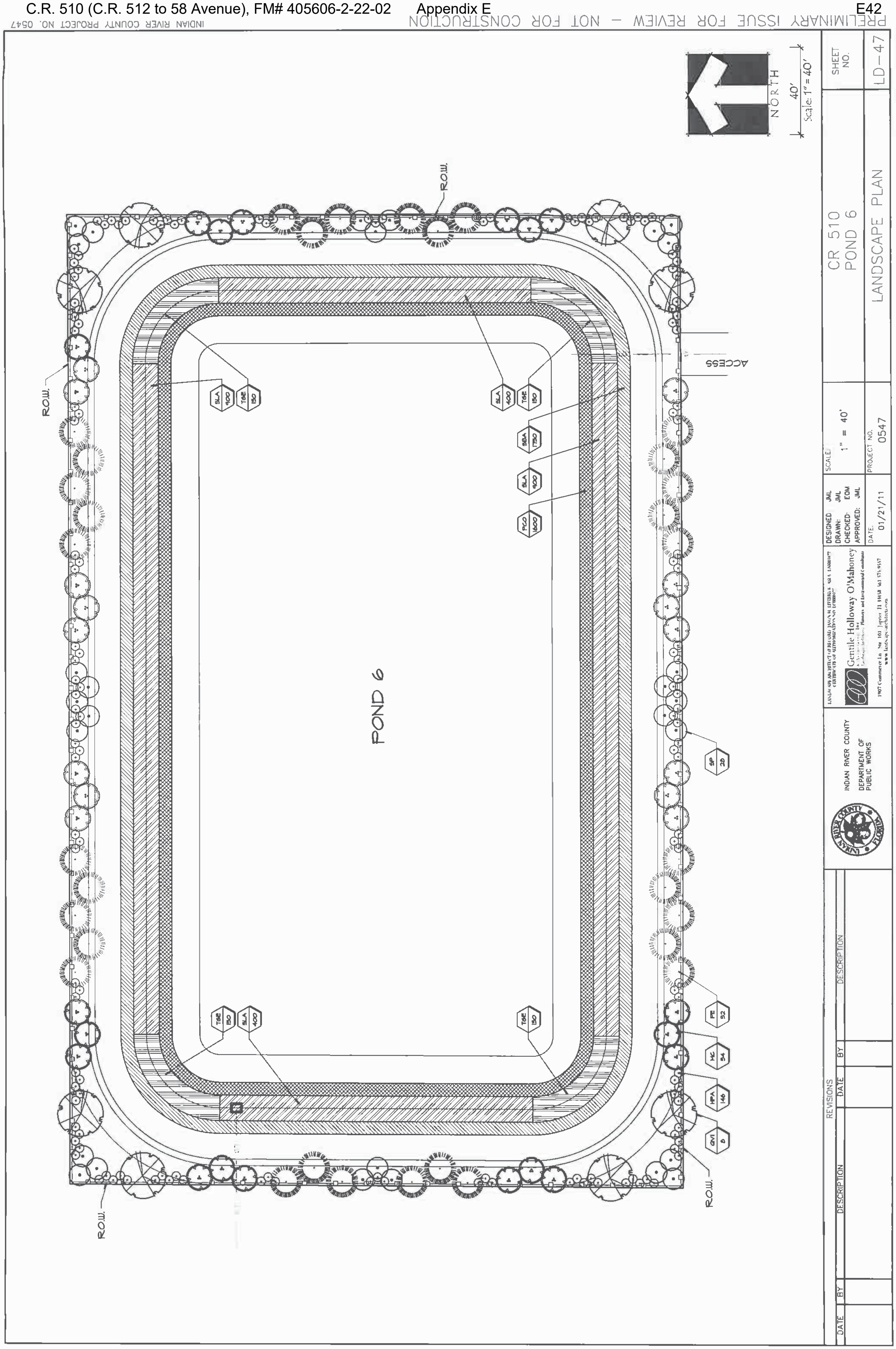

PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION
INDIAN RIVER COUNTY PROJECT NO. 0547
MATCHLINE STA. 124+00 (POND 2)
BEGIN LANDSCAPING
STA. 119+20
120
B/L CONST. POND 2
R.O.W.
FENCE
POND 2
EXISTING SWALE
PROPERTY LINE
SEBASTIAN RIVER HIGH SCHOOL
NORTH
Scale: 1" = 40'
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
Gentile Holloway O'Mahoney
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
SCALE: 1" = 40'
PROJECT NO. 0547
CR 510
POND 2 (STA. 119+20 TO 124+00)
LANDSCAPE PLAN
SHEET NO.
LD-42
REVISIONS
DATE
BY
DESCRIPTION


PRELIMINARY ISSUE FOR REVIEW — NOT FOR CONSTRUCTION
INDIAN RIVER COUNTY PROJECT NO. 0547
C.R. 510 (SOUTHBOUND LANES)
NORTH
40'
Scale: 1" = 40'
SWALE
ACCESS
FENCE
20' DRAINAGE EASEMENT
LOCATION OF NEW IRRIGATION WELL & PUMP
END LANDSCAPING
STA. 129+00
R.O.W.
B/L CONST. POND 2
POND 2
10' DRAINAGE EASEMENT
SEBASTIAN RIVER HIGH SCHOOL
EXISTING SWALE
125
MATCHLINE STA. 124+00 (POND 2)
CR 510
POND 2 (STA. 124+00 TO 129+00)
LANDSCAPE PLAN
SHEET NO.
LD-43
SCALE: 1" = 40'
PROJECT NO. 0547
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
Gentile Holloway O'Mahoney
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
REVISIONS
DATE
BY
DESCRIPTION


PRELIMINARY ISSUE FOR REVIEW — NOT FOR CONSTRUCTION
INDIAN RIVER COUNTY PROJECT NO. 0547
MATCHLINE (SEE SHEET LD-45)
NORTH
50'
Scale: 1" = 50'
POND 3
SLA 300
TSE 150
PLO 750
SBA 750
SLA 750
TSE 150
PE 4
SVI 7
MC 17
SP 14
HPA 68
PROPERTY LINE
15' EASEMENT
R.O.W.
R.O.W.
89TH STREET
828
827
826
SHEET NO
LD-44
CR 510
POND 3
LANDSCAPE PLAN
SCALE: 1" = 40'
PROJECT NO. 0547
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
Gentile Holloway O'Mahoney
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
REVISIONS
DATE
BY
DESCRIPTION


PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION
INDIAN RIVER COUNTY PROJECT NO. 0547
NORTH
Scale: 1" = 50'
R.O.W.
POND 3
PROPERTY LINE
15' EASEMENT
MATCHLINE (SEE SHEET LD-44)
REVISIONS
DATE
BY
DESCRIPTION
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
Gentile Holloway O'Mahoney
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
SCALE: 1" = 40'
PROJECT NO 0547
CR 510
POND 3
LANDSCAPE PLAN
SHEET NO.
LD-45

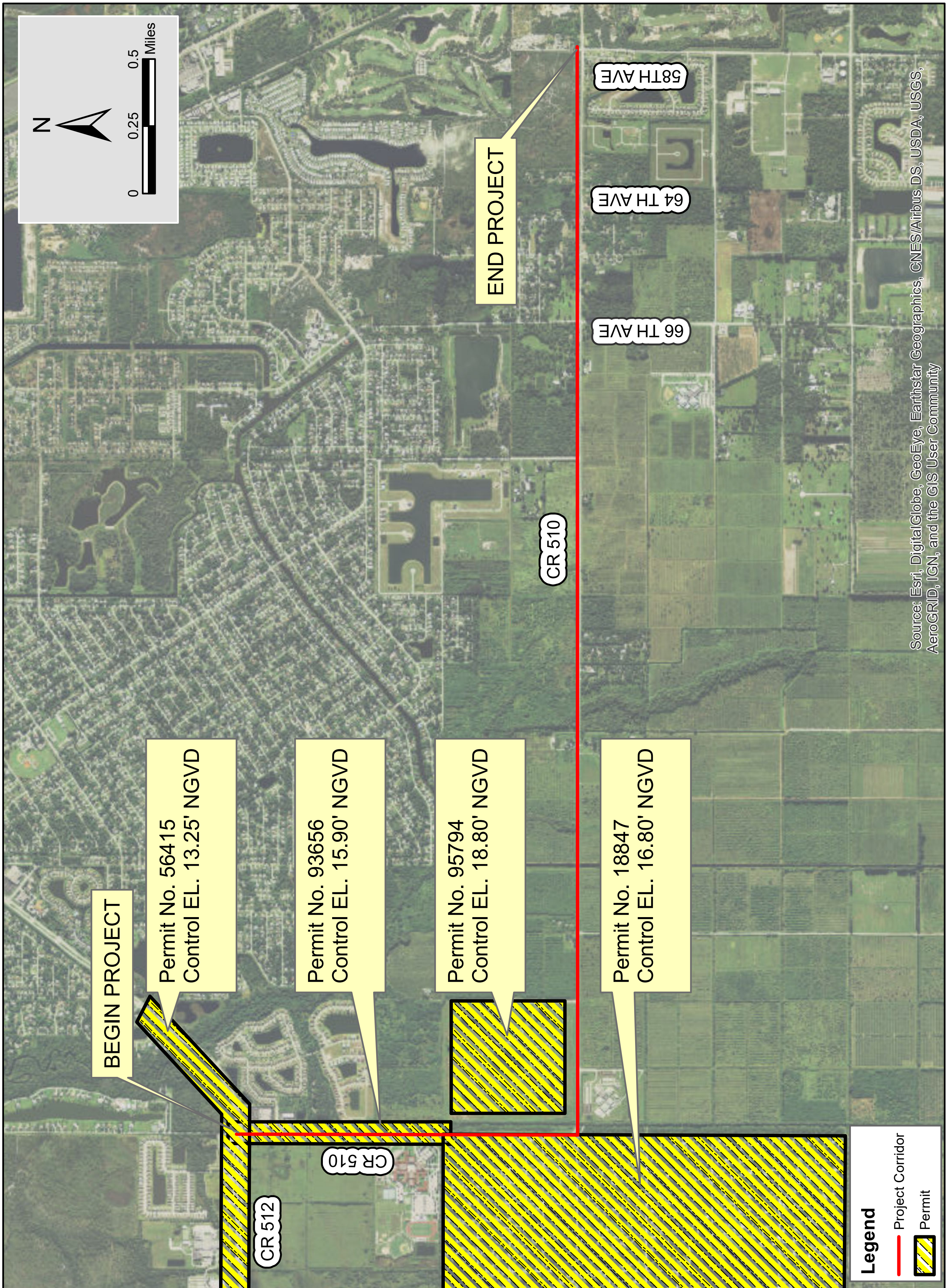

PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION
INDIAN RIVER COUNTY PROJECT NO. 0547
NORTH
50'
Scale 1" = 50'
C.R. 510
R.O.W.
SIDEWALK
DRY DETENTION AREA
SP 16
HPA 44
MC 11
CR 510
DRY DETENTION
LANDSCAPE PLAN
SHEET NO.
LD-46
SCALE: 1" = 40'
PROJECT NO. 0547
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
Gentile Holloway O'Mahoney
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
REVISIONS
DATE
BY
DESCRIPTION


INDIAN RIVER COUNTY PROJECT NO. 0547
PRELIMINARY ISSUE FOR REVIEW — NOT FOR CONSTRUCTION
POND 6
R.O.W.
ACCESS
NORTH
40'
Scale: 1" = 40'
SLA 400
TGE 150
SBA 1750
FICO 1800
SP 20
FE 52
MC 54
HPA 146
QVI 6
REVISIONS
DATE
BY
DESCRIPTION
INDIAN RIVER COUNTY
DEPARTMENT OF PUBLIC WORKS
Gentile Holloway O'Mahoney
DESIGNED: JML
DRAWN: JML
CHECKED: EOM
APPROVED: JML
DATE: 01/21/11
SCALE: 1" = 40'
PROJECT NO. 0547
CR 510
POND 6
LANDSCAPE PLAN
SHEET NO.
LD-47

APPENDIX F

(Excerpts from Existing Permits)

PERMITS



Prepared by: Snubbs Consulting Inc.

Date:10/13/2016

St. Johns River
Water Management District
Ann B. Shortelle, Ph.D., Executive Director

4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • (386) 329-4500
On the Internet at www.sjrwmd.com.

Excerpts from SJRWMD
Permit No. 4-061-56415

May 25, 2016

Scott Carr
S&S FLP#2 "B" LLC
8195 N Wickham Rd Ste 210
Melbourne, FL 32940-8285

SUBJECT: 56415-8
AutoZone 4910

Dear Sir:

Enclosed is your individual permit issued by the St. Johns River Water Management District on May 25, 2016. This permit is a legal document and should be kept with your other important documents. Permit issuance does not relieve you from the responsibility of obtaining any necessary permits from any federal, state, or local agencies for your project.

Technical Staff Report:
If you wish to review a copy of the Technical Staff Report (TSR) that provides the District's staff analysis of your permit application, you may view the TSR by going to the Permitting section of the District's website at floridaswater.com/permitting. Using the "search applications and permits" feature, you can use your permit number or project name to find information about the permit. When you see the results of your search, click on the permit number and then on the TSR folder.

Noticing Your Permit:
For noticing instructions, please refer to the noticing materials in this package regarding closing the point of entry for someone to challenge the issuance of your permit. Please note that if a timely petition for administrative hearing is filed, your permit will become nonfinal and any activities that you choose to undertake pursuant to your permit will be at your own risk.

Compliance with Permit Conditions:
To submit your required permit compliance information, go to the District's website at floridaswater.com/permitting. Under the "Apply for a permit or submit compliance data" section, click to sign-in to your existing account or to create a new account. Select the "Compliance Submittal" tab, enter your permit number, and select "No Specific Date" for the Compliance Due Date Range. You will then be able to view all the compliance submittal requirements for your project. Select the compliance item that you are ready to submit and then attach the appropriate information or form. The forms to comply with your permit conditions are available at floridaswater.com/permitting under the section "Handbooks, forms, fees, final orders". Click on forms to view all permit compliance forms, then scroll to the ERP application forms section and select the applicable compliance forms. Alternatively, if you have difficulty finding forms or need

copies of the appropriate forms, please contact the Bureau of Regulatory Support at (386) 329-4570.

Transferring Your Permit:

Your permit requires you to notify the District within 30 days of any change in ownership or control of the project or activity covered by the permit, or within 30 days of any change in ownership or control of the real property on which the permitted project or activity is located or occurs. You will need to provide the District with the information specified in rule 62-330.340, Florida Administrative Code (F.A.C.). Generally, this will require you to complete and submit Form 62-330.340(1), "Request to Transfer Permit," available at http://www.floridaswater.com/permitting/permitforms.html.

Please note that a permittee is liable for compliance with the permit before the permit is transferred. The District, therefore, recommends that you request a permit transfer in advance in accordance with the applicable rules. You are encouraged to contact District staff for assistance with this process.

Thank you and please let us know if you have additional questions. For general questions contact e-permit@sjrwmd.com or (386) 329-4570.

Sincerely,

M. Daniels

Margaret Daniels, Office Director
Office of Business and Administrative Services
St. Johns River Water Management District
4049 Reid Street
Palatka, FL 32177-2529
(386) 329-4570

Enclosures: Permit

cc: District Permit File

St. Johns River
Water Management District
Kirby B. Green III, Executive Director • David W. Fisk, Assistant Executive Director

4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • (386) 329-4500
On the Internet at www.sjrwmd.com.

Excerpts from SJRWMD Permit NO. 4-061-95794

August 9, 2005

510 Group, LLC
P.O. Box 1328
Vero Beach, FL 32961

SUBJECT: Permit Number 4-061-95794-1
Bluewater Bay Subdivision

Dear Sir/Madam:

Enclosed is your permit as authorized by the Governing Board of the St. Johns River Water Management District on August 9, 2005.

This permit is a legal document and should be kept with your other important documents. The attached MSSW/Stormwater As-Built Certification Form should be filled in and returned to the Palatka office within thirty days after the work is completed. By so doing, you will enable us to schedule a prompt inspection of the permitted activity.

In addition to the MSSW/Stormwater As-Built Certification Form, your permit also contains conditions which require submittal of additional information. All information submitted as compliance to permit conditions must be submitted to the Palatka office address.

Permit issuance does not relieve you from the responsibility of obtaining permits from any federal, state and/or local agencies asserting concurrent jurisdiction for this work.

In the event you sell your property, the permit can be transferred to the new owner, if we are notified by you within thirty days of the sale. Please assist us in this matter so as to maintain a valid permit for the new property owner.

Thank you for your cooperation and if this office can be of any further assistance to you, please do not hesitate to contact us.

Sincerely,

Gloria Green Lewis

Gloria Lewis, Director
Permit Data Services Division

Enclosures: Permit with EN Form(s), if applicable

cc: District Permit File

Agent: Schulke,Bittle & Stoddard
1717 Indian River Blvd. #301
Vero Beach, FL 32960

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
Post Office Box 1429
Palatka, Florida 32178-1429

PERMIT NO. 4-061-95794-1 **DATE ISSUED:** August 9, 2005
PROJECT NAME: Bluewater Bay Subdivision

A PERMIT AUTHORIZING:

A Permit Authorizing:
Construction of a surface water management system for a 141.79-acre, 379-unit single-family residential development to be known as Bluewater Bay Subdivision, new road construction for 86th Avenue and 89th Street, and drainage improvements on C.R. 510 (Wabasso Road).

LOCATION:

Section(s): 26 Township(s): 31S Range(s): 38E

Indian River County

ISSUED TO:

510 Group, LLC
P.O. Box 1328
Vero Beach, FL 32961

Permittee agrees to hold and save the St. Johns River Water Management District and its successors harmless from any and all damages, claims, or liabilities which may arise from permit issuance. Said application, including all plans and specifications attached thereto, is by reference made a part hereof.

This permit does not convey to permittee any property rights nor any rights or privileges other than those specified therein, nor relieve the permittee from complying with any law, regulation or requirement affecting the rights of other bodies or agencies. All structures and works installed by permittee hereunder shall remain the property of the permittee.

This permit may be revoked, modified or transferred at any time pursuant to the appropriate provisions of Chapter 373, Florida Statutes:

PERMIT IS CONDITIONED UPON:

See conditions on attached "Exhibit A", dated August 9, 2005

AUTHORIZED BY: St. Johns River Water Management District

Department of Water Resources	Governing Board
By: Jeffrey C Elledge	By: Kirby B. Green
Jeff Elledge (Director)	Kirby B. Green III (Assistant Secretary)

file

St. Johns River Water Management District

Kirby B. Green III, Executive Director • John R. Wehle, Assistant Executive Director • Mike Slayton, Deputy Executive Director
John Juilianna, Palm Bay Service Center Director, Regulatory

525 Community College Parkway S.E. • Palm Bay, FL 32909 • (321) 984-4940

February 18, 2003

Excerpts from SJRWMD Permit NO. 4-061-18847

Mr. Christopher Kafer, Jr., P.E.
Indian River County
1840 25th Street
Vero Beach, FL 32960

Re: 83rd Street: from 102nd Avenue to 91st Avenue
Application No. 4-061-18847-~~1~~2

Dear Mr. Kafer:

The St. Johns River Water Management District received your Environmental Resource Standard Permit application and plans on January 23, 2003. Upon preliminary review of the proposed project, it was determined that the proposed improvements were permitted under permit no. 4-061-18847-1 (formerly permit no. 4-061-0163G-ERP) issued on September 8, 1998. This permit is valid for a 10-year period.

Your attention is directed to permit condition 33. of the above referenced permit, which reads:

> 33. Prior to construction of roadway improvements and drainage improvements within a specific drainage basin served by a proposed stormwater pond and swale system, the permittee must complete construction of the stormwater pond, swales, and structures designed to serve the drainage basin.

Furthermore, it shall be Indian River County's responsibility to insure that the grading and drainage is proper to convey runoff to the surface water management system.

Therefore, a new Environmental Resource Permit is not required. A refund of the $1,000.00 application fee is forthcoming. If you have any questions, please call Leigh Stewart at (321) 722-5365 or Fariborz Zanganeh at (321) 676-676-6630

Sincerely,

Leigh Stewart

Leigh Stewart, P.E.
Department of Water Resources

cc: Permit Data Services – NPR; Michelle Reiber; John Juilianna; Marc von Canal; Fariborz Zanganeh

St. Johns River Water Management District

Kirby B. Green III, Executive Director • David W. Fisk, Assistant Executive Director

4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • (386) 329-4500
On the Internet at *www.sjrwmd.com.*

Excerpts from SJRWMD
Permit No. 40-061-93656

July 28, 2004

Indian River Co Board of County Commissioners
1840 25th St
Vero Beach, FL 32960

SUBJECT: Permit Number 40-061-93656-1
C.R. 510 Widening from Shark Blvd. t C.R. 512

Dear Sir/Madam:

Enclosed is your standard permit as authorized by the staff of the St. Johns River Water Management District on July 28, 2004.

This permit is a legal document and should be kept with your other important documents. The attached MSSW/Stormwater As-Built Certification Form should be filled in and returned to the Palatka office within thirty days after the work is completed. By so doing, you will enable us to schedule a prompt inspection of the permitted activity.

In addition to the MSSW/Stormwater As-Built Certification Form, your permit also contains conditions which require submittal of additional information. All information submitted as compliance to permit conditions must be submitted to the Palatka office address.

Permit issuance does not relieve you from the responsibility of obtaining permits from any federal, state and/or local agencies asserting concurrent jurisdiction for this work.

Please be advised that the District has not published a notice in the newspaper advising the public that it is issuing a permit for this proposed project. Publication, using the District form, notifies members of the public (third parties) of their rights to challenge the issuance of the standard permit. If proper notice is given by publication, third parties have a 21-day time limit on the time they have to file a petition opposing the issuance of the permit. If you do not publish, a party's right to challenge the issuance of the standard permit extends for an indefinite period of time. If you wish to have certainty that the period for filing such a challenge is closed, then you may publish, at your own expense, such a notice in a newspaper of general circulation. A copy of the form of the notice and a list of newspapers of general circulation is attached for your use.

In the event you sell your property, the permit will be transferred to the new owner, if we are notified by you within thirty days of the sale and if you provide the information required by 40C-1.612, F.A.C. Please assist us in this matter so as to maintain a valid permit for the new property owner.

Thank you for your cooperation, and if this office can be of any further assistance to you, please do not hesitate to contact us.

Sincerely,

Jo Ann Fuqua

Jo Ann Fuqua
Service Center Data Management Supervisor
Division of Permit Data Services

Enclosures: Permit with As-built Certification Form
Notice of Rights
List of Newspapers for Publication

cc: District Permit File

Agent: Indian River Co Board of County Commissioners
1840 25th St
Vero Beach, FL 32960

Consultant: Indian River Co Board of County Commissioners
1840 25th St
Vero Beach, FL 32960

SEBASTIAN RIVER IMPROVEMENT DISTRICT

C/O SPECIAL DISTRICT SERVICES, INC.
2501A BURNS ROAD
PALM BEACH GARDENS, FL 33410

January 5, 2018

Florida Department of Transportation - District Four
Attention: Maria Formoso, P.E., P.M.P., Project Manager
3400 Commercial Blvd.
Ft. Lauderdale, FL., 33309

Subject: **Sebastian River Improvement District (SRID)**
Project: CR 510 PD&E Study - Lateral D crossing structure
FM#: 405606-2-22-02

Dear Ms. Formoso,

This letter is to confirm the conceptual approval of the use of concrete box culverts in lieu of a bridge at the proposed CR 510 crossing of the SRID Lateral D canal. At the June 7, 2017 meeting, the SRID Board provided conceptual approval at the SRID with the following conditions,

1. A SRID permit application will be provided by FDOT along with detailed plans for review and approval before any construction is commenced
2. The crossing will include three (3) 12' x 15' concrete box culverts
3. The culvert(s) invert will match the existing canal bottom
4. The height of the culvert opening will provide a minimum of one (1) foot of clearance above the peak 100 year storm event stage elevation
5. The flow capacity of the canal will need to be maintained during construction
6. The slope transitions from the existing canal side slopes to the culvert opening(s) must be stabilized with rock rip rap
7. Provisions for maintenance of the culvert crossing structure must be provided

Should you need any additional information regarding this matter please feel free to contact me at (561) 630-4922.

