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MEMORANDUM

To:	Jennifer Marshall, PE FDOT Chief Engineer of Production
From:	Victor Gallo, PE – Project Manager Armando Orozco PE – Deputy Project Manager Kimley-Horn & Associates, Inc.
Date:	December 16, 2025
Subject:	New Stormwater Rule Evaluation for State Road 16 Project Development and Environment (PD&E) Study

Introduction & Objective

The project is located in St. Johns County along the existing SR 16 roadway corridor, between International Golf Parkway and I-95. This technical memorandum provides a revised analysis of the SR 16 PD&E Study from July 2024 (FPID: 210447-5), following the new stormwater rule as set forth in Chapter 62-330, F.A.C. The PD&E study proposes the widening of SR 16 from its current two-lane rural section with a flush shoulder to a curb-and-gutter section consisting of four lanes, bike lanes, and pedestrian facilities. The primary objective of the widening is to improve traffic mobility, reduce congestion, and address safety concerns. The total length of this project is approximately 5.9 miles.

The objective of this task is to review the pond site alternatives developed in the original Pond Siting Report (PSR), utilizing traditional first flush treatment volume design and performance standards, and to assess the modifications required to meet the new nutrient reduction criteria established by the updated stormwater rule. The new nutrient reduction criteria are quantified differently, focusing on the removal of total nitrogen (TN) and total phosphorus (TP) in surface water discharges, as determined by Best Management Practice (BMP) efficiency rates based on the existing ambient water quality conditions of the downstream Water of the State, as outlined in Sections 8.3.2 through 8.3.5 of the Applicant's Handbook Volume 1 (A.H. Vol 1). This technical memorandum aims to provide findings and mitigative alternatives regarding the impacts of the new stormwater rule, on stormwater management systems for a curb and gutter typical section.

New Stormwater Rule

The new stormwater rule nutrient reduction performance standards listed in the A.H Vol. 1 have changed from the first flush treatment volume method, to showing nutrient reduction rates through calculations or modeling to meet minimum standards listed in **Table 1**. Like the old rule, the new rule retains the presumption that the design, construction, operation, and maintenance of the stormwater management system will not cause or contribute to violations of applicable state water quality standards as outlined in Section 373.4131(3)(b)-(c), F.S.

This memorandum also assumes the application of the stormwater rule standards without the use of any grandfathering provisions within the rule, in order to fully assess the potential future impacts to the Department's Work Program once fully implemented. **Table 1** summarizes the minimum post-development nutrient reduction performance standards of the new stormwater rule.

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Table 1: New Post-Development Nutrient Reduction Standards

Project Scenario	BMP Reduction Rate % (TP)	BMP Reduction Rate % (TN)	Nutrient Reduction Analysis	Presumptive TSS Reduction Efficiencies %	A.H. Section
All Sites	80	55	Post ≤ Pre	80	8.3.2
Impaired Waters	80	80	Post ≤ Pre	80	8.3.4
OFW	90	80	Post ≤ Pre	95	8.3.3
Impaired + OFW	95	95	Post ≤ Pre	95	8.3.4

For this evaluation, the Florida Department of Environmental Protection (FDEP) Division of Environmental Assessment and Restoration's (DEAR) Waters Not Attaining Standards (WNAS) from the adopted 2022-2024 Biennial Assessment dataset was used to identify impaired waterbodies (WBIDs) within the HUC 12 sub-watersheds. Impaired WBIDs are defined as those that are not meeting their applicable water quality standards under Chapter 62-302, F.A.C., and have been verified as impaired and can be used for regulatory programs under Chapter 62-303, F.A.C., which are associated with assessment categories 4a, 4b, and 5. This definition of impaired waterbodies for administration of the ERP program was confirmed with FDEP's DEAR and Division of Water Resource Management administrators. This memorandum is focused on the A.H. Vol. 1 of the stormwater rule, Applicant's Handbook Volume II (A.H. Vol. 2) will vary by Water Management District (WMD). Although the new rule establishes nutrient reduction rate standards for TN and TP, the rule does not specify if the impairment classification is to be used for nutrient and nutrient response variable impairments, or all water quality parameters (e.g. bacteria, mercury and metals). Thus, two ambient water quality scenarios were evaluated:

- Scenario 1: focused on nutrient-specific impairments.
- Scenario 2: considered additional risks of using impaired WBIDs with any water quality parameters, including but not limited to nutrients, bacteria, mercury, and metals.

It should be noted that impaired WBIDs within the HUC 12 sub-watershed boundaries at the time of application must follow the impaired performance standards of the new rule. During the PD&E phase, a WBID may be listed as impaired. However, by the time the project advances to design and the ERP application is submitted, that same WBID could be reclassified as meeting its designated use. Then, the WBID would no longer be considered impaired and the impaired performance standards would not apply. For example, an impaired WBID with a TMDL (assessment category 4a) under Chapter 62-304, F.A.C., but classified as meeting its designated use at the time of application (assessment category 2t), is not required to use the impairment performance standards. Similarly, it is possible that a WBID could be reclassified as impaired by the time the project advances to design. In this case, the WBID would be required to use the impairment nutrient reduction performance standards.

Methodology

BMPTrains 2020 Version 4.3.5 was employed to evaluate the BMP nutrient reduction rates provided by the stormwater alternatives originally sized and sited in the original PSR. Compliance with equations, methodology and limitations in Appendix O of the A.H Vol I. was verified. The BMP model's primary focus

was on the nutrient reduction rate of TN and TP, verifying reasonable assurance with the new criteria. Within the pond's BMPTrains, separate catchments were created for each pond alternative (as set forth in the original PSR). For this study the pre/post Event Mean Concentration (EMC) values were sourced from the A.H. Vol. 1 Table 9.2. To determine combined nutrient reduction rates, BMPTrains was used to calculate stand-alone nutrient reduction rates, treatment trains in series were then combined using Equation 9-5 of the A.H. Vol. 1.

For wet ponds, limits to the average residence time throughout the State were used to calculate BMP nutrient reduction rates for both TN and TP. Appendix O of the A.H Vol. I identifies the maximum average annual residence time as 200 days, which yields maximum nutrient reduction rates of 43% and 80% for TN and TP respectively. BMPTrains along with equations and limitations in Appendix O of the A.H. Vol 1. were used to determine nutrient reduction rates of wet ponds. Each wet pond's Permanent Pool Volume (PPV) remained unchanged from that in the original PSR.

For side bank filters, the detention with media filtration method in Appendix O in the A.H Vol. 1 was used to determine the BMP nutrient reduction rate of the side banks. Refer to Alternative 1 in the following narrative for more details on methodology and approach.

The stormwater management alternatives in the original PSR did not achieve the nutrient reduction rates required under the new stormwater rule without the addition of BMPs in series. To address this, one alternative was developed to upgrade the stormwater management facilities to meet the nutrient reduction standards of the new stormwater rule. This alternative is composed of retrofitting the first-flush treatment volume used in the old rule into side bank filters. Other alternatives were considered and will be discussed in greater detail in the report, with the option to re-evaluate them during the design phase if necessary.

Analysis & Results

This project lies within the limits of the Sixmile Creek Basin, which contributes to the Lower St. Johns River Basin. The original PSR includes two WBIDs: Mill Creek (WBID 2460) and Sixmile Creek (WBID 2411). The boundaries of these WBIDs closely align with the HUC 12 sub-watershed Palmo Cove and Twelvemile Swamp–Turnbull Creek. Mill Creek WBID is classified as impaired (Bacteria and Metals in the 2022-2024 Biennial Assessment), which resides in the Palmo Cove HUC 12 sub-watershed boundaries and would only apply to Scenario 2. However, ambient water quality analyses indicate that the Mill Creek WBID is not downstream of the discharge points of the project's stormwater management systems. Therefore, it does not influence the impairment status of the basins despite residing inside the Palmo Cove HUC 12 sub-watershed. Refer to **Appendix A** for an ambient water quality analysis.

In the original PSR, the project limits were divided into six roadway sub basins, each with alternative stormwater management facilities. The original PSR states that Basin 1 was merged with Basin 2 due to the impacts the pond alternatives proposed in Basin 1 had on the residential and commercial parcels. Thus, Basin 1 was excluded from BMP analysis and incorporated into the analysis of Basin 2. Although Basin 1 resides within the Mill Creek WBID, the stormwater management system outfalls to the Sixmile Creek WBID and is not considered impaired. The preferred alternatives in the original PSR are composed of three ponds, Pond 2C, 3C and 4C. Pond 2C treats and attenuates stormwater from Basins 1 and 2, 3C from Basin 3, and 4C from Basins 4,5 and 6. To align with the preferred alternative decision of the original PSR, only these three facilities were analyzed and placed in series with other BMPs to meet the nutrient reduction standards of the new rule. Typically, two scenarios are evaluated and presented; however, because the

downstream water bodies do not exhibit impairments nor are they Outstanding Florida Waters (OFWs), both scenarios would yield the same results. With no differences in ambient water quality, only one matrix was developed and provided in **Appendix A**. Additionally, compensatory treatment was not evaluated for this project, as it was not required. Side bank filters is the primary alternative proposed in this memo for stormwater management facilities to meet the nutrient reduction standards of the new rule as presented in the following narrative. Please note that the results suggest an opportunity to downsize ponds during the design phase. Because only a fraction of the allotted first-flush treatment volume was required for the side bank filter BMP to meet nutrient reduction targets, the ponds may be reduced proportionally to the surplus treatment volume provided.

Alternative 1 – Wet Pond in Series with Side Bank Filters

Side bank filters refer to the earthen banks above the Normal Water Level (NWL) of a wet pond that can be used for treatment with the implementation of a weir or grate control structure to mechanically control the stage and volume of water above the permanent pool volume. Refer to **Figure 1**.

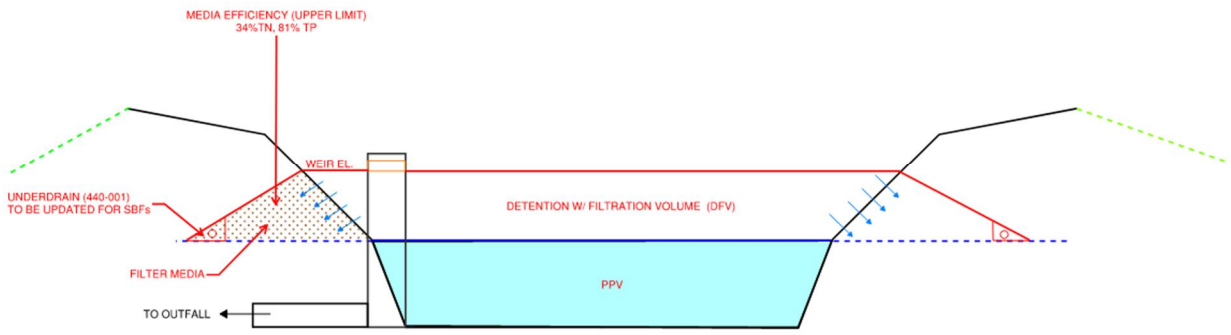


Figure 1: Side Bank Filter Section

The "detention with media filtration" in Appendix O in the A.H Vol. I was used to determine the BMP efficiency of the side banks. The following equation was used to determine the efficiency rate of side bank filters:

Detention with Filtration BMP Efficiency = Retention BMP Efficiency[1] X Media Efficiency[2]

1. Retention volume measured from NWL up to the assumed weir or grate elevation of the control structure, which is treated as "dry retention".

2. Efficiency of filter media. Upper limits for TN and TP are 34% and 81% respectively. This assumes 3-feet deep select soils to match the results in BDV24-977-25

These filters, which enhanced nutrient removal, were placed in series with the nutrient removal of the wet pond. The detention with filtration equation in Appendix O reflects that side bank filters can provide an additional 30% of TN removal, and 77% TP removal, bringing the overall combined efficiency above the required 55% for TN, and 80% for TP for the two HUC 12 sub-watersheds.

Other Alternatives

Roadside swales were considered as an alternative for this project. The curb and gutter typical section would be maintained, and stormwater would be routed to swales through closed flume inlets or open flumes. The nutrient reduction pretreatment provided by the swales would be placed in series with the PPV of the pond downstream. Preliminary models indicate the nutrient reduction provided by swales would be sufficient to meet the new requirements but were removed due to the uncertain impacts to base clearance (due to swale blocks), and potential Right-of-Way (ROW) needs in some areas. This is an alternative that can be revisited during the design phase, if necessary.

Another alternative considered was the split BMP, which is a hybrid treatment train composed of a dry BMP and a wet pond that would occupy the same footprint as the facilities sized in the original PSR. This system was considered, sized, and preliminarily modeled in ICPR.v4, but were removed as alternatives as it would require thorough design level ICPR modeling to provide reasonable assurance that was not feasible in the PD&E phase for this project. The original pond sites that were proposed in the PSR could be optimized to include additional treatment using a treatment train of a dry retention BMP and the permanent pool volume of a wet pond. These dry retention BMPs would be designed to be no deeper than 2-feet, with 1-foot for retention and 1-foot for freeboard and other variables. These dry retention BMPs maintain at least a 1-foot separation from the bottom of the dry pond to the NWL (2-feet preferred). **Figure 2** shows the cross-section of the dry BMP and wet pond treatment train.

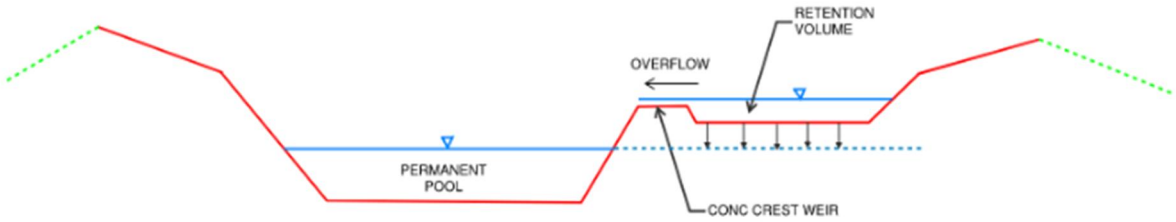


Figure 2: Cross-section of Treatment Train

The split BMP would also include a flow diversion structure that would connect to the stormwater trunkline. A flow diversion structure would direct stormwater towards the dry BMP at a higher elevation while also routing it to the wet pond, ensuring sufficient flow during larger storm events. A key element of determining hydraulic feasibility is in modeling and preliminarily sizing the flow diversion structure weir to balance the optimization of nutrient reduction, meet attenuation pre-post requirements, without introducing flood risks. This alternative can be evaluated in detail in the design phase, if needed. **Figure 3** shows a diagram of a flow diversion structure.

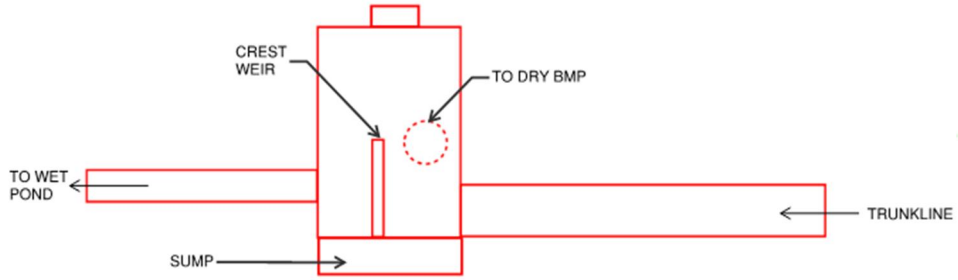


Figure 3: Flow Diversion Structure Sketch

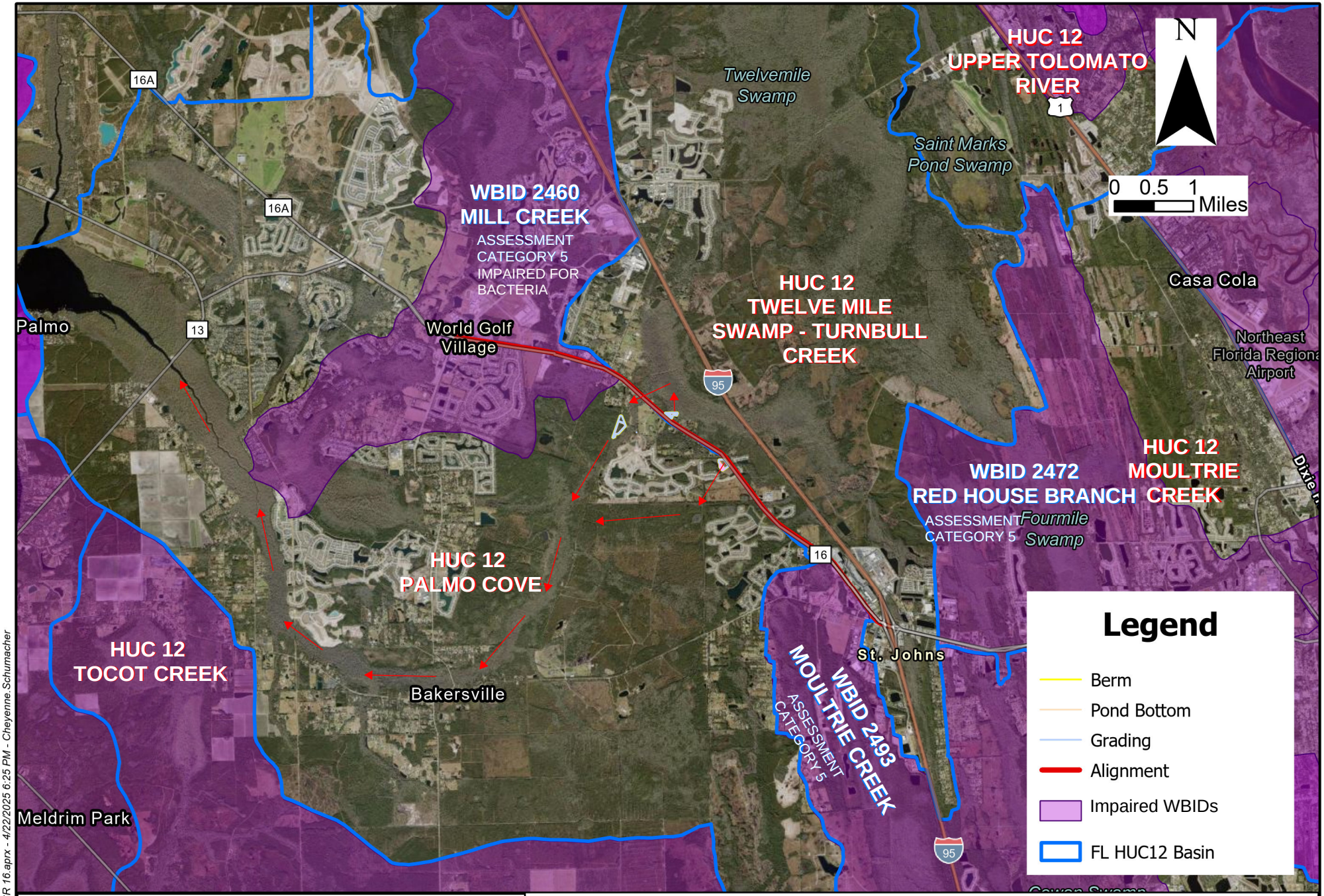
Conclusion

This memorandum evaluated the stormwater management facilities proposed in the original SR 16 PSR against the updated nutrient reduction requirements established by Chapter 62-330, F.A.C. The analysis confirmed that the original pond alternatives, designed under the first-flush treatment approach, do not achieve the nutrient reduction rates required under the new rule without supplemental BMPs in series. To address this, one primary alternative was developed, incorporating side bank filters to retrofit the existing pond sites and meet the nutrient reduction standards. Additional concepts, including roadside swales and split BMP systems, were also considered but deferred for potential reconsideration during the design phase due to feasibility constraints at the PD&E level. Overall, this evaluation provides a framework for upgrading the stormwater management strategy along the SR 16 corridor to meet the new stormwater rule, while maintaining flexibility for further refinement in later project phases.

APPENDIX A

Pre-Post Pollutant Nutrient Reduction Analysis
Current PSR BMP Train Comparison
Alternative 1 BMP Train Results
Exhibits: Alternative 1 BMPs, HUC 12s & WNAS

Nutrient Reduction Analysis							
Basin	Pond ID	Total Nitrogen			Total Phosphorus		
		Pre Loading (kg/y)	Post Loading (kg/y)	Loading Change (%)	Pre Loading (kg/y)	Post Loading (kg/y)	Loading Change (%)
1	1A	Pond alternativesfor basin 1 were determined as not feasible per PSR					
	1B						
	1C						
	1D						
1+2	2A	63.47	118.48	46%	8.79	16.40	46%
	2B	63.47	118.48	46%	8.79	16.40	46%
	2C	63.47	118.48	46%	8.79	16.40	46%
3	3A	49.52	55.86	11%	6.85	7.73	11%
	3B	49.52	55.86	11%	6.85	7.73	11%
	3C	49.52	55.86	11%	6.85	7.73	11%
4	4A	39.22	69.78	44%	5.43	9.66	44%
	4B	39.22	69.78	44%	5.43	9.66	44%
4+5+6	4C	100.98	183.32	45%	13.98	25.37	45%
5	5A	39.22	61.92	37%	5.43	8.57	37%
	5B	39.22	61.92	37%	5.43	8.57	37%
6	6A	27.91	45.84	39%	3.86	6.34	39%
	6B	27.91	45.84	39%	3.86	6.34	39%



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IMPAIRED WBIDs & HUC 12 BASINS

SR-16 NEW RULES POND SITING ANALYSIS
ST. JOHN COUNTY, FLORIDA

Scale: As Noted	FPID: 210447-5	April, 2025	Figure 5

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Performance Efficiency Rates Matrix (Current PSR)

HUC-12		PSR Data							BMP Series Train	Nitrogen		Phosphorus	
HUC-12 ID	HUC-12 Name	Basin ID	WBID.	Basin Impairments	Impairments	Impairment Assessment Category	Pond ID	Facility Type	BMP Element 1	BMP Element 1	Req. Nitrogen Treatment (New Rule)	BMP Element 1	Req. Phosphorus Treatment (New Rule)
30801031203	Palmo Cove	1	WBID 2460, Mill Creek	No Hazards	N/A	N/A	1A	wet	Wet Pond	-	-	-	-
				No Hazards	N/A	N/A	1B	wet	Wet Pond	-	-	-	-
				No Hazards	N/A	N/A	1C	wet	Wet Pond	-	-	-	-
				No Hazards	N/A	N/A	1D	wet	Wet Pond	-	-	-	-
30801031203	Palmo Cove	1+2	WBID 2460, Mill Creek & WBID 2411, Sixmile Creek	No Hazards	N/A	N/A	2A	wet	Wet Pond	42%	55%	77%	80%
				No Hazards	N/A	N/A	2B	wet	Wet Pond	42%	55%	77%	80%
				No Hazards	N/A	N/A	2C	wet	Wet Pond	43%	55%	80%	80%
30801031203	Palmo Cove	3	WBID 2411, Sixmile Creek	No Hazards	N/A	N/A	3A	wet	Wet Pond	42%	55%	75%	80%
				No Hazards	N/A	N/A	3B	wet	Wet Pond	42%	55%	75%	80%
				No Hazards	N/A	N/A	3C	wet	Wet Pond	42%	55%	74%	80%
030801031203/ 030801031201	Palmo Cove/Twelvemile Swamp-Turnbull Creek	4	WBID 2411, Sixmile Creek	No Hazards	N/A	N/A	4A	wet	Wet Pond	43%	55%	80%	80%
				No Hazards	N/A	N/A	4B	wet	Wet Pond	43%	55%	80%	80%
				No Hazards	N/A	N/A	4C	wet	Wet Pond	43%	55%	79%	80%
30801031201	Twelvemile Swamp-Turnbull Creek	5	WBID 2411, Sixmile Creek	No Hazards	N/A	N/A	5A	wet	Wet Pond	42%	55%	75%	80%
				No Hazards	N/A	N/A	5B	wet	Wet Pond	42%	55%	75%	80%
30801031201	Twelvemile Swamp-Turnbull Creek	6	WBID 2411, Sixmile Creek	No Hazards	N/A	N/A	6A	wet	Wet Pond	42%	55%	75%	80%
				No Hazards	N/A	N/A	6B	wet	Wet Pond	42%	55%	75%	80%

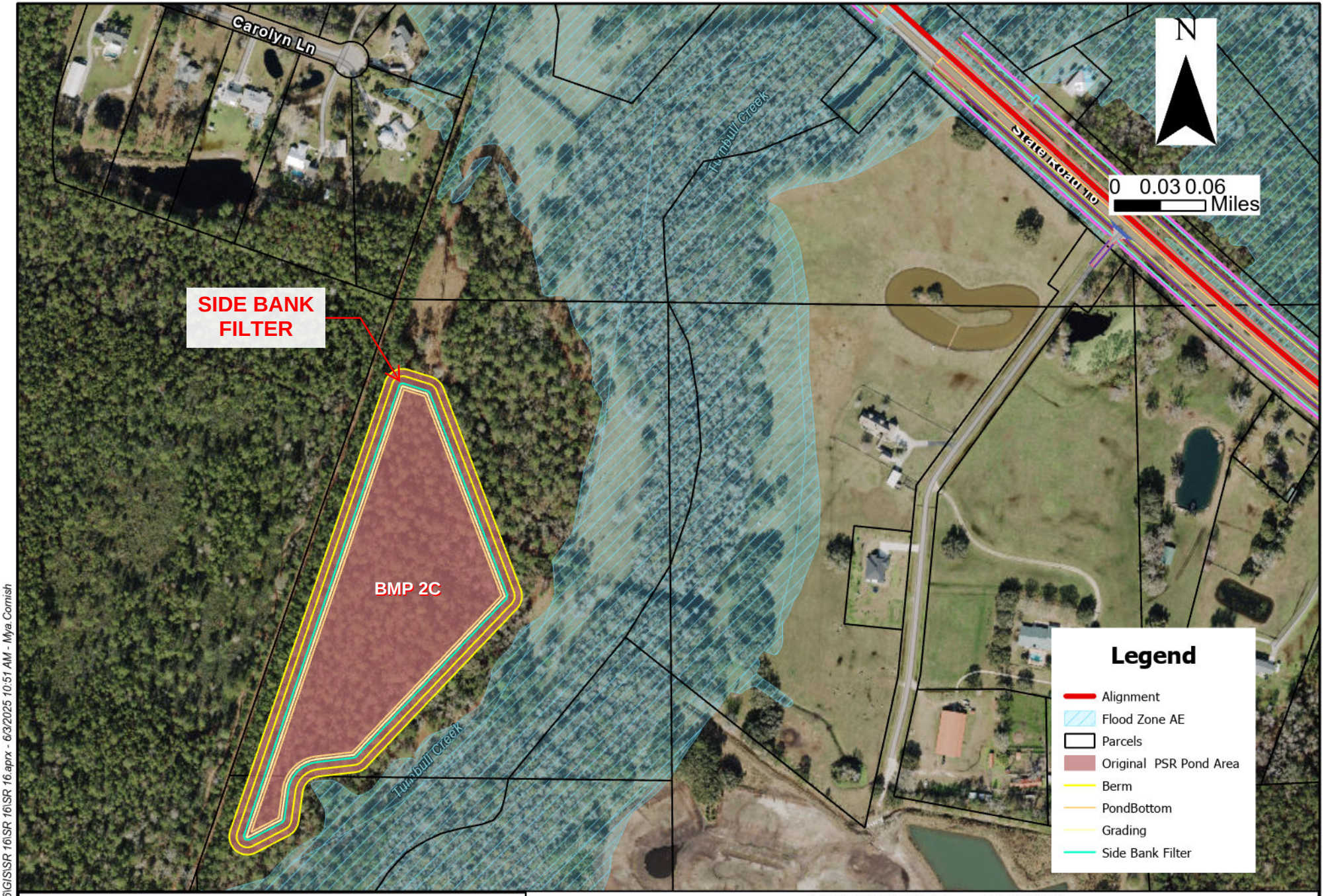
These facilies were removed as alternatives in the original PSR.

These facilities were chosen as the preffered alternatives in the original PSR

Nutrient Reduction Performance Matrix - Alternative 1

HUC-12		Basin Parameters				BMP Treatment Train			Nutrient Reduction for Total Nitrogen (TN)				Nutrient Reduction for Total Nitrogen (TP)			
HUC-12 ID	HUC-12 Name	Basin ID	WBID	Basin Impairments	Impairments	Pond ID	BMP Element 1	BMP Element 2	BMP Element 1[1]	BMP Element 2	Req. Nitrogen Treatment (New Rule)	Nitrogen Combined Efficiency Rate	BMP Element 1[1]	BMP Element 2	Req. Phosphorus Treatment (New Rule)	Phosphorus Combined Efficiency Rate
30801031203	Palmo Cove	1+2	WBID 2411 - Sixmile Creek	No Hazards	N/A	2C	Side Bank Filter	Wet Pond	30%	42%	55%	59%	72%	77%	80%	94%
30801031201	Twelve Mile Swamp	3	WBID 2411 - Sixmile Creek	No Hazards	N/A	3C	Side Bank Filter	Wet Pond	30%	42%	55%	59%	71%	74%	80%	92%
30801031203	Palmo Cove	4+5+6	WBID 2411 - Sixmile Creek	No Hazards	N/A	4C	Side Bank Filter	Wet Pond	30%	42%	55%	59%	71%	77%	80%	93%

1. Upper limit media efficiency for side bank filters is 34% for TN and 81% for TP, per FDOT research project BDV24-977-25



ALTERNATIVE 1 - BMP 2C

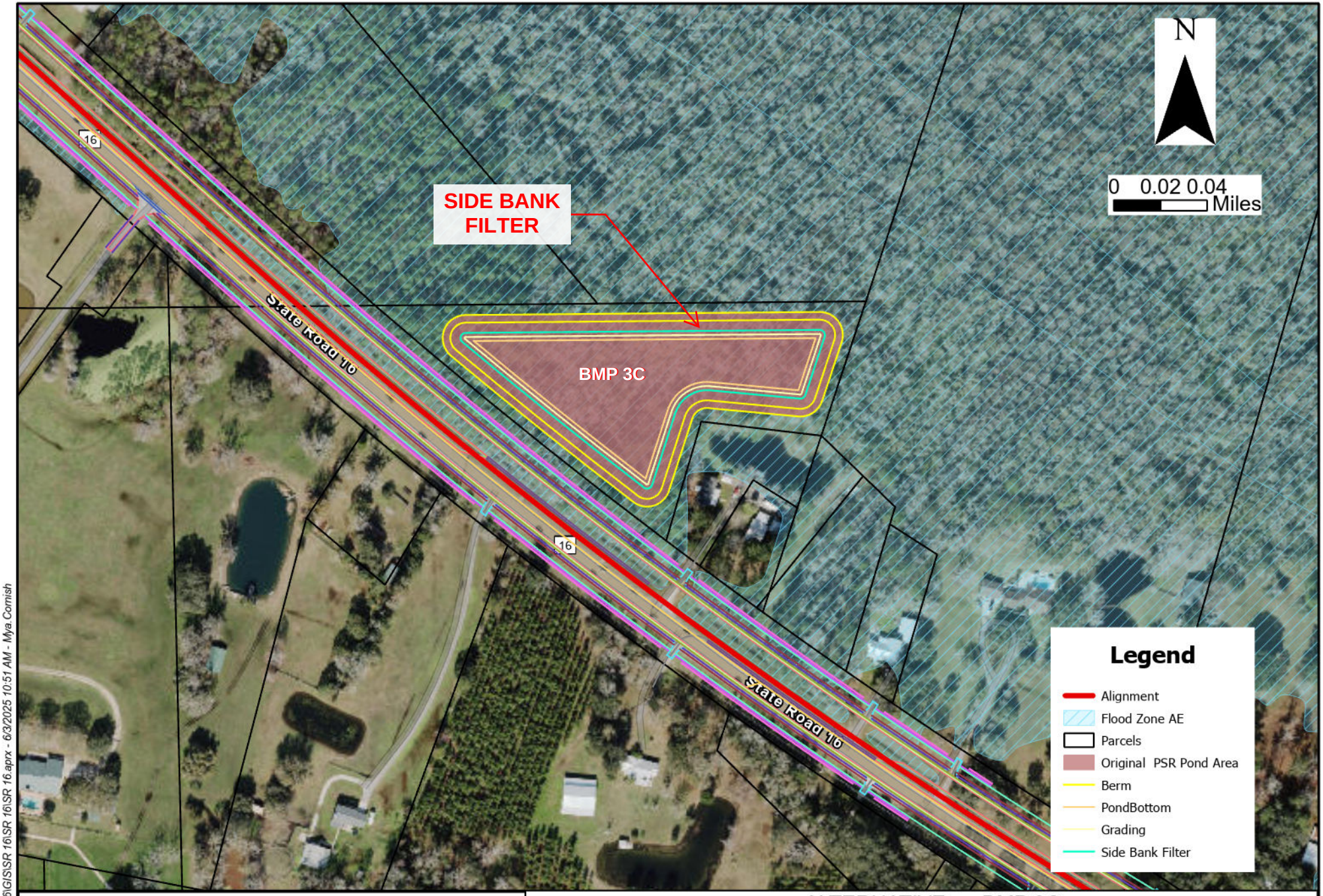
SR-16 NEW RULES POND SITING ANALYSIS
ST. JOHN COUNTY, FLORIDA

Scale: As Noted	FPID: 210447-5	April, 2025	Figure 1

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ALTERNATIVE 1 - BMP 3C

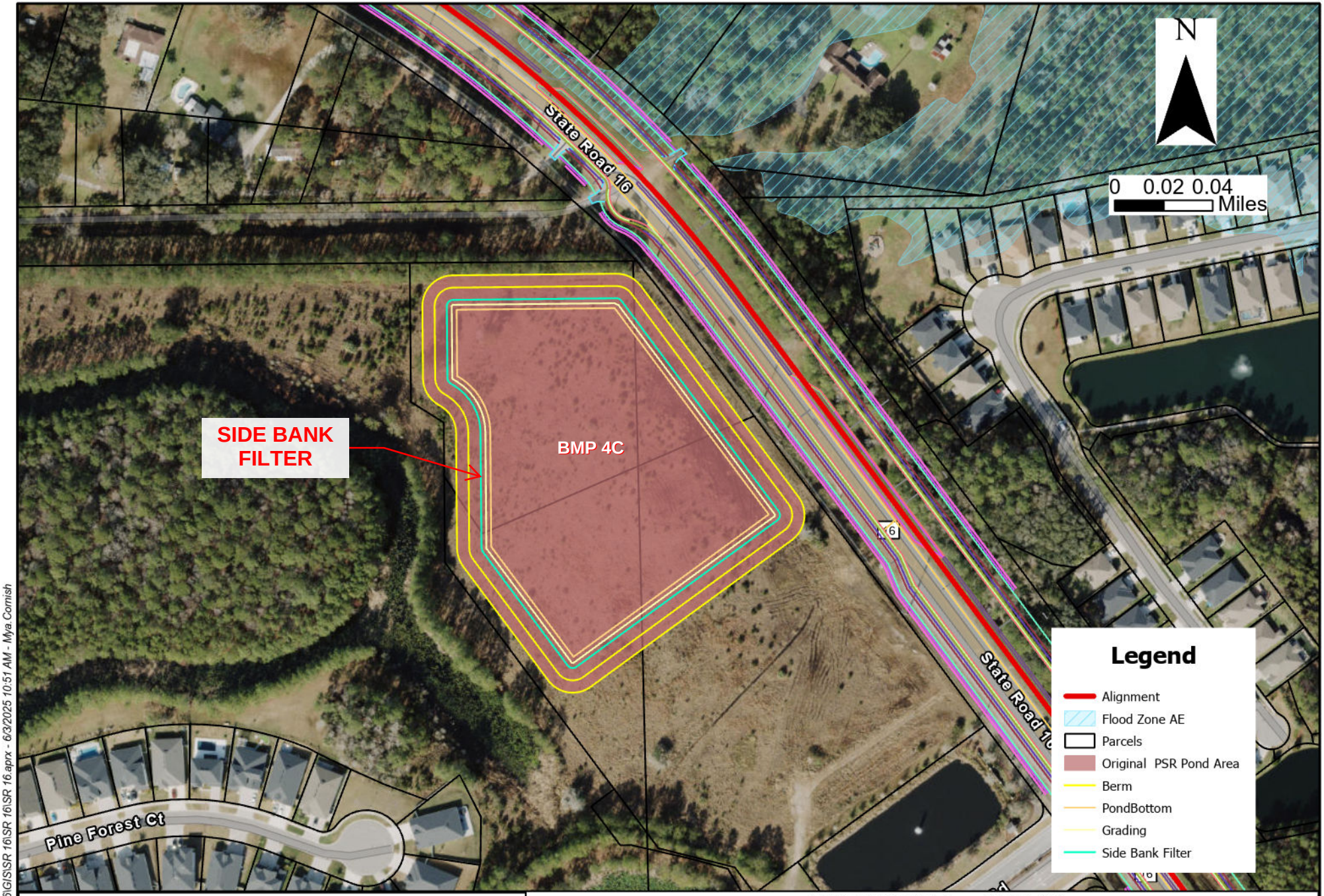
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ST. JOHN COUNTY, FLORIDA

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ALTERNATIVE 1 - BMP 4C

SR-16 NEW RULES POND SITING ANALYSIS
ST. JOHN COUNTY, FLORIDA

Scale: As Noted	FPID: 210447-5	April, 2025	Figure 4

Summary of PPV and TV from Original Pond Siting Report			
Pond 2C			
Stage	**Area**	**Storage Volume**	**Description**
ft-NAVD	***acres***	***ac-ft***	
22.00	9.23	4.58	TV (Side Bank Filter Vol.)
21.50	9.09	30.35	PPV (NWL)
18.00	8.25	0.00	Pond Bottom
Pond 3C			
Stage	**Area**	**Storage Volume**	**Description**
ft-NAVD	***acres***	***ac-ft***	
25.00	2.00	1.94	TV (Side Bank Filter Vol.)
24.00	1.88	10.02	PPV (NWL)
18.00	1.46	0.00	Pond Bottom
Pond 4C			
Stage	**Area**	**Storage Volume**	**Description**
ft-NAVD	***acres***	***ac-ft***	
25.25	8.71	6.47	TV (Side Bank Filter Vol.)
24.50	8.53	48.42	PPV (NWL)
18.50	7.61	0.00	Pond Bottom

Note: Volumes used are congruent to what is shown in the original pond siting report. Volume for side bank filters, equate to the first-flush treatment volume.