Regards,

Todd Wodraska, Administrator
Sebastian River Improvement District
cc: George Simons, P.E., SRID District Engineer

APPENDIX G

(ICPR Data)

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

INPUT DATA

Table 1: Pre-Development Hydrologic Data

Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	AC	AC	AC		AC	AC	AC	
Basin 1	3.17	2.09	1.08	94.92	73.46	0.00	73.46	89.00
Basin 2	6.58	3.41	3.17	93.66	158.41	0.00	158.41	89.00
Basin 3	7.65	3.12	4.53	92.67	184.20	92.10	92.10	93.50
Basin 4	6.69	2.73	3.96	92.67	161.16	0.00	161.16	89.00
Basin 5	10.14	1.93	8.21	90.71	54.34	0.28	54.06	89.05
Basin 6	10.03	1.91	8.12	90.71	53.72	0.28	53.44	89.05
Basin 7	10.22	1.95	8.27	90.71	54.75	4.56	50.19	89.75
Basin 8	20.63	3.93	16.70	90.71	110.54	5.53	105.01	89.45
Basin 9	6.30	1.94	4.36	91.77	54.55	10.91	43.64	90.80
Basin 10	6.47	2.49	3.98	92.46	18.66	4.67	14.00	91.25
Total	87.88	25.49	62.39		923.78	118.31	805.47	

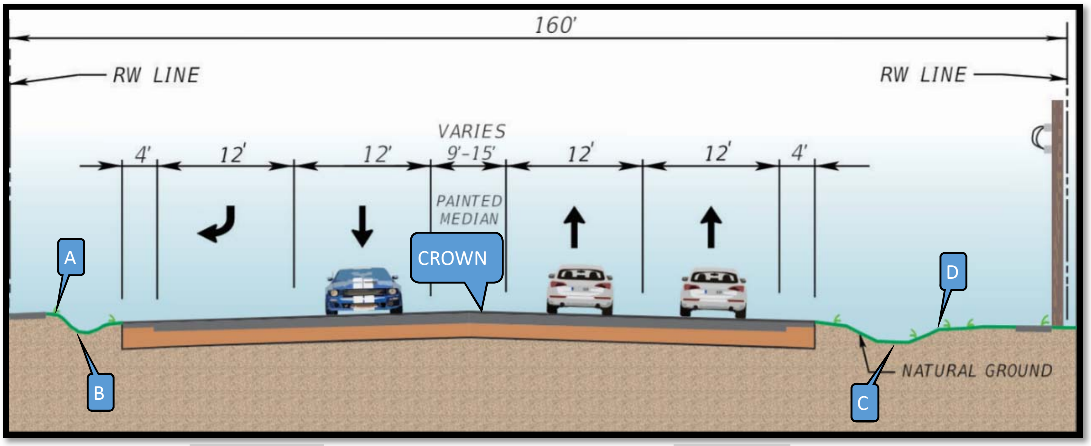
$$CN = \frac{(Area_{imperv} * CN_{imperv}) + (Area_{perv} * CN_{perv})}{Area_{imperv} + Area_{perv}}$$

CURVE NUMBERS (CN)				
SOIL TYPE	**A**	**B**	**C**	**D**
IMPERVIOUS AREA				
Paved Areas	98	98	98	98
Lakes and wet are	98	98	98	98
Other	98	98	98	98
PERVIOUS AREA				
Gravel roads	76	85	89	91
Dirt roads	72	82	87	89
Cultivated land	72	81	88	91
Pasture or range	68	79	86	89
Meadow, good coı	30	58	71	78
Wood or forest lar	45	66	77	83
Lawns/sod, fair co	49	69	79	84
Other				
Commercial	89	92	94	95
Industrial	81	88	91	93
Residential	61	75	83	87

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 1 EXISTING CONDITION



Basin length (B_L)=	1280 ft	**Crown=**	19.1 ft
RW width (RW_w)=	160 ft	**Avg Swale top (S_t)=** $\left(\frac{A+D}{2}\right)=$	18.7 ft
Swale width (S_w)=	6 ft	**Avg Swale bottom(S_b)=** $\left(\frac{B+C}{2}\right)=$	18.0 ft

	E1-OFF		
	Stage (ft)	Area (ac)	
	18.0	0.001	
S_t	18.7	71.5	(A_f - 2)
Off Top	24.0	73.5	(2500*B_L)

PIPE
Type/size: 18"
Length: 30'

	E1-ON		
	Stage (ft)	Area (ac)	
S_b	18.0	0.4	2*(B_L * S_w)
S_t	18.7	0.5	2*{[(S_t-S_b)*4)+S_w]*(B_L)}
Crown	19.1	3.17	(B_L * RW_w)

PIPE
Type/size: 36"
Length: 530'

PIPE
Type/size: 18"
Length: 20'

	POND1	
	Stage (ft)	Area (ac)
SHGWT+2	18.0	2.1
SHGWT EL.	16.0	2.1

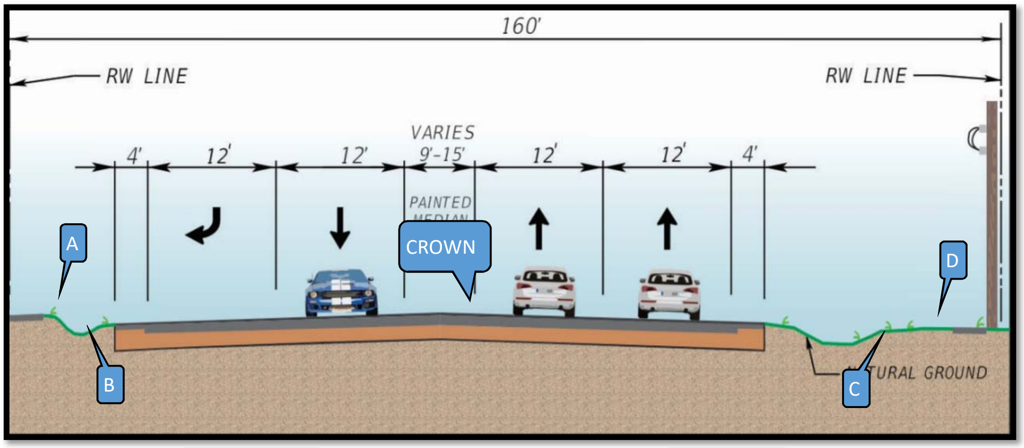
LAT D		
Time (hr)	Stage (ft)	
0	16.0	SHGWT EL.
999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 2 EXISTING CONDITION



Basin length (B_L)= 2654.0 ft

RW width (RW_w)= 160.0 ft

Swale width (S_w)= 6.0 ft

Crown= 19.1 ft

Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 18.1 ft

Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 16.8 ft

	E2-OFF		
	Stage (ft)	Area (ac)	
	18.0	0.001	
S_t	18.1	156.4	$(A_f - 2)$
Off Top	24.0	158.4	$(2600*B_L)$

PIPE
Type/size: 18"
Length: 30'

	E2-ON		
	Stage (ft)	Area (ac)	
S_b	16.8	0.7	$2*(B_L * S_w)$
S_t	18.1	1.4	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	19.1	6.58	$(B_L * RW_w)$

SWALE
Length: 2654'

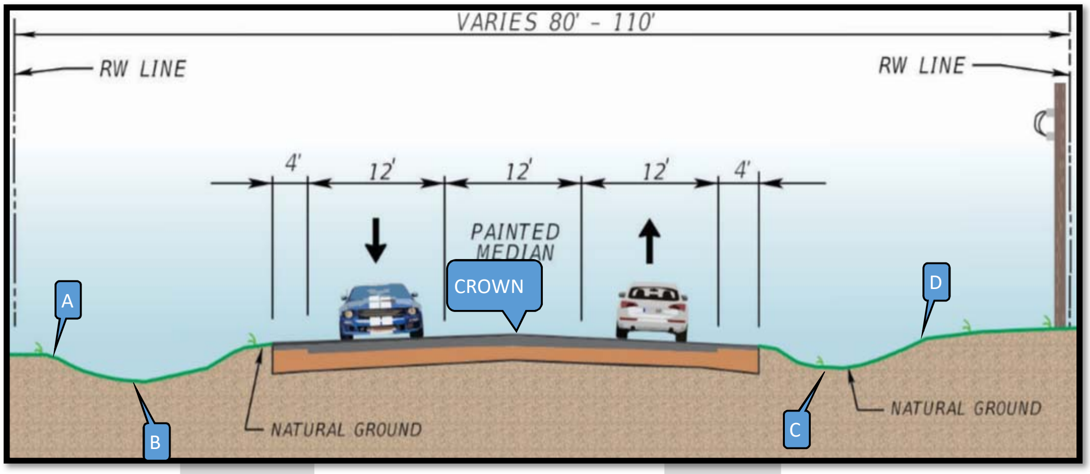
	LAT D	
	Time (hr)	Stage (ft)
SHGWT EL.	0	16.0
SHGWT EL.	999	16.0

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 3 EXISTING CONDITION



Basin length (B_L)= 3086.0 ft
Crown= 20.5 ft

RW width (RW_w)= 104.0 ft
Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 19.5 ft

Swale width (S_w)= 6.0 ft
Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 18.7 ft

E3-OFF

	Stage (ft)	Area (ac)	
	19.0	0.001	
S_t	19.5	182.2	$(A_f - 2)$
Off Top	24	184.2	$(2600 * B_L)$

PIPE
18", 40 FT

E3-ON

	Stage (ft)	Area (ac)	
S_b	18.7	0.9	$2*(B_L * S_w)$
S_t	19.5	1.3	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	20.5	7.65	$(B_L * RW_w)$

SWALE
3086 FT

3-LAKE

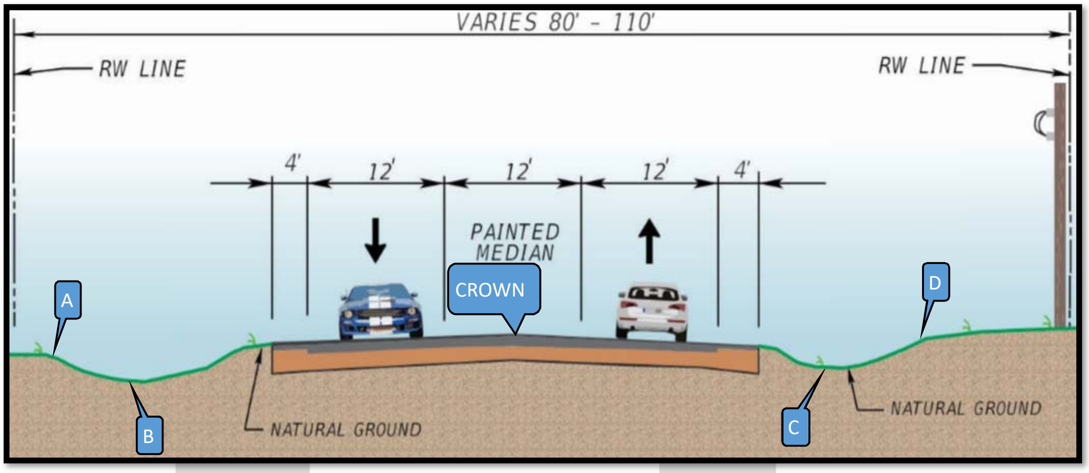
	Stage (ft)	Area (ac)
SHGWT+2	18.0	3.4
SHGWT EL.	16.0	3.4

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 4 EXISTING CONDITION



Basin length (B_L)= 2700.0 ft **Crown=** 20.4 ft

RW width (RW_w)= 104.0 ft **Ave Swale top (S_t)=** $\left(\frac{A+D}{2}\right) =$ 19.9 ft

Swale width (S_w)= 6.0 ft **Ave Swale bottom(S_b)=** $\left(\frac{B+C}{2}\right) =$ 18.4 ft

E4-OFF

	Stage (ft)	Area (ac)	
	19.0	0.001	
S_t	19.9	159.2	(A_f - 2)
Off Top	24	161.2	(2600*B_L)

WEIR

E4-ON

	Stage (ft)	Area (ac)	
S_b	18.4	0.7	2*(B_L * S_w)
S_t	19.9	1.5	2*{[(S_t-S_b)*4)+S_w]*(B_L)}
Crown	20.4	6.69	(B_L * RW_w)

SWALE
2700 FT

4- LAKE

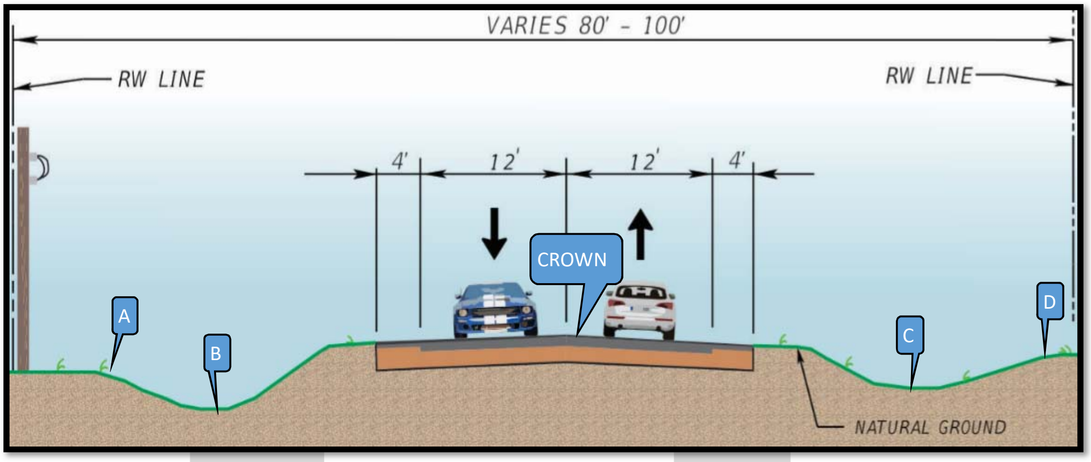
	Time (hr)	Stage (ft)
SHGWT+2	18.0	5.6
SHGWT EL.	16.0	5.6

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 5 EXISTING CONDITION



Basin length (B_L)= 2630.0 ft

RW width (RW_w)= 163.0 ft

Swale width (S_w)= 6.0 ft

Crown= 19.0 ft

Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 18.5 ft

Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 17.8 ft

E5-OFF

	Stage (ft)	Area (ac)	
	18.0	0.001	
S_t	18.5	52.3	$(A_f - 2)$
Off Top	24	54.3	$((600+300)*B_L)$

WEIR

E5-ON

	Stage (ft)	Area (ac)	
S_b	17.8	0.7	$2*(B_L * S_w)$
S_t	18.5	1.1	$2*\{[(S_t - S_b)*4)+S_w]*(B_L)\}$
Crown	19.0	10.14	$(B_L * RW_w)$

SWALE
2630 FT

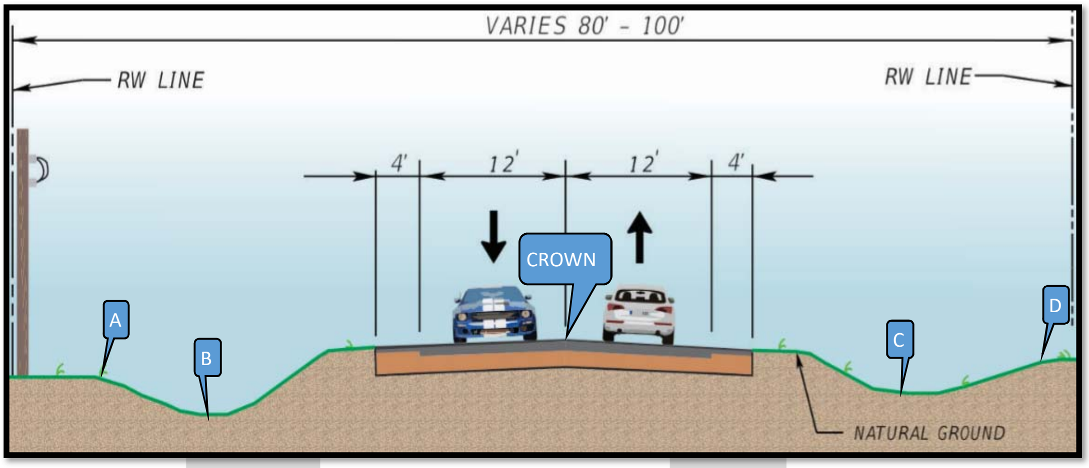
LAT C

	Time (hr)	Stage (ft)
SHGWT EL.	0	16.0
SHGWT EL.	999	16.0

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 6 EXISTING CONDITION



Basin length (B_L)=	2600.0 ft	**Crown=**		18.7 ft
RW width (RW_w)=	163.0 ft	**Ave Swale top (S_t)=**	$\left(\frac{A+D}{2}\right) =$	18.3 ft
Swale width (S_w)=	6.0 ft	**Ave Swale bottom(S_b)=**	$\left(\frac{B+C}{2}\right) =$	16.4 ft

E6-OFF

	Stage (ft)	Area (ac)	
	18.0	0.001	
S_t	18.3	51.7	$(A_f - 2)$
Off Top	24	53.7	$((600+300)*B_L)$

WEIR

E6-ON

	Stage (ft)	Area (ac)	
S_b	16.4	0.7	$2*(B_L * S_w)$
S_t	18.3	1.6	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	18.7	10.03	$(B_L * RW_w)$

SWALE 1300 FT

SWALE 1300 FT

LAT C

	Time (hr)	Stage (ft)
Bottom	0	16.0
Top	999	16.0

LAT L

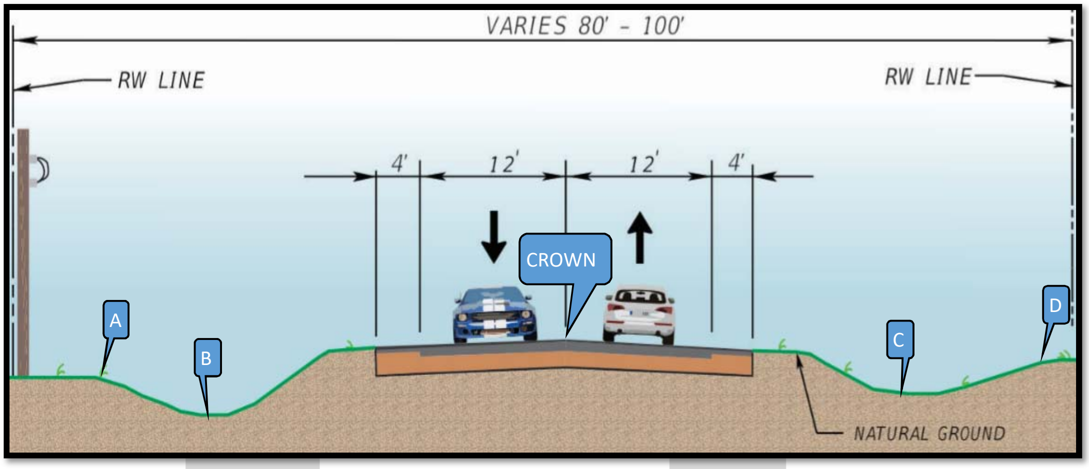
Time (hr)	Stage (ft)	
0	16.0	SHGWT EL.
999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 7 EXISTING CONDITION



Basin length (B_L)= 2650.0 ft

RW width (RW_w)= 163.0 ft

Swale width (S_w)= 6.0 ft

Crown= 17.3 ft

Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 16.9 ft

Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 13.9 ft

	E7-OFF		
	Stage (ft)	Area (ac)	
	16.0	0.001	
S_t	16.9	52.8	$(A_f - 2)$
Off Top	24	54.8	$((600+300)*B_L)$

WEIR

	E7-ON		
	Stage (ft)	Area (ac)	
S_b	13.9	0.7	$2*(B_L * S_w)$
S_t	16.9	2.2	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	17.3	10.22	$(B_L * RW_w)$

SWALE
2650 FT

	LAT L		
	Time (hr)	Stage (ft)	
Bottom	0	16.0	SHGWT EL.
Top	999	16.0	SHGWT EL.

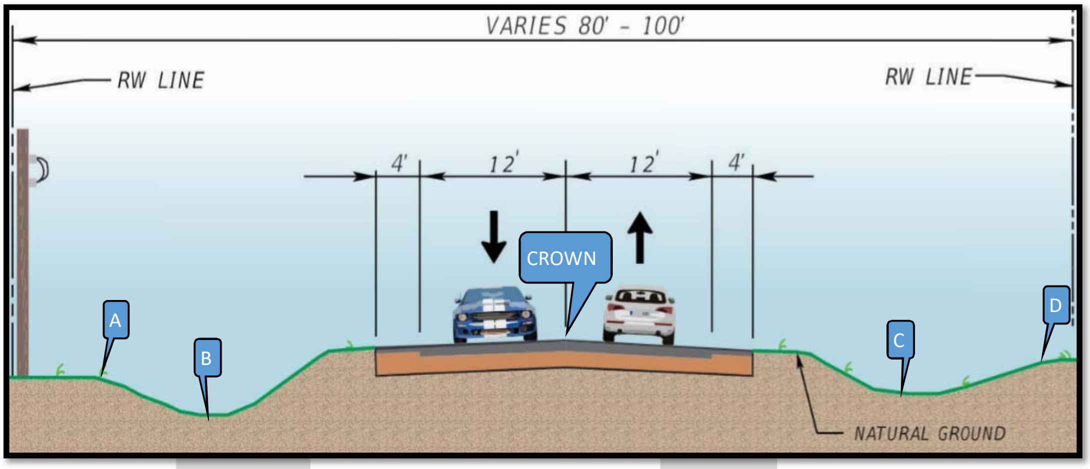
SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

Designed By: KT

Date: 4/13/2017

BASIN 8 EXISTING CONDITION



Basin length (B_L)= 5350.0 ft

Crown= 20.3 ft

RW width (RW_w)= 163.0 ft

Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 19.9 ft

Swale width (S_w)= 6.0 ft

Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 16.8 ft

	E8-OFF		
	Stage (ft)	Area (ac)	
	19.0	0.001	
S_t	19.9	108.5	$(A_f - 2)$
Off Top	24	110.5	$((600+300)*B_L)$

WEIR

	E8-ON		
	Stage (ft)	Area (ac)	
S_b	16.8	1.5	$2*(B_L * S_w)$
S_t	19.9	4.5	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	20.3	20.63	$(B_L * RW_w)$

SWALE

5350 FT

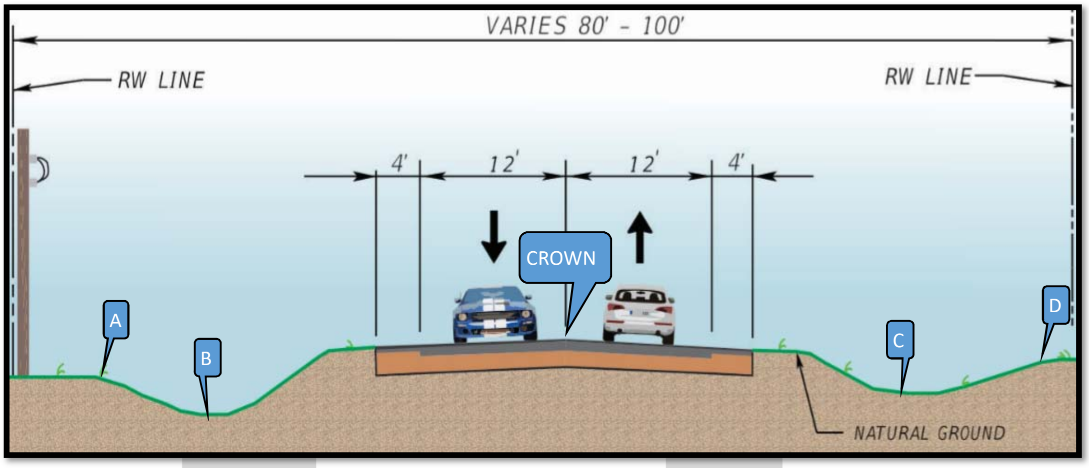
BASIN 7 SYSTEM

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 9 EXISTING CONDITION



Basin length (B_L)= 2640.0 ft

RW width (RW_w)= 104.0 ft

Swale width (S_w)= 6.0 ft

Crown= 22.3 ft

Ave Swale top (S_t)= $\left(\frac{A+D}{2}\right) =$ 21.9 ft

Ave Swale bottom(S_b)= $\left(\frac{B+C}{2}\right) =$ 20.0 ft

	E9-OFF		
	Stage (ft)	Area (ac)	
	21.0	0.001	
S_t	21.9	52.5	$(A_f - 2)$
Off Top	28	54.5	$((600+300)*B_L)$

WEIR

	E9-ON		
	Stage (ft)	Area (ac)	
S_b	20.0	0.7	$2*(B_L * S_w)$
S_t	21.9	1.7	$2*\{[(S_t-S_b)*4)+S_w]*(B_L)\}$
Crown	22.3	6.30	$(B_L * RW_w)$

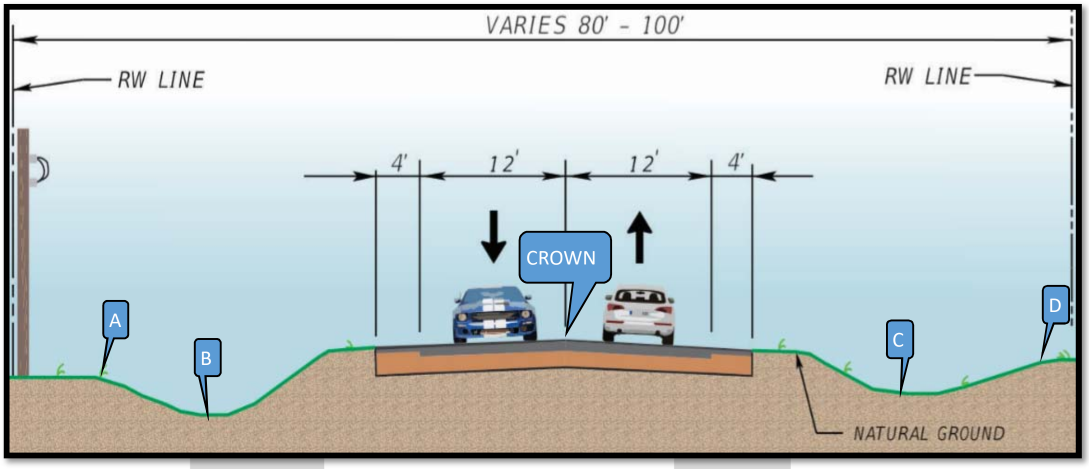
SWALE
2640 FT

BASIN 8 SYSTEM

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 10 EXISTING CONDITION



Basin length (B_L)=	2710.0 ft	**Crown=**	23.1 ft		
RW width (RW_w)=	104.0 ft	**Ave Swale top (S_t)=**	$\left(\frac{A+D}{2}\right) =$	22.7 ft	
Swale width (S_w)=	6.0 ft	**Ave Swale bottom(S_b)=**	$\left(\frac{B+C}{2}\right) =$	19.3 ft	

E10-OFF — WEIR → E10-ON

	Stage (ft)	Area (ac)	
	22.0	0.001	
S_t	22.7	16.7	(A_f - 2)
Off Top	24	18.7	(300*B_L)

E10-ON

	Stage (ft)	Area (ac)	
S_b	19.3	0.7	2*(B_L * S_w)
S_t	22.7	2.4	2*{[(S_t-S_b)*4)+S_w]*(B_L)}
Crown	23.1	6.47	(B_L * RW_w)

SWALE 2710 FT

LAT G

	Time (hr)	Stage (ft)
Bottom	0.0	16.8
Top	999.0	16.8

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

Designed By: KT

Date: 4/13/2017

INPUT DATA

Table 2: Post-Development Hydrologic Data

Basin	Onsite Area	Impervious Area	Pervious Area	CN	Offsite Area	Impervious Area	Pervious Area	CN
	AC	AC	AC		AC	AC	AC	
Basin 1	3.17	2.35	0.82	95.67	73.5	0.0	73.5	89.0
Basin 2	6.58	4.87	1.71	95.66	158.4	0.0	158.4	89.0
Basin 3	7.65	5.67	1.98	95.67	184.2	92.1	92.1	93.5
Basin 4	6.69	5.45	1.24	96.33	161.2	0.0	161.2	89.0
Basin 5	10.14	5.31	4.83	93.71	54.3	0.3	54.1	89.0
Basin 6	10.03	5.25	4.78	93.71	53.7	0.3	53.4	89.0
Basin 7	10.22	5.35	4.87	93.71	54.8	4.6	50.2	89.8
Basin 8	20.63	10.81	9.82	93.72	110.5	5.5	105.0	89.5
Basin 9	6.30	4.85	1.45	95.93	54.5	10.9	43.6	90.8
Basin 10	6.47	4.98	1.49	95.93	18.7	4.7	14.0	91.3
Total	87.88	54.89	32.99		923.8	118.3	805.5	

$$CN = \frac{(Area_{imperv} * CN_{imperv}) + (Area_{perv} * CN_{perv})}{Area_{imperv} + Area_{perv}}$$

CURVE NUMBERS (CN)

SOIL TYPE	A	B	C	D
IMPERVIOUS AREA				
Paved Areas	98	98	98	98
Lakes and wet are	98	98	98	98
Other	98	98	98	98
PERVIOUS AREA				
Gravel roads	76	85	89	91
Dirt roads	72	82	87	89
Cultivated land	72	81	88	91
Pasture or range	68	79	86	89
Meadow, good coı	30	58	71	78
Wood or forest lar	45	66	77	83
Lawns/sod, fair co	49	69	79	84
Other				
Commercial	89	92	94	95
Industrial	81	88	91	93
Residential	61	75	83	87

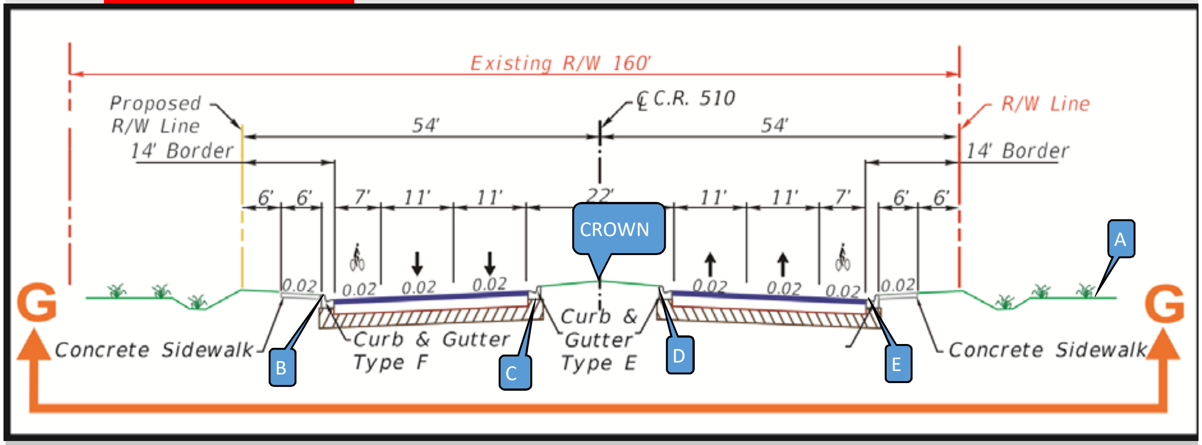
SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