APPENDIX B

BMPTrains Reports

Project: Basin 1+2

Date: 10/02/2025

Catchment Information

Analysis: Specified Removal Efficiency Required Removal N: 55% P: 80%

Catchment Name	Pond 2C
Rainfall Zone	Florida Zone 2
Annual Mean Rainfall (in)	53.00

Pre-Condition Landuse Information

Pre-Condition Landuse	User Defined Values
Pre Condition Area (acres)	34.97
Pre Rational Coefficient (0-1)	0.27
Pre Non DCIA Curve Number	80.00
Pre DCIA Percent (0-100)	22.30
Pre Nitrogen EMC (mg/l)	1.250
Pre Phosphorus EMC (mg/l)	0.173
Pre Runoff Volume (ac-ft/yr)	41.183
Pre Nitrogen Loading (kg/yr)	63.473
Pre Phosphorus Loading (kg/yr)	8.785

Post-Condition Landuse Information

Post-Condition Landuse	User Defined Values
Post Condition Area (acres)	34.97

Post Rational Coefficient (0-1)	0.50
Post Non DCIA Curve Number	80.00
Post DCIA Percent (0-100)	55.39
Post Nitrogen EMC (mg/l)	1.250
Post Phosphorus EMC (mg/l)	0.173
Post Runoff Volume (ac-ft/yr)	76.875
Post Nitrogen Loading (kg/yr)	118.483
Post Phosphorus Loading (kg/yr)	16.398

Project: Basin 1+2
Date: 10/2/2025

Surface Discharge Filtration Design

Treatment Depth (in)	1.572
Hydraulic Capture Efficiency (%)	89
Media Type	User Defined
Media N Reduction (%)	34
Media P Reduction (%)	81

Watershed Characteristics

Catchment Area (acres)	34.97
Contributing Area (acres)	34.970
Non-DCIA Curve Number	80.00
DCIA Percent	55.39
Rainfall Zone	Florida Zone 2

Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	30
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	72

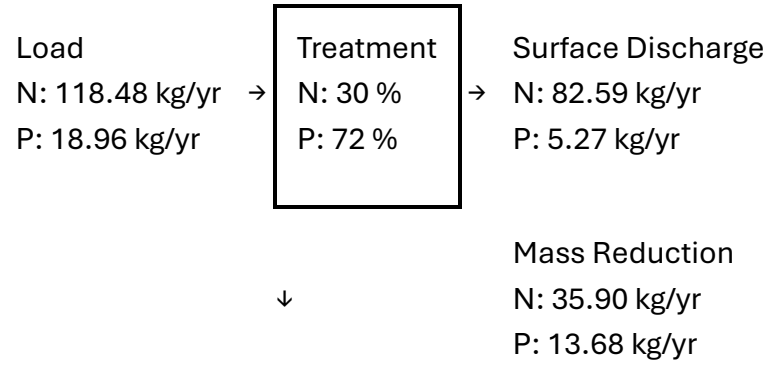
Media Mix Information

Type of Media Mix	User Defined
Media N Reduction (%)	34
Media P Reduction (%)	81

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	22.324
TN Mass Load (kg/yr)	82.585
TN Concentration (mg/L)	0.977
TP Mass Load (kg/yr)	5.274
TP Concentration (mg/L)	0.062

Load Diagram for Surface Discharge Filtration (stand-alone)



Project: Basin 1+2
Date: 10/2/2025

Wet Detention Design

Permanent Pool Volume (ac-ft)	30.350
Permanent Pool Volume (ac-ft) for 31 days residence	6.529
Annual Residence Time (days)	144
Littoral Zone Efficiency Credit	
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	34.97
Contributing Area (acres)	34.970
Non-DCIA Curve Number	80.00
DCIA Percent	55.39
Rainfall Zone	Florida Zone 2
Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	42
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	77

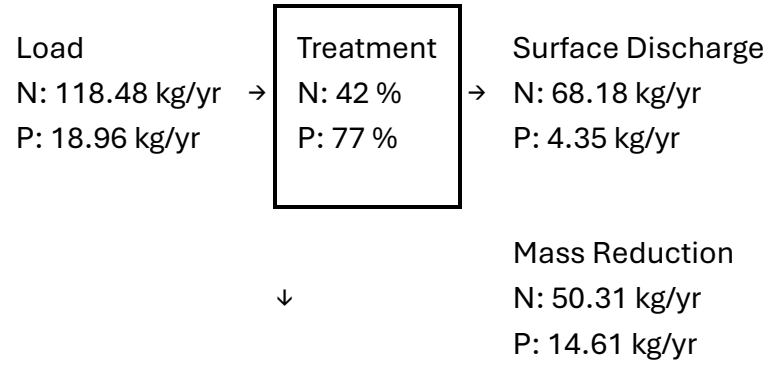
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for Wet Detention (stand-alone)



Project: Basin 3

Date: 10/02/2025

Catchment Information

Analysis: Specified Removal Efficiency Required Removal N: 55% P: 80%

Catchment Name	Pond 3C
Rainfall Zone	Florida Zone 2
Annual Mean Rainfall (in)	53.00

Pre-Condition Landuse Information

Pre-Condition Landuse	User Defined Values
Pre Condition Area (acres)	16.50
Pre Rational Coefficient (0-1)	0.44
Pre Non DCIA Curve Number	80.00
Pre DCIA Percent (0-100)	47.27
Pre Nitrogen EMC (mg/l)	1.250
Pre Phosphorus EMC (mg/l)	0.173
Pre Runoff Volume (ac-ft/yr)	32.130

Pre Nitrogen Loading (kg/yr)	49.520
Pre Phosphorus Loading (kg/yr)	6.854

Post-Condition Landuse Information

Post-Condition Landuse	User Defined Values
Post Condition Area (acres)	16.50
Post Rational Coefficient (0-1)	0.50
Post Non DCIA Curve Number	80.00
Post DCIA Percent (0-100)	55.33
Post Nitrogen EMC (mg/l)	1.250
Post Phosphorus EMC (mg/l)	0.173
Post Runoff Volume (ac-ft/yr)	36.241
Post Nitrogen Loading (kg/yr)	55.857
Post Phosphorus Loading (kg/yr)	7.731

Project: Basin 3
Date: 10/2/2025

Surface Discharge Filtration Design

Treatment Depth (in)	1.410
Hydraulic Capture Efficiency (%)	87
Media Type	User Defined
Media N Reduction (%)	34
Media P Reduction (%)	81

Watershed Characteristics

Catchment Area (acres)	16.50
Contributing Area (acres)	16.500
Non-DCIA Curve Number	80.00
DCIA Percent	55.33
Rainfall Zone	Florida Zone 2
Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	30
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	71

Media Mix Information

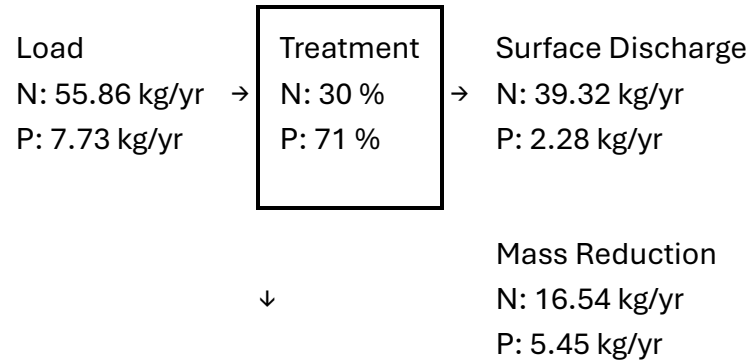
Type of Media Mix	User Defined
Media N Reduction (%)	34
Media P Reduction (%)	81

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	10.283
TN Mass Load (kg/yr)	39.322
TN Concentration (mg/L)	1.010
TP Mass Load (kg/yr)	2.279

TP Concentration (mg/L) 0.059

Load Diagram for Surface Discharge Filtration (stand-alone)



Project: Basin 3
Date: 10/2/2025

Wet Detention Design

Permanent Pool Volume (ac-ft)	10.020
Permanent Pool Volume (ac-ft) for 31 days residence	3.078
Annual Residence Time (days)	101
Littoral Zone Efficiency Credit	
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	16.50
Contributing Area (acres)	16.500
Non-DCIA Curve Number	80.00

DCIA Percent	55.33
Rainfall Zone	Florida Zone 2
Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	42
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	74

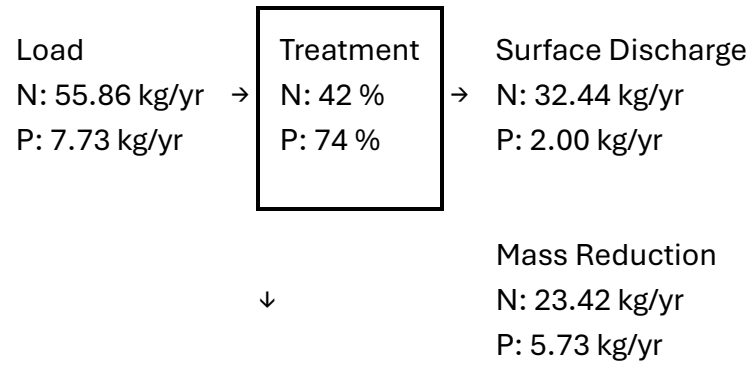
Media Mix Information

Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000
TP Concentration (mg/L)	0.000

Load Diagram for Wet Detention (stand-alone)



Project: Basin 4

Date: 10/02/2025

Catchment Information

Analysis: Specified Removal Efficiency Required Removal N: 55% P: 80%

Catchment Name	Pond 4C
Rainfall Zone	Florida Zone 2
Annual Mean Rainfall (in)	53.00

Pre-Condition Landuse Information

Pre-Condition Landuse	User Defined Values
Pre Condition Area (acres)	53.32
Pre Rational Coefficient (0-1)	0.28
Pre Non DCIA Curve Number	80.00
Pre DCIA Percent (0-100)	24.00
Pre Nitrogen EMC (mg/l)	1.250

Pre Phosphorus EMC (mg/l)	0.173
Pre Runoff Volume (ac-ft/yr)	65.515
Pre Nitrogen Loading (kg/yr)	100.975
Pre Phosphorus Loading (kg/yr)	13.975

Post-Condition Landuse Information

Post-Condition Landuse	User Defined Values
Post Condition Area (acres)	53.32
Post Rational Coefficient (0-1)	0.51
Post Non DCIA Curve Number	80.00
Post DCIA Percent (0-100)	56.44
Post Nitrogen EMC (mg/l)	1.250
Post Phosphorus EMC (mg/l)	0.173
Post Runoff Volume (ac-ft/yr)	118.945
Post Nitrogen Loading (kg/yr)	183.323
Post Phosphorus Loading (kg/yr)	25.372

Project: Basin 4
Date: 10/2/2025

Surface Discharge Filtration Design

Treatment Depth (in)	1.457
Hydraulic Capture Efficiency (%)	88
Media Type	User Defined
Media N Reduction (%)	34

Media P Reduction (%)	81

Watershed Characteristics

Catchment Area (acres)	53.32
Contributing Area (acres)	53.320
Non-DCIA Curve Number	80.00
DCIA Percent	56.44
Rainfall Zone	Florida Zone 2
Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	30
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	71

Media Mix Information

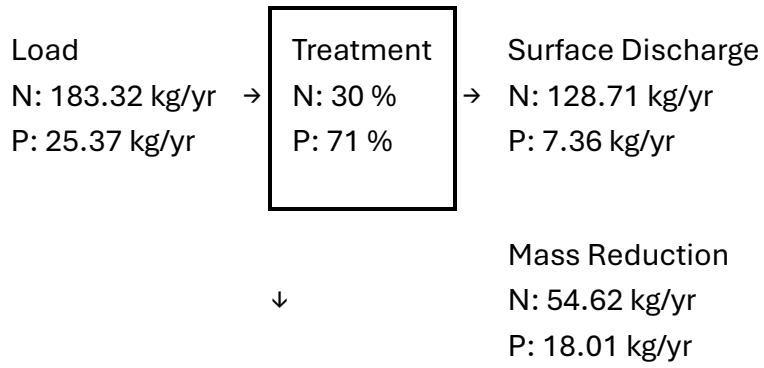
Type of Media Mix	User Defined
Media N Reduction (%)	34
Media P Reduction (%)	81

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	33.965

TN Mass Load (kg/yr)	128.706
TN Concentration (mg/L)	1.001
TP Mass Load (kg/yr)	7.364
TP Concentration (mg/L)	0.057

Load Diagram for Surface Discharge Filtration (stand-alone)



Project: Basin 4
Date: 10/2/2025

Wet Detention Design

Permanent Pool Volume (ac-ft)	48.420
Permanent Pool Volume (ac-ft) for 31 days residence	10.102
Annual Residence Time (days)	149
Littoral Zone Efficiency Credit	
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	53.32
Contributing Area (acres)	53.320
Non-DCIA Curve Number	80.00
DCIA Percent	56.44
Rainfall Zone	Florida Zone 2
Rainfall (in)	53.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	55
Provided TN Treatment Efficiency (%)	42
Required TP Treatment Efficiency (%)	80
Provided TP Treatment Efficiency (%)	77

Media Mix Information

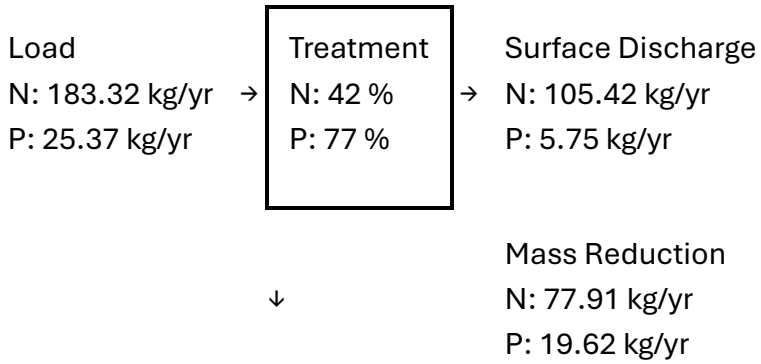
Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	0.000
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.000

TP Concentration (mg/L) 0.000

Load Diagram for Wet Detention (stand-alone)



APPENDIX C

Original Pond Siting Report

Pond Siting Report

Florida Department of Transportation

District 2

SR 16 PD&E Study

(from International Golf Parkway to I-95)

St. Johns County, Florida

Financial Management Number: 210447-5

ETDM Number: 14535

July 2024

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. §327 and a Memorandum of Understanding dated May 26, 2022, and executed by Federal Highway Administration and FDOT.

Pond Siting Report

SR 16 Project Development and Environment (PD&E) Study

(from International Golf Parkway to I-95)

St. Johns County, Florida

Financial Project ID (FPID) Number: 210447-5

Efficient Transportation Decision Making (ETDM) Number: 14535

July 2024

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Appendix B – FEMA FIRM Panels
Appendix C – Drainage Maps
Appendix D – Pond Sizing Calculations
Appendix E – Pond Site Evaluation Matrix
Appendix F – Impact and Compensation Maps
Appendix G – Floodplain Compensation Site Evaluation Matrix
Appendix H – Straight Line Diagrams

1.0 Project Summary

1.1 Project Description

This Project Development and Environment (PD&E) Study involves a 5.9-mile segment of State Road (SR) 16 from International Golf Parkway (IGP) to I-95 in St. Johns County, Florida. A map of the project limits is shown in **Figure 1.2.1**. Within the study limits, SR 16 is functionally classified as a rural principal arterial-other. Between IGP and the St. Augustine Outlet Mall, approximately 5.1 miles, SR 16 is a two-lane undivided roadway with sporadic left turn lanes and no pedestrian or bicycle features. **Figure 1.1.1** shows the existing typical section for this segment. From the St. Augustine Outlet Mall to I-95, approximately 0.8 miles, SR 16 is a four-lane divided roadway with a sidewalk located on both sides of the road for approximately 0.5 miles, from the southern entrance of the St. Augustine Outlet Mall to I-95. **Figure 1.1.2** shows the existing typical section for this segment.

Figure 1.1.1: Existing Typical Section

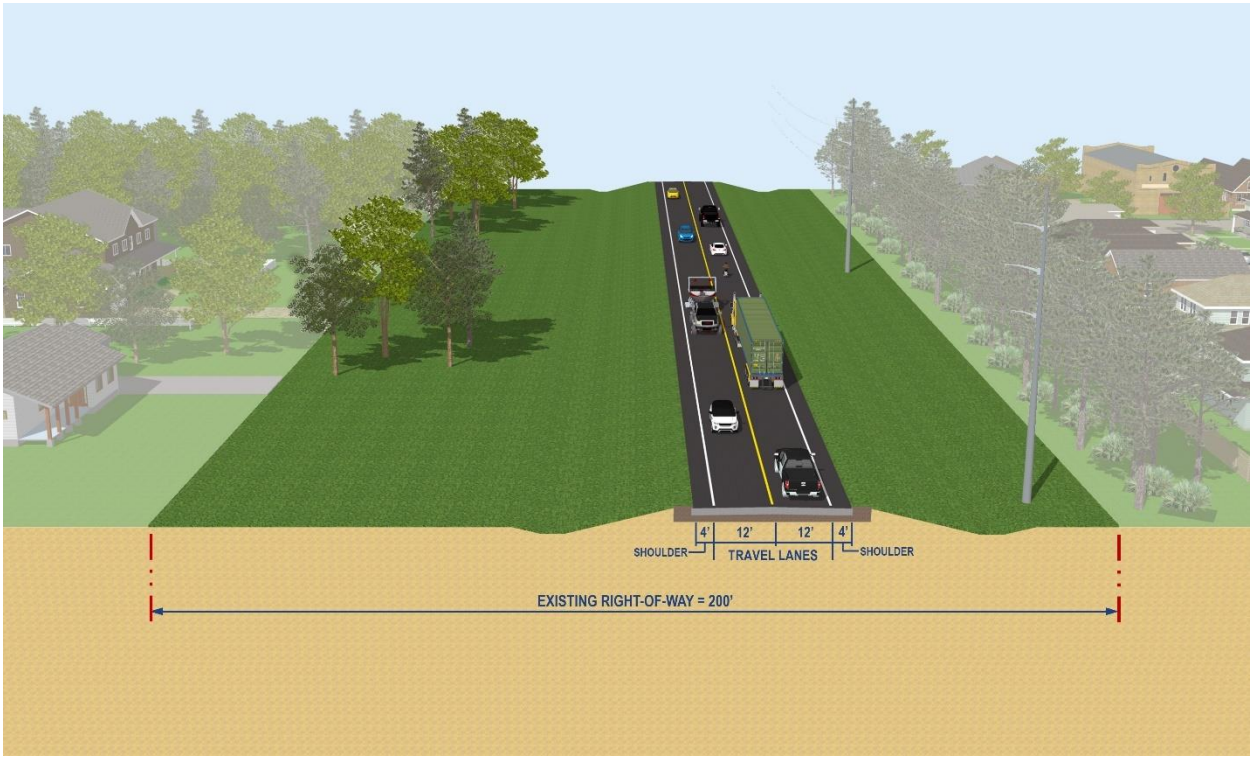
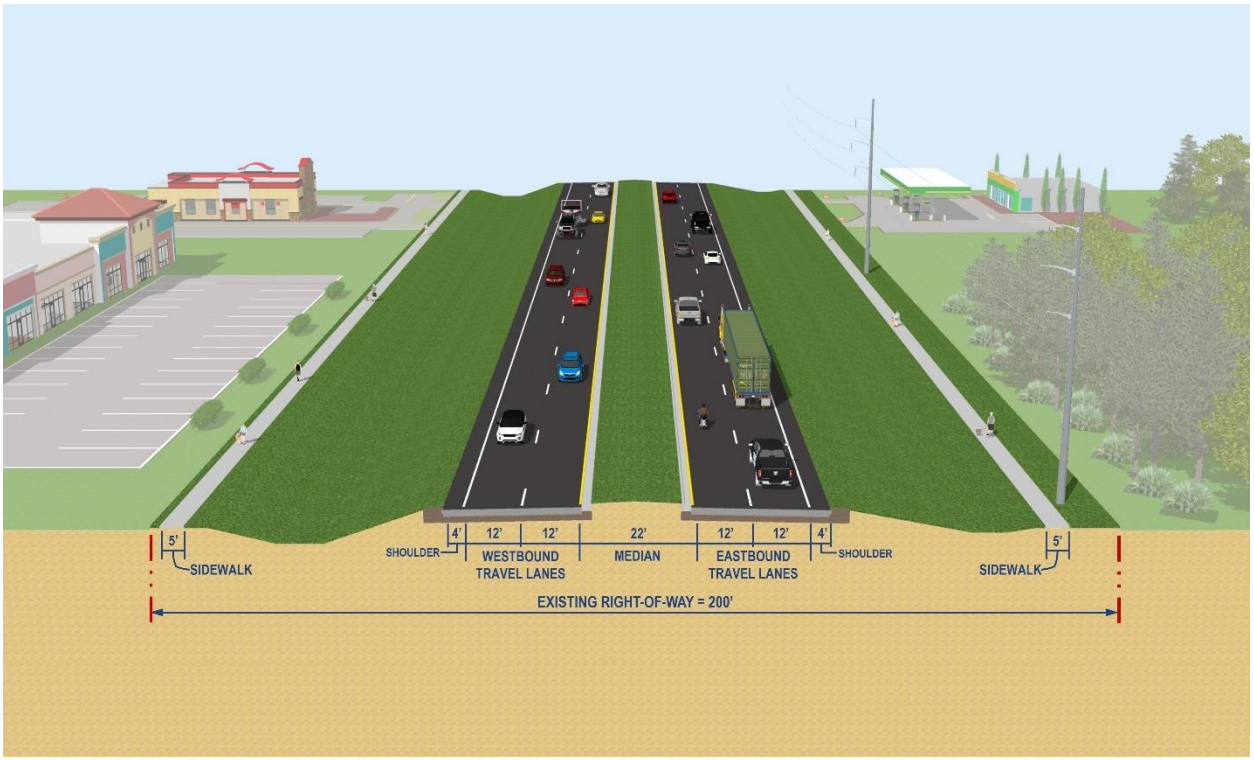


Figure 1.1.2: Existing Typical Section



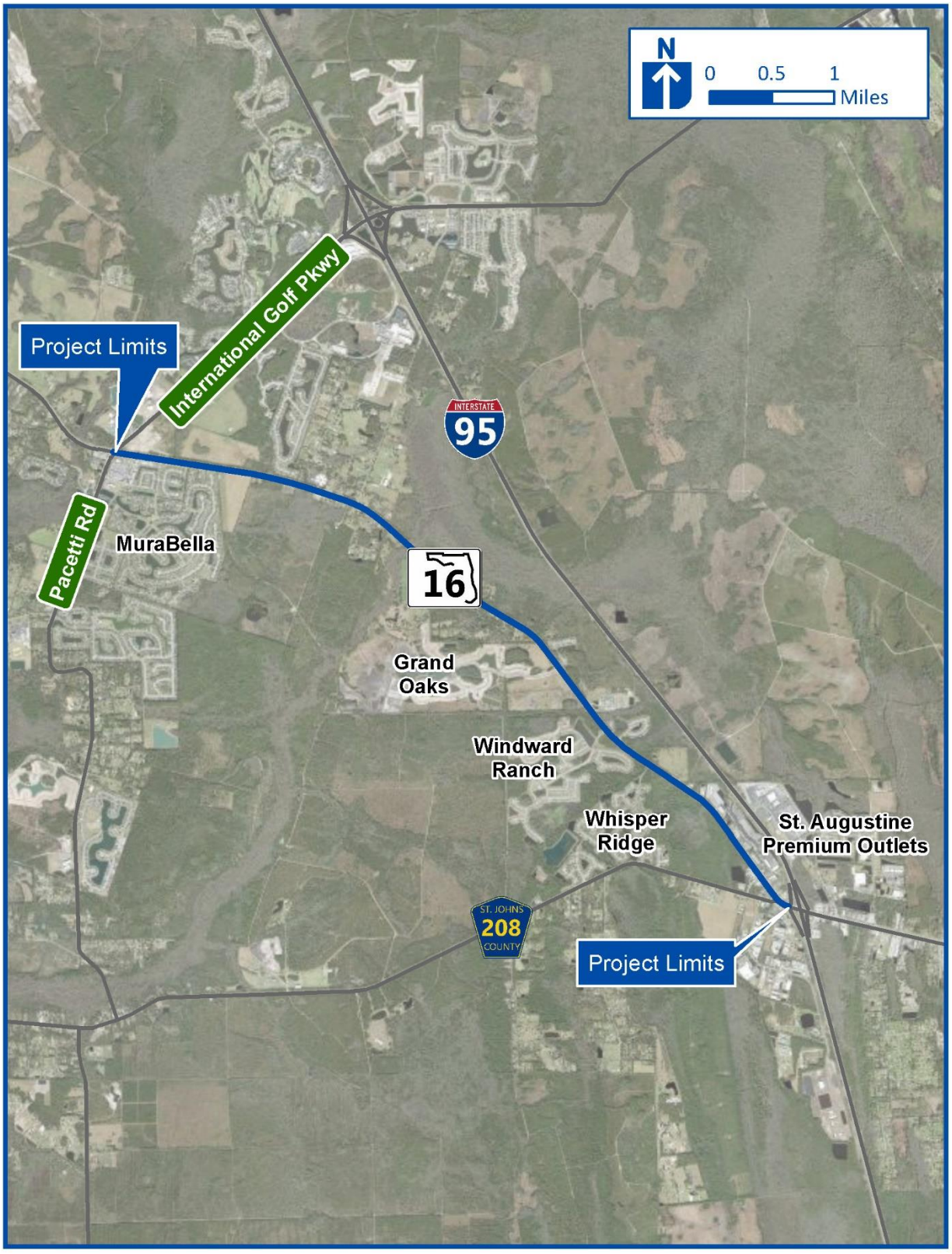
This study will evaluate widening the existing two-lane rural roadway to a four-lane divided urban roadway. In addition, multi-modal transportation improvements including continuous bicycle and pedestrian facilities will be evaluated. SR 16 has one existing bridge (Bridge number 780064) over Turnbull Creek, the structural integrity and functionality of this bridge will be evaluated.

1.2 Purpose & Need

The purpose of this project is to improve traffic mobility, reduce congestion, and address safety on SR 16 from IGP to I-95.

The project is needed to address traffic congestion and safety concerns. A secondary need for the project is to accommodate planned developments.

Figure 1.2.1: Project Location Map

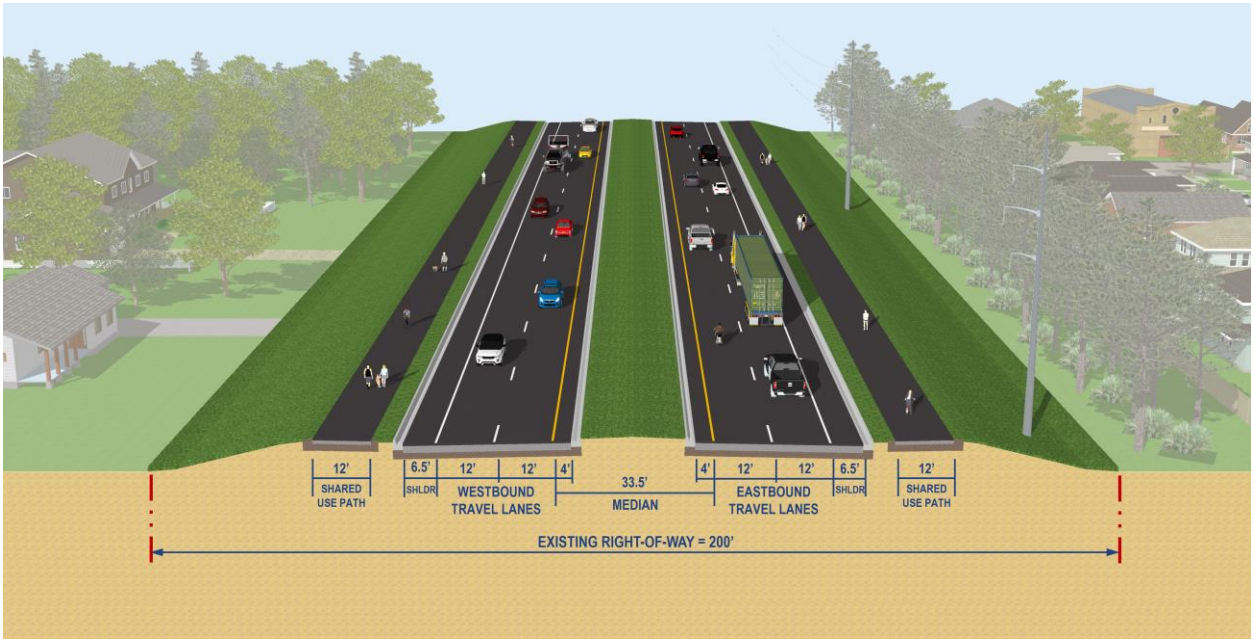


1.3 Alternatives Analysis

SR 16 is divided into two segments: Segment 1: IGP to the St. Augustine Outlet Mall, and Segment 2: St. Augustine Outlet Mall to I-95. St. Johns County is upgrading the portion of SR 16 between IGP and conducting improvements around the proposed CR 2209 intersection, approximately 0.75 miles. The proposed improvements described below will tie into the County's project.

The proposed typical section for Segment 1 features a four-lane divided high-speed arterial with curb and gutter. The roadway consists of two 12-foot lanes in each direction with a four-foot paved inside shoulder and a 6.5-foot paved outside shoulder. The opposing lanes are divided by a 33.5-foot raised grassed median (including the inside shoulder width). A 12-foot-wide shared use path is proposed on both sides of SR 16. The proposed design speed is 55 miles per hour (mph). The existing right-of-way is approximately 200 feet and no additional right-of-way is required to accommodate the proposed typical section. **Figure 1.3.1** shows the proposed typical section for Segment 1.

Figure 1.3.1: Proposed Typical Section



SR 16 is currently a two-lane undivided roadway which would be classified as non-restrictive, meaning there are no median openings. Upgrading Segment 1 to a four-lane divided facility will require the implementation of access management. The proposed access management classification is Class 3, which states directional median openings can be spaced at 1,320 feet and full median openings or signals may be spaced every 2,640 feet.

Segment 2 is already four lanes in the existing condition and no additional capacity is recommended within this segment. The shared use paths from Segment 1 will be extended and tie into the existing sidewalk. Safety and operational improvements are being evaluated within this segment of SR 16.

2.0 Existing Conditions

2.1 General Drainage Conditions

The project is located along the existing SR 16 roadway corridor between International Golf Parkway and I-95 within the limits of the Sixmile Creek basin contributing to the Lower St. Johns River basin. The majority of the corridor drains to Turnbull Creek, while the western portion drains to Mill Creek, both tributaries ultimately to Sixmile Creek. The area along the corridor is generally flat and consists of undeveloped and developed upland areas draining towards lower wetland areas. The existing SR 16 road base was generally constructed at grade and is slightly elevated above the surrounding areas. Stormwater runoff sheds from the roadway pavement and collects in a series of roadside ditches, and is conveyed to Turnbull Creek, which crosses the corridor near the center of the project limits. Areas at the western end of the project are conveyed towards the IGP intersection towards Mill Creek.

2.2 Drainage Basins

As mentioned above, most of the corridor drains to Turnbull Creek, a named tributary of Sixmile Creek, while the western portion drains to Mill Creek, also a named tributary of Sixmile Creek. The basin divide is just east of the Mura Bella Community based on the U.S. Geological Survey (USGS) LiDAR data. West of the basin divide, stormwater runoff is collected and conveyed in roadside stormwater ditches west toward IGP and ultimately reaches Mill Creek. East of the basin divide, stormwater runoff is collected and conveyed in roadside stormwater ditches directly into Turnbull Creek. At the eastern end of the project, stormwater runoff is collected and conveyed in roadside stormwater ditches to a channel that eventually outfalls at the northern limits of Turnbull Creek. Both Mill Creek and Sixmile Creek are considered open basins that eventually outfall into the St. Johns River and the Atlantic Ocean. Within the project limits, the existing roadway basins total approximately 101 acres in area measured along the SR 16 corridor from IGP to I-95.

2.3 Receiving Waterbodies

Turnbull Creek is part of the Sixmile Creek Water Body Identification (WBID# 2411). Sixmile Creek is a class 3F water body and is not a verified impaired basin through the Florida Department of

Environmental Protection (FDEP)'s Total Maximum Daily Load (TMDL) Program. Mill Creek (WBID# 2460) is also a class 3F water body; however, it is a verified impaired basin for Fecal Coliform, Dissolved Oxygen, and Nutrients.

2.4 Cross Drains

There are multiple existing culverts within the project limits. **Table 2-1: Summary of Existing Cross Drains** provides a summary of the existing culverts. See **Appendix H – Straight Line Diagrams** for more information regarding the existing structures along SR-16.

Table 2-1: Summary of Existing Cross Drains

Station	Mile Post	Cross Drain Size	Length (ft)	Stream Name
102+58.72	9.549	2 - 24"	102	Unnamed Tributary to Turnbull Creek
157+86.88	10.596	1 - 24"	82	Unnamed Tributary to Turnbull Creek
189+76.00	11.200	2 - 24"	86	Unnamed Tributary to Turnbull Creek
233+58.40	12.030	1 - 24"	94	Unnamed Tributary to Turnbull Creek
266+84.80	12.660	3 - 36"	86	Unnamed Tributary to Turnbull Creek
361+36.00	14.450	1 - 24"	106	Unnamed Tributary to Turnbull Creek
400+48.48	15.191	1 - 30"	121	Unnamed Tributary to Turnbull Creek

2.5 Previous Permit Information

Existing Environmental Resource Permits (ERP) were not found within the project limits for the SR 16 corridor. Three offsite permitted stormwater ponds which outfall into the roadside ditches along SR 16 were identified:

- Clyde E. Lassen Veterans Nursing Home (ERP# 84623-27)
- Grand Oaks community (ERP# 139022-5)
- Turning Point Christian Academy (ERP# 93623-3)

2.6 Base Flood Elevation

The base flood elevation of Turnbull Creek at the existing SR 16 bridge crossing has been identified as elevation 23.0' from the FEMA Flood Insurance Study (12109CV001D). Upstream from this crossing, Turnbull Creek flows parallel along the northside of the SR 16 corridor with

base flood elevations ranging from 23.0' to 26.0'. Further east along the corridor, small pockets of floodplains feature base flood elevations of 27.5' (Park Wetland A) and 29.5' (Park Wetland B). See **Appendix B – FEMA FIRM Panels** for additional information.

2.7 Land Uses

The land uses along the corridor consists of low-density commercial and residential developments and undeveloped forested areas. Refer to **Appendix A – Figures** for the Land Use Map.

2.8 Existing Deficiencies

The roadside ditches along SR 16 were observed to be generally wet, and due to the flat terrain, contain stagnant runoff water throughout the year. Due to the presence of water and wet conditions, the ditches appear to be unmaintainable during the wettest times of the year. Trash and other debris collect where ditches are unmaintainable. Although the roadside ditches are generally wet, there have been no records of significant flooding or roadway overtopping. With the SR 16 road base constructed at existing grade, and due to the presence of flat areas with stagnant water conditions, the roadway base presents substandard clearances above the water table along the low segments of the corridor.

No scour or other erosion problems were observed at the bridge crossing over Turnbull Creek.