Designed By: KT

Date: 4/13/2017

BASIN 1 **NO PROPOSED POND**



Basin length (B_L)= 1280 ft

RW width (RW_w)= 108 ft

Curb width (C_w)= 0.5 ft

Crown (C)= 18.90 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 18.10 ft

Avg Swale bottom(S_b)= A= 17.55 ft

	E1-OFF		
	Stage (ft)	Area (ac)	
	17.0	0.001	
Swale Bot	17.6	71.5	((2500*BL) - 2)
Off Top	24.0	73.5	(2500*BL)

	E1-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	18.1	0.06	4*(curb width*B_L)
EOP (C,D)	18.7	2.53	(BL * (RWw-Medium))
Crown	18.9	3.17	(BL * RWw)

PIPE
36", 1280 FT

PIPE
36", 530 FT

PIPE
36", 1280 FT
count: 4

	POND1	
	Stage (ft)	Area (ac)
SHGWT+2	18.0	2.1
SHGWT EL.	16.0	2.1

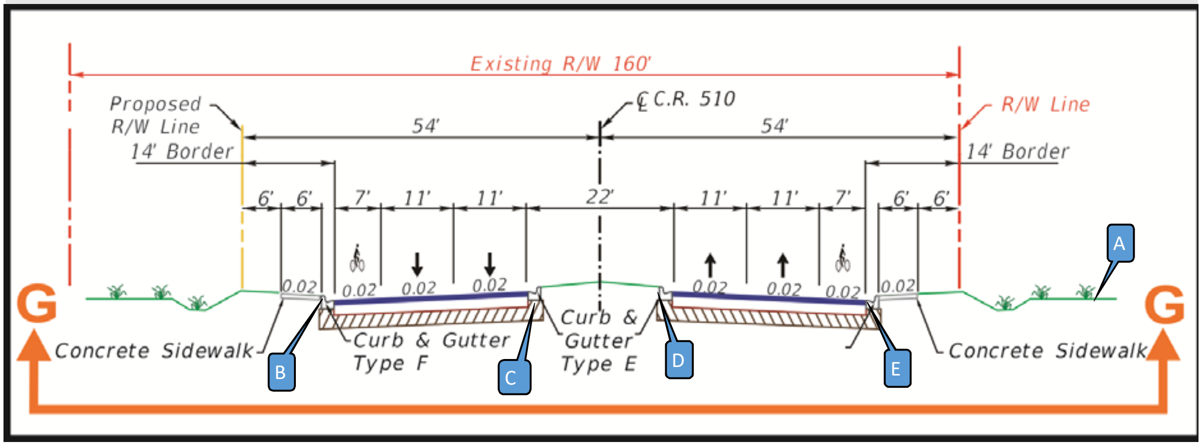
LAT D		
Time (hr)	Stage (ft)	
0	16.0	SHGWT EL.
999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 2 PROPOSED CONDITION



Basin length (B_L)=	2654.0	ft	**Crown=**		19.3	ft
RW width (RW_w)=	108.0	ft	**Avg EOP=** $\left(\frac{B+E}{2}\right)=$		18.5	ft
Curb width (C_w)=	0.5	ft	**Avg Swale bottom(S_b)=**	A=	18.0	ft

	E2-OFF		
	Stage (ft)	Area (ac)	
	17.0	0.001	
Swale Bot	18.0	156.4	((2600*BL) - 2)
Off Top	24.0	158.4	(2600*B_L)

PIPE
2654'
count: 4

	E2-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	18.5	0.12	4*(curb width*B_L)
EOP (C,D)	19.1	5.24	(BL * (RWw-Medium))
Crown	19.3	6.58	(BL * RWw)

PIPE
count: 4
Type/size: 36"
Length: 2654'

	P2-WETPOND		
	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT)	16.0	1.7	See pond design Calcs
($Pond_{bot}$+1)	17.0	1.7	

SYSTEM
1500 FT

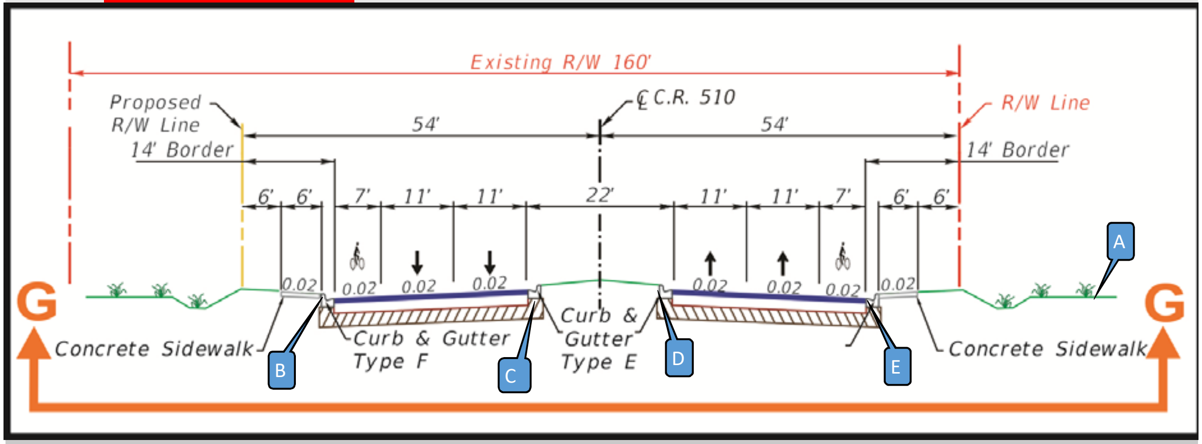
	LAT D		
	Time (hr)	Stage (ft)	
Bottom	0	16.0	SHGWT EL.
Top	999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 3 **NO PROPOSED POND**



Basin length (BL)= 3086.0 ft

RW width (RWw)= 108.0 ft

Curb width (C_w)= 0.5 ft

Crown (C)= 21.3 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 20.5 ft

Avg Swale bottom(S_b)= A= 20.0 ft

	E3-OFF		
	Stage (ft)	Area (ac)	
	19.0	0.001	
Swale Bot	20.0	182.2	((2600*BL) - 2)
Off Top	24	184.2	(2600*BL)

PIPE 18", 40 FT
count: 5

	E3-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	20.5	0.14	4*(curb width*B_L)
EOP (C,D)	21.1	6.09	(BL * (RWw-Medium))
Crown	21.3	7.65	(BL * RWw)

PIPE
Type/size: 36"
Length: 3086'
count: 4

	3-LAKE	
	Stage (ft)	Area (ac)
SHGWT+2	18.0	3.4
SHGWT EL	16.0	3.4

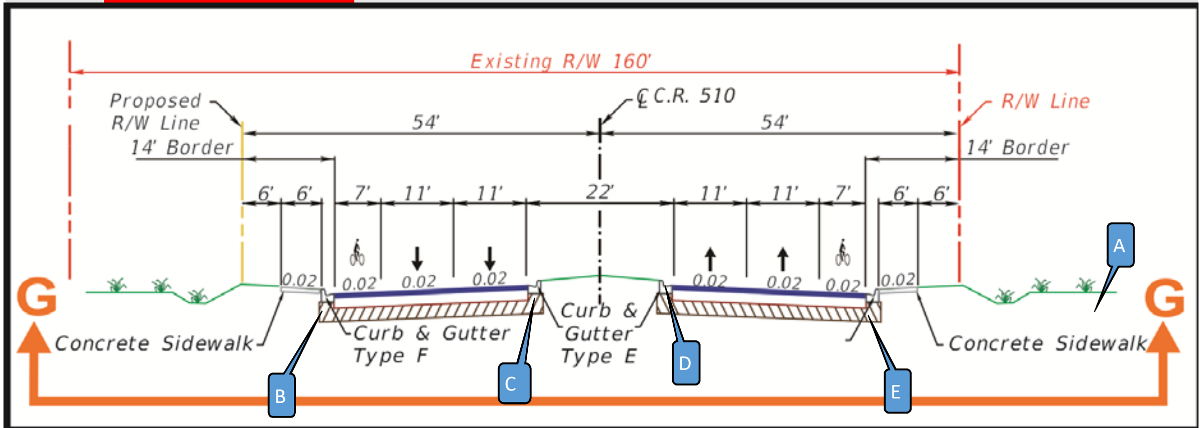
SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E** **Project No.** **1602**

Designed By: KT

Date: 4/13/2017

BASIN 4 **NO PROPOSED POND**



Basin length (BL)= 2700.0 ft **Crown (C)=** 20.7 ft

RW width (RWw)= 108.0 ft **Avg EOP=** $\left(\frac{B+E}{2}\right) =$ 19.90 ft

Curb width (C_w)= 0.5 ft **Ave Swale bottom(Sb)=** A= 9.7 ft

	E4-OFF		
	Stage (ft)	Area (ac)	
	19.0	0.001	
S_t	19.9	159.2	((2600*BL) - 2)
Off Top	24	161.2	(2600*BL)

WEIR

	E4-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	19.9	0.12	4*(curb width*B_L)
EOP (C,D)	20.5	5.33	(BL * (RWw-Medium))
Crown	20.7	6.69	(BL * RWw)

PIPE
Type/size: 36"
Length: 2700'
count: 4

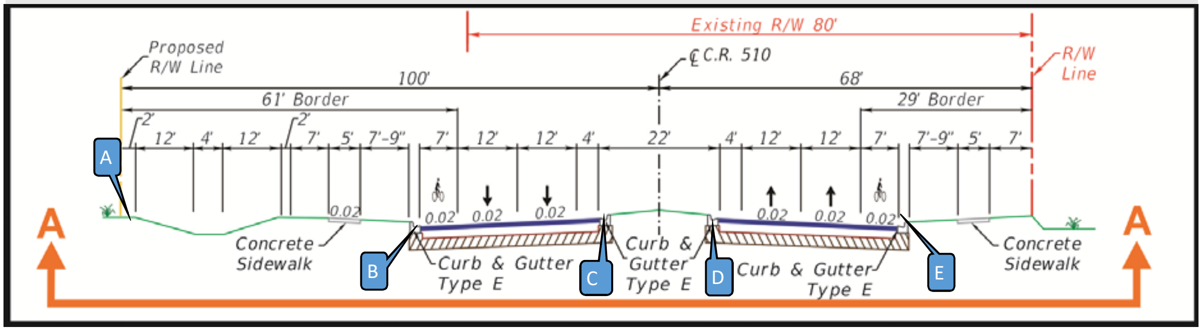
	4- LAKE	
	Stage (ft)	Area (ac)
SHGWT+2	18.0	5.6
SHGWT EL.	16.0	5.6

SNUBBS CONSULTING INC.

Project Name: **CR-510 PD&E**

Project No. **1602**
Designed By: KT
Date: 4/13/2017

BASIN 5 PROPOSED CONDITION



Basin length (B_L)= 2630.0 ft

RW width (RW_w)= 168.0 ft

Curb width (C_w)= 0.5 ft

Crown= 19.3 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 18.38 ft

Avg Swale bottom(S_b)= A= 18.0 ft

	E5-OFF		
	Stage (ft)	Area (ac)	
	17.0	0.001	
Swale Bot	18.0	52.3	(((600+300)*BL) - 2)
Off Top	24	54.3	((600+300)*B_L)

SWALE
2630 FT

	E5-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	18.4	0.12	4*(curb width*B_L)
EOP (C,D)	19.1	8.81	(BL * (RWw-Medium))
Crown	19.3	10.14	(BL * RWw)

PIPE
count: 4
Type/size:36"
Length: 2630'

	P5-WETPOND		
	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT)	16.0	1.7	See pond
($Pond_{bot}$+1)	17.0	1.7	design Calcs

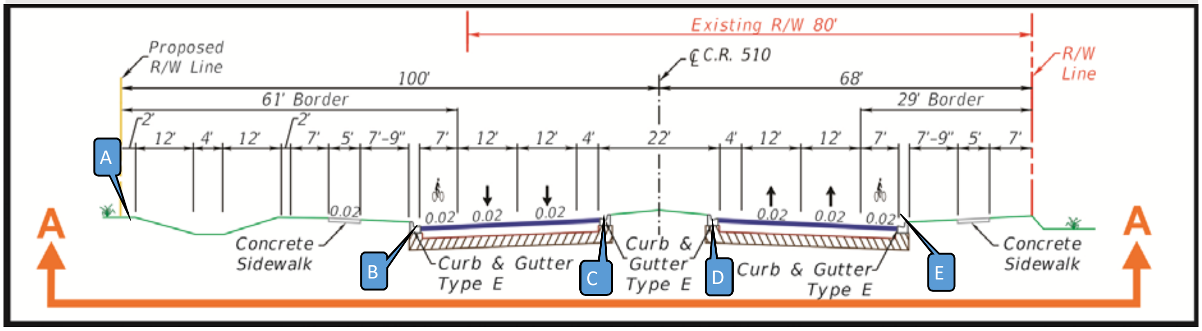
SYSTEM
1650 FT

LAT C		
Time (hr)	Stage (ft)	
0	16.0	SHGWT EL.
999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 6 PROPOSED CONDITION



Basin length (B_L)= 2600.0 ft

RW width (RW_w)= 168.0 ft

Curb width (C_w)= 0.5 ft

Crown= 19.8 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 18.88 ft

Avg Swale bottom(S_b)= A= 18.5 ft

	E6-OFF		
	Stage (ft)	Area (ac)	
	18.0	0.001	
Swale Bot	18.5	51.7	(((600+300)*BL) - 2)
Off Top	24	53.7	((600+300)*B_L)

	E6-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	18.9	0.12	4*(curb width*B_L)
EOP (C,D)	19.6	8.71	(BL * (RWw-Medium))
Crown	19.8	10.03	(BL * RWw)

PIPE
count: 4
Type/size: 36"
Length: 2600'

SWALE

SWALE

	P6-WETPOND		
	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT)	16.0	1.7	See pond design Calcs
($Pond_{bot}$+1)	17.0	1.7	

SYSTEM
1600 FT

	LAT C		
	Time (hr)	Stage (ft)	
Bottom	0	16.0	SHGWT EL.
Top	999	16.0	SHGWT EL.

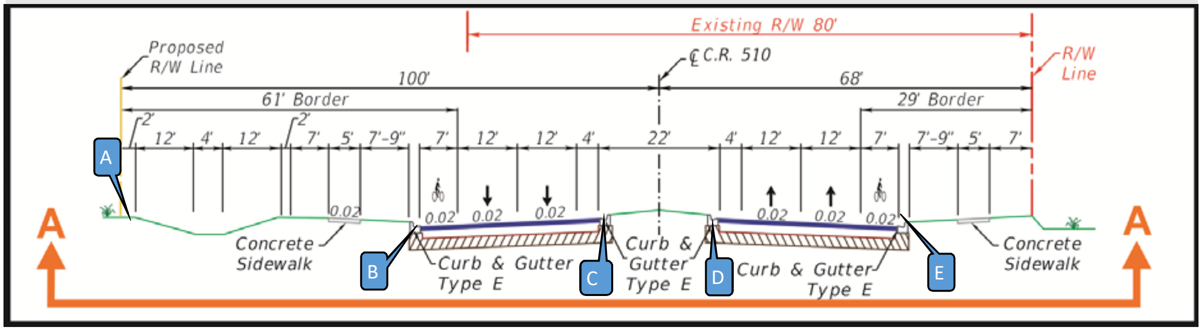
LAT L		
Stage (ft)	Area (ac)	
0	16.0	SHGWT EL.
999	16.0	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name: CR-510 PD&E

Project No. 1602
Designed By: KT
Date: 4/13/2017

BASIN 7 PROPOSED CONDITION



Basin length (B_L)= 2650.0 ft

RW width (RW_w)= 168.0 ft

Curb width (C_w)= 0.5 ft

Crown= 19.4 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 18.48 ft

Avg Swale bottom(S_b)= A= 18.1 ft

	E7-OFF		
	Stage (ft)	Area (ac)	
	18.0	0.001	
Swale Bot	18.1	52.8	(((600+300)*BL) - 2)
Off Top	24	54.8	((600+300)*B_L)

SWALE Length: 2650'

	E7-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	18.5	0.12	4*(curb width*B_L)
EOP (C,D)	19.2	8.88	(BL * (RWw-Medium))
Crown	19.4	10.22	(BL * RWw)

PIPE count: 4 Type/size: 36" Length: 2650'

	P7-REGIONAL SWALE	
	Stage (ft)	Area (ac)
Bottom	16.8	0.001
S_t	18.5	0.001

SYSTEM Length: 2650'

	P7-WETPOND		
	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT)	16.8	1.7	See pond design Calcs
($Pond_{bot}$+1)	17.8	1.7	

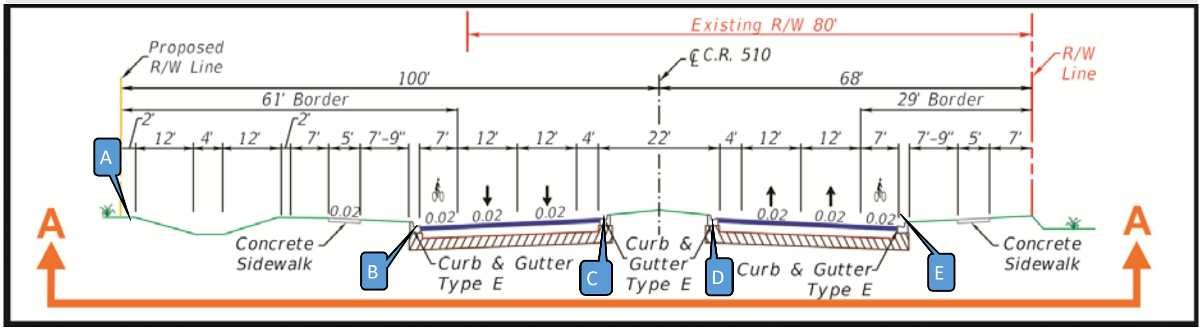
SWALE Length: 30'

	LAT L		
	Time (hr)	Stage (ft)	
Bottom	0	16.8	SHGWT EL.
Top	999	16.8	SHGWT EL.

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 8 PROPOSED CONDITION



Basin length (B_L)=	5350.0 ft		**Crown=**	20.2 ft
RW width (RW_w)=	168.0 ft		**Avg EOP=** $\left(\frac{B+E}{2}\right) =$	19.28 ft
Curb width (C_w)=	0.5 ft		**Avg Swale bottom(S_b)=** A=	18.9 ft

	E8-OFF		
	Stage (ft)	Area (ac)	
	18.0	0.001	
Swale Bot	18.9	108.5	(((600+300)*BL) - 2)
Off Top	24	110.5	((600+300)*B_L)

SWALE Length: 5350'

	E8-ON		
	Stage (ft)	Area (ac)	
EOP (B,E)	19.3	0.25	4*(curb width*B_L)
EOP (C,D)	20.0	17.93	(BL * (RWw-Medium))
Crown	20.2	20.63	(BL * RWw)

PIPE count: 4 Type/size: 36" Length: 5350'

	P8-REGIONAL SWALE	
	Stage (ft)	Area (ac)
Bottom	16.5	0.001
S_t	19.3	0.001

SYSTEM

	P8-WETPOND		
	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT)	16.5	3.4	See pond design Calcs
($Pond_{bot}$+1)	17.5	3.4	

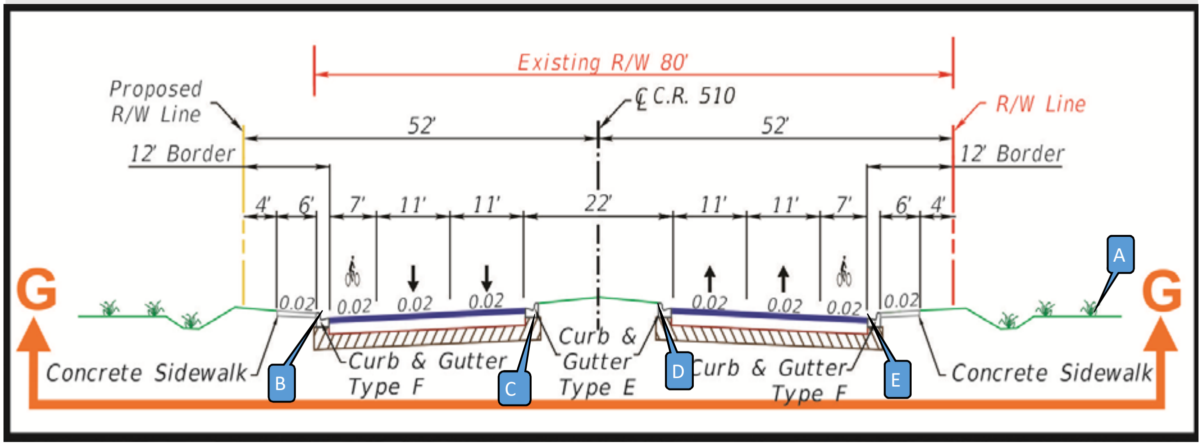
SWALE Length: 30'

BASIN 7 SYSTEM

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 9 PROPOSED CONDITION



Basin length (B_L)= 2640.0 ft

RW width (RW_w)= 104.0 ft

Curb width (C_w)= 0.5 ft

Crown= 22.3 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 21.50 ft

Avg Swale bottom(S_b)= A= 20.9 ft

	E9-OFF Stage (ft)	Area (ac)	
	20.0	0.001	
Swale Bot	20.9	52.5	(((600+300)*BL) - 2)
Off Top	28	54.5	((600+300)*B_L)

SWALE Length: 30 FT

	E9-ON Stage (ft)	Area (ac)	
EOP (B,E)	21.5	0.12	4*(curb width*B_L)
EOP (C,D)	22.1	4.97	(BL * (RWw-Medium))
Crown	22.3	6.30	(BL * RWw)

PIPE count: 4 Type/size: 36" Length: 2640'

	P9-REGIONAL SWALE Stage (ft)	Area (ac)
Bottom	18.5	0.001
S_t	21.5	0.001

SYSTEM Length:

	P9-DRYPOND Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT+1)	18.5	1.6	See pond
($Pond_{bot}$+1)	19.5	1.6	design Calcs

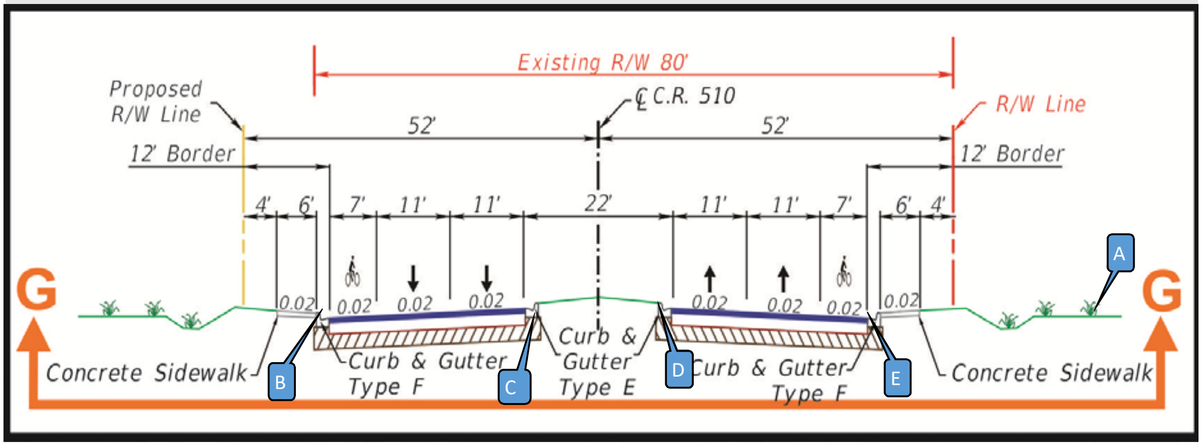
SWALE Length: 30 FT

BASIN 8 SYSTEM

SNUBBS CONSULTING INC.

Project Name:	**CR-510 PD&E**	**Project No.**	**1602**
		Designed By:	KT
		Date:	4/13/2017

BASIN 10 PROPOSED CONDITION



Basin length (B_L)= 2710.0 ft

RW width (RW_w)= 104.0 ft

Curb width (C_w)= 0.5 ft

Crown= 24.8 ft

Avg EOP= $\left(\frac{B+E}{2}\right) =$ 24.00 ft

Avg Swale bottom(S_b)= A= 23.4 ft

E10-OFF

	Stage (ft)	Area (ac)	
	23.0	0.001	
Swale Bot	23.4	16.7	(((300)*BL)- 2)
Off Top	26	18.7	((300)*B_L)

E10-ON

	Stage (ft)	Area (ac)	
EOP (B,E)	24.0	0.12	4*(curb width*B_L)
EOP (C,D)	24.6	5.10	(BL * (RWw-Medium))
Crown	24.8	6.47	(BL * RWw)

SWALE
2710 FT

PIPE
count: 4
Type/size: 36"
Length: 2710'

P10-POND

	Stage (ft)	Area (ac)	
$Pond_{bot}$=(SHGWT+1)	20.0	1.1	See pond design Calcs
($Pond_{bot}$+1.5)	21.5	1.1	