2.9 Soil Types

The United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) National Cooperative Soil Survey indicates that the project area consists of soils with a variety of different hydraulic groups, ranging from A, A/D, B, B/D, C, C/D, and D. Refer to **Appendix A – Figures**, for the Hydrologic Soils map. Most of the soils within the project limits are classified as fine sand and assigned dual hydrologic group (A/D, B/D, or C/D) based on their drained or undrained condition.

2.10 Existing Stormwater Systems and Management Facilities

As previously mentioned, stormwater runoff collects within roadside ditches and is conveyed to Turnbull Creek and Mill Creek. No existing stormwater management facilities or permits were identified along this segment of SR 16, and therefore, the existing roadway pavement is considered untreated.

2.11 Existing Ground Contamination Concerns

An initial desktop review was performed using the FDEP contamination locator map; however, no contamination sites were found within the project limits.

2.12 Existing Historical / Archaeological / Environmental Concerns

A Cultural Resource Assessment Survey (CRAS) was performed by Search and a Natural Resources Evaluation (NRE) was performed by SES Environmental Resource Solutions, included under separate covers. The CRAS found the proposed SR 16 improvements will have no effect on cultural resources listed or eligible for listing in the National Register of Historic Places (NRHP). The NRE found Pond Alternatives 2B and 6A fall within conservation easements, and potential effects to listed species will need further coordination with state and federal agencies. This activity will occur in association with the permitting process. The findings from these reports will be used to assess the historical, archaeological, and environmental impact.

3.0 Proposed Drainage Conditions

3.1 Onsite Drainage Basins

The proposed onsite drainage divides generally matches the existing drainage divides with the addition of stormwater management ponds. Basin limits have been outlined on the proposed drainage maps included in **Appendix C – Drainage Maps**.

3.2 Offsite Stormwater Runoff

As mentioned previously, there are several existing ponds adjacent to the corridor that outfall into the SR 16 roadside ditches. In the proposed condition, the existing ditches will be filled and replaced with a closed drainage system. The proposed drainage system will be designed to accept these offsite outfalls and convey them to Turnbull Creek during the final design phase.

3.3 Water Quality / Water Quantity Requirements

Project improvements will be designed to meet the regulatory requirements of the applicable water management districts, the requirements outlined in the FDOT Drainage Manual, and the requirements of the FDOT Design Manual. The entirety of the project is located within the regulatory authority of the St. Johns River Water Management District; therefore, an Environmental Resource Permit will be secured through this district.

3.3.1 SJRWMD Water Quality Criteria

For wet detention systems, the design treatment volume is the greater of the following: (a) one inch of runoff over the drainage area (b) 2.5 inches times the impervious area (excluding water bodies).

3.3.2 SJRWMD Water Quantity Criteria

(a) The post-development peak discharge rate must not exceed the pre-development peak rate of discharge for the mean annual 24-hour storm for systems serving both of the following: (1) New construction area greater than 50% impervious (excluding waterbodies)

(2) Projects for the construction of new developments that exceed the thresholds in paragraphs 62-330.020(2)(b) or (c), F.A.C.

(b) 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 areas of the District.

The FDEP maintains the Statewide Comprehensive List of Impaired Waters, which contains waterbody-parameter combinations that have been verified as impaired based on criteria and assessment methodologies. The waters are identified by their respective waterbody ID (WBID). The WBID Maps included in **Appendix A – Figures** identify WBIDs surrounding the project. This project discharges into WBID 2411, Sixmile Creek. Total Maximum Daily Load (TMDL) requirements have not been adopted for this WBID. This project is within the Lower St. Johns Basin Management Action Plan (BMAP). No Special Basin Criteria were identified for this area.

3.4 Floodplain Compensation Requirements

As discussed in the Location Hydraulics Report, the proposed project improvements will impact the adjacent floodplain. The floodplain impact volumes were calculated using the United States Geological Survey (USGS) LiDAR data and the mapped 100-year FEMA Floodplain. Refer to **Table 3-1** below for the floodplain impact volume estimated.

Table 3-1: Summary of Floodplain Impact Volumes

Area	Location	Volume (ac-ft)	Total Volume (ac-ft)
1	Pond Alternative 2A	4.06*	33.52
	Pond Alternative 2B	2.45	
	Pond Alternative 2C	1.57	
	Pond Alternative 3A	0.07	
	Pond Alternative 3B	2.54	
	Pond Alternative 3C	12.51*	
	Pond Alternative 4A	5.68*	1.84
	Roadway R/W at Turnbull	11.26*	1.90
2	Roadway R/W West of Downs Corner Rd	1.84	1.84
3	Roadway R/W East of Downs Corner Rd	1.90	1.90

*Values used for Area 1 Total Volume

Floodplain Compensation Areas (FPCAs) are proposed adjacent to Turnbull Creek adjacent to the SR 16 corridor. The FPCA volumes were estimated between seasonal high-water elevations and the lesser of the existing ground or 100-year floodplain elevation. Refer to **Table 3-2** below for the FPCA volumes estimated using this method. The floodplain impact and compensation areas are depicted in **Appendix F – Impact and Compensation Maps**.

Table 3-2: Summary of Floodplain Compensation Areas

Area	FPC Alternative	Volume (ac-ft)	R/W Area (ac)
1	1A	33.40	15.79
	1B	34.17	11.82
	1C	39.29	9.60
	1D	46.81	11.43
2	2	1.90	2.78
3	3	1.95	1.58

During the final design phase, the roadway geometry will be optimized within the right-of-way to minimize the floodplain impact volume and will reduce the need for floodplain compensation. Additionally, stormwater management facilities should be designed to provide additional floodplain compensation, where possible. Refer to **Appendix G – Floodplain Compensation Site Evaluation Matrix** for a summary of the floodplain compensation alternatives analyses.

3.5 Proposed Drainage Improvements

The project proposes to reconstruct the existing two lanes, and to construct an additional two lanes. Stormwater runoff will be collected from the roadway surface via curb inlets and will be conveyed to stormwater management facilities via closed pipe conduits. Stormwater management facilities will feature control structures that will be designed to meet the required water quality and water quantity requirements and will ultimately convey treated runoff to Turnbull Creek.

3.6 Proposed Stormwater Management Facilities

The proposed stormwater management ponds will be designed as wet detention facilities with the assumption that the seasonal high-water elevation (SHWE) was close to or at existing ground elevation. Pond sites were selected adjacent to the corridor and within vacant parcels when possible. The normal water (NWL) elevation was set at the SHWE found in the USDA NRCS Web Soil Survey. The inside top of berm was set to 5 foot above the NWL, providing 4 feet of treatment and attenuation and 1 foot of freeboard. The rainfall depth for the 25-year 24-hour design storm was determined to be 8.60 inches using the National Oceanic and Atmospheric Administration (NOAA) Atlas 14. The USGS LiDAR terrain was used to calculate the pre-development time of concentration. With these assumptions, ponds were sized to meet treatment and attenuation requirements.

The time of concentration calculations, pond treatment calculations, and ICPR modeling are included in **Appendix D – Pond Sizing Calculations**

3.7 Bridge Structures

Today, there is a single bridge crossing over (Turnbull Creek, #780064) within the project limits. This bridge structure was constructed in 1962 and was later reconstructed in 1971. The bridge is approximately 111 feet long and spans over the limits of the Turnbull Creek FEMA Floodway. A new proposed bridge structure will be constructed for both the eastbound and westbound lanes and will fully span the Turnbull Creek floodway.

3.8 Utility Conflicts

Telephone, electric, water, sewer, and gas lines were identified to be within 250 feet of the corridor. Pond infrastructure will be designed to avoid these when possible during the design phase.

4.0 Stormwater Ponds

When possible, two off-site pond alternatives have been provided for each basin. They can be found in **Appendix C – Drainage Maps**.

All pond alternatives have been added to **Appendix E – Pond Site Evaluation Matrix** and relevant pond location information has been added to help determine which alternative is the most suitable choice. Several categories are described as low, moderate, or high impact areas. Each category was assigned the potential level of impact using the following criteria:

- Low - Pond alternatives that are more than 500 feet from an area of concern.
- Moderate - Pond alternatives that are within 500 feet of an area of concern.
- High - Pond alternatives that are within an area of concern.

See **Table 4.1** for the sources used in developing the Pond Site Evaluation Matrix.

Table 4.1: Pond Site Evaluation Matrix Sources

Matrix Category	Source(s)
Groundwater Condition	NRCS Soil Survey
Soil Condition	NRCS Soil Survey
Potential Hazardous Waste Contaminations	PD&E CSER Report
Potential Impacts to Endangered Species	Florida Fish and Wildlife Conservation Commission Areas, Florida Managed Areas, FGDL[1] Animal and Plant Species
Potential Impacts to Cultural Resources	PD&E CRAS Report
Wetland Impacts	PD&E NRE Report
Potential Impacts to Utilities	Certified Power Plants, FGDL Electric Power Substations, Natural Gas Pipelines, FGDL Power Transmission Lines, Public Water Supply Plants, FGDL National Rail Network Railroads, Sabal Trail Transmission Natural Gas Pipelines, Transmission Lines, Wastewater Supply Plants
Existing Landscapes	SJRWMD Land Use Data
Adjoining Land Uses	SJRWMD Land Use Data

1. Florida Geographic Data Library

Each pond alternative was also kept within the limits of one parcel, when possible. The alternatives were sited outside wetland limits when possible, but there are several cases where wetlands are impacted. Refer to **Appendix C – Drainage Maps** and **Appendix E – Pond Site Evaluation Matrix** for the locations.

5.0 Results

The analysis presented in this report identifies potential pond sites based on recent aerials and other preliminary data. Once the potential pond sites were narrowed down, a more detailed analysis was conducted utilizing the following parameters: right-of-way requirements, easement requirements, typical construction costs for a given pond site, hazardous materials, threatened and endangered species, maintenance, cultural resources, wetland impacts, floodplain impacts, and impacts to other relevant features as noted in the pond site evaluation matrix provided in **Appendix E – Pond Site Evaluation Matrix**. A desktop analysis was performed for wetland impacts.

Ponds 2C, 3C, and 4C were selected as the preferred alternative due to the minimal environmental impacts and cost savings. The owners of the respective parcels have reached out to the Department for a potential sale.

Pond alternatives for Basin 1, Ponds 1A, 1B, 1C, and 1D, were eliminated as preferred pond because of the potential impacts to residential and commercial parcels. Basin 1 was merged with Basin 2 for the drainage analysis. Ponds 2A, 2B, and 2C were sized to handle both Basins 1 and 2. Pond 2C was also sized to offset attenuation requirements for Basin 3, in case treatment credits are available for Basin 3. Basins 5 and 6 were integrated with Basin 4 for the drainage analysis of Pond 4C. Pond 4C was designed to accommodate Basins 4, 5, and 6. The costs and feasibility of conveying Basins 5 and 6 were also considered due to the significant distance from Basins 5 and 6 to Basin 4. There is a considerable elevation difference from Basins 5 and 6 to Basin 4, which should facilitate the conveyance of stormwater runoff via a storm sewer system. The cost for Pond 4C was found to be less than the cost of individual ponds and conveyance systems for Basins 4, 5, and 6.

6.0 Conclusions

As part of this analysis, pond site alternatives were analyzed. The previous sections of this report and the evaluation matrix included in **Appendix E – Pond Site Evaluation Matrix** summarize the results of the analysis. Pond 2C, 3C, and 4C were selected as the preferred alternatives.

The information contained herein is preliminary and will need to be refined once this project progresses the PD&E study. Additional analysis will be required as the design progresses and accurate geotechnical and survey information is obtained.

Appendix A – Figures

Figure 1: Land Use

Figure 2: FEMA Floodplains

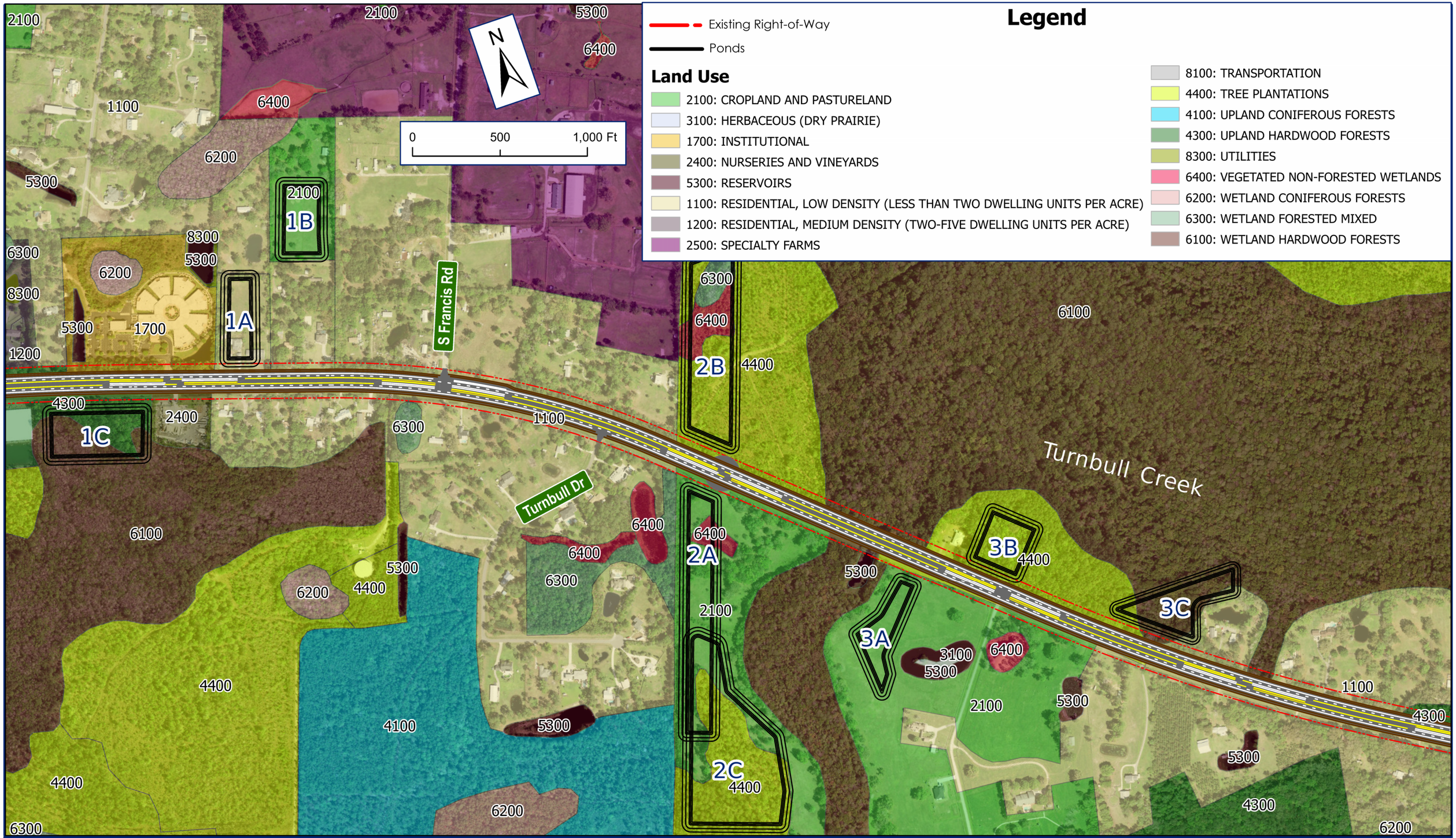
Figure 3: Hydrologic Soils



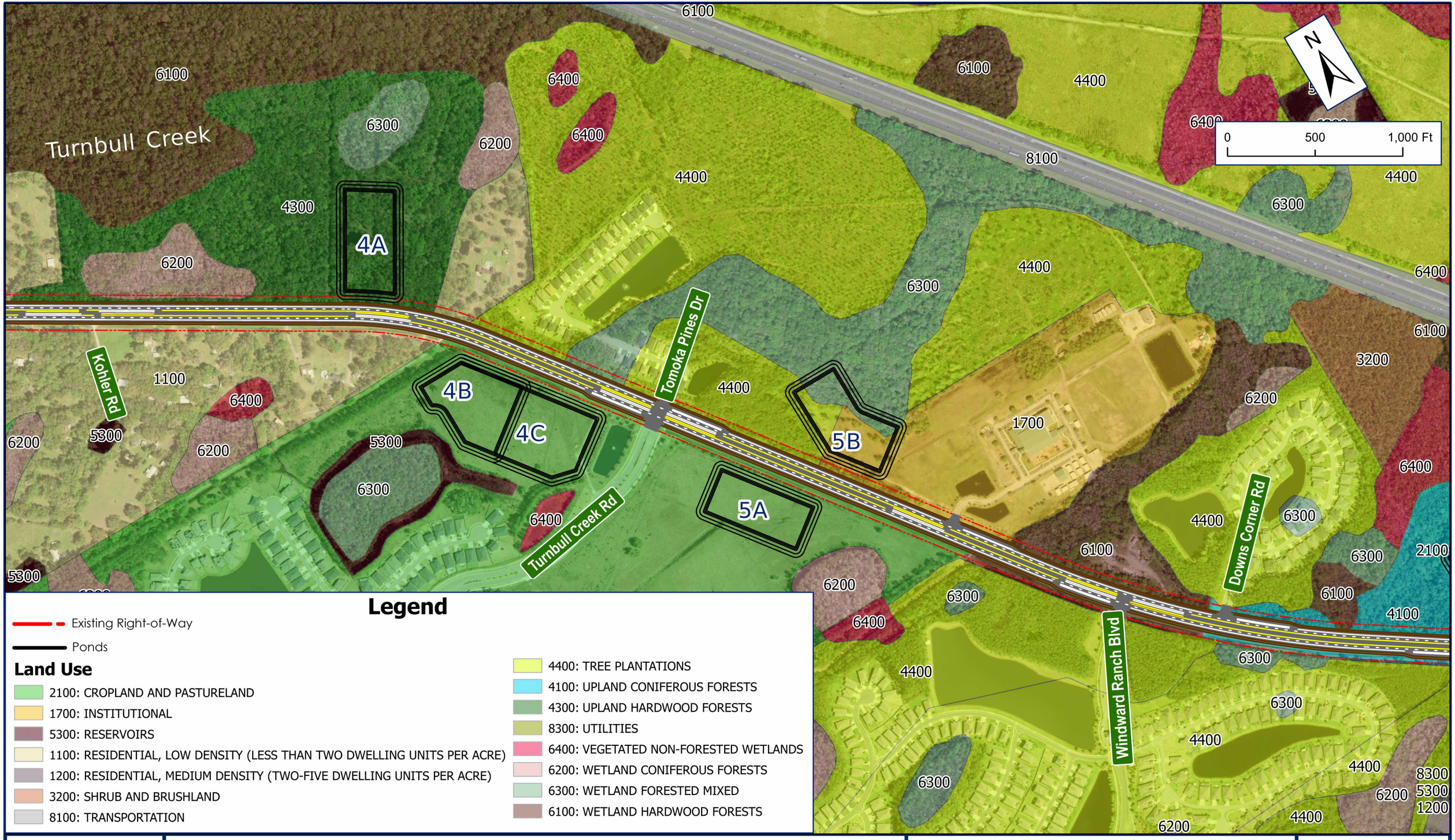
FDOT

SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

Figure 1: Land Use



FDOT	**SR 16 from International Golf Parkway to I-95 PD&E Study** **FPID: 210447-5-32-01**	**Figure 1: Land Use**	**Page No.** **2 of 4**