SYSTEM
1250 FT

LAT G

	Time (hr)	Stage (ft)
Bottom	0.0	19.0
Top	999.0	19.0

```
==========================================================================================
==== Basins ==============================================================================
==========================================================================================

         Name: EB1-OFFSITE              Node: E1-OFFSITE            Status: Onsite
        Group: Basin 1                  Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 10.00
               Area(ac): 73.500                  Time Shift(hrs): 0.00
           Curve Number: 89.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB1-ONSITE               Node: E1-ONSITE             Status: Onsite
        Group: Basin 1                  Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 10.00
               Area(ac): 4.700                   Time Shift(hrs): 0.00
           Curve Number: 93.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB10-OFF                 Node: E10-OFF               Status: Onsite
        Group: Basin 10                 Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 10.00
               Area(ac): 18.700                  Time Shift(hrs): 0.00
           Curve Number: 91.30             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB10-ON                  Node: E10-ON                Status: Onsite
        Group: Basin 10                 Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 10.00
               Area(ac): 6.470                   Time Shift(hrs): 0.00
           Curve Number: 93.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB2-OFF                  Node: E2-OFF                Status: Onsite
        Group: Basin 2                  Type: SCS Unit Hydrograph CN

        Unit Hydrograph: Uh256                    Peaking Factor: 256.0
          Rainfall File:                     Storm Duration(hrs): 0.00
    Rainfall Amount(in): 0.000                 Time of Conc(min): 10.00
               Area(ac): 158.400                 Time Shift(hrs): 0.00
           Curve Number: 89.00             Max Allowable Q(cfs): 999999.000
                DCIA(%): 0.00
```

```
------------------------------------------------------------------------------------------------------
        Name: EB2-ON                    Node: E2-ON                  Status: Onsite
       Group: Basin 2                   Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                     Peaking Factor: 256.0
         Rainfall File:                      Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                  Time of Conc(min): 10.00
              Area(ac): 9.700                    Time Shift(hrs): 0.00
          Curve Number: 92.10               Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

------------------------------------------------------------------------------------------------------
        Name: EB3-OFF                   Node: E3-OFF                 Status: Onsite
       Group: Basin 3                   Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                     Peaking Factor: 256.0
         Rainfall File:                      Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                  Time of Conc(min): 10.00
              Area(ac): 184.200                  Time Shift(hrs): 0.00
          Curve Number: 93.50               Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

------------------------------------------------------------------------------------------------------
        Name: EB3-ON                    Node: E3-ON                  Status: Onsite
       Group: Basin 3                   Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                     Peaking Factor: 256.0
         Rainfall File:                      Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                  Time of Conc(min): 10.00
              Area(ac): 7.400                    Time Shift(hrs): 0.00
          Curve Number: 92.40               Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

------------------------------------------------------------------------------------------------------
        Name: EB4-OFF                   Node: E4-OFF                 Status: Onsite
       Group: Basin 4                   Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                     Peaking Factor: 256.0
         Rainfall File:                      Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                  Time of Conc(min): 10.00
              Area(ac): 161.200                  Time Shift(hrs): 0.00
          Curve Number: 89.00               Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

------------------------------------------------------------------------------------------------------
        Name: EB4-ON                    Node: E4-ON                  Status: Onsite
       Group: Basin 4                   Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                     Peaking Factor: 256.0
         Rainfall File:                      Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                  Time of Conc(min): 10.00
              Area(ac): 6.690                    Time Shift(hrs): 0.00
          Curve Number: 92.40               Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00
```

```
----------------------------------------------------------------------------------------------------
         Name: EB5-OFF                   Node: E5-OFF                 Status: Onsite
        Group: Basin 5                   Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                       Peaking Factor: 256.0
        Rainfall File:                        Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                   Time of Conc(min): 10.00
             Area(ac): 4.300                      Time Shift(hrs): 0.00
         Curve Number: 89.00                 Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB5-ON                    Node: E5-ON                  Status: Onsite
        Group: Basin 5                   Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                       Peaking Factor: 256.0
        Rainfall File:                        Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                   Time of Conc(min): 10.00
             Area(ac): 10.140                     Time Shift(hrs): 0.00
         Curve Number: 92.20                 Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB6-OFF                   Node: E6-OFF                 Status: Onsite
        Group: Basin 6                   Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                       Peaking Factor: 256.0
        Rainfall File:                        Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                   Time of Conc(min): 10.00
             Area(ac): 53.700                     Time Shift(hrs): 0.00
         Curve Number: 89.00                 Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB6-ON                    Node: E6-ON                  Status: Onsite
        Group: Basin 6                   Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                       Peaking Factor: 256.0
        Rainfall File:                        Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                   Time of Conc(min): 10.00
             Area(ac): 10.030                     Time Shift(hrs): 0.00
         Curve Number: 92.20                 Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: EB7-OFF                   Node: E7-OFF                 Status: Onsite
        Group: Basin 7                   Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                       Peaking Factor: 256.0
        Rainfall File:                        Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                   Time of Conc(min): 10.00
             Area(ac): 54.800                     Time Shift(hrs): 0.00
         Curve Number: 89.80                 Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00
```

```
------------------------------------------------------------------------------------------
        Name: EB7-ON                  Node: E7-ON                  Status: Onsite
       Group: Basin 7                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 3.170                  Time Shift(hrs): 0.00
          Curve Number: 92.20            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

------------------------------------------------------------------------------------------
        Name: EB8-OFF                 Node: E8-OFF                 Status: Onsite
       Group: Basin 8                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 110.500                Time Shift(hrs): 0.00
          Curve Number: 89.50            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

------------------------------------------------------------------------------------------
        Name: EB8-ON                  Node: E8-ON                  Status: Onsite
       Group: Basin 8                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 20.630                 Time Shift(hrs): 0.00
          Curve Number: 93.00            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

------------------------------------------------------------------------------------------
        Name: EB9-OFF                 Node: E9-OFF                 Status: Onsite
       Group: Basin 9                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 54.500                 Time Shift(hrs): 0.00
          Curve Number: 90.80            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

------------------------------------------------------------------------------------------
        Name: EB9-ON                  Node: E9-ON                  Status: Onsite
       Group: Basin 9                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                   Peaking Factor: 256.0
         Rainfall File:                    Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000                Time of Conc(min): 10.00
              Area(ac): 6.300                  Time Shift(hrs): 0.00
          Curve Number: 92.20            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00
```

```
-----------------------------------------------------------------------------------------------------
        Name: PB1-OFFSITE             Node: P1-OFFSITE             Status: Onsite
       Group: Basin 1                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                  Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 73.500                Time Shift(hrs): 0.00
          Curve Number: 89.00             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
        Name: PB1-ONSITE              Node: P1-ONSITE              Status: Onsite
       Group: Basin 1                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                  Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 4.700                 Time Shift(hrs): 0.00
          Curve Number: 93.40             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
        Name: PB10-OFF                Node: P10-OFF                Status: Onsite
       Group: Basin 10                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                  Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 18.700                Time Shift(hrs): 0.00
          Curve Number: 91.30             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
        Name: PB10-ON                 Node: P10-ON                 Status: Onsite
       Group: Basin 10                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                  Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 6.470                 Time Shift(hrs): 0.00
          Curve Number: 95.80             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

-----------------------------------------------------------------------------------------------------
        Name: PB2-OFF                 Node: P2-OFF                 Status: Onsite
       Group: Basin 2                 Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                  Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 158.400               Time Shift(hrs): 0.00
          Curve Number: 89.00             Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

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```
       Name: PB2-ON                  Node: P2-ON                Status: Onsite
      Group: Basin 2                 Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                  Peaking Factor: 256.0
        Rainfall File:                   Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
             Area(ac): 9.700                 Time Shift(hrs): 0.00
         Curve Number: 93.40            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
       Name: PB3-OFF                 Node: P3-OFF               Status: Onsite
      Group: Basin 3                 Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                  Peaking Factor: 256.0
        Rainfall File:                   Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
             Area(ac): 184.200               Time Shift(hrs): 0.00
         Curve Number: 93.50            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
       Name: PB3-ON                  Node: P3-ON                Status: Onsite
      Group: Basin 3                 Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                  Peaking Factor: 256.0
        Rainfall File:                   Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
             Area(ac): 7.650                 Time Shift(hrs): 0.00
         Curve Number: 95.80            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
       Name: PB4-OFF                 Node: P4-OFF               Status: Onsite
      Group: Basin 4                 Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                  Peaking Factor: 256.0
        Rainfall File:                   Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
             Area(ac): 161.200               Time Shift(hrs): 0.00
         Curve Number: 89.00            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
       Name: PB4-ON                  Node: P4-ON                Status: Onsite
      Group: Basin 4                 Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                  Peaking Factor: 256.0
        Rainfall File:                   Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
             Area(ac): 6.690                 Time Shift(hrs): 0.00
         Curve Number: 96.10            Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
       Name: PB5-OFF                 Node: P5-OFF               Status: Onsite
```

```
       Group: Basin 5                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                 Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 54.300                Time Shift(hrs): 0.00
          Curve Number: 89.00            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
        Name: PB5-ON                 Node: P5-ON                 Status: Onsite
       Group: Basin 5                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                 Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 10.140                Time Shift(hrs): 0.00
          Curve Number: 93.80            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
        Name: PB6-OFF                Node: P6-OFF                Status: Onsite
       Group: Basin 6                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                 Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 53.700                Time Shift(hrs): 0.00
          Curve Number: 89.00            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
        Name: PB6-ON                 Node: P6-ON                 Status: Onsite
       Group: Basin 6                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                 Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 9.700                 Time Shift(hrs): 0.00
          Curve Number: 97.90            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
        Name: PB7-OFF                Node: P7-OFF                Status: Onsite
       Group: Basin 7                Type: SCS Unit Hydrograph CN

       Unit Hydrograph: Uh256                 Peaking Factor: 256.0
         Rainfall File:                   Storm Duration(hrs): 0.00
   Rainfall Amount(in): 0.000               Time of Conc(min): 10.00
              Area(ac): 54.800                Time Shift(hrs): 0.00
          Curve Number: 89.80            Max Allowable Q(cfs): 999999.000
               DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
        Name: PB7-ON                 Node: P7-ON                 Status: Onsite
       Group: Basin 7                Type: SCS Unit Hydrograph CN
```

```
      Unit Hydrograph: Uh256                 Peaking Factor: 256.0
        Rainfall File:                  Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 10.220               Time Shift(hrs): 0.00
         Curve Number: 93.90           Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: PB8-OFF                Node: P8-OFF                Status: Onsite
        Group: Basin 8                Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                 Peaking Factor: 256.0
        Rainfall File:                  Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 110.500              Time Shift(hrs): 0.00
         Curve Number: 89.50           Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: PB8-ON                 Node: P8-ON                 Status: Onsite
        Group: Basin 8                Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                 Peaking Factor: 256.0
        Rainfall File:                  Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 20.630               Time Shift(hrs): 0.00
         Curve Number: 93.90           Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: PB9-OFF                Node: P9-OFF                Status: Onsite
        Group: Basin 9                Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                 Peaking Factor: 256.0
        Rainfall File:                  Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 54.500               Time Shift(hrs): 0.00
         Curve Number: 90.80           Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

----------------------------------------------------------------------------------------------------
         Name: PB9-ON                 Node: P9-ON                 Status: Onsite
        Group: Basin 9                Type: SCS Unit Hydrograph CN

      Unit Hydrograph: Uh256                 Peaking Factor: 256.0
        Rainfall File:                  Storm Duration(hrs): 0.00
  Rainfall Amount(in): 0.000              Time of Conc(min): 10.00
             Area(ac): 6.300                Time Shift(hrs): 0.00
         Curve Number: 95.70           Max Allowable Q(cfs): 999999.000
              DCIA(%): 0.00

==========================================================================================
==== Nodes ===============================================================================
==========================================================================================
```

```
     Name: 1-POND              Base Flow(cfs): 0.000          Init Stage(ft): 16.000
    Group: BASE                                               Warn Stage(ft): 18.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          1.9000
        18.000          1.9000

------------------------------------------------------------------------------------------
     Name: 4-LAKE              Base Flow(cfs): 0.000          Init Stage(ft): 16.000
    Group: BASE                                               Warn Stage(ft): 18.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          3.4000
        18.000          3.4000

------------------------------------------------------------------------------------------
     Name: E1-OFFSITE          Base Flow(cfs): 0.000          Init Stage(ft): 19.000
    Group: Basin 1                                            Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        17.000          0.0010
        18.000         71.5000
        24.000         73.5000

------------------------------------------------------------------------------------------
     Name: E1-ONSITE           Base Flow(cfs): 0.000          Init Stage(ft): 16.000
    Group: Basin 1                                            Warn Stage(ft): 19.100
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          0.0010
        18.000          0.4000
        18.700          0.5000
        19.100          3.1700

------------------------------------------------------------------------------------------
     Name: E10-OFF             Base Flow(cfs): 0.000          Init Stage(ft): 22.000
    Group: Basin 10                                           Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        22.000          0.0010
        22.700         16.7000
        24.000         18.7000

------------------------------------------------------------------------------------------
     Name: E10-ON              Base Flow(cfs): 0.000          Init Stage(ft): 19.300
    Group: Basin 10                                           Warn Stage(ft): 22.700
```

```
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        19.300          0.7000
        22.700          2.4000
        23.100          6.4700

------------------------------------------------------------------------------------------
     Name: E2-OFF              Base Flow(cfs): 0.000          Init Stage(ft): 17.000
    Group: Basin 2                                            Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          0.0010
        16.800        156.0000
        24.000        158.4000

------------------------------------------------------------------------------------------
     Name: E2-ON               Base Flow(cfs): 0.000          Init Stage(ft): 16.800
    Group: Basin 2                                            Warn Stage(ft): 18.100
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          0.0010
        16.800          0.7000
        18.100          1.4000
        19.100          9.7000

------------------------------------------------------------------------------------------
     Name: E3-OFF              Base Flow(cfs): 0.000          Init Stage(ft): 19.000
    Group: Basin 3                                            Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        18.700          0.0010
        19.000          0.0010
        19.500        182.2000
        24.000        184.2000

------------------------------------------------------------------------------------------
     Name: E3-ON               Base Flow(cfs): 0.000          Init Stage(ft): 18.700
    Group: Basin 3                                            Warn Stage(ft): 19.500
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        16.000          0.0010
        18.700          0.9000
        19.500          1.3000
        20.500          7.6500

------------------------------------------------------------------------------------------
```

```
     Name: E4-OFF             Base Flow(cfs): 0.000         Init Stage(ft): 19.000
    Group: Basin 4                                          Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        19.000          0.0010
        19.900        159.2000
        20.400        161.2000

------------------------------------------------------------------------------------------
     Name: E4-ON              Base Flow(cfs): 0.000         Init Stage(ft): 18.400
    Group: Basin 4                                          Warn Stage(ft): 19.900
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        18.400          0.7000
        19.900          1.5000
        20.400          6.6900

------------------------------------------------------------------------------------------
     Name: E5-OFF             Base Flow(cfs): 0.000         Init Stage(ft): 18.000
    Group: Basin 5                                          Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        18.000          0.0010
        18.500         52.3000
        24.000         54.3000

------------------------------------------------------------------------------------------
     Name: E5-ON              Base Flow(cfs): 0.000         Init Stage(ft): 17.800
    Group: Basin 5                                          Warn Stage(ft): 18.500
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        17.000          0.0010
        17.800          0.7000
        18.500          1.1000
        19.000         10.1400

------------------------------------------------------------------------------------------
     Name: E6-OFF             Base Flow(cfs): 0.000         Init Stage(ft): 18.000
    Group: Basin 6                                          Warn Stage(ft): 24.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
        18.000          0.0010
        18.300         50.0000
        24.000         53.7000

------------------------------------------------------------------------------------------
```

```
      Name: E6-ON               Base Flow(cfs): 0.000          Init Stage(ft): 16.400
     Group: Basin 6                                            Warn Stage(ft): 18.300
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         15.600          0.0010
         16.400          0.7000
         18.200          1.6000
         18.700         10.0300

------------------------------------------------------------------------------------------
      Name: E7-OFF              Base Flow(cfs): 0.000          Init Stage(ft): 16.000
     Group: Basin 7                                            Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         16.900         52.8000
         24.000         54.8000

------------------------------------------------------------------------------------------
      Name: E7-ON               Base Flow(cfs): 0.000          Init Stage(ft): 16.500
     Group: Basin 7                                            Warn Stage(ft): 16.900
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         13.900          0.7000
         16.900          2.2000
         17.300         10.2200

------------------------------------------------------------------------------------------
      Name: E8-OFF              Base Flow(cfs): 0.000          Init Stage(ft): 19.000
     Group: Basin 8                                            Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         19.000          0.0010
         19.900        108.5000
         24.000        110.5000

------------------------------------------------------------------------------------------
      Name: E8-ON               Base Flow(cfs): 0.000          Init Stage(ft): 16.800
     Group: Basin 8                                            Warn Stage(ft): 19.900
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.800          1.5000
         19.900          4.5000
         20.300         20.6300

------------------------------------------------------------------------------------------
```

```
     Name: E9-OFF             Base Flow(cfs): 0.000         Init Stage(ft): 21.000
    Group: Basin 9                                          Warn Stage(ft): 28.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
         21.000          0.0010
         21.100         52.5000
         28.000         54.5000

-------------------------------------------------------------------------------------------
     Name: E9-ON              Base Flow(cfs): 0.000         Init Stage(ft): 20.000
    Group: Basin 9                                          Warn Stage(ft): 22.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
         20.000          0.7000
         22.000          1.7000
         22.300          6.3000

-------------------------------------------------------------------------------------------
     Name: LAKE               Base Flow(cfs): 0.000         Init Stage(ft): 16.000
    Group: BASE                                             Warn Stage(ft): 18.000
     Type: Stage/Area


     Stage(ft)        Area(ac)
--------------- ---------------
         16.000          3.4000
         18.000          3.4000

-------------------------------------------------------------------------------------------
     Name: LAT D              Base Flow(cfs): 0.000         Init Stage(ft): 16.000
    Group: BASE                                             Warn Stage(ft): 16.000
     Type: Time/Stage


     Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          16.000
         999.00          16.000

-------------------------------------------------------------------------------------------
     Name: LAT-C              Base Flow(cfs): 0.000         Init Stage(ft): 16.000
    Group: BASE                                             Warn Stage(ft): 16.000
     Type: Time/Stage


     Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          16.000
         999.00          16.000

-------------------------------------------------------------------------------------------
     Name: LAT-G              Base Flow(cfs): 0.000         Init Stage(ft): 19.000
    Group: BASE                                             Warn Stage(ft): 19.000
     Type: Time/Stage
```

```
      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          19.000
         999.00          19.000

------------------------------------------------------------------------------------------
      Name: LAT-L              Base Flow(cfs): 0.000          Init Stage(ft): 16.000
     Group: BASE                                              Warn Stage(ft): 16.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          16.000
         999.00          16.000

------------------------------------------------------------------------------------------
      Name: P-LAKE             Base Flow(cfs): 0.000          Init Stage(ft): 16.000
     Group: BASE                                              Warn Stage(ft): 18.000
      Type: Stage/Area

According to Permit No. 18847, Lake A provides water quality treatment and attenuation for the Vero Lakes Estate as well as CR-510. The approach to meet water quality requ

      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          5.3000
         18.000          5.8000

------------------------------------------------------------------------------------------
      Name: P-LAT D            Base Flow(cfs): 0.000          Init Stage(ft): 16.000
     Group: BASE                                              Warn Stage(ft): 16.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          16.000
         999.00          16.000

------------------------------------------------------------------------------------------
      Name: P-LAT-C            Base Flow(cfs): 0.000          Init Stage(ft): 16.000
     Group: BASE                                              Warn Stage(ft): 16.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          16.000
         999.00          16.000

------------------------------------------------------------------------------------------
      Name: P-LAT-G            Base Flow(cfs): 0.000          Init Stage(ft): 19.000
     Group: BASE                                              Warn Stage(ft): 19.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00          19.000
         999.00          19.000
```

Name: P-LAT-L Base Flow(cfs): 0.000 Init Stage(ft): 16.000
Group: BASE Warn Stage(ft): 16.000
Type: Time/Stage

Time(hrs)	Stage(ft)
0.00	16.000
999.00	16.000

Name: P1-OFFSITE Base Flow(cfs): 0.000 Init Stage(ft): 16.000
Group: Basin 1 Warn Stage(ft): 24.000
Type: Stage/Area

Stage(ft)	Area(ac)
16.000	0.0010
17.600	71.5000
24.000	73.5000

Name: P1-ONSITE Base Flow(cfs): 0.000 Init Stage(ft): 18.100
Group: Basin 1 Warn Stage(ft): 18.900
Type: Stage/Area

Stage(ft)	Area(ac)
15.900	0.0010
18.100	0.0600
18.700	2.5300
18.900	3.1700

Name: P1-POND Base Flow(cfs): 0.000 Init Stage(ft): 16.000
Group: BASE Warn Stage(ft): 18.000
Type: Stage/Area

According to Permit No. 56415, existing Pond D has a surplus capacity of 2.94 ac-ft. (total lake volume of 4.23 ac-ft. - treatment volume of 1.29 ac-ft. provided for CR-51

Stage(ft)	Area(ac)
16.000	2.1000
18.000	2.1000

Name: P10-OFF Base Flow(cfs): 0.000 Init Stage(ft): 23.000
Group: Basin 10 Warn Stage(ft): 26.000
Type: Stage/Area

Stage(ft)	Area(ac)
15.500	0.0010
24.000	0.0010
24.600	16.7000
26.000	18.7000

```
-----------------------------------------------------------------------------------------
      Name: P10-ON              Base Flow(cfs): 0.000         Init Stage(ft): 24.000
     Group: Basin 10                                          Warn Stage(ft): 24.800
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         24.000          0.1200
         24.600          5.1000
         24.800          6.4700

-----------------------------------------------------------------------------------------
      Name: P10-POND            Base Flow(cfs): 0.000         Init Stage(ft): 20.000
     Group: Basin 10                                          Warn Stage(ft): 22.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         20.000          1.1000
         21.500          1.1000

-----------------------------------------------------------------------------------------
      Name: P2-OFF              Base Flow(cfs): 0.000         Init Stage(ft): 18.000
     Group: Basin 2                                           Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         17.900          0.0010
         18.000        156.4000
         24.000        158.4000

-----------------------------------------------------------------------------------------
      Name: P2-ON               Base Flow(cfs): 0.000         Init Stage(ft): 18.500
     Group: Basin 2                                           Warn Stage(ft): 19.300
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         18.500          0.1200
         19.100          5.2400
         19.300          6.5800

-----------------------------------------------------------------------------------------
      Name: P2-POND             Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: Basin 2                                           Warn Stage(ft): 17.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          1.7000
         17.000          1.7000
```

```
----------------------------------------------------------------------------------------------
      Name: P3-OFF              Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: Basin 3                                           Warn Stage(ft): 24.000
      Type: Stage/Area
```

Stage(ft)	Area(ac)
16.000	0.0010
17.900	182.2000
24.000	184.2000

```
----------------------------------------------------------------------------------------------
      Name: P3-ON               Base Flow(cfs): 0.000         Init Stage(ft): 20.500
     Group: Basin 3                                           Warn Stage(ft): 21.300
      Type: Stage/Area
```

Stage(ft)	Area(ac)
16.000	0.0010
20.500	0.1400
21.100	6.0900
21.300	7.6500

```
----------------------------------------------------------------------------------------------
      Name: P4-LAKE             Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: BASE                                              Warn Stage(ft): 18.000
      Type: Stage/Area
```

According to Permit No. 95794, Lake 5 and Lake 6 of the Bluewater Bay PUD are providing 3.18 ac-ft. of treatment volume for CR-510.

Stage(ft)	Area(ac)
16.000	5.6000
18.000	5.6000

```
----------------------------------------------------------------------------------------------
      Name: P4-OFF              Base Flow(cfs): 0.000         Init Stage(ft): 19.500
     Group: Basin 4                                           Warn Stage(ft): 24.000
      Type: Stage/Area
```

Stage(ft)	Area(ac)
19.500	0.0010
20.000	159.2000
24.000	161.2000

```
----------------------------------------------------------------------------------------------
      Name: P4-ON               Base Flow(cfs): 0.000         Init Stage(ft): 19.900
     Group: Basin 4                                           Warn Stage(ft): 20.700
      Type: Stage/Area
```