Legend

Existing Right-of-Way

Ponds

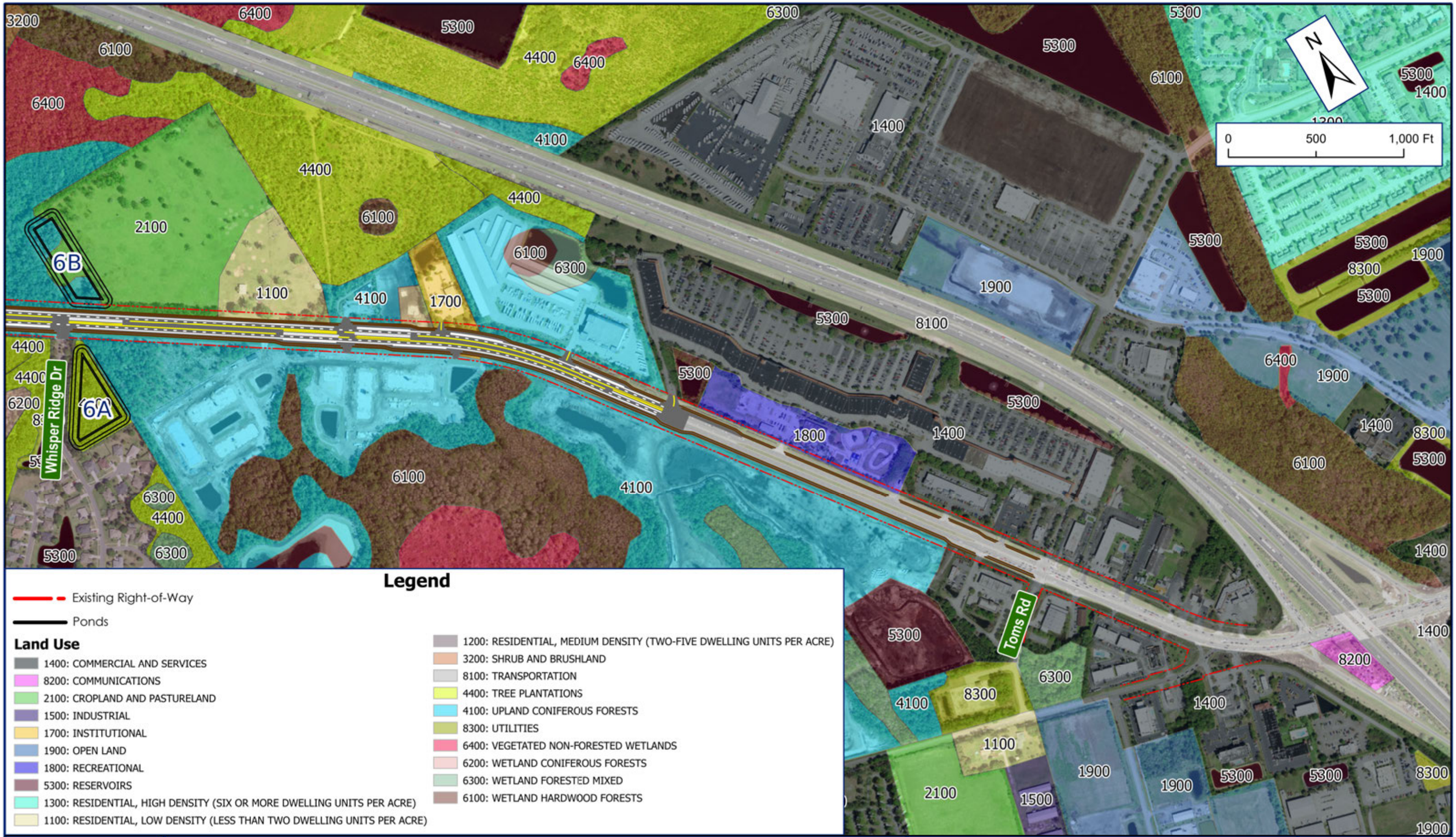
Land Use

- 2100: CROPLAND AND PASTURELAND
- 1700: INSTITUTIONAL
- 5300: RESERVOIRS
- 1100: RESIDENTIAL, LOW DENSITY (LESS THAN TWO DWELLING UNITS PER ACRE)
- 1200: RESIDENTIAL, MEDIUM DENSITY (TWO-FIVE DWELLING UNITS PER ACRE)
- 3200: SHRUB AND BRUSHLAND
- 8100: TRANSPORTATION
- 4400: TREE PLANTATIONS
- 4100: UPLAND CONIFEROUS FORESTS
- 4300: UPLAND HARDWOOD FORESTS
- 8300: UTILITIES
- 6400: VEGETATED NON-FORESTED WETLANDS
- 6200: WETLAND CONIFEROUS FORESTS
- 6300: WETLAND FORESTED MIXED
- 6100: WETLAND HARDWOOD FORESTS

FDOT

SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

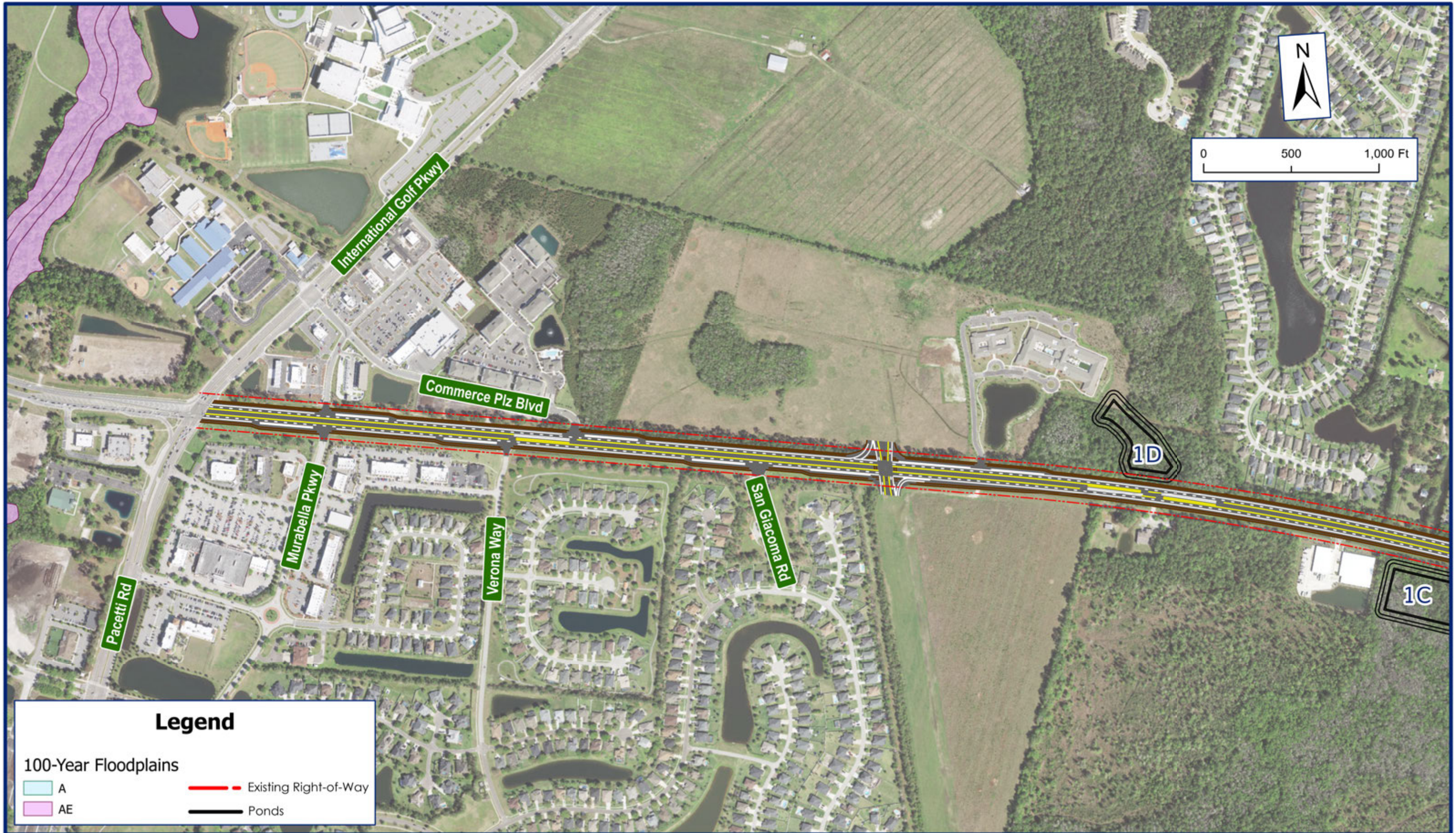
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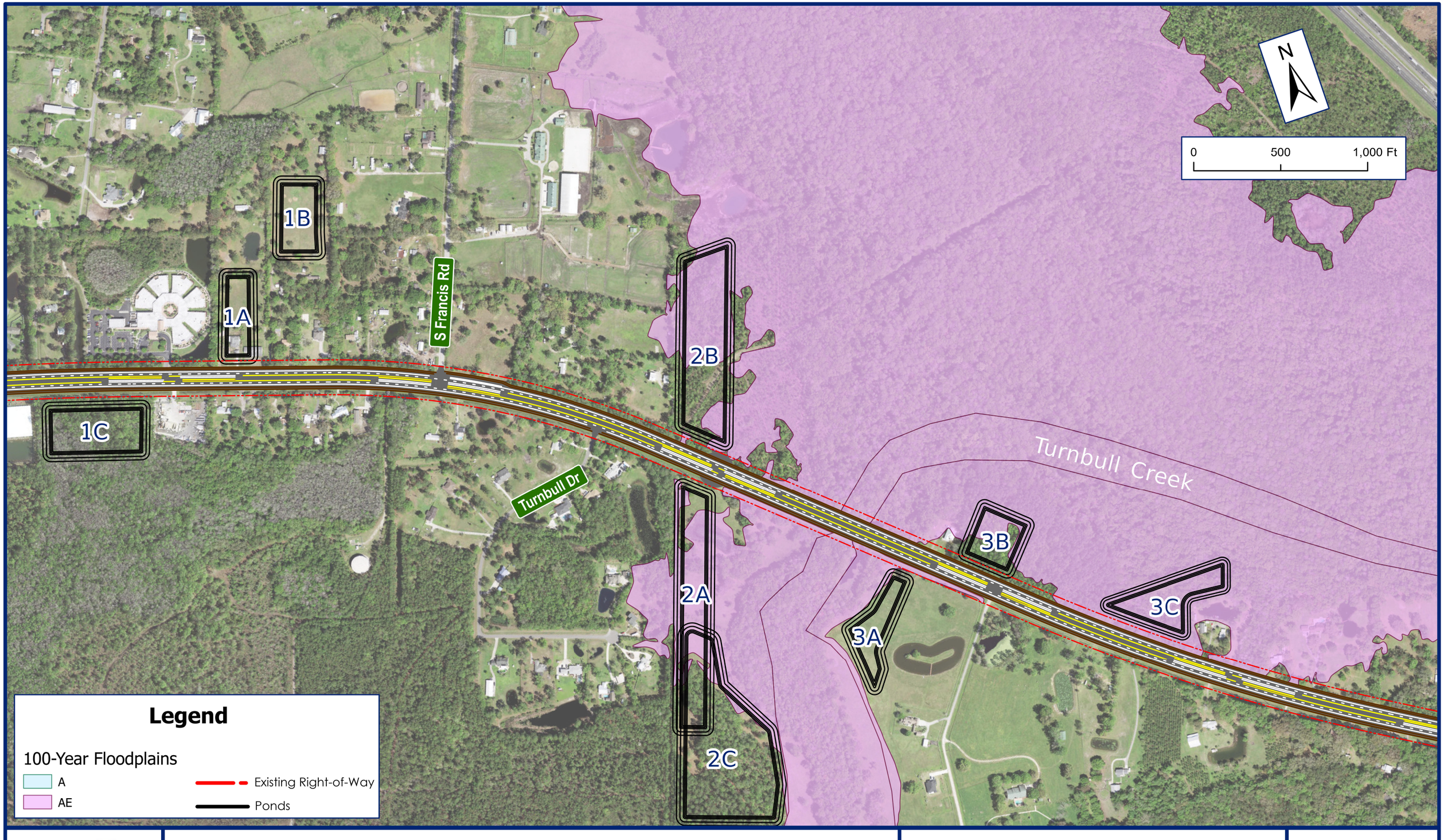
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SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

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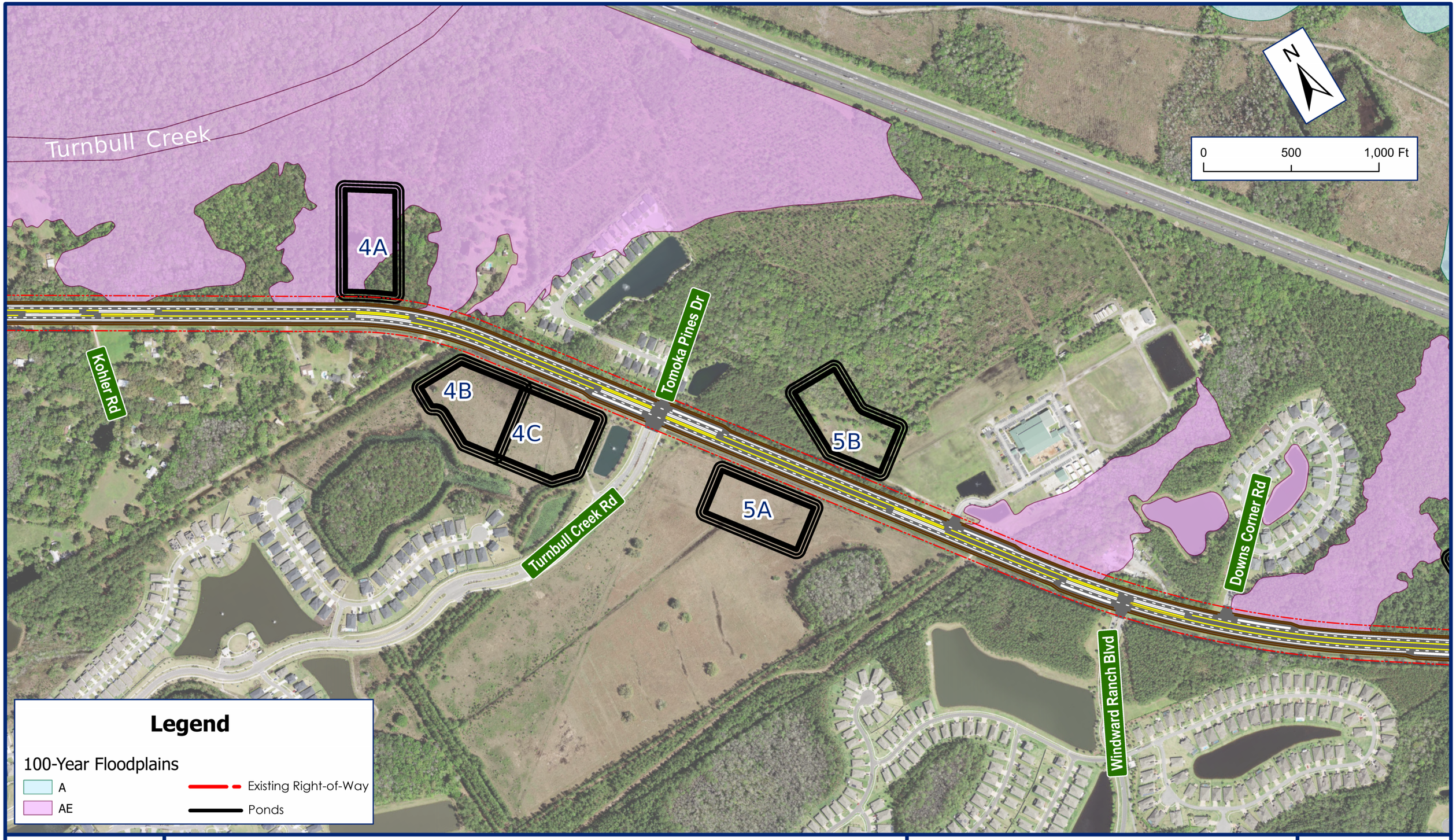
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FDOT

SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

Figure 2: FEMA Floodplains



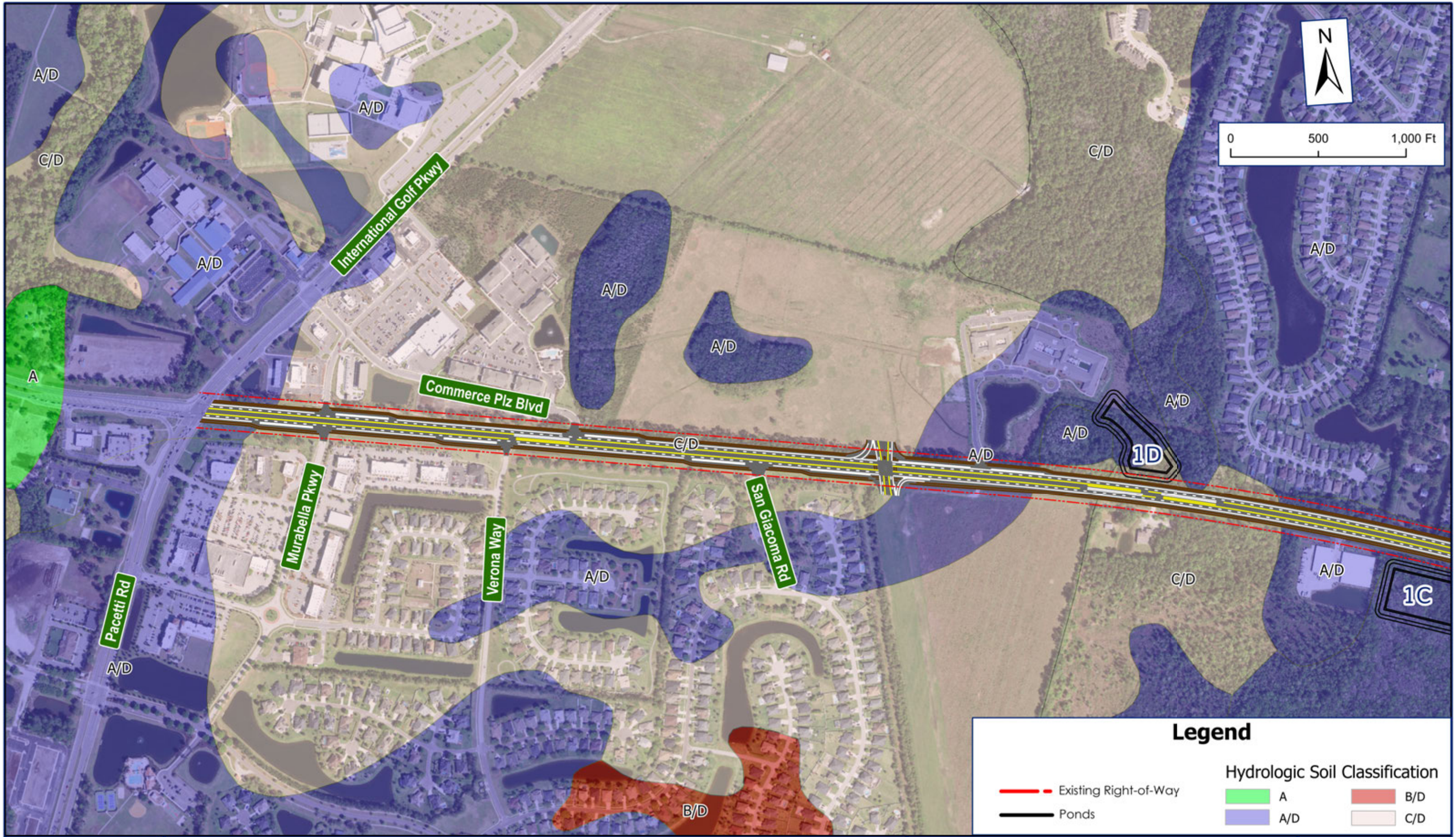
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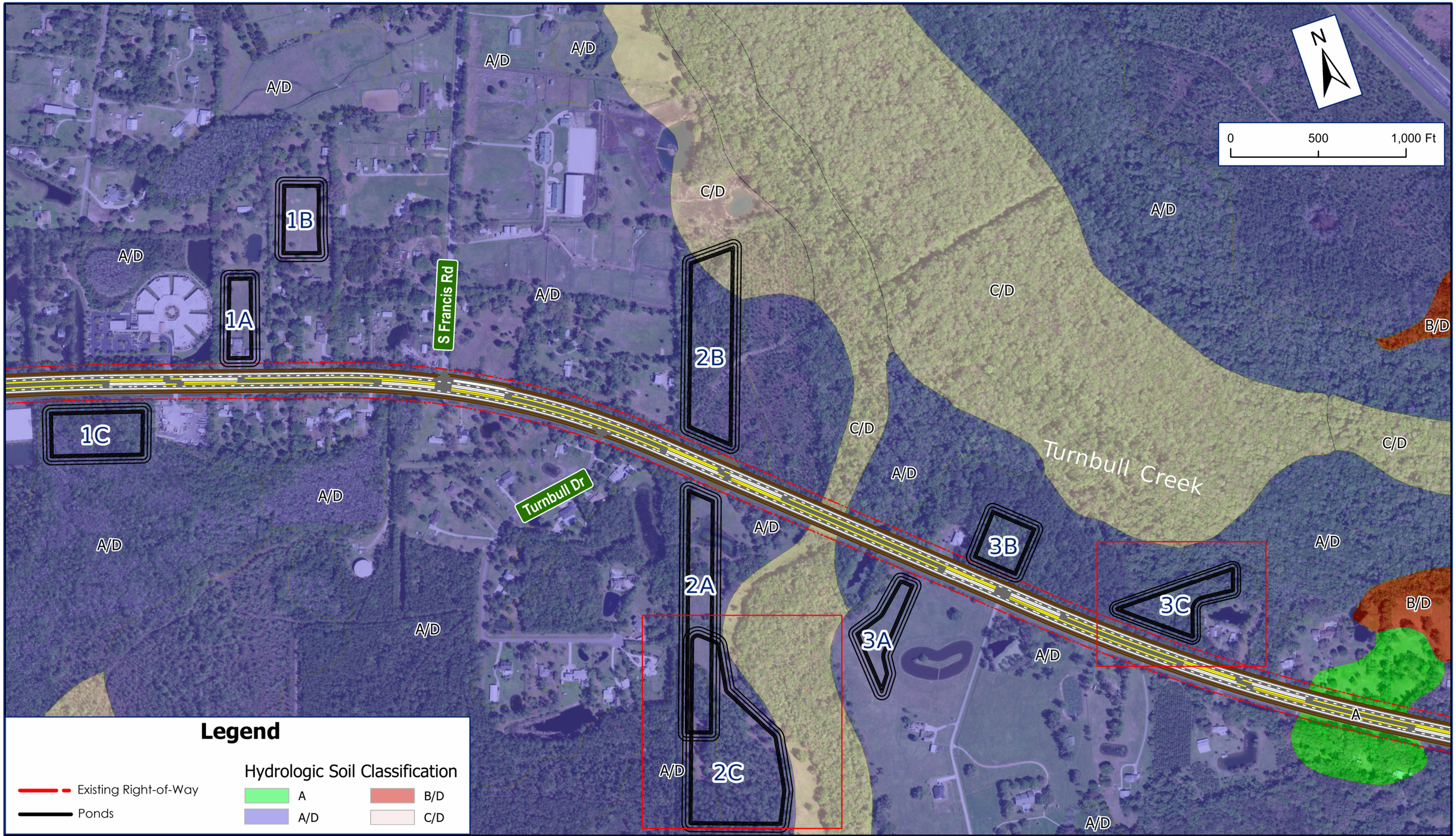
Figure 2: FEMA Floodplains



FDOT	**SR 16 from International Golf Parkway to I-95 PD&E Study** **FPID: 210447-5-32-01**	**Figure 2: FEMA Floodplains**	**Page No.** **4 of 4**

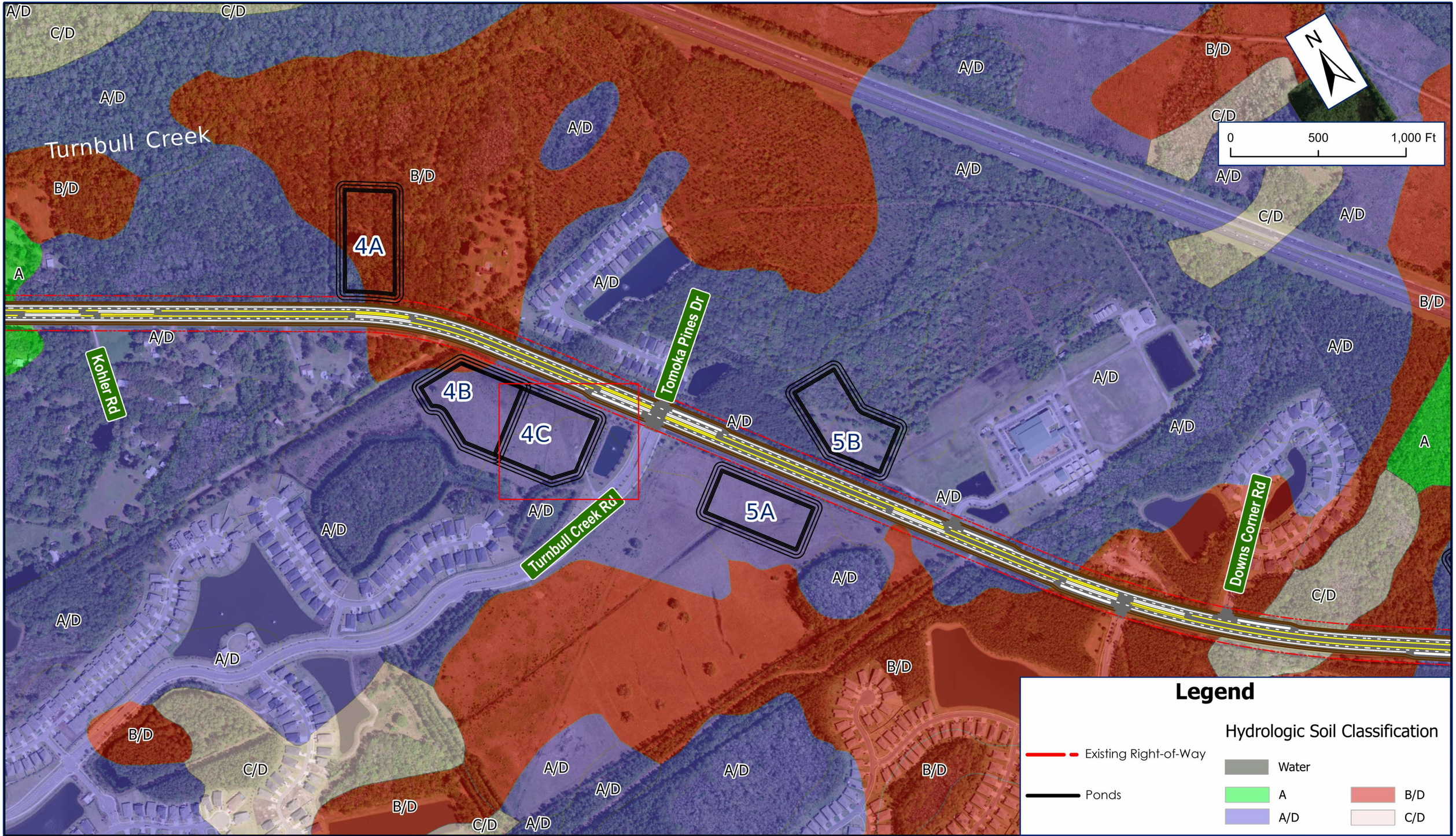


FDOT	**SR 16 from International Golf Parkway to I-95 PD&E Study** **FPID: 210447-5-32-01**	**Figure 3: Hydrologic Soils**	**Page No. 1 of 4**



SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

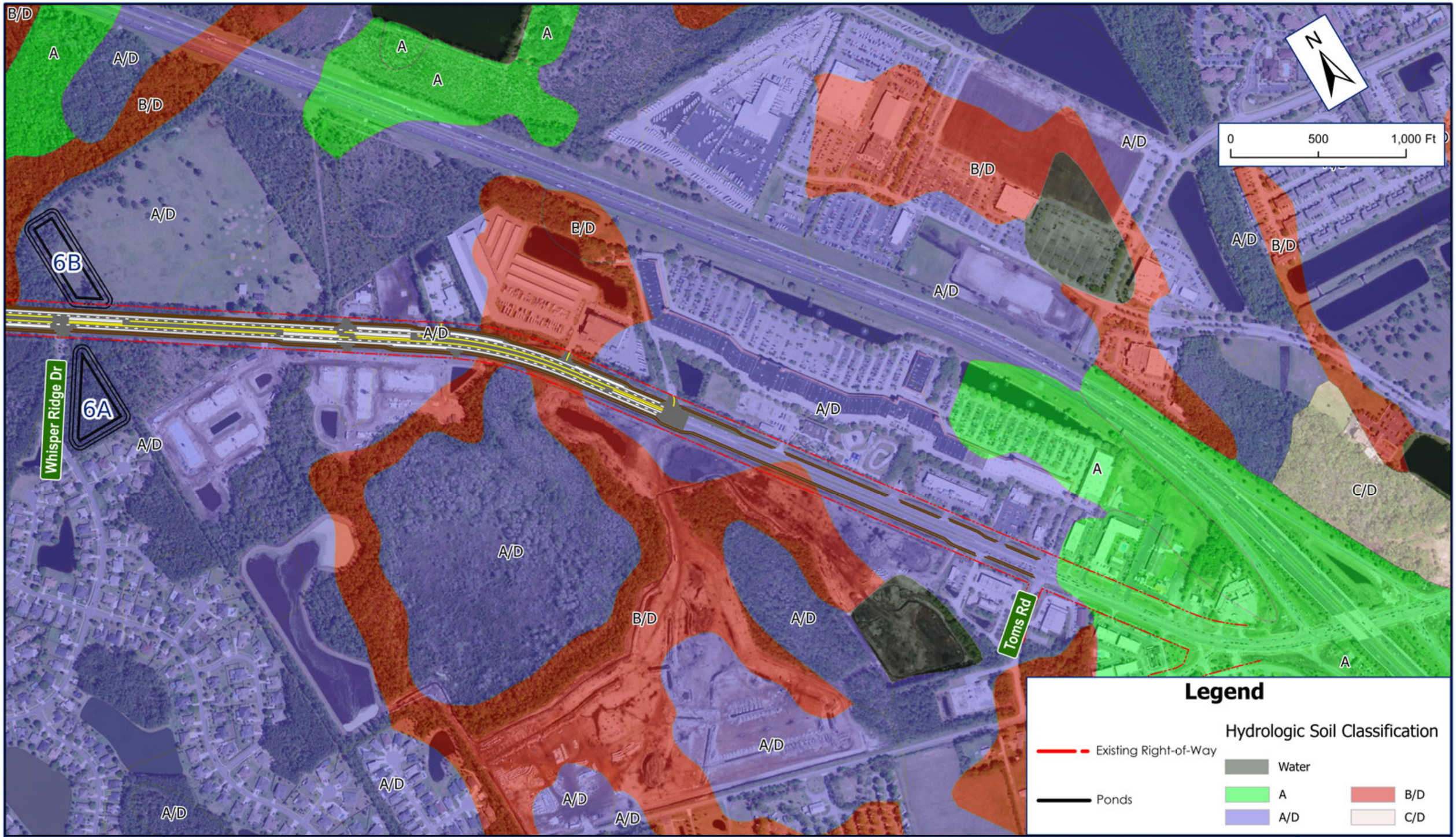
Figure 3: Hydrologic Soils



FDOT

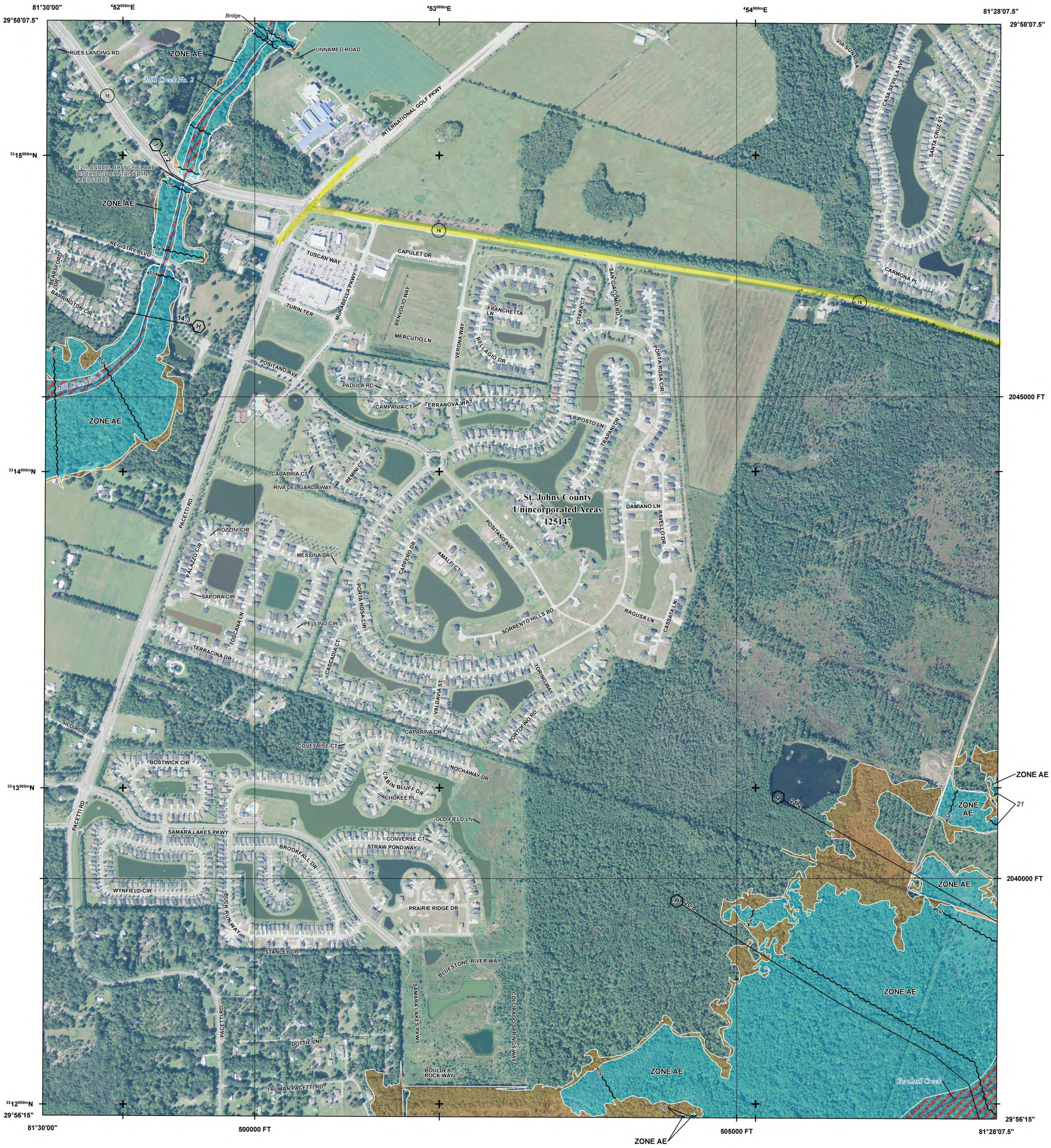
SR 16 from International Golf Parkway to I-95 PD&E Study
FPID: 210447-5-32-01

Figure 3: Hydrologic Soils



FDOT	**SR 16 from International Golf Parkway to I-95 PD&E Study** **FPID: 210447-5-32-01**	**Figure 3: Hydrologic Soils**	**Page No.** **4 of 4**