Stage(ft)	Area(ac)
16.000	0.0010
19.900	0.1200
20.500	5.3300
20.700	6.6900

```
------------------------------------------------------------------------------------------
      Name: P5-OFF              Base Flow(cfs): 0.000         Init Stage(ft): 17.700
     Group: Basin 5                                           Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         17.700         52.3000
         24.000         54.3000

------------------------------------------------------------------------------------------
      Name: P5-ON               Base Flow(cfs): 0.000         Init Stage(ft): 18.400
     Group: Basin 5                                           Warn Stage(ft): 19.300
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         18.400          0.1200
         19.100          8.8100
         19.300         10.1400

------------------------------------------------------------------------------------------
      Name: P5-POND             Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: Basin 5                                           Warn Stage(ft): 17.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          1.6000
         17.000          1.7000

------------------------------------------------------------------------------------------
      Name: P6-OFF              Base Flow(cfs): 0.000         Init Stage(ft): 18.000
     Group: Basin 6                                           Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         18.000          0.0010
         18.300         51.7000
         24.000         53.7000

------------------------------------------------------------------------------------------
      Name: P6-ON               Base Flow(cfs): 0.000         Init Stage(ft): 18.900
     Group: Basin 6                                           Warn Stage(ft): 19.800
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         18.900          0.1200
         19.600          8.7100
         19.800         10.0300
```

```
------------------------------------------------------------------------------------------
      Name: P6-POND              Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: Basin 6                                             Warn Stage(ft): 17.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          1.6000
         17.000          1.7000

------------------------------------------------------------------------------------------
      Name: P7-OFF               Base Flow(cfs): 0.000         Init Stage(ft): 17.000
     Group: Basin 7                                             Warn Stage(ft): 24.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         16.900         52.8000
         24.000         54.8000

------------------------------------------------------------------------------------------
      Name: P7-ON                Base Flow(cfs): 0.000         Init Stage(ft): 18.500
     Group: Basin 7                                             Warn Stage(ft): 19.400
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          0.0010
         18.500          0.1200
         19.200          8.8800
         19.400         10.2200

------------------------------------------------------------------------------------------
      Name: P7-POND              Base Flow(cfs): 0.000         Init Stage(ft): 16.000
     Group: Basin 7                                             Warn Stage(ft): 18.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.000          1.6000
         17.000          1.7000

------------------------------------------------------------------------------------------
      Name: P7-REG SWALE         Base Flow(cfs): 0.000         Init Stage(ft): 16.500
     Group: Basin 7                                             Warn Stage(ft): 18.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------

------------------------------------------------------------------------------------------
      Name: P8-OFF               Base Flow(cfs): 0.000         Init Stage(ft): 16.500
     Group: Basin 8                                             Warn Stage(ft): 24.000
      Type: Stage/Area
```

```
      Stage(ft)        Area(ac)
--------------- ---------------
         16.500          0.0010
         17.700        108.5000
         24.000        110.5000

------------------------------------------------------------------------------------------
      Name: P8-ON              Base Flow(cfs): 0.000          Init Stage(ft): 19.300
     Group: Basin 8                                           Warn Stage(ft): 20.200
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         19.300          0.2500
         20.000         17.9300
         20.200         20.6300

------------------------------------------------------------------------------------------
      Name: P8-POND            Base Flow(cfs): 0.000          Init Stage(ft): 16.500
     Group: Basin 8                                           Warn Stage(ft): 18.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         16.500          3.3000
         17.500          3.4000

------------------------------------------------------------------------------------------
      Name: P8-REG SWALE       Base Flow(cfs): 0.000          Init Stage(ft): 16.500
     Group: Basin 8                                           Warn Stage(ft): 19.300
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------

------------------------------------------------------------------------------------------
      Name: P9-OFF             Base Flow(cfs): 0.000          Init Stage(ft): 18.500
     Group: Basin 9                                           Warn Stage(ft): 28.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         18.500          0.0010
         23.400         52.5000
         28.000         54.5000

------------------------------------------------------------------------------------------
      Name: P9-ON              Base Flow(cfs): 0.000          Init Stage(ft): 21.500
     Group: Basin 9                                           Warn Stage(ft): 22.300
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
```

```
         21.500          0.1200
         22.100          4.9700
         22.300          6.3000

------------------------------------------------------------------------------------------
      Name: P9-POND             Base Flow(cfs): 0.000         Init Stage(ft): 18.500
     Group: Basin 9                                           Warn Stage(ft): 20.000
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------
         18.500          1.4000
         19.500          1.6000

------------------------------------------------------------------------------------------
      Name: P9-REG SWALE        Base Flow(cfs): 0.000         Init Stage(ft): 18.500
     Group: Basin 9                                           Warn Stage(ft): 21.500
      Type: Stage/Area


      Stage(ft)        Area(ac)
--------------- ---------------

==========================================================================================
==== Pipes ===============================================================================
==========================================================================================

         Name: 4-LAKE_LAT D       From Node: 4-LAKE            Length(ft): 2420.00
        Group: Basin 2              To Node: LAT D                  Count: 1
                                                         Friction Equation: Automatic
              UPSTREAM      DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                  Flow: Both
     Span(in): 48.00         48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00         48.00                          Exit Loss Coef: 0.10
   Invert(ft): 15.900        15.600                         Bend Loss Coef: 0.00
  Manning's N: 0.024000      0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: E1-OFF_E1-ON       From Node: E1-OFFSITE        Length(ft): 26.00
        Group: Basin 1              To Node: E1-ONSITE              Count: 1
                                                         Friction Equation: Automatic
              UPSTREAM      DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                  Flow: Both
     Span(in): 18.00         18.00                      Entrance Loss Coef: 0.50
     Rise(in): 18.00         18.00                          Exit Loss Coef: 0.10
   Invert(ft): 19.000        18.000                         Bend Loss Coef: 0.00
  Manning's N: 0.024000      0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                        Stabilizer Option: None
```

```
Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


-----------------------------------------------------------------------------------------------------
         Name: E1-ON_1-LATD        From Node: E1-ONSITE          Length(ft): 20.00
        Group: Basin 1               To Node: LAT D                   Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 18.00          18.00                      Entrance Loss Coef: 0.50
     Rise(in): 18.00          18.00                          Exit Loss Coef: 1.00
   Invert(ft): 18.000         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


-----------------------------------------------------------------------------------------------------
         Name: E1-ON_1-POND        From Node: E1-ONSITE          Length(ft): 530.00
        Group: Basin 1               To Node: 1-POND                  Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 36.00          36.00                      Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                          Exit Loss Coef: 0.10
   Invert(ft): 18.000         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


-----------------------------------------------------------------------------------------------------
         Name: E1-POND_P-LAT D     From Node: 1-POND             Length(ft): 1225.00
        Group: Basin 1               To Node: LAT D                   Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 48.00          48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                          Exit Loss Coef: 0.10
   Invert(ft): 18.000         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
```

```
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: E2-OFF_E2-ON       From Node: E2-OFF            Length(ft): 30.00
        Group: Basin 2              To Node: E2-ON                  Count: 4
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 18.00          18.00                      Entrance Loss Coef: 0.50
     Rise(in): 18.00          18.00                          Exit Loss Coef: 0.10
   Invert(ft): 17.000         16.800                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: E3-OFF_E3-ON       From Node: E3-OFF            Length(ft): 200.00
        Group: Basin 3              To Node: E3-ON                  Count: 8
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 18.00          18.00                      Entrance Loss Coef: 0.50
     Rise(in): 18.00          18.00                          Exit Loss Coef: 0.10
   Invert(ft): 19.000         18.700                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: LAKE_LAT D         From Node: LAKE              Length(ft): 400.00
        Group: Basin 2              To Node: LAT D                  Count: 1
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 48.00          48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                          Exit Loss Coef: 0.10
```

```
   Invert(ft): 15.900         15.600                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P-LAKE_P-LAT D      From Node: P-LAKE            Length(ft): 400.00
        Group: Basin 2               To Node: P-LAT D                Count: 1
                                                           Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                  Flow: Both
     Span(in): 48.00          48.00                       Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                           Exit Loss Coef: 0.10
   Invert(ft): 15.900         15.600                          Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                      Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                          Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P1-OFF_P1-ON        From Node: P1-OFFSITE        Length(ft): 1280.00
        Group: Basin 1               To Node: P-LAT D                Count: 4
                                                           Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                  Flow: Both
     Span(in): 36.00          36.00                       Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                           Exit Loss Coef: 0.10
   Invert(ft): 17.000         15.900                          Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                      Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                          Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P1-ON_P1-LATD       From Node: P1-ONSITE         Length(ft): 1280.00
        Group: Basin 1               To Node: P-LAT D                Count: 4
                                                           Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
```

```
     Geometry: Circular       Circular                          Flow: Both
     Span(in): 36.00          36.00                Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                    Exit Loss Coef: 1.00
   Invert(ft): 18.000         15.900                   Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                 Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P1-ON_P1-POND      From Node: P1-ONSITE         Length(ft): 530.00
        Group: Basin 1              To Node: P1-POND                Count: 4
                                                        Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                               Flow: Both
     Span(in): 36.00          36.00                Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                    Exit Loss Coef: 0.10
   Invert(ft): 18.000         15.900                   Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                 Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P1-POND_P-LAT D    From Node: P1-POND           Length(ft): 26540.00
        Group: Basin 2              To Node: P-LAT D                Count: 4
                                                        Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                               Flow: Both
     Span(in): 48.00          48.00                Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                    Exit Loss Coef: 0.10
   Invert(ft): 18.000         15.900                   Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000               Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                   Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                 Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P10-ON_P10-POND    From Node: P10-ON            Length(ft): 2710.00
```

```
       Group: Basin 10             To Node: P10-POND             Count: 4
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                               Flow: Both
    Span(in): 36.00          36.00                    Entrance Loss Coef: 0.50
    Rise(in): 36.00          36.00                        Exit Loss Coef: 0.10
  Invert(ft): 23.900         19.500                       Bend Loss Coef: 0.00
 Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                     Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
        Name: P10-POND_P-LAT      From Node: P10-POND          Length(ft): 1250.00
       Group: Basin 10             To Node: P-LAT-G              Count: 1
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                               Flow: Both
    Span(in): 36.00          36.00                    Entrance Loss Coef: 0.50
    Rise(in): 36.00          36.00                        Exit Loss Coef: 0.10
  Invert(ft): 19.800         19.000                       Bend Loss Coef: 0.00
 Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                     Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
        Name: P2-OFF_P-LAT D      From Node: P2-OFF            Length(ft): 26540.00
       Group: Basin 2              To Node: P-LAT D              Count: 4
                                                       Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM               Solution Algorithm: Most Restrictive
    Geometry: Circular       Circular                               Flow: Both
    Span(in): 48.00          48.00                    Entrance Loss Coef: 0.50
    Rise(in): 48.00          48.00                        Exit Loss Coef: 0.10
  Invert(ft): 18.000         15.900                       Bend Loss Coef: 0.00
 Manning's N: 0.024000       0.024000                   Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000          0.000                       Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000          0.000                     Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall
```

```
----------------------------------------------------------------------------------------------------
         Name: P2-OND_P2-POND      From Node: P2-ON            Length(ft): 2654.00
        Group: Basin 2               To Node: P2-POND               Count: 4
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 48.00          48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                          Exit Loss Coef: 0.10
   Invert(ft): 18.400         15.000                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P2-POND_P2-END      From Node: P2-POND          Length(ft): 1500.00
        Group: Basin 2               To Node: P-LAT D               Count: 1
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 48.00          48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                          Exit Loss Coef: 0.10
   Invert(ft): 15.900         15.500                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P3-OFF_P3-ON        From Node: P3-OFF           Length(ft): 200.00
        Group: Basin 3               To Node: P-LAKE                Count: 5
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 18.00          18.00                      Entrance Loss Coef: 0.50
     Rise(in): 18.00          18.00                          Exit Loss Coef: 0.10
   Invert(ft): 17.000         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
```

```
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P3-ON_P3-POND       From Node: P3-ON             Length(ft): 2654.00
        Group: Basin 3               To Node: P-LAKE                 Count: 4
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 24.00          24.00                      Entrance Loss Coef: 0.50
     Rise(in): 24.00          24.00                          Exit Loss Coef: 0.10
   Invert(ft): 20.000         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P4-LAKE_P-LAT D     From Node: P4-LAKE           Length(ft): 2420.00
        Group: Basin 2               To Node: P-LAT D                Count: 1
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 48.00          48.00                      Entrance Loss Coef: 0.50
     Rise(in): 48.00          48.00                          Exit Loss Coef: 0.10
   Invert(ft): 15.900         15.600                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P4-ON_P4-LAKE       From Node: P4-ON             Length(ft): 2700.00
        Group: Basin 4               To Node: P4-LAKE                Count: 4
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 24.00          24.00                      Entrance Loss Coef: 0.50
     Rise(in): 24.00          24.00                          Exit Loss Coef: 0.10
   Invert(ft): 19.500         15.900                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
```

```
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P5-ON_P5-POND       From Node: P5-ON             Length(ft): 2630.00
        Group: Basin 5               To Node: P5-POND               Count: 4
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 36.00         36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00         36.00                         Exit Loss Coef: 0.10
   Invert(ft): 18.300        15.000                        Bend Loss Coef: 0.00
  Manning's N: 0.024000      0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P5-POND_P5-LAT      From Node: P5-POND           Length(ft): 1650.00
        Group: Basin 5               To Node: P-LAT-C               Count: 1
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 36.00         36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00         36.00                         Exit Loss Coef: 0.10
   Invert(ft): 15.900        15.500                        Bend Loss Coef: 0.00
  Manning's N: 0.024000      0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P6-ON_P6-POND       From Node: P6-ON             Length(ft): 2600.00
        Group: Basin 6               To Node: P6-POND               Count: 4
                                                        Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                Flow: Both
     Span(in): 36.00         36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00         36.00                         Exit Loss Coef: 0.10
   Invert(ft): 18.800        15.000                        Bend Loss Coef: 0.00
  Manning's N: 0.024000      0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000         0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000         0.000                       Stabilizer Option: None
```

```
Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P6-POND_P6-LAT      From Node: P6-POND           Length(ft): 1600.00
        Group: Basin 6               To Node: P-LAT-C                Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 36.00          36.00                      Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                          Exit Loss Coef: 0.10
   Invert(ft): 15.900         15.500                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P7-ON_P7-POND       From Node: P7-ON             Length(ft): 2650.00
        Group: Basin 7               To Node: P7-POND                Count: 4
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 36.00          36.00                      Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                          Exit Loss Coef: 0.10
   Invert(ft): 18.400         15.000                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                         Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                       Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P7-POND_P7-REG      From Node: P7-POND           Length(ft): 100.00
        Group: Basin 7               To Node: P7-REG SWALE           Count: 1
                                                          Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                 Flow: Both
     Span(in): 36.00          36.00                      Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                          Exit Loss Coef: 0.10
   Invert(ft): 15.900         15.400                         Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                     Outlet Ctrl Spec: Use dc or tw
```

```
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P8-ON_P8-POND       From Node: P8-ON             Length(ft): 5350.00
        Group: Basin 8               To Node: P8-POND                Count: 4
                                                         Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                         Exit Loss Coef: 0.10
   Invert(ft): 19.200         16.000                        Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P8-POND_P8-REG      From Node: P8-POND           Length(ft): 100.00
        Group: Basin 8               To Node: P8-REG SWALE           Count: 1
                                                         Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                         Exit Loss Coef: 0.10
   Invert(ft): 16.400         16.000                        Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                    Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                        Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P9-ON_P9-POND       From Node: P9-ON             Length(ft): 2640.00
        Group: Basin 9               To Node: P9-POND                Count: 4
                                                         Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                Flow: Both
     Span(in): 36.00          36.00                     Entrance Loss Coef: 0.50
```

```
     Rise(in): 36.00          36.00                          Exit Loss Coef: 0.10
    Invert(ft): 21.400        18.000                         Bend Loss Coef: 0.00
   Manning's N: 0.024000      0.024000                     Outlet Ctrl Spec: Use dc or tw
  Top Clip(in): 0.000         0.000                         Inlet Ctrl Spec: Use dc
  Bot Clip(in): 0.000         0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


----------------------------------------------------------------------------------------------------
         Name: P9-POND_P9-REG      From Node: P9-POND           Length(ft): 100.00
        Group: Basin 9               To Node: P9-REG SWALE           Count: 1
                                                           Friction Equation: Automatic
               UPSTREAM       DOWNSTREAM                  Solution Algorithm: Most Restrictive
     Geometry: Circular       Circular                                  Flow: Both
     Span(in): 36.00          36.00                       Entrance Loss Coef: 0.50
     Rise(in): 36.00          36.00                           Exit Loss Coef: 0.10
   Invert(ft): 18.400         18.000                          Bend Loss Coef: 0.00
  Manning's N: 0.024000       0.024000                      Outlet Ctrl Spec: Use dc or tw
 Top Clip(in): 0.000          0.000                          Inlet Ctrl Spec: Use dc
 Bot Clip(in): 0.000          0.000                        Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


==========================================================================================
==== Channels ============================================================================
==========================================================================================

          Name: E10-ON_E10-END      From Node: E10-ON           Length(ft): 2710.00
         Group: Basin 10              To Node: LAT-G                 Count: 1

                UPSTREAM       DOWNSTREAM                  Friction Equation: Automatic
      Geometry: Trapezoidal    Trapezoidal                Solution Algorithm: Automatic
    Invert(ft): 19.300         19.000                                   Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                     Contraction Coef: 0.100
   Manning's N: 0.012000       0.012000                       Expansion Coef: 0.300
  Top Clip(ft): 0.000          0.000                      Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000          0.000                          Exit Loss Coef: 1.000
     Main XSec:                                             Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                              Inlet Ctrl Spec: Use dc
     Aux XSec1:                                            Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 6.000          6.000
  LtSdSlp(h/v): 0.25           0.25
  RtSdSlp(h/v): 0.25           0.25
```

```
----------------------------------------------------------------------------------------------------
         Name: E2-ON_E2-END       From Node: E2-ON            Length(ft): 2654.00
        Group: Basin_2              To Node: LAT D                 Count: 2

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
  Invert(ft): 16.800         15.900                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
         Name: E3-ON_E3-END       From Node: E3-ON            Length(ft): 3086.00
        Group: Basin_3              To Node: LAKE                  Count: 2

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
  Invert(ft): 18.500         17.000                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 8.000          8.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
         Name: E4-ON_E4-END       From Node: E4-ON            Length(ft): 2700.00
        Group: Basin_4              To Node: 4-LAKE                Count: 2

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
  Invert(ft): 18.400         16.000                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
```

```
Bot Width(ft): 6.000         6.000
 LtSdSlp(h/v): 0.25          0.25
 RtSdSlp(h/v): 0.25          0.25


----------------------------------------------------------------------------------------------------
         Name: E5-ON_E5-END       From Node: E5-ON            Length(ft): 2630.00
        Group: Basin 5              To Node: LAT-C                 Count: 2

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
   Invert(ft): 17.800         15.900                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                           Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                            Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
         Name: E6-ON_E6-END1      From Node: E6-ON            Length(ft): 1300.00
        Group: Basin 6              To Node: LAT-C                 Count: 2

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
   Invert(ft): 16.400         15.900                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                           Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                            Inlet Ctrl Spec: Use dc
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
         Name: E6-ON_E6-END2      From Node: E6-ON            Length(ft): 1300.00
        Group: Basin 6              To Node: LAT-L                 Count: 2

               UPSTREAM       DOWNSTREAM                Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal              Solution Algorithm: Automatic
   Invert(ft): 16.400         15.900                                 Flow: Both
TClpInitZ(ft): 9999.000       9999.000                   Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                     Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                    Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                        Exit Loss Coef: 1.000
    Main XSec:                                           Outlet Ctrl Spec: Use dc or tw
```

```
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                         Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25

--------------------------------------------------------------------------------------------------
         Name: E7-ON_E7-END        From Node: E7-ON            Length(ft): 2650.00
        Group: Basin 7               To Node: LAT-L                 Count: 2

               UPSTREAM       DOWNSTREAM                   Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal                 Solution Algorithm: Automatic
   Invert(ft): 16.500         15.900                                    Flow: Both
TClpInitZ(ft): 9999.000       9999.000                      Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                        Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                   Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                       Exit Loss Coef: 1.000
    Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                         Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25

--------------------------------------------------------------------------------------------------
         Name: E8-ON_E7-ON         From Node: E8-ON            Length(ft): 5350.00
        Group: Basin 8               To Node: E7-ON                 Count: 2

               UPSTREAM       DOWNSTREAM                   Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal                 Solution Algorithm: Automatic
   Invert(ft): 16.800         16.500                                    Flow: Both
TClpInitZ(ft): 9999.000       9999.000                      Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                        Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                   Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                       Exit Loss Coef: 1.000
    Main XSec:                                          Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                           Inlet Ctrl Spec: Use dc
    Aux XSec1:                                         Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 6.000          6.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25

--------------------------------------------------------------------------------------------------
         Name: E9-ON_E8-ON         From Node: E9-ON            Length(ft): 2640.00
        Group: Basin 9               To Node: E8-ON                 Count: 2

               UPSTREAM       DOWNSTREAM                   Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal                 Solution Algorithm: Automatic
```

```
    Invert(ft): 20.000          16.700                         Flow: Both
 TClpInitZ(ft): 9999.000        9999.000           Contraction Coef: 0.100
   Manning's N: 0.012000        0.012000             Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000            Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                Exit Loss Coef: 1.000
     Main XSec:                                    Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                     Inlet Ctrl Spec: Use dc
     Aux XSec1:                                   Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 6.000           6.000
  LtSdSlp(h/v): 0.25            0.25
  RtSdSlp(h/v): 0.25            0.25


----------------------------------------------------------------------------------------------------
          Name: P10-OFF_P10-END     From Node: P10-OFF           Length(ft): 2710.00
         Group: Basin 10              To Node: P-LAT-G                Count: 1

                UPSTREAM        DOWNSTREAM                Friction Equation: Automatic
      Geometry: Trapezoidal     Trapezoidal              Solution Algorithm: Automatic
    Invert(ft): 23.900          19.000                                 Flow: Both
 TClpInitZ(ft): 9999.000        9999.000                   Contraction Coef: 0.100
   Manning's N: 0.012000        0.012000                     Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                        Exit Loss Coef: 1.000
     Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
     Aux XSec1:                                           Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 4.000           4.000
  LtSdSlp(h/v): 0.25            0.25
  RtSdSlp(h/v): 0.25            0.25


----------------------------------------------------------------------------------------------------
          Name: P5-OFF_P5-END       From Node: P5-OFF            Length(ft): 2630.00
         Group: Basin 5               To Node: P-LAT-C                Count: 2

                UPSTREAM        DOWNSTREAM                Friction Equation: Automatic
      Geometry: Trapezoidal     Trapezoidal              Solution Algorithm: Automatic
    Invert(ft): 17.600          15.900                                 Flow: Both
 TClpInitZ(ft): 9999.000        9999.000                   Contraction Coef: 0.100
   Manning's N: 0.012000        0.012000                     Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000                    Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                        Exit Loss Coef: 1.000
     Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
     Aux XSec1:                                           Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 4.000           4.000
  LtSdSlp(h/v): 0.25            0.25
  RtSdSlp(h/v): 0.25            0.25
```

```
-----------------------------------------------------------------------------------------------------
         Name: P6-OFF_P6-END1      From Node: P6-OFF            Length(ft): 1300.00
        Group: Basin 6               To Node: P-LAT-C                Count: 2

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
   Invert(ft): 17.900         15.900                                  Flow: Both
TClpInitZ(ft): 9999.000       9999.000                    Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                      Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                     Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                         Exit Loss Coef: 1.000
    Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
    Aux XSec1:                                           Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 4.000          4.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


-----------------------------------------------------------------------------------------------------
         Name: P6-OFF_P6-END2      From Node: P6-OFF            Length(ft): 1300.00
        Group: Basin 6               To Node: P-LAT-L                Count: 2

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
   Invert(ft): 17.900         15.900                                  Flow: Both
TClpInitZ(ft): 9999.000       9999.000                    Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                      Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                     Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                         Exit Loss Coef: 1.000
    Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
    Aux XSec1:                                           Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft): 4.000          4.000
 LtSdSlp(h/v): 0.25           0.25
 RtSdSlp(h/v): 0.25           0.25


-----------------------------------------------------------------------------------------------------
         Name: P7-REG_P7-END       From Node: P7-REG SWALE      Length(ft): 2650.00
        Group: Basin 7               To Node: P-LAT-L                Count: 1

               UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
   Invert(ft): 16.000         15.900                                  Flow: Both
TClpInitZ(ft): 9999.000       9999.000                    Contraction Coef: 0.100
  Manning's N: 0.012000       0.012000                      Expansion Coef: 0.300
 Top Clip(ft): 0.000          0.000                     Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                         Exit Loss Coef: 1.000
    Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
    Aux XSec1:                                           Stabilizer Option: None
 AuxElev2(ft):
    Aux XSec2:
Top Width(ft):
    Depth(ft):
```

```
 Bot Width(ft): 4.000          4.000
  LtSdSlp(h/v): 0.25           0.25
  RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
          Name: P8-REG_P7-REG      From Node: P8-REG SWALE      Length(ft): 5350.00
         Group: Basin 8              To Node: P7-REG SWALE           Count: 1

                UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
      Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
    Invert(ft): 16.400         15.900                                  Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                    Contraction Coef: 0.100
   Manning's N: 0.012000       0.012000                      Expansion Coef: 0.300
  Top Clip(ft): 0.000          0.000                     Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000          0.000                         Exit Loss Coef: 1.000
     Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
     Aux XSec1:                                           Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 4.000          4.000
  LtSdSlp(h/v): 0.25           0.25
  RtSdSlp(h/v): 0.25           0.25


----------------------------------------------------------------------------------------------------
          Name: P9-REG_P8-REG      From Node: P9-REG SWALE      Length(ft): 2640.00
         Group: Basin 9              To Node: P8-REG SWALE           Count: 1

                UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
      Geometry: Trapezoidal    Trapezoidal               Solution Algorithm: Automatic
    Invert(ft): 18.500         16.500                                  Flow: Both
 TClpInitZ(ft): 9999.000       9999.000                    Contraction Coef: 0.100
   Manning's N: 0.012000       0.012000                      Expansion Coef: 0.300
  Top Clip(ft): 0.000          0.000                     Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000          0.000                         Exit Loss Coef: 1.000
     Main XSec:                                            Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft):                                             Inlet Ctrl Spec: Use dc
     Aux XSec1:                                           Stabilizer Option: None
  AuxElev2(ft):
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft): 4.000          4.000
  LtSdSlp(h/v): 0.25           0.25
  RtSdSlp(h/v): 0.25           0.25


==========================================================================================
==== Weirs ===============================================================================
==========================================================================================

         Name: E10-OFF_E10-ON      From Node: E10-OFF
        Group: Basin 10              To Node: E10-ON
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 24.00
                    Rise(in): 12.00
                  Invert(ft): 22.700
```

```
     Control Elevation(ft): 22.700
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
       Name: E10_Lat G weir      From Node: E10-ON
      Group: Basin 10              To Node: LAT-G
       Flow: Both                    Count: 1
       Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 3.00
                  Rise(in): 3.00
                Invert(ft): 19.300
     Control Elevation(ft): 19.300
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
       Name: E1_Onsite weir      From Node: E1-ONSITE
      Group: Basin 1               To Node: LAT D
       Flow: Both                    Count: 1
       Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 3.00
                  Rise(in): 3.00
                Invert(ft): 16.000
     Control Elevation(ft): 16.000
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
       Name: E1_pondweir         From Node: 1-POND
      Group: Basin 1               To Node: LAT D
       Flow: Both                    Count: 1
       Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 3.00
                  Rise(in): 3.00
                Invert(ft): 16.000
     Control Elevation(ft): 16.000
                                         TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
       Name: E2_weir             From Node: E2-ON
      Group: Basin 2               To Node: LAT D
```

```
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                          TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: E3_weir             From Node: LAKE
        Group: Basin 3               To Node: LAT D
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                          TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: E4-OFF_E4-ON        From Node: E4-OFF
        Group: Basin 4               To Node: E4-ON
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 24.00
                    Rise(in): 12.00
                  Invert(ft): 19.000
       Control Elevation(ft): 19.000
                                          TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: E4_weir             From Node: 4-LAKE
        Group: Basin 4               To Node: LAT D
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                          TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600
```

```
--------------------------------------------------------------------------------------------------
        Name: E5-OFF_E5-ON        From Node: E5-OFF
       Group: Basin 5               To Node: E5-ON
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                   Span(in): 24.00
                   Rise(in): 12.00
                 Invert(ft): 18.000
      Control Elevation(ft): 18.000
                                                TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: E5_weir             From Node: E5-ON
       Group: Basin 5               To Node: LAT-C
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
      Control Elevation(ft): 17.800
                                                TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: E6-OFF_E6-ON        From Node: E6-OFF
       Group: Basin 6               To Node: E6-ON
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                   Span(in): 24.00
                   Rise(in): 12.00
                 Invert(ft): 18.300
      Control Elevation(ft): 18.300
                                                TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: E6_Lat C weir       From Node: E6-ON
       Group: Basin 6               To Node: LAT-C
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
```

```
      Control Elevation(ft): 17.800
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600

----------------------------------------------------------------------------------------------------
        Name: E6_Lat L weir       From Node: E6-ON
       Group: Basin 6               To Node: LAT-L
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
      Control Elevation(ft): 17.800
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600

----------------------------------------------------------------------------------------------------
        Name: E7-OFF_E7-ON        From Node: E7-OFF
       Group: Basin 7               To Node: E7-ON
        Flow: Both                    Count: 1
        Type: Vertical: Fread      Geometry: Rectangular

                   Span(in): 24.00
                   Rise(in): 12.00
                 Invert(ft): 16.900
      Control Elevation(ft): 16.900
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600

----------------------------------------------------------------------------------------------------
        Name: E7_Lat L weir       From Node: E7-ON
       Group: Basin 7               To Node: LAT-L
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
      Control Elevation(ft): 17.800
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600

----------------------------------------------------------------------------------------------------
        Name: E8-OFF_E8-ON        From Node: E8-OFF
       Group: Basin 8               To Node: E8-ON
```

```
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 24.00
                    Rise(in): 12.00
                  Invert(ft): 19.900
       Control Elevation(ft): 19.900
                                                TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600

--------------------------------------------------------------------------------------------------
         Name: E9-OFF_E9-ON        From Node: E9-OFF
        Group: Basin 9               To Node: E9-ON
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 24.00
                    Rise(in): 12.00
                  Invert(ft): 19.800
       Control Elevation(ft): 21.600
                                                TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600

--------------------------------------------------------------------------------------------------
         Name: P10_Bleeder         From Node: P10-POND
        Group: Basin 10              To Node: P-LAT-G
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 20.000
       Control Elevation(ft): 20.000
                                                TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600

--------------------------------------------------------------------------------------------------
         Name: P10_Grate           From Node: P10-POND
        Group: Basin 10              To Node: P-LAT-G
         Flow: Both                    Count: 1
         Type: Horizontal           Geometry: Rectangular

                    Span(in): 36.00
                    Rise(in): 36.00
                  Invert(ft): 21.500
       Control Elevation(ft): 21.500
                                                TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600
```

```
--------------------------------------------------------------------------------------------------
        Name: P10_Lat G weir      From Node: P10-OFF
       Group: Basin 10              To Node: P-LAT-G
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
       Control Elevation(ft): 17.800
                                             TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: P1_Offsite weir     From Node: P1-OFFSITE
       Group: Basin 1               To Node: P-LAT D
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.200
       Control Elevation(ft): 16.200
                                             TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: P1_Onsite weir      From Node: P1-ONSITE
       Group: Basin 1               To Node: P-LAT D
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                             TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


--------------------------------------------------------------------------------------------------
        Name: P1_Pond weir        From Node: P1-POND
       Group: Basin 1               To Node: P-LAT D
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
```

```
      Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P2_Bleeder         From Node: P2-POND
       Group: Basin 2              To Node: P-LAT D
        Flow: Both                   Count: 1
        Type: Vertical: Mavis     Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
      Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P2_Grate           From Node: P2-POND
       Group: Basin 2              To Node: P-LAT D
        Flow: Both                   Count: 1
        Type: Horizontal          Geometry: Rectangular

                   Span(in): 36.00
                   Rise(in): 36.00
                 Invert(ft): 17.000
      Control Elevation(ft): 17.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P2_weir            From Node: P2-OFF
       Group: Basin 2              To Node: P-LAT D
        Flow: Both                   Count: 1
        Type: Vertical: Mavis     Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
      Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P3_weir            From Node: P-LAKE
       Group: Basin 3              To Node: P-LAT D
```

```
        Flow: Both                  Count: 1
        Type: Vertical: Mavis    Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
     Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P4-OFF_P4-ON      From Node: P4-OFF
       Group: Basin 4             To Node: P4-LAKE
        Flow: Both                  Count: 1
        Type: Vertical: Fread    Geometry: Rectangular

                   Span(in): 24.00
                   Rise(in): 12.00
                 Invert(ft): 20.000
     Control Elevation(ft): 20.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P4_weir           From Node: P4-LAKE
       Group: Basin 4             To Node: P-LAT D
        Flow: Both                  Count: 1
        Type: Vertical: Mavis    Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
     Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P5_Bleeder        From Node: P5-POND
       Group: Basin 5             To Node: P-LAT-C
        Flow: Both                  Count: 1
        Type: Vertical: Mavis    Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
     Control Elevation(ft): 16.000
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600
```

```
----------------------------------------------------------------------------------------------------
         Name: P5_Grate            From Node: P5-POND
        Group: Basin 5               To Node: P-LAT-C
         Flow: Both                    Count: 1
         Type: Horizontal           Geometry: Rectangular

                    Span(in): 36.00
                    Rise(in): 36.00
                  Invert(ft): 17.000
       Control Elevation(ft): 17.000
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P5_weir             From Node: P5-OFF
        Group: Basin 5               To Node: P-LAT-C
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P6_Bleeder          From Node: P6-POND
        Group: Basin 6               To Node: P-LAT-C
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.000
       Control Elevation(ft): 16.000
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P6_Grate            From Node: P6-POND
        Group: Basin 6               To Node: P-LAT-C
         Flow: Both                    Count: 1
         Type: Horizontal           Geometry: Rectangular

                    Span(in): 36.00
                    Rise(in): 36.00
                  Invert(ft): 17.000
```

```
     Control Elevation(ft): 17.000
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P6_Lat C weir       From Node: P6-OFF
        Group: Basin 6               To Node: P-LAT-C
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 3.00
                  Rise(in): 3.00
                Invert(ft): 17.800
     Control Elevation(ft): 17.800
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P6_Lat L weir       From Node: P6-OFF
        Group: Basin 6               To Node: P-LAT-L
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                  Span(in): 3.00
                  Rise(in): 3.00
                Invert(ft): 17.800
     Control Elevation(ft): 17.800
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P7-OFF_P7-REG S     From Node: P7-OFF
        Group: Basin 7               To Node: P7-REG SWALE
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                  Span(in): 24.00
                  Rise(in): 12.00
                Invert(ft): 17.000
     Control Elevation(ft): 17.000
                                          TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P7_Bleeder          From Node: P7-POND
        Group: Basin 7               To Node: P7-REG SWALE
```

```
        Flow: Both                   Count: 1
        Type: Vertical: Mavis     Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 16.000
      Control Elevation(ft): 16.000
                                           TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P7_Grate           From Node: P7-POND
       Group: Basin 7              To Node: P7-REG SWALE
        Flow: Both                   Count: 1
        Type: Horizontal          Geometry: Rectangular

                   Span(in): 36.00
                   Rise(in): 36.00
                 Invert(ft): 17.000
      Control Elevation(ft): 17.000
                                           TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P7_Lat L weir      From Node: P7-REG SWALE
       Group: Basin 7              To Node: P-LAT-L
        Flow: Both                   Count: 1
        Type: Vertical: Mavis     Geometry: Circular

                   Span(in): 3.00
                   Rise(in): 3.00
                 Invert(ft): 17.800
      Control Elevation(ft): 17.800
                                           TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
        Name: P8-OFF_P8-REG S    From Node: P8-OFF
       Group: Basin 8              To Node: P8-REG SWALE
        Flow: Both                   Count: 1
        Type: Vertical: Fread     Geometry: Rectangular

                   Span(in): 24.00
                   Rise(in): 12.00
                 Invert(ft): 16.500
      Control Elevation(ft): 16.500
                                           TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600
```

```
----------------------------------------------------------------------------------------------------
         Name: P8_Bleeder          From Node: P8-POND
        Group: Basin 8               To Node: P8-REG SWALE
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 16.500
       Control Elevation(ft): 16.500
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P8_Grate            From Node: P8-POND
        Group: Basin 8               To Node: P8-REG SWALE
         Flow: Both                    Count: 1
         Type: Horizontal           Geometry: Rectangular

                    Span(in): 36.00
                    Rise(in): 36.00
                  Invert(ft): 17.500
       Control Elevation(ft): 17.500
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P9-OFF_P9-REG S     From Node: P9-OFF
        Group: Basin 9               To Node: P9-REG SWALE
         Flow: Both                    Count: 1
         Type: Vertical: Fread      Geometry: Rectangular

                    Span(in): 24.00
                    Rise(in): 12.00
                  Invert(ft): 18.500
       Control Elevation(ft): 18.500
                                             TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


----------------------------------------------------------------------------------------------------
         Name: P9_Bleeder          From Node: P9-POND
        Group: Basin 9               To Node: P9-REG SWALE
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Circular

                    Span(in): 3.00
                    Rise(in): 3.00
                  Invert(ft): 18.500
```

```
       Control Elevation(ft): 18.500
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600



----------------------------------------------------------------------------------------------------
         Name: P9_Grate           From Node: P9-POND
        Group: Basin 9              To Node: P9-REG SWALE
         Flow: Both                   Count: 1
         Type: Horizontal          Geometry: Rectangular

                    Span(in): 36.00
                    Rise(in): 36.00
                  Invert(ft): 19.500
       Control Elevation(ft): 19.500
                                              TABLE
             Bottom Clip(in): 0.000
                Top Clip(in): 0.000
         Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600



==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: 025Y024H
     Filename: T:\1603_Metric\CR 510\Analysis\ICPR\Basin - Copy\025Y024H.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: FDOT-24
    Rainfall Amount(in): 8.60

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 100Y072H
     Filename: T:\1603_Metric\CR 510\Analysis\ICPR\Basin\100Y072H.R32

      Override Defaults: Yes
    Storm Duration(hrs): 72.00
          Rainfall File: FDOT-72
    Rainfall Amount(in): 13.75

Time(hrs)       Print Inc(min)
--------------- ---------------
77.000          5.00

==========================================================================================
==== Routing Simulations =================================================================
==========================================================================================

         Name: 025Y024H           Hydrology Sim: 025Y024H
     Filename: T:\1603_Metric\CR 510\Analysis\ICPR\Basin - Copy\025Y024H.I32

      Execute: Yes        Restart: No           Patch: No
  Alternative: No
```

```
       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
   Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 30.00
     Min Calc Time(sec): 0.2500               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:

025 yr / 024 hr

Time(hrs)       Print Inc(min)
--------------- ---------------
999.000         5.000

Group           Run
--------------- -----
BASE            Yes
Basin 1         Yes
Basin 10        Yes
Basin 2         Yes
Basin 3         Yes
Basin 4         Yes
Basin 5         Yes
Basin 6         Yes
Basin 7         Yes
Basin 8         Yes
Basin 9         Yes


----------------------------------------------------------------------------------------------------
        Name: 100Y072H           Hydrology Sim: 100Y072H
    Filename: T:\1603_Metric\CR 510\Analysis\ICPR\Basin\100Y072H.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(ft): 1.00                     Delta Z Factor: 0.00500
   Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 77.00
     Min Calc Time(sec): 0.2500               Max Calc Time(sec): 60.0000
       Boundary Stages:                          Boundary Flows:

100 yr / 072 hr

Time(hrs)       Print Inc(min)
--------------- ---------------
999.000         5.000

Group           Run
--------------- -----
BASE            Yes
Basin 1         Yes
Basin 10        Yes
Basin 2         Yes
Basin 3         Yes
Basin 4         Yes
Basin 5         Yes
Basin 6         Yes
Basin 7         Yes
Basin 8         Yes
Basin 9         Yes
```

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
1-POND	BASE	025Y024H	30.00	16.806	18.000	0.0012	83534	12.15	1.739	30.00	0.195
4-LAKE	BASE	025Y024H	30.00	17.817	18.000	0.0028	170809	12.13	8.932	30.00	6.191
E1-OFFSITE	Basin 1	025Y024H	24.38	19.603	24.000	0.0011	3137835	12.00	60.318	24.21	1.497
E1-ONSITE	Basin 1	025Y024H	12.15	18.635	19.100	0.0035	22025	12.00	4.347	12.15	3.978
E10-OFF	Basin 10	025Y024H	24.13	23.011	24.000	0.0014	748289	12.00	15.646	24.13	1.110
E10-ON	Basin 10	025Y024H	12.35	20.034	22.700	0.0018	55034	12.00	5.477	12.35	4.297
E2-OFF	Basin 2	025Y024H	24.25	17.592	24.000	0.0012	6806947	12.00	129.992	24.18	5.392
E2-ON	Basin 2	025Y024H	19.16	17.349	18.100	0.0014	59995	19.00	7.690	19.16	7.441
E3-OFF	Basin 3	025Y024H	24.13	19.852	24.000	0.0011	7944614	12.00	156.406	24.13	10.923
E3-ON	Basin 3	025Y024H	16.23	19.037	19.500	0.0014	73017	21.00	12.400	19.36	12.854
E4-OFF	Basin 4	025Y024H	24.21	20.020	24.000	0.0015	6955714	12.00	132.290	24.21	6.568
E4-ON	Basin 4	025Y024H	21.13	18.773	19.900	0.0009	56279	12.00	9.306	12.13	8.932
E5-OFF	Basin 5	025Y024H	22.15	18.210	24.000	0.0004	957281	12.00	3.529	22.15	0.616
E5-ON	Basin 5	025Y024H	12.10	18.241	18.500	0.0013	57746	11.91	7.796	12.10	7.283
E6-OFF	Basin 6	025Y024H	24.23	18.770	24.000	0.0012	2191290	12.00	44.069	24.23	2.062
E6-ON	Basin 6	025Y024H	12.10	16.775	18.300	0.0012	54666	12.00	8.771	12.10	8.346
E7-OFF	Basin 7	025Y024H	26.86	17.121	24.000	0.0015	2302675	12.00	45.295	29.51	0.653
E7-ON	Basin 7	025Y024H	16.65	17.324	16.900	0.0017	517305	12.10	17.345	16.65	12.152
E8-ON	Basin 8	025Y024H	12.93	18.040	19.900	0.0029	169909	12.00	22.482	12.78	16.362
E9-OFF	Basin 9	025Y024H	24.18	21.677	28.000	0.0012	2294187	12.00	45.422	24.18	2.672
E9-ON	Basin 9	025Y024H	12.10	20.228	22.000	0.0008	51959	12.00	5.305	12.08	5.042
LAKE	BASE	025Y024H	24.91	17.704	18.000	0.0027	174533	19.36	12.854	24.91	11.071
LAT D	BASE	025Y024H	0.00	16.000	16.000	0.0000	15825	22.16	24.446	0.00	0.000
LAT-C	BASE	025Y024H	0.00	16.000	16.000	0.0000	18127	12.10	11.456	0.00	0.000
LAT-G	BASE	025Y024H	0.00	19.000	19.000	0.0000	407	12.35	4.297	0.00	0.000
LAT-L	BASE	025Y024H	0.00	16.000	16.000	0.0000	18219	16.08	14.860	0.00	0.000
P-LAKE	BASE	025Y024H	30.00	17.122	18.000	0.0014	252924	16.26	7.765	30.00	4.967
P-LAT D	BASE	025Y024H	0.00	16.000	16.000	0.0000	113833	22.23	11.838	0.00	0.000
P-LAT-C	BASE	025Y024H	0.00	16.000	16.000	0.0000	19078	19.08	24.323	0.00	0.000
P-LAT-G	BASE	025Y024H	0.00	19.000	19.000	0.0000	945	16.41	10.392	0.00	0.000
P-LAT-L	BASE	025Y024H	0.00	16.000	16.000	0.0000	10715	21.15	18.863	0.00	0.000
P1-OFFSITE	Basin 1	025Y024H	24.38	17.397	24.000	0.0020	2723243	12.00	60.318	24.38	1.466
P1-ONSITE	Basin 1	025Y024H	12.10	18.332	18.900	-0.0046	50622	12.00	3.988	12.20	3.819
P1-POND	BASE	025Y024H	22.61	16.557	18.000	0.0012	118158	12.31	2.382	22.61	0.155
P10-OFF	Basin 10	025Y024H	16.15	24.525	26.000	0.0050	642832	12.00	15.646	16.15	7.436
P10-ON	Basin 10	025Y024H	12.70	24.372	24.800	0.0008	152757	12.00	5.556	12.53	3.975
P10-POND	Basin 10	025Y024H	17.10	20.990	22.000	0.0020	64657	12.53	3.975	17.10	2.989
P2-OFF	Basin 2	025Y024H	24.56	18.596	24.000	0.0011	6954556	12.00	129.992	24.56	1.397
P2-ON	Basin 2	025Y024H	13.15	18.977	19.300	0.0010	199039	12.00	8.232	12.58	5.555
P2-POND	Basin 2	025Y024H	16.73	17.115	17.500	0.0025	96148	12.58	5.555	16.73	4.554
P3-OFF	Basin 3	025Y024H	24.28	17.557	24.000	0.0021	6504508	12.00	156.406	22.35	5.674
P3-ON	Basin 3	025Y024H	12.58	20.776	21.300	-0.0027	135274	12.00	6.569	15.65	5.062
P4-LAKE	BASE	025Y024H	30.00	16.793	18.000	0.0009	256500	17.05	4.647	30.00	1.271
P4-OFF	Basin 4	025Y024H	24.56	20.358	24.000	0.0011	6942556	12.00	132.290	24.56	1.373
P4-ON	Basin 4	025Y024H	13.08	20.232	20.700	-0.0017	140813	12.00	5.752	15.21	4.026
P5-OFF	Basin 5	025Y024H	22.16	18.190	24.000	0.0011	2296162	12.00	44.562	22.16	7.329
P5-ON	Basin 5	025Y024H	15.21	18.905	19.300	0.0010	291573	12.00	8.625	13.25	4.865
P5-POND	Basin 5	025Y024H	17.56	17.134	17.500	0.0024	90774	13.25	4.865	17.56	4.375
P6-OFF	Basin 6	025Y024H	19.05	18.409	24.000	0.0008	2264716	12.00	44.069	19.05	17.941
P6-ON	Basin 6	025Y024H	15.06	19.381	19.800	0.0009	275269	12.00	8.383	13.15	5.059
P6-POND	Basin 6	025Y024H	16.70	17.143	17.500	0.0023	90515	13.15	5.059	16.70	4.628
P7-OFF	Basin 7	025Y024H	29.90	17.663	24.000	0.0012	2309325	12.00	45.295	13.98	1.457
P7-ON	Basin 7	025Y024H	15.36	19.017	19.400	0.0010	299884	12.00	8.698	13.23	4.724
P7-POND	Basin 7	025Y024H	24.20	17.707	18.000	0.0029	87287	13.23	4.724	17.58	3.152
P7-REG SWALE	Basin 7	025Y024H	24.26	17.703	18.500	0.0029	19609	24.01	10.520	24.26	10.514
P8-ON	Basin 8	025Y024H	19.28	20.007	20.200	0.0012	813739	12.00	17.557	16.18	6.073
P9-OFF	Basin 9	025Y024H	21.56	20.539	28.000	0.0034	951675	12.00	45.422	22.13	9.827
P9-ON	Basin 9	025Y024H	13.11	21.898	22.300	0.0012	158203	12.00	5.408	12.90	3.684
P9-POND	Basin 9	025Y024H	16.21	19.544	20.000	0.0021	84984	12.90	3.684	15.58	3.272
P9-REG SWALE	Basin 9	025Y024H	19.60	19.503	21.500	0.0020	6307	16.75	12.360	16.78	12.359

APPENDIX H

(Geotechnical Data)

H1-H15: Geotechnical Report Excerpts (Apr 2017)

H16-H28: Data from Double Ring Infiltration Test (Oct 2017)

Date: April 12, 2017

Prepared by: **GCME, Inc.**

TO: Metric Engineering, Inc.
13940 SW 136th St #200
Miami, Florida 33186

Attention: Mr. Carlos Rodriguez, P.E.
Transportation Planning Manager

SUBJECT: **Geotechnical Report -Revised**
Roadway Soils Survey and Structures
CR 510 PD&E Study
From CR 512 to 58th Avenue
Indian River County, Florida
FM No.: 405606-2-22-02
GCME Project No.: 2000-01-15013

Dear Mr. Rodriguez

GCME, Inc. has completed the Geotechnical Services Report – Roadway Soils Survey and Structures in connection with the subject project. The purpose of this report is to provide all available existing geotechnical information to the roadway/structural engineers and for preparation of the plans for the proposed improvements (PD&E Study).

This report is updated to incorporate the comments made in reference to our previous report dated December 20, 2016 and the follow up discussion during our meeting with Ms. Maria Formoso, P.E., Mr. Matthew Gisondi, P.E., Mr. Terrance Walters (with FDOT) and you on March 21, 2017, at the FDOT District IV office.

The following report includes the methods of study, evaluations and recommendations concerning geotechnical aspects of the proposed improvements.

The work was completed following our contract with your firm and followed the basic guidelines of the Florida Department of Transportation (FDOT) Soils and Foundations Handbook, 2016. This report is written using English units.

-oo0oo-

We are pleased to be of continued service to Metric Engineering, Inc. and the FDOT. If you have any questions or comments regarding the contents of the following report, please call.

Very truly yours,

GCME, INC.

Zhijun Pan, P.E.
Project Geotechnical Engineer
FL. Reg. No. 70634

Partha Ghosh., P.E.
Principal Engineer
FL Registration No. 51377

ZP/PG: mg
2000-01-15013_PD&E_Geo_Rpt_dt_04-12-17

3.6 Groundwater – Roadway

The depths to the water table was measured in each of the auger borings (drilled for both FDOT and Indian River County projects) and are plotted adjacent to the soil profiles in Appendix – B, Figure 1 through 26. Depth to groundwater measured in the borings drilled along the project corridor ranged between 1.2 and 10 feet below ground surface. However, in many locations, groundwater was not encountered within the depth of the borings. The wide variation in groundwater table depths is attributed to the difference in site grades.

As mentioned earlier, Stanley Consultants, Inc. provided the offset and ground elevation of the boring locations where groundwater was encountered for the FDOT project. The elevation information for the IRC project was provided by the project surveyor. Therefore, based on ground elevation at the boring location, groundwater depths were changed to ground water elevations. The ground elevation and the groundwater elevation for the borings drilled for the FDOT project are presented in Table – F1, Appendix – F. Similarly, the same information for the Indian River County Project are presented in Table – F2, Appendix – F. Based on the review of the groundwater table elevation along the project corridor, we anticipate the estimated seasonal high ground water table (SHGWT) elevation for the project corridor up to approximate station 220+00 to be about +16.00 feet (NAVD), and gradually increasing to an estimated seasonal high groundwater table elevation about +19.00 feet (NAVD) to the end of the project corridor.

Groundwater condition will vary with environmental variation and seasonal condition, such as the frequency and magnitude of rainfall patters, as well as man-made influences, such as existing swells, drainage ponds, and underdrains.

3.7 Roadway Embankment Evaluation

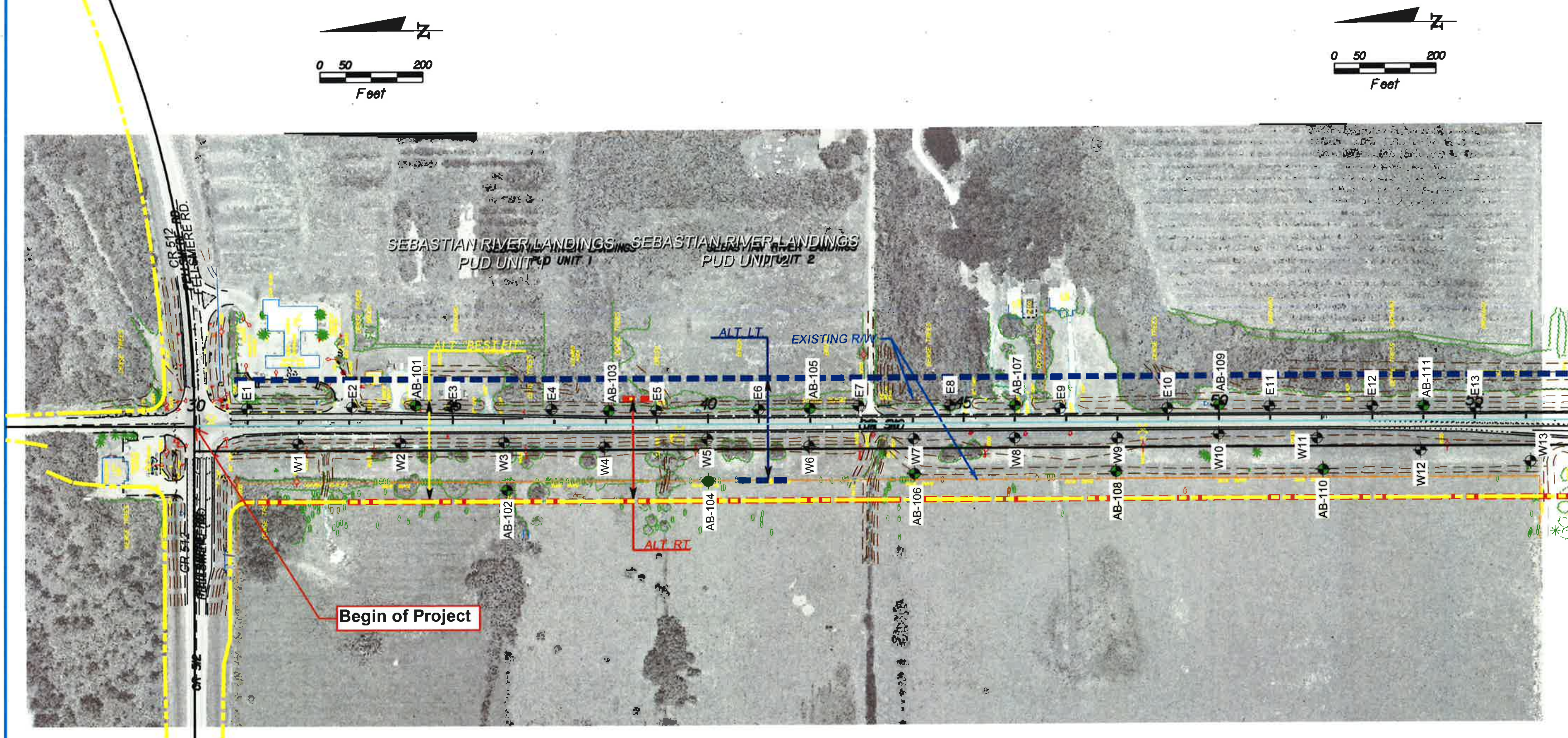
After reviewing the findings of field and laboratory analytical data for this study indicate that the roadway alignment is generally suitable for the planned construction when viewed from a geotechnical engineering perspective. The subsurface conditions of the roadway alignment are not expected to impose any significant constraints or limitations on the design or construction of the planned project from a soil mechanics, foundation engineering or engineering geology standpoint. The position of the groundwater table must also be generally considered during final design phase and construction.

The existing soils along the majority of the project alignments should have modest subgrade strength for pavement support. Subgrade preparation in these areas should consist of normal clearing, stripping, and compacting.

The majority of the project corridor is underlain with interlayering of Strata 1, 2, and 3. Strata 4, 5, 6 and 7 soils were only encountered in some isolated borings.

Stratum 1 is topsoil and shall be removed during clearing and grubbing in accordance with section 110 of the FDOT Standard Specifications.

Stratum 2 consists of select materials and are adequate for subgrade and embankment support.



LEGEND

- Borings Drilled for Indian River County Project
- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

NOTE:

This Boring Location Plan is approximate. We understand that the borings were not actually surveyed.

This Approximate Boring Location Plan is prepared based on an old hard copy of the plan set received during 2004 from the prime consultant for FDOT Project - FPID No.: 405606-1-22-01.

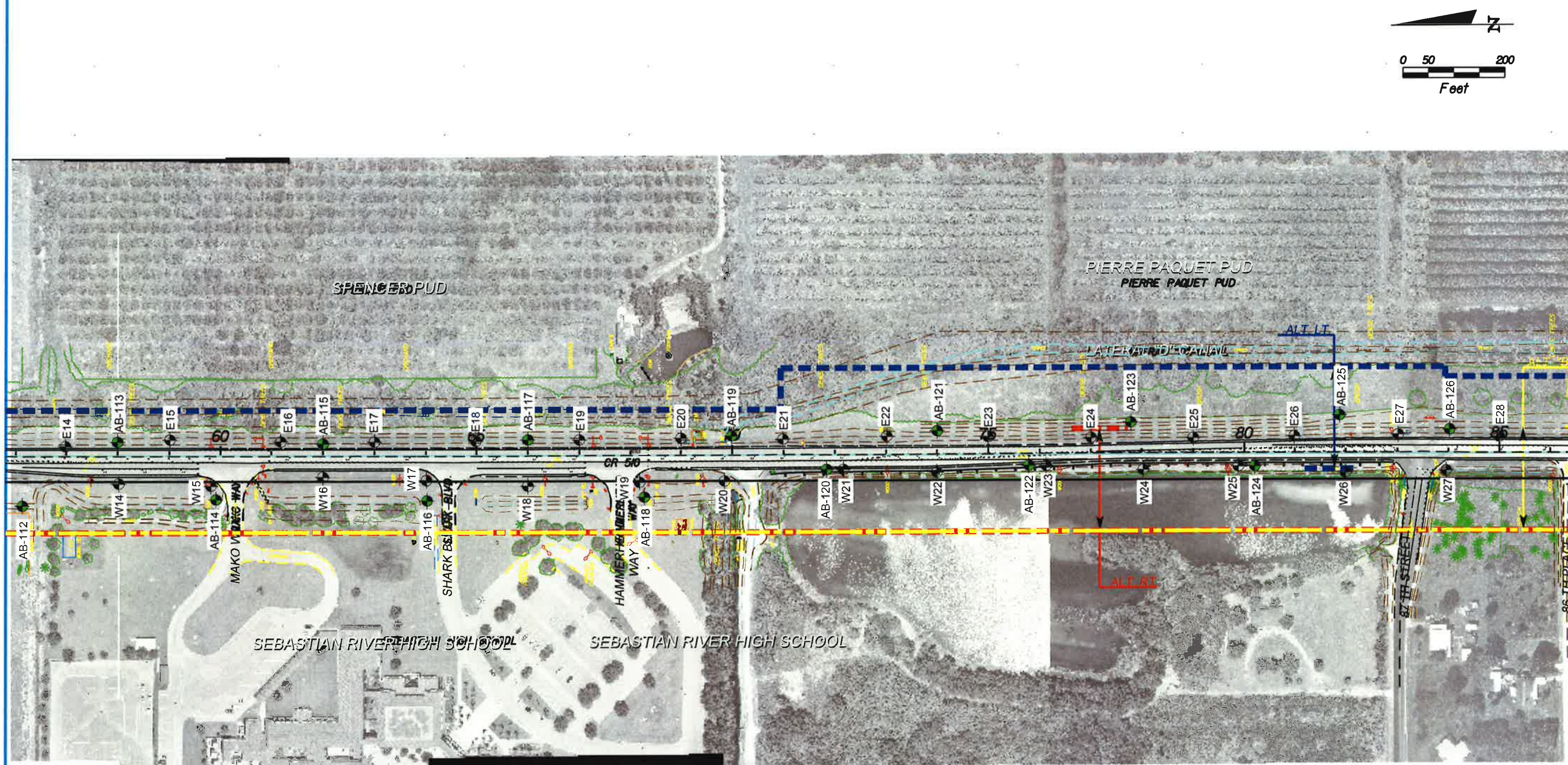
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN
PLATE-1

SHEET NO. 1



LEGEND

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REVISIONS					
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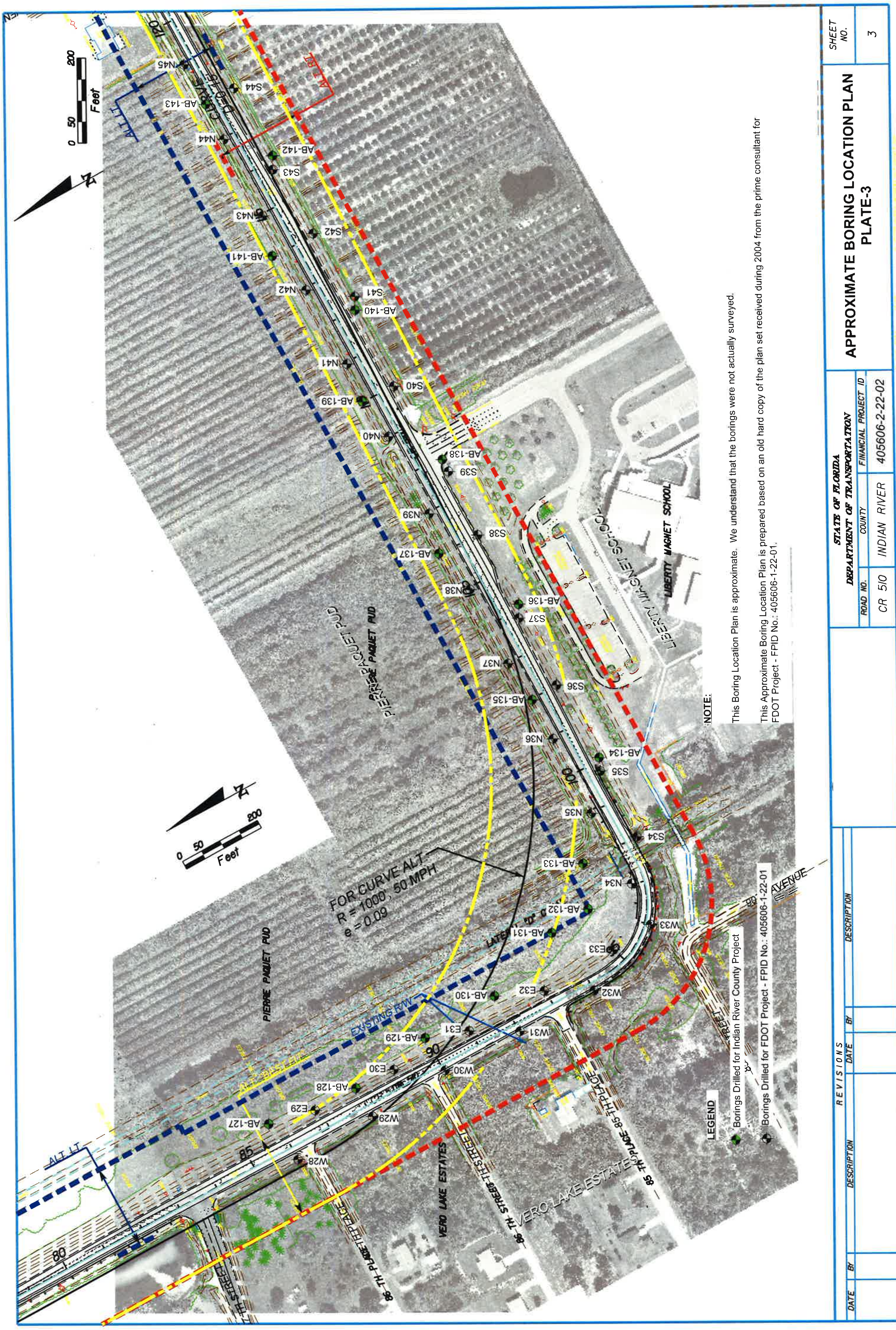
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN
PLATE-2

SHEET NO.
2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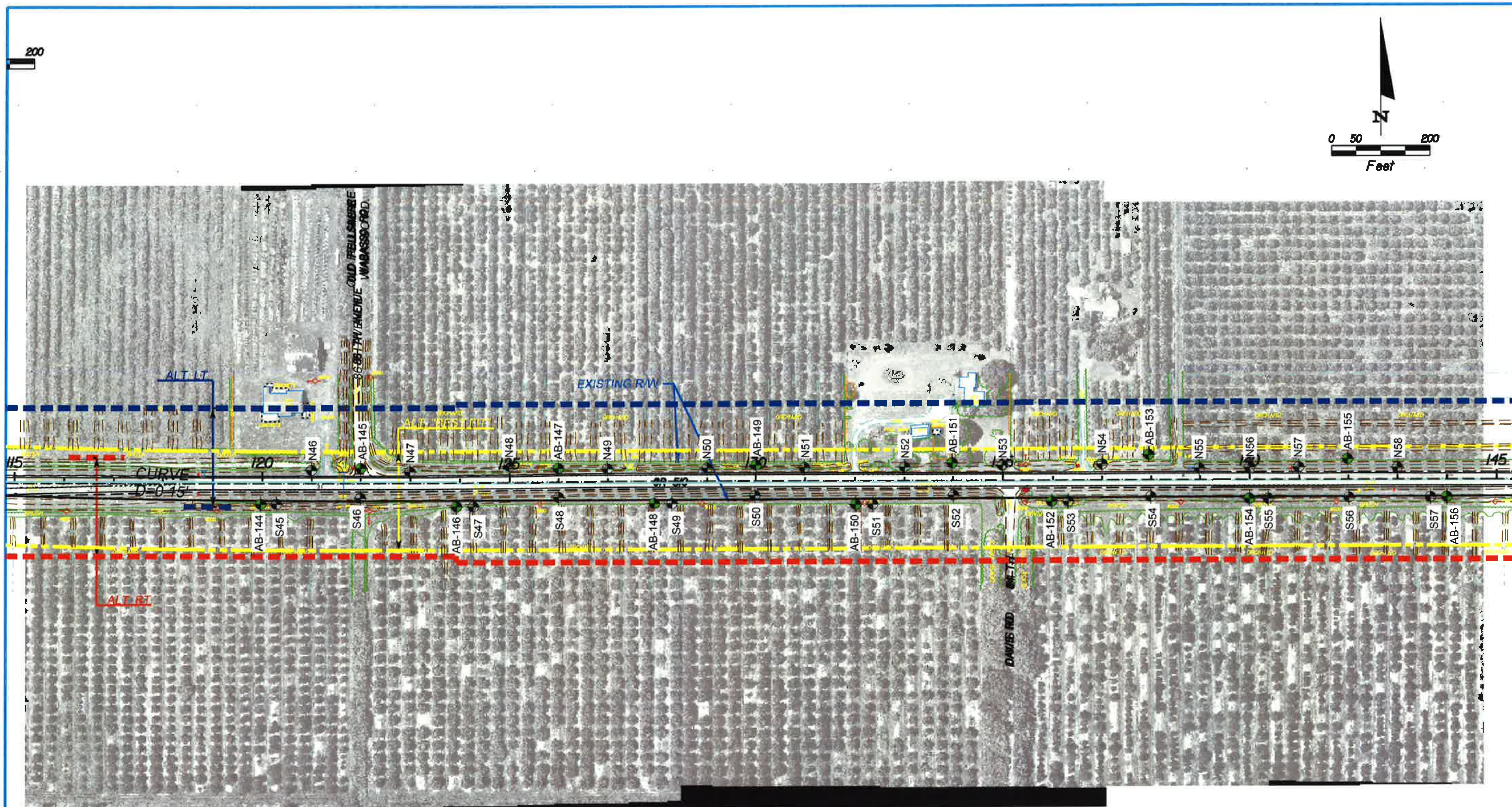
LEGEND
Borings Drilled for Indian River County Project
Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01
FOR CURVE ALT
R = 1000', 50 MPH
e = 0.09
PIERRE PAQUET PUD
LIBERTY MAGNET SCHOOL
VERO LAKE ESTATES
EXISTING R/W
Feet
APPROXIMATE BORING LOCATION PLAN
PLATE-3
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
ROAD NO.
CR 510
COUNTY
INDIAN RIVER
FINANCIAL PROJECT ID
405606-2-22-02
SHEET NO.
3
REVISIONS



LEGEND

- Borings Drilled for Indian River County Project
- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

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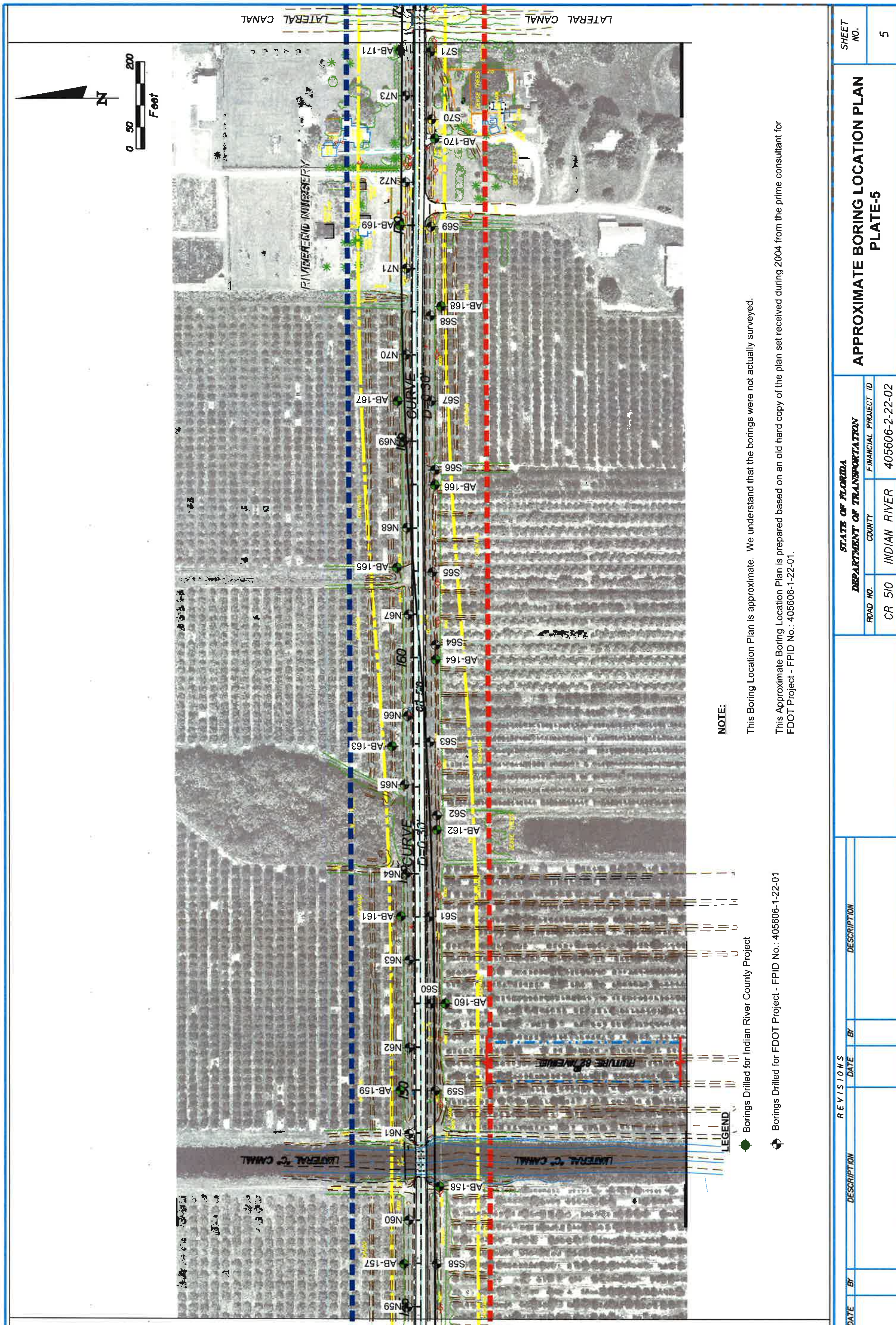
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN
PLATE-4

SHEET NO. 4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Borings Drilled for Indian River County Project
Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01
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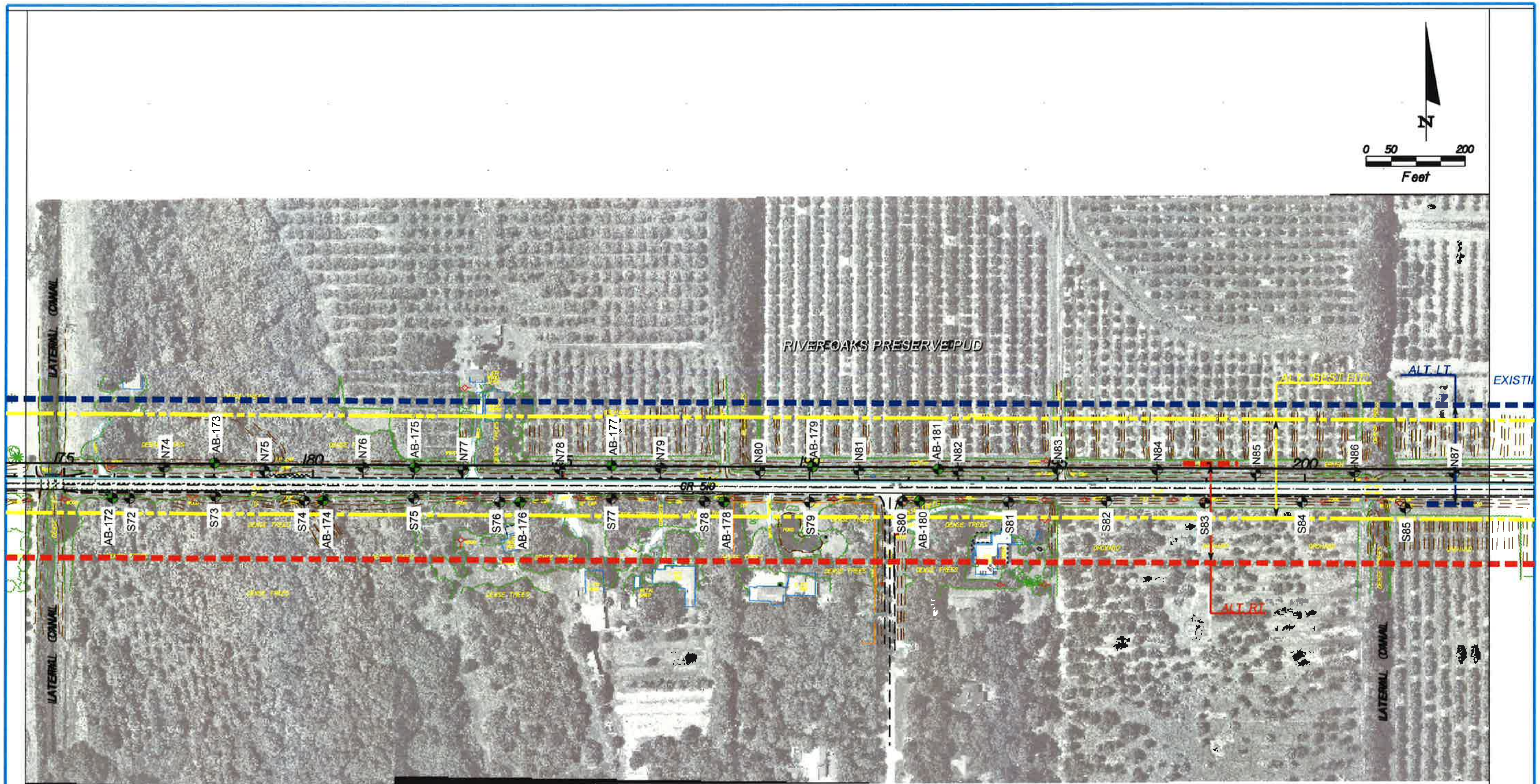
APPROXIMATE BORING LOCATION PLAN
PLATE-5
SHEET NO.
5
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
ROAD NO.
CR 510
COUNTY
INDIAN RIVER
FINANCIAL PROJECT ID
405606-2-22-02
REVISIONS
DATE
BY
DESCRIPTION
LATERAL CANAL
LATERAL "C" CANAL
RIVERBEND NURSERY
FUTURE 82 AVENUE
Feet
0 50 200



LEGEND

- Borings Drilled for Indian River County Project
- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

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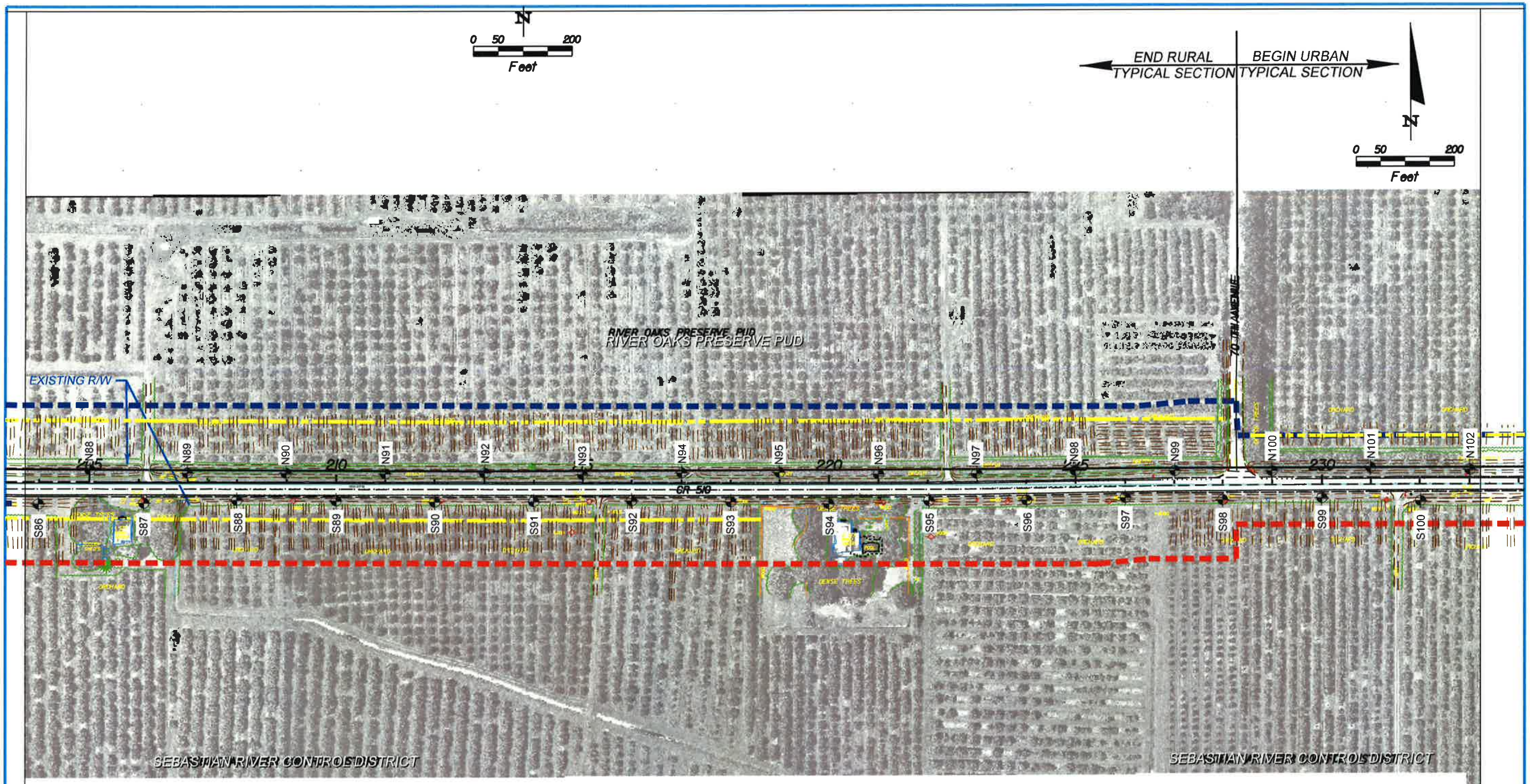
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN PLATE-6

SHEET NO. 6



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- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

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REVISIONS					
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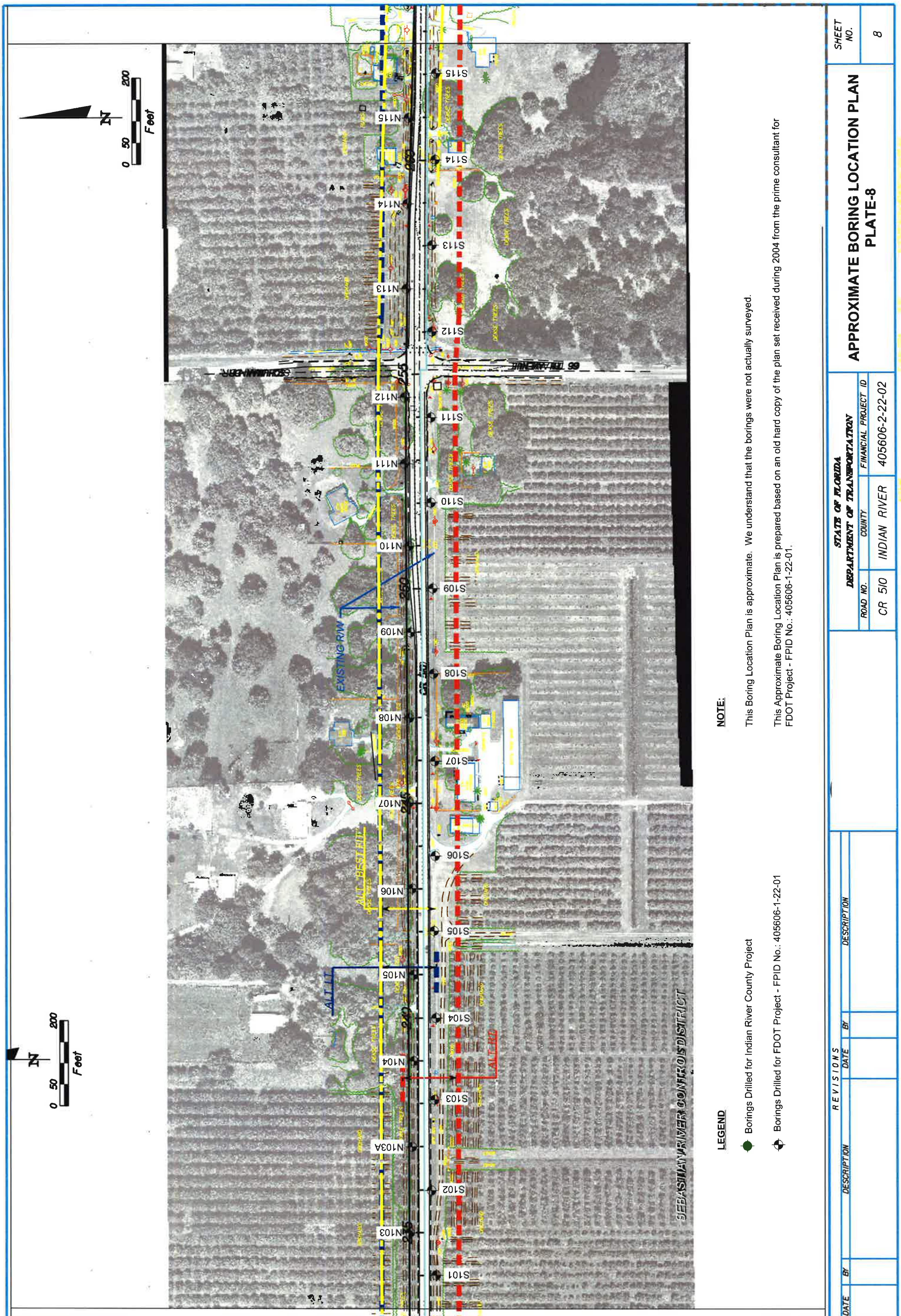
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN PLATE-7

SHEET NO. 7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Borings Drilled for Indian River County Project
Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01
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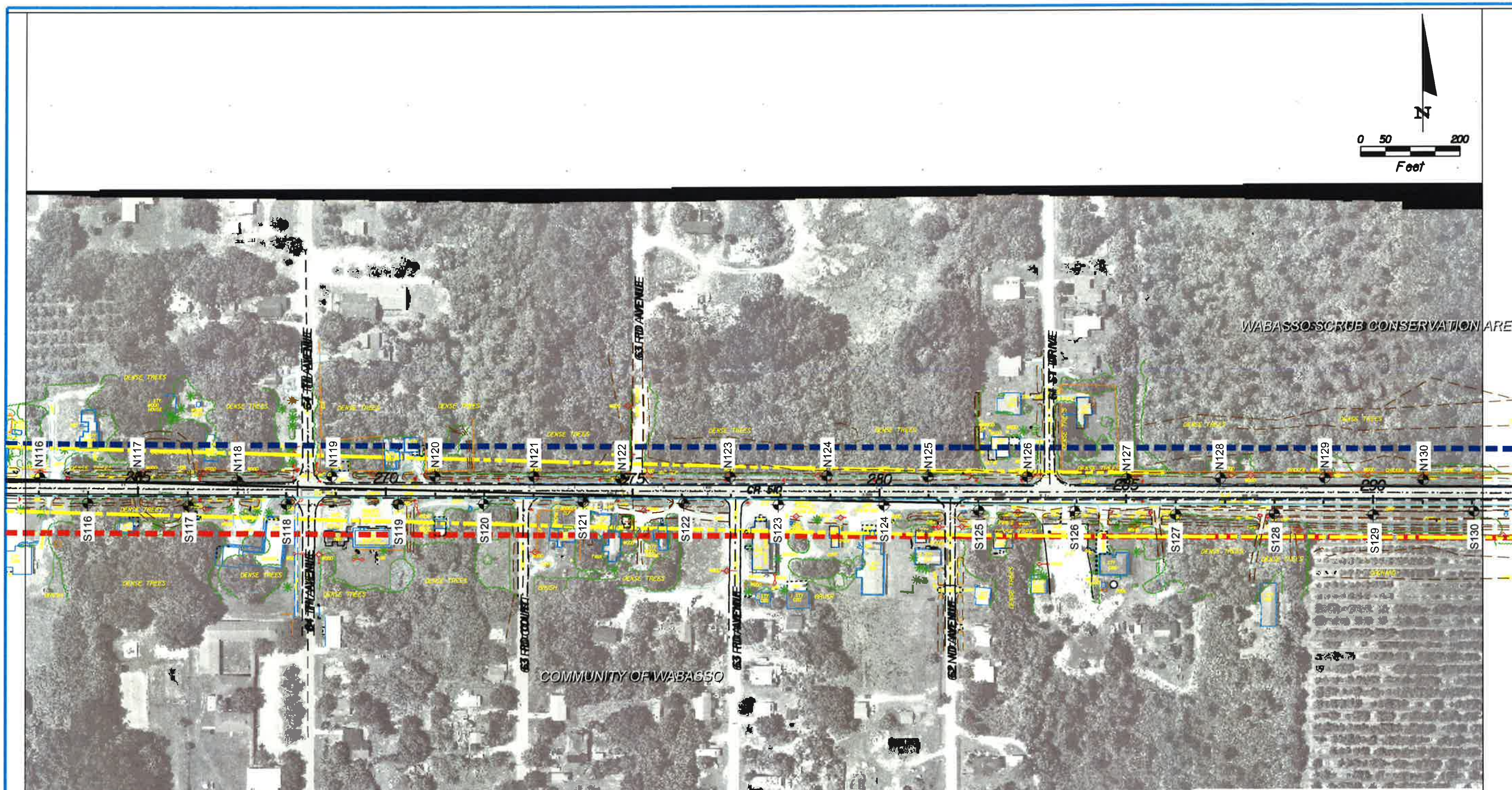
0 50 200
Feet
N
SEBASTIAN RIVER CONTROL DISTRICT
EXISTING R/W
ALT. BEST FIT
ALT. LT.
ALT. RT.
66 TH AVENUE
N103 N103A N104 N105 N106 N107 N108 N109 N110 N111 N112 N113 N114 N115
S101 S102 S103 S104 S105 S106 S107 S108 S109 S110 S111 S112 S113 S114 S115
REVISIONS
DATE BY DESCRIPTION
DATE BY DESCRIPTION
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION
ROAD NO. COUNTY FINANCIAL PROJECT ID
CR 510 INDIAN RIVER 405606-2-22-02
APPROXIMATE BORING LOCATION PLAN
PLATE-8
SHEET NO.
8



LEGEND

- Borings Drilled for Indian River County Project
- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

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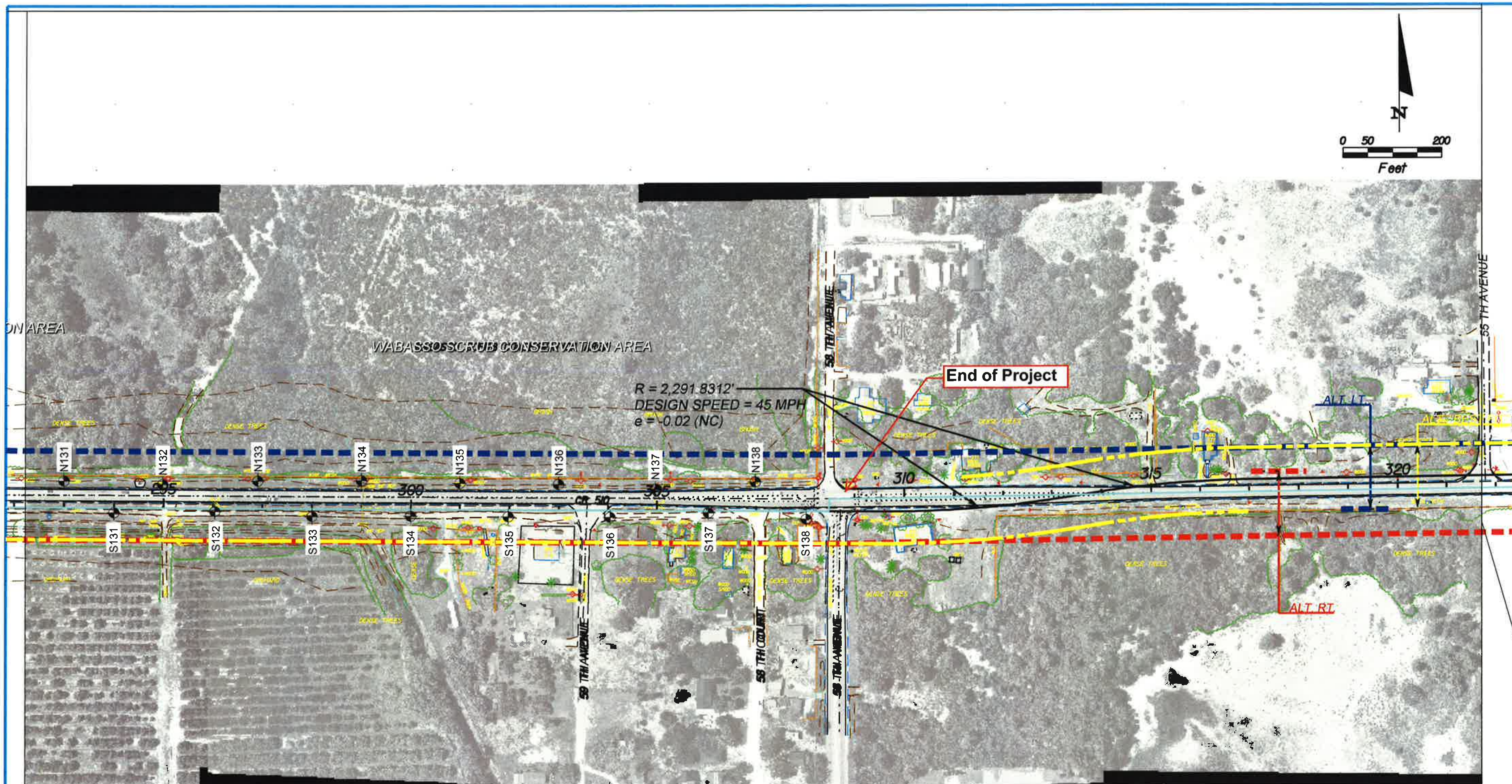
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			APPROXIMATE BORING LOCATION PLAN PLATE-9	SHEET NO.
ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
CR 510	INDIAN RIVER	405606-2-22-02		9



LEGEND

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- Borings Drilled for FDOT Project - FPID No.: 405606-1-22-01

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REVISIONS					
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STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR 510	INDIAN RIVER	405606-2-22-02

APPROXIMATE BORING LOCATION PLAN
PLATE-10

SHEET NO. 10

TABLE - C3

SUMMARY OF CORROSION TEST RESULTS

Reference: FDOT Project (FPID No.: 405606-1-22-01) & Indian River County Project

Boring No.	Station	Depth (feet)	Stratum No.	AASHTO Symbol	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	Substructure Environmental Classification	
									Steel	Concrete
AB-E3*	35+00	4.0-4.5	3	A-2-4	5.6	5,990	105.0	106.0	Extremely Aggressive	Moderately Aggressive
AB-N49*	127+00	4.0-4.5	3	A-2-4	7.0	3,590	90.0	140.0	Moderately Aggressive	Slightly Aggressive
AB-N79*	187+00	1.0-5.0	2	A-3	7.1	5,490	105.0	114.0	Slightly Aggressive	Slightly Aggressive
AB-N85*	199+00	2-4	6	A-4/A-6	7.4	3,890	75.0	125.0	Moderately Aggressive	Slightly Aggressive
AB-N163*	357+00	2.5-4	3	A-2-4	7.9	3,990	105.0	116.0	Moderately Aggressive	Slightly Aggressive
AB-S96*	224+00	0.5-5	3	A-2-4	7.6	-	105.0	106.0	Moderately Aggressive	Slightly Aggressive
AB-S118*	268+00	2-5	2	A-3	6.9	10,000	120.0	130.0	Moderately Aggressive	Slightly Aggressive
AB-S150*	332+00	0.5-3.5	3	A-2-4	7.0	-	105.0	127.0	Moderately Aggressive	Slightly Aggressive
B-102*	97+1□	4.0-4.5	4	A-2-6	7.6	5,190	90.0	132.0	Slightly Aggressive	Slightly Aggressive
B-201*	147+57	3.0-4.0	2	A-3	7.0	6,490	75.0	137.0	Slightly Aggressive	Slightly Aggressive
B-302*	175+29	3.0-4.0	4	A-2-6	7.3	9,690	90.0	127.0	Slightly Aggressive	Slightly Aggressive
TB-1	89+59	8.0-10.0	2	A-3	9.0	8,100	10.0	16.0	Slightly Aggressive	Slightly Aggressive
B-3	180+09	13.5-15.0	3	A-2-4	6.3	1,070	130.0	106.0	Moderately Aggressive	Moderately Aggressive
BC-2	69+46	6.0-8.0	2	A-3	9.1	19,000	8.9	1.5	Slightly Aggressive	Slightly Aggressive
BC-3	179+86	8.0-10.0	2	A-3	4.2	890	11.0	700.0	Extremely Aggressive	Extremely Aggressive
BC-4	89th St. (824+42)	8.0-10.0	2	A-3	8.7	8,300	10.0	13.0	Slightly Aggressive	Slightly Aggressive

" * " - Boring drilled during FDOT Project

□eference□Structure Design Guidelines, Table 1.3.2□1

Table 1.3.2-1 Criteria for Substructure Environmental Classifications

Classification	Environmental Condition	Units	Steel		Concrete	
			Water	Soil	Water	Soil
Extremely Aggressive (If any of these conditions exist)	pH		< 6.0		< 5.0	
	Cl	ppm	> 2000		> 2000	
	SO4	ppm	N.A.		> 1500	> 2000
	Resistivity	Ohm-cm	< 1000		< 500	
Slightly Aggressive (If all of these conditions exist)	pH		> 7.0		> 6.0	
	Cl	ppm	<500		< 500	
	SO4	ppm	N.A.		< 150	< 1000
	Resistivity	Ohm-cm	> 5000		> 3000	
Moderately Aggressive	This classification must be used at all sites not meeting requirements for either slightly aggressive or extremely aggressive environments.					
pH = acidity (-log$_{10}$H+; potential of Hydrogen), Cl = chloride content, SO4 = Sulfate content.						

Table - E1

Borehole Permeability Test Results

Reference: FDOT Project, FPID No.: 405606-1-22-01

BHP Name /Location	Station	Offset*	k (cfs/ft^2)	k (feet/day)
BHP # 1 [E5]	39+00	4 RT	6.94E-05	6.0
BHP # 2 [W10]	50+00	5 LT	1.16E-05	1.0
BHP # 3 [E27]	83+00	8 RT	3.47E-05	3.0
BHP # 4 [W32]	94+00	1 LT	1.15E-05	1.0
BHP # 5 [N51]	131+00	0 LT	1.16E-05	1.0
BHP # 6 [S56]	142+00	2 RT	3.47E-05	3.0
BHP # 7 [N74]	177+00	1 LT	6.14E-06	0.5
BHP # 8 [S89]	210+00	1 RT	1.23E-05	1.1
BHP # 9 [N97]	223+00	1 LT	3.50E-05	3.0
BHP # 10 [S101]	234+00	2 RT	8.02E-05	7.0
BHP # 11 [N121]	273+00	1 LT	3.62E-05	3.1
BHP # 12 [S127]	286+00	2 RT	9.69E-05	8.4
BHP # 13 [N145]	321+00	2 LT	1.53E-05	1.3
BHP # 14 [S165]	362+00	5 RT	2.59E-05	2.2

* Offset measured from edge of pavement

Date: October 26, 2017

Prepared by: **GCME, Inc.**

TO: Metric Engineering, Inc.
13940 SW 136th St. # 200
Miami, Florida 33186

Attention: Mr. Carlos Rodriguez, P.E.
Transportation Planning Manager

SUBJECT: **Geotechnical Services Report**
CR-510 PD&E Study
From CR-512 to 58th Avenue
Indian River County, Florida
GCME Project No.: 2000-01-15013

Dear Mr. Rodriguez,

GCME, Inc. has completed the additional Geotechnical Services Report in connection with the subject project. Five (5) SPT Borings and five (5) Double Ring Infiltration Test (DRIT) were completed at the project site as authorized/requested by your office for the above referenced project. The purpose of this report is to provide existing geotechnical information to the roadway/drainage engineers and for preparation of the plans for the proposed improvements (PD&E Study).

The five (5) SPT borings were drilled to depth of 20 feet below grade. Samples of the in-place materials were recovered with a standard split barrel advanced with a 140-pound hammer falling 30 inches (the SPT after ASTM D 1586). Soil samples were field classified, placed in sealed containers and transported to our laboratory for further analysis by a soils engineer. Classification of the subsoils found in the borings followed the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System.

The Approximate locations of the SPT Boring and the Double Ring Infiltration Test (DRIT) are performed at the locations as requested by your office and presented on Plates 1 thru 4. The Soil Profiles are presented in Figure 1. The laboratory test results are presented in Table 1.

The Double Ring Infiltration Tests (DRIT) were performed at the ground surface in general accordance with the procedures outlined in ASTM Standard Method D-3385. The infiltration test values which were determined from the test results are presented in Table 2 and are graphically presented thereafter.

This report should be considered as an addendum to our previous Geotechnical Services Report – Roadway Soils Survey and Structures dated April 12, 2017 in connection with the subject project.

In the reference report all available groundwater information for the project corridor was present in Appendix – F, Table – F1. Therefore, we have updated this table showing the groundwater table depths and corresponding elevations of the groundwater measured in the five (5) borings drilled in September 2017. The recent borings were drilled after Hurricane Erma passed through South Florida and generally provides an estimation of the anticipated seasonal high groundwater table (SHGWT) along the project corridor. The updated Table – F1 [from previous report] is provided in Appendix – A and the new boring groundwater information is highlighted.

-oo0oo-

We are pleased to be of service to Metric Engineering, Inc. If you have any questions or comments regarding the contents of this report, please call.

Very truly yours,

GCME, INC.

ZHIJUN PAN
LICENSE
No 70634
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

Zhijun Pan, P.E.
Project Engineer
FL Registration No. 70634

Partha Ghosh, P.E.
Principal Engineer
FL Registration No. 51377

ZP/PG: mg
2000-01-15013_DRIT_&_SPT Boring

Attachments:

Plates – 1 thru. 4	Approximate DRIT & Boring Location Plan
Figure – 1	Soil Profiles
Table – 1	Laboratory Test Results
Table – 2	Corrosion Test Results
Table – 3	Double Ring Infiltration Test Results
Appendix – A	Groundwater Information (Table – F1 from previous report updated)

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
					LEGEND: -ROADWAY BORING -DOUBLE RING INFILTRATION TEST

ENGINEER OF RECORD:
PARTHA GHOSH, P.E. LICENSE NO. 51377
GCME, INC.
1730 W. 10TH STREET
RIVIERA BEACH, FLORIDA 33404
CERTIFICATE OF AUTHORIZATION NO. 9076

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR-510	INDIAN RIVER	405606-2-22-02

APPROXIMATE DRIT & BORING LOCATION PLAN PLATE-1

SHEET NO.

REVISIONS						LEGEND	ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			TITLE	SHEET NO.
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	LEGEND: -ROADWAY BORING -DOUBLE RING INFILTRATION TEST	ENGINEER OF RECORD: PARTHA GHOSH, P.E. LICENSE NO. 51377 GCME, INC. 1730 W. 10TH STREET RIVIERA BEACH, FLORIDA 33404 CERTIFICATE OF AUTHORIZATION NO. 9076	ROAD NO.	COUNTY	FINANCIAL PROJECT ID	APPROXIMATE DRIT & BORING LOCATION PLAN PLATE-2	
								CR-510	INDIAN RIVER	405606-2-22-02		

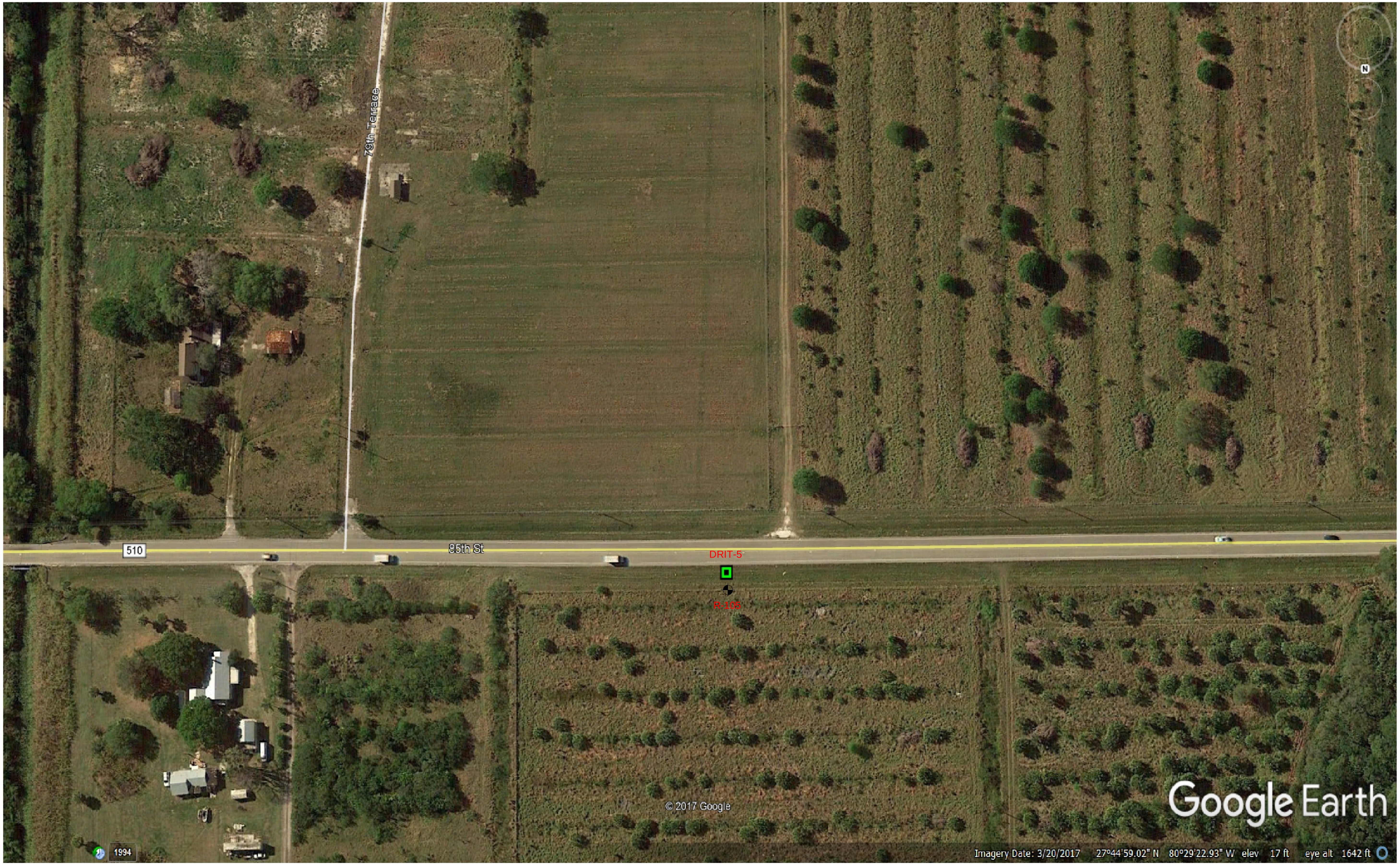
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
					LEGEND: -ROADWAY BORING -DOUBLE RING INFILTRATION TEST

ENGINEER OF RECORD:
PARTHA GHOSH, P.E. LICENSE NO. 51377
GCME, INC.
1730 W. 10TH STREET
RIVIERA BEACH, FLORIDA 33404
CERTIFICATE OF AUTHORIZATION NO. 9076

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR-510	INDIAN RIVER	405606-2-22-02

APPROXIMATE DRIT & BORING LOCATION PLAN PLATE-3

SHEET NO.



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
					LEGEND: -ROADWAY BORING -DOUBLE RING INFILTRATION TEST

ENGINEER OF RECORD:
PARTHA GHOSH, P.E. LICENSE NO. 51377
GCME, INC.
1730 W. 10TH STREET
RIVIERA BEACH, FLORIDA 33404
CERTIFICATE OF AUTHORIZATION NO. 9076

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CR-510	INDIAN RIVER	405606-2-22-02

APPROXIMATE DRIT & BORING LOCATION PLAN PLATE-4

SHEET NO.

TABLE - 2

SUMMARY OF CORROSION TEST RESULTS

Project Name: CR-510 PD&E Study

Boring No.	Station	Depth (feet)	Stratum No.	AASHTO Symbol	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	Substructure Environmental Classification	
									Steel	Concrete
R-102		8-10	2	A-3	5.1	13,100	18.1	9.4	Extremely Aggressive	Moderately Aggressive
R-105		6-8	3	A-2-4	7.3	6,500	5.9	19.7	Slightly Aggressive	Slightly Aggressive

Reference: Structure Design Guidelines, Table 1.3.2-1

Table 1.3.2-1 Criteria for Substructure Environmental Classifications

Classification	Environmental Condition	Units	Steel		Concrete	
			Water	Soil	Water	Soil
Extremely Aggressive (If any of these conditions exist)	pH		< 6.0		< 5.0	
	Cl	ppm	> 2000		> 2000	
	SO4	ppm	N.A.		> 1500	> 2000
	Resistivity	Ohm-cm	< 1000		< 500	
Slightly Aggressive (If all of these conditions exist)	pH		> 7.0		> 6.0	
	Cl	ppm	<500		< 500	
	SO4	ppm	N.A.		< 150	< 1000
	Resistivity	Ohm-cm	> 5000		> 3000	
Moderately Aggressive	This classification must be used at all sites not meeting requirements for either slightly aggressive or extremely aggressive environments.					
pH = acidity ($-\log_{10}H+$; potential of Hydrogen), Cl = chloride content, SO4 = Sulfate content.						

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
E2	33+20	50.8	5	3	20.30	17.30
E3	35+00	26.9	20	2	18.10	16.10
E5	39+00	20.1	10	3	17.90	14.90
E8	44+80	19.8	20	2	18.40	16.40
E14	57+00	20.6	20	10	18.20	8.20
E20	69+00	22.2	20	10	19.30	9.30
E27	83+00	38	10	7	19.30	12.30
E28	85+00	35.3	20	2.9	19.00	16.10
E33	95+00	24.6	20	6.5	21.40	14.90
N38	105+00	21.8	20	3	18.90	15.90
N42	113+00	21.8	5	3.5	19.00	15.50
N43	115+00	18	20	3	19.30	16.30
N44	117+00	21.1	5	4	19.00	15.00
N45	119+00	19.5	5	4	19.20	15.20
N46	121+00	20.3	5	3	18.90	15.90
N48	125+00	17.8	20	2.3	18.40	16.10
N49	127+00	22.7	5	3.5	17.90	14.40
N50	129+00	21.9	5	3.5	18.00	14.50
N51	131+00	20.6	10	7	18.20	11.20
N52	133+00	26.5	5	2.5	16.90	14.40
N53	135+00	22.8	20	7	18.40	11.40
N54	137+00	24.6	5	4	17.70	13.70
N55	139+00	29.5	5	3	16.30	13.30
N56	140+00	27.5	5	3	16.40	13.40
N57	141+00	33.3	5	2.5	16.50	14.00
N58	143+00	32.1	5	3	16.20	13.20
N59	145+00	20.6	20	4.5	17.40	12.90
N60	147+00	33.3	5	3	16.30	13.30
N62	151+00	33.4	5	3	16.00	13.00
N64	155+00	22.2	20	5	17.60	12.60

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
N69	165+00	19.8	20	2	17.30	15.30
N71	169+00	27.8	5	4	16.90	12.90
N74	177+00	5.6	10	7	16.20	9.20
N78	184+80	10.2	20	7	16.30	9.30
N88	205+00	5.1	20	7.5	18.10	10.60
N92	213+00	11.1	5	3	18.00	15.00
N93	215+00	5.5	20	7.5	18.70	11.20
N94	217+00	10.9	5	4	18.20	14.20
N97	223+00	8	10	5	19.20	14.20
N98	225+00	13.6	20	6.7	18.70	12.00
N102	233+00	22.1	5	4.5	18.30	13.80
N103	235+00	15.8	20	4.5	19.80	15.30
N104	239+00	22.6	5	4	18.90	14.90
N105	241+00	22.1	5	4	19.30	15.30
N106	243+00	23.6	5	4	19.00	15.00
N107	245+00	15.4	20	5.3	20.50	15.20
N110	251+00	43.4	5	4	19.60	15.60
N113	257+00	58.2	5	4.5	18.90	14.40
N114	259+00	73.4	5	5	21.00	16.00
N115	261+00	42.1	5	4	19.10	15.10
N116	263+00	38.5	5	4.5	21.50	17.00
N117	265+00	30.9	20	3.2	21.50	18.30
N118	267+00	40.1	5	3	20.40	17.40
N119	269+00	46.7	5	2.5	22.40	19.90
N120	271+00	38.1	5	2.5	21.50	19.00
N121	273+00	31	10	3.4	22.10	18.70
N122	274+80	31	20	3.5	22.20	18.70
N123	277+00	33.3	5	3	22.20	19.20
N124	279+00	37.8	5	2.5	21.70	19.20
N125	281+00	38.2	5	3.5	22.20	18.70

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
N126	283+00	55.4	5	4.5	21.30	16.80
N127	285+00	60.2	20	5	21.00	16.00
N128	287+00	57.6	5	4.5	20.60	16.10
N129	289+00	57.2	5	4.5	19.90	15.40
N130	291+00	57.2	5	4.5	19.70	15.20
N131	293+00	60.2	5	4.5	20.90	16.40
N132	295+00	40.7	20	5.2	22.50	17.30
N133	297+00	58.3	5	4.5	19.30	14.80
N135	301+00	59.7	5	5	22.30	17.30
N136	303+00	59.6	5	4.5	22.50	18.00
N137	305+00	42.9	20	2.7	23.40	20.70
W1	32+00	30.9	5	3	16.70	13.70
W2	34+00	34.9	5	2	15.40	13.40
W3	36+00	34.4	5	2.5	15.80	13.30
W5	40+00	18.8	20	6	18.40	12.40
W10	50+00	20.6	10	7	18.40	11.40
W11	52+00	20	20	4	18.50	14.50
W17	64+00	31.6	20	7.3	19.10	11.80
W22	74+00	37.5	5	3.7	19.10	15.40
W23	76+00	31.2	5	4	19.10	15.10
W24	78+00	15.4	20	7	20.10	13.10
W25	80+00	29.2	5	5	18.00	13.00
W26	82+00	27.1	5	5	18.40	13.40
W30	90+00	16.8	20	4	19.80	15.80
W32	94+00	15.7	10	8	22.60	14.60
S35	100+00	19.6	20	4	20.30	16.30
S36	102+00	53.8	5	4	18.40	14.40
S37	104+00	75.1	5	4.5	19.50	15.00
S38	106+00	65.1	5	4.5	19.10	14.60

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
S39	107+80	64.5	5	4.5		
S40	110+00	38.5	20	1.2	18.80	17.60
S41	112+00	48.3	5	3.2	18.10	14.90
S42	114+00	52	5	2.2	18.30	16.10
S43	116+00	57.6	5	5	19.00	14.00
S44	118+00	49.5	5	3.2	18.70	15.50
S47	124+00	40.8	5	4.5	18.00	13.50
S48	126+00	34.3	5	4	17.70	13.70
S49	128+00	37.4	5	4.5	17.80	13.30
S50	130+00	14.3	20	3	18.20	15.20
S51	132+00	36	5	4.5	17.90	13.40
S52	134+00	37.7	5	3.5	17.40	13.90
S53	136+00	23.6	5	3.1	17.10	14.00
S54	138+00	25.2	5	4	16.40	12.40
S55	140+00	18	20	3	17.80	14.80
S56	142+00	16.4	10	4	18.00	14.00
S57	144+00	23.7	5	4.5	16.60	12.10
S58	146+00	23.8	5	4	16.40	12.40
S59	150+00	18.5	20	4.5	17.50	13.00
S60	152+00	37	5	4.2	17.00	12.80
S61	154+00	41.5	5	5	16.90	11.90
S62	156+00	40.9	5	4	17.00	13.00
S63	158+00	42.4	5	5	16.90	11.90
S64	160+00	19	20	4.5	18.00	13.50
S65	162+00	41	5	5	17.60	12.60
R-105	165+33	-26.05	20	2	16.39	14.39
S69	170+00	23.2	20	6	17.00	11.00
S74	180+00	26.2	20	7.5	16.80	9.30
S76	184+00	33.4	5	4	15.20	11.20
S78	188+00	37.9	5	5	15.80	10.80

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
S79	190+00	26.1	20	7	17.40	10.40
S81	194+00	36.1	5	5	15.90	10.90
S83	198+00	37.5	5	4.5	16.30	11.80
S84	200+00	26.7	20	7	17.60	10.60
S89	210+00	26.1	10	6	18.50	12.50
S94	220+00	25.8	20	6.2	19.10	12.90
S99	230+00	15.5	20	5.5	19.70	14.20
S100	232+00	43.9	5	4	18.60	14.60
S101	234+00	16.2	10	6	19.80	13.80
R-104	235+33	36.55	20	3	19.28	16.28
S102	236+00	42.8	5	4	18.60	14.60
S103	238+00	38.9	5	4.5	18.90	14.40
S104	240+00	15.3	20	4.3	20.40	16.10
S106	243+70	27	5	4.5	20.30	15.80
S107	246+00	28.7	5	4.5	19.70	15.20
S108	248+00	31.3	5	4.5	20.00	15.50
S109	250+00	14.9	20	5.3	21.00	15.70
S110	252+00	33.1	5	5	20.60	15.60
S111	254+00	42.6	5	4.5	20.30	15.80
S112	256+00	27.1	5	4.5	19.90	15.40
S113	258+00	11.2	5	3.5	19.00	15.50
S114	260+00	12.3	5	3	19.60	16.60
S115	262+00	26.1	5	3	20.10	17.10
R-103	262+91	-63.36	20	3	21.58	18.58
S116	264+00	9.9	5	3	19.60	16.60
S117	266+00	3.4	5	4.5	21.80	17.30
S118	268+00	17	5	4	22.20	18.20
S119	270+40	2.6	20	3.5	22.40	18.90
S120	272+00	17.2	5	3.5	22.20	18.70
S121	274+00	18.7	5	5	22.50	17.50

TABLE - F1

GROUNDWATER INFORMATION [ROADWAY]

Reference: FDOT Project, FPID No.: 405606-1-22-01

BORING #	STATION (B/L Survey CR510)	OFFSET (B/L Survey CR510)	Boring Depth	Groundwater Table Depth	Ground Surface Elevation (NAVD 1988)	Groundwater Table Elevation (NAVD 1988)
	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]	[Feet]
S122	276+10	17.4	5	4.5	22.40	17.90
S123	278+00	34.7	5	5	22.90	17.90
S124	280+00	4.6	20	4	22.40	18.40
S125	282+00	9.7	5	5	23.20	18.20
S126	284+00	8.2	5	5	23.30	18.30
S127	286+00	-6.6	10	3.3	22.50	19.20
R-102	287+79	1.36	20	3.5	22.35	18.85
S128	288+00	16.3	5	5	22.20	17.20
S129	290+00	-10	20	4.4	22.60	18.20
S130	292+00	17.2	5	5.5	22.40	16.90
S131	294+00	11.8	5	5	21.80	16.80
S134	300+00	6.9	20	3.7	22.20	18.50
R-101	301+09	14.8	20	3	21.63	18.63
S136	304+00	6.5	5	5	23.10	18.10