Appendix B – FEMA FIRM Panels



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

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SCALE

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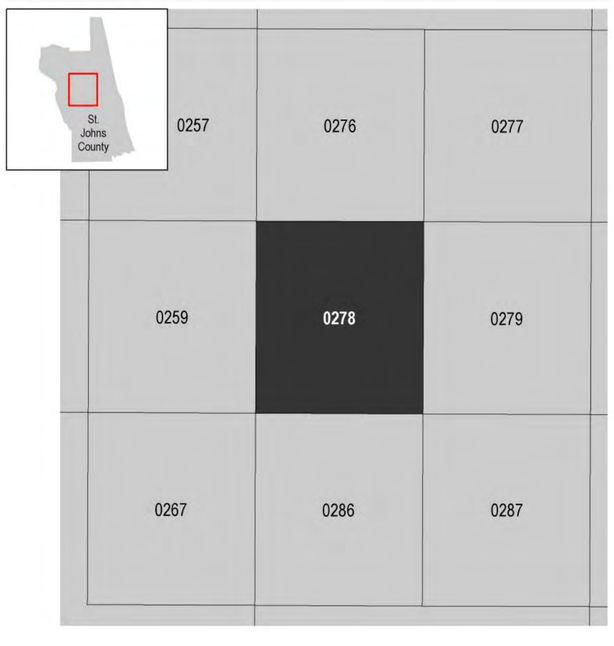
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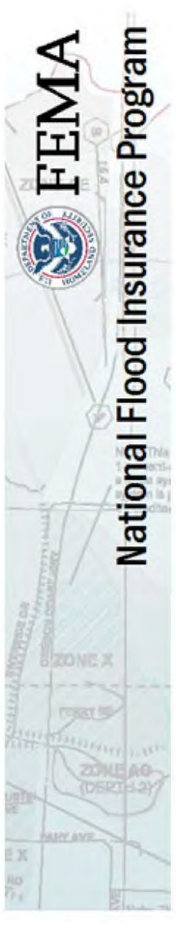
1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR





NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ST. JOHNS COUNTY, FLORIDA
and Incorporated Areas

PANEL 278 OF 560

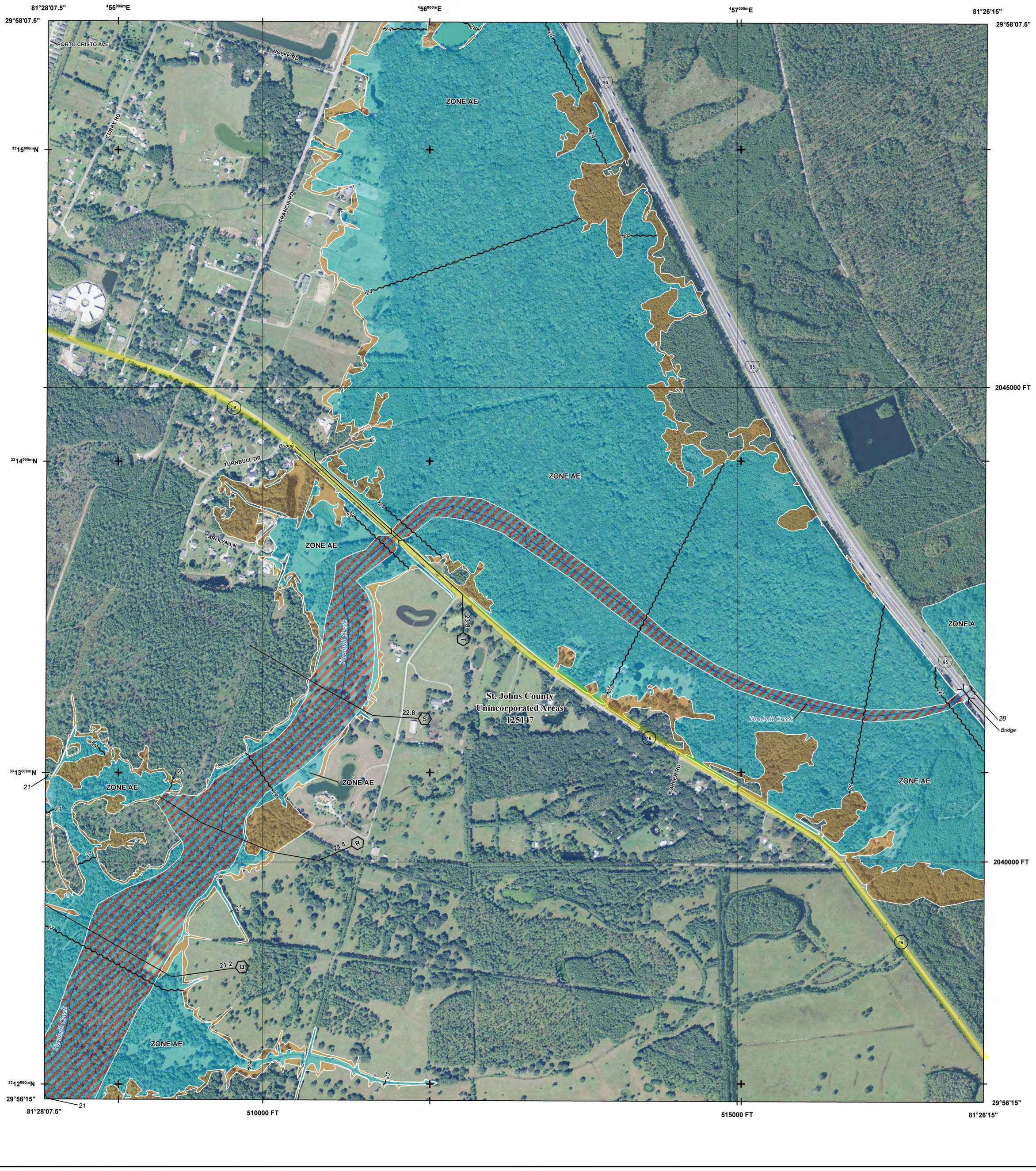
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ST. JOHNS COUNTY	125147	0278	J

VERSION NUMBER
2.3.3.2

MAP NUMBER
12109C0278J

MAP REVISED
DECEMBER 7, 2018



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

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SCALE

N

Map Projection:
State Plane Transverse Mercator, Florida East Zone 0901;
North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ST. JOHNS COUNTY, FLORIDA

and Incorporated Areas

PANEL 279 OF 560

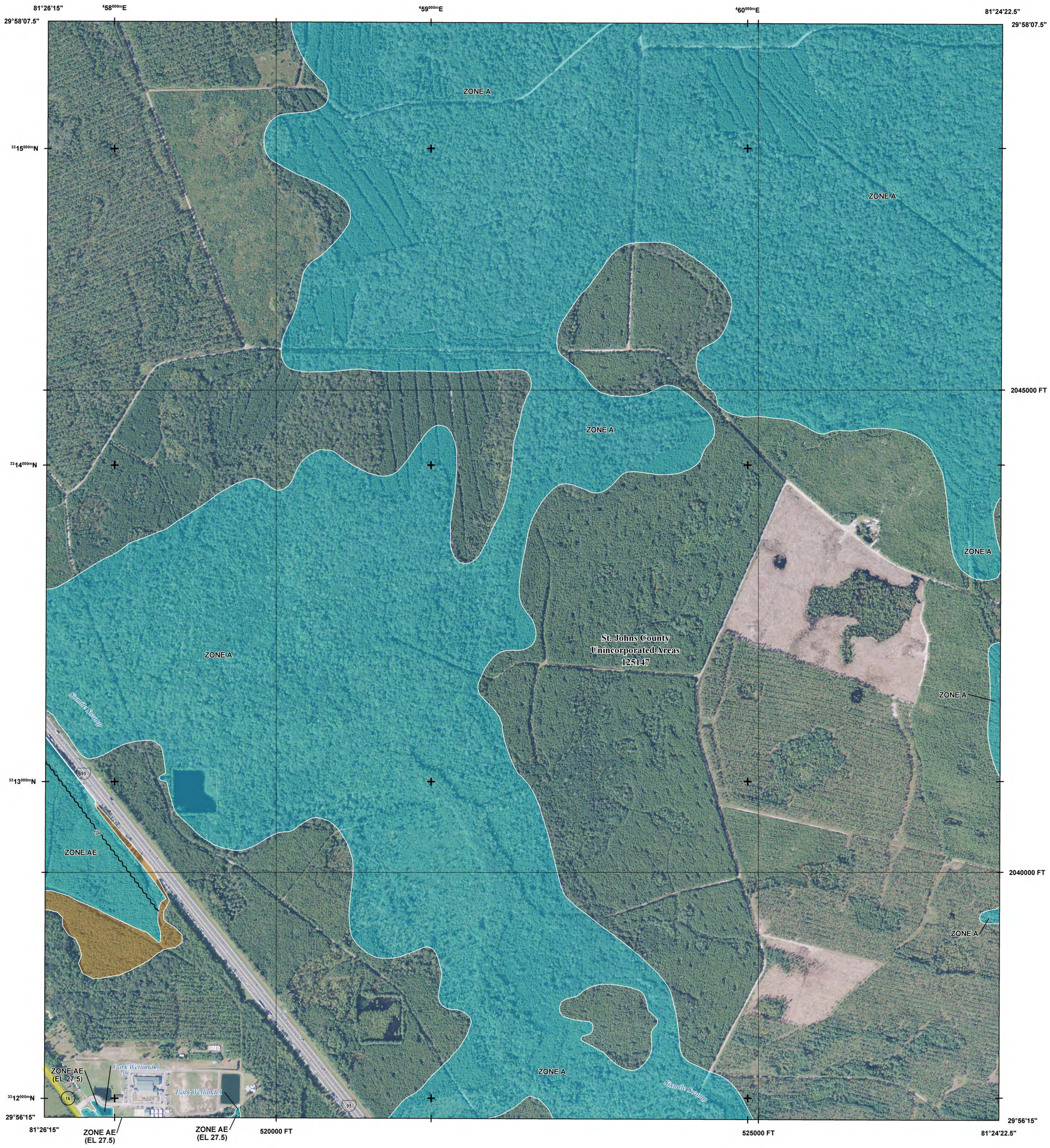
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ST. JOHNS COUNTY	125147	0279	J

VERSION NUMBER
2.3.3.2

MAP NUMBER
12109C0279J

MAP REVISED
DECEMBER 7, 2018



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

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SCALE

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North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ST. JOHNS COUNTY, FLORIDA

and Incorporated Areas

PANEL 283 OF 560

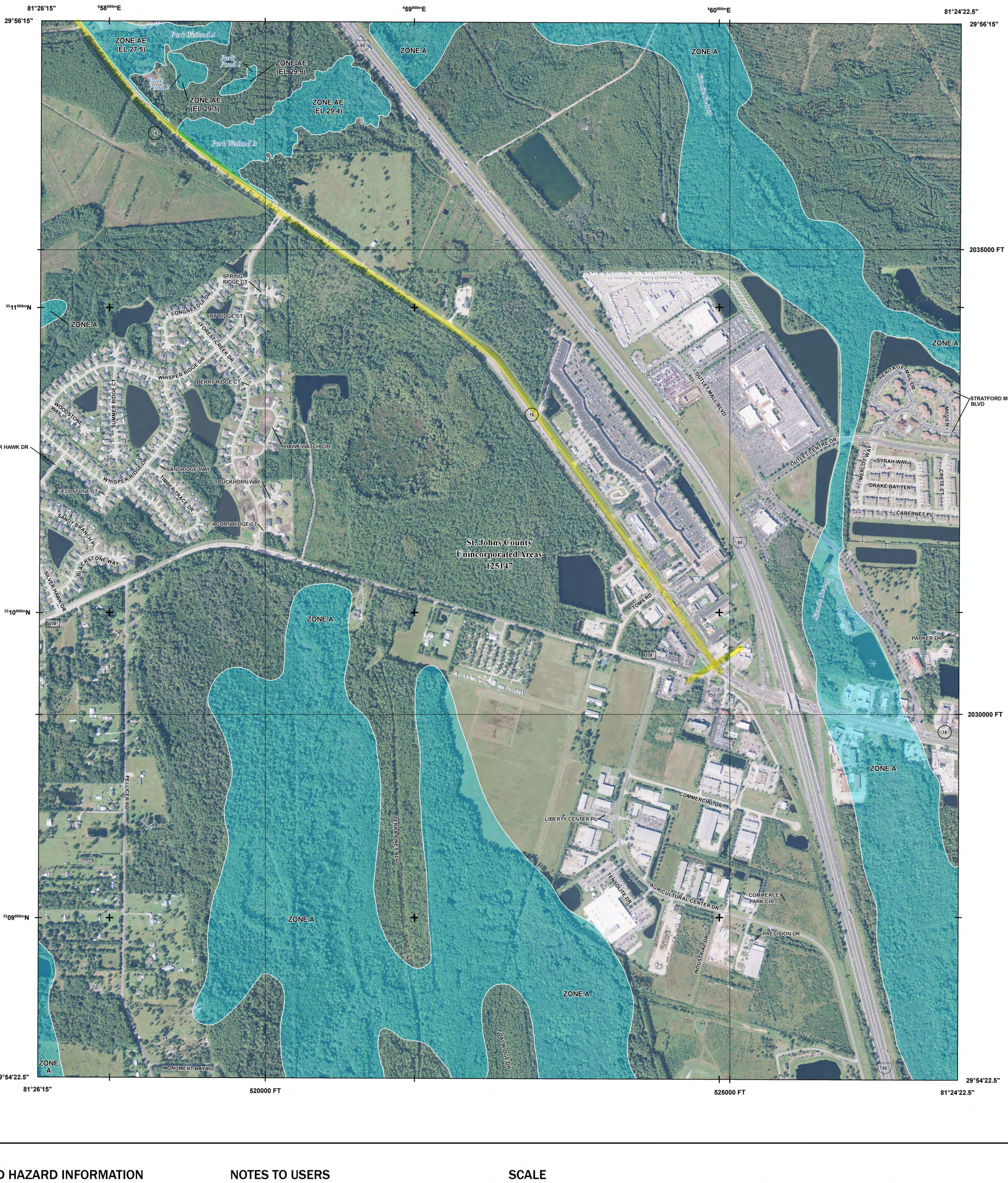
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ST. JOHNS COUNTY	125147	0283	J

VERSION NUMBER
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MAP NUMBER
12109C0283J

MAP REVISED
DECEMBER 7, 2018



FLOOD HAZARD INFORMATION

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SCALE

N

Map Projection:
State Plane Transverse Mercator, Florida East Zone 0901;
North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

ST. JOHNS COUNTY, FLORIDA

and Incorporated Areas

PANEL 291 OF 560

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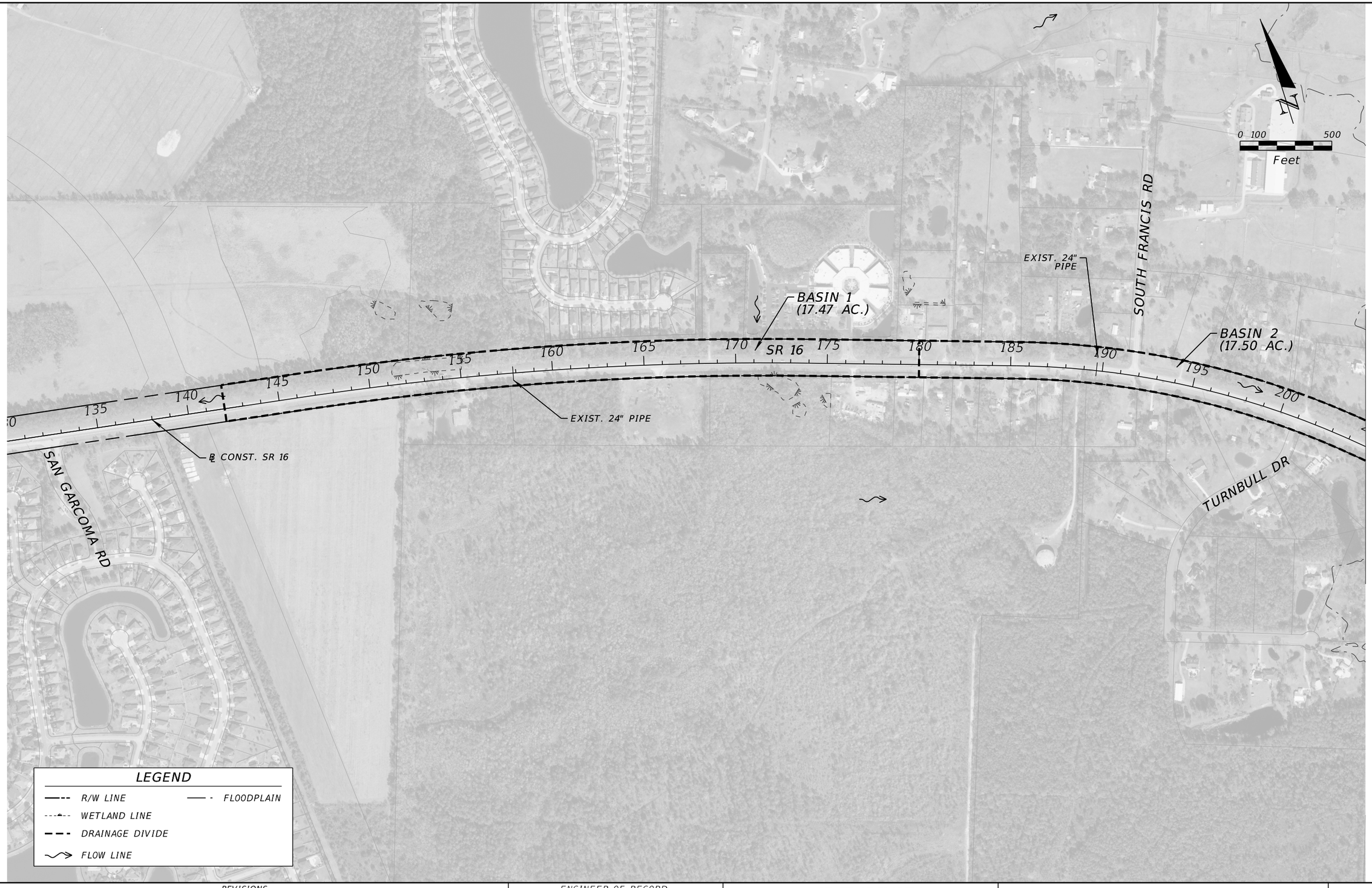
COMMUNITY	NUMBER	PANEL	SUFFIX
ST. JOHNS COUNTY	125147	0291	J

VERSION NUMBER
2.3.3.2

MAP NUMBER
12109C0291J

MAP REVISED
DECEMBER 7, 2018

Appendix C – Drainage Maps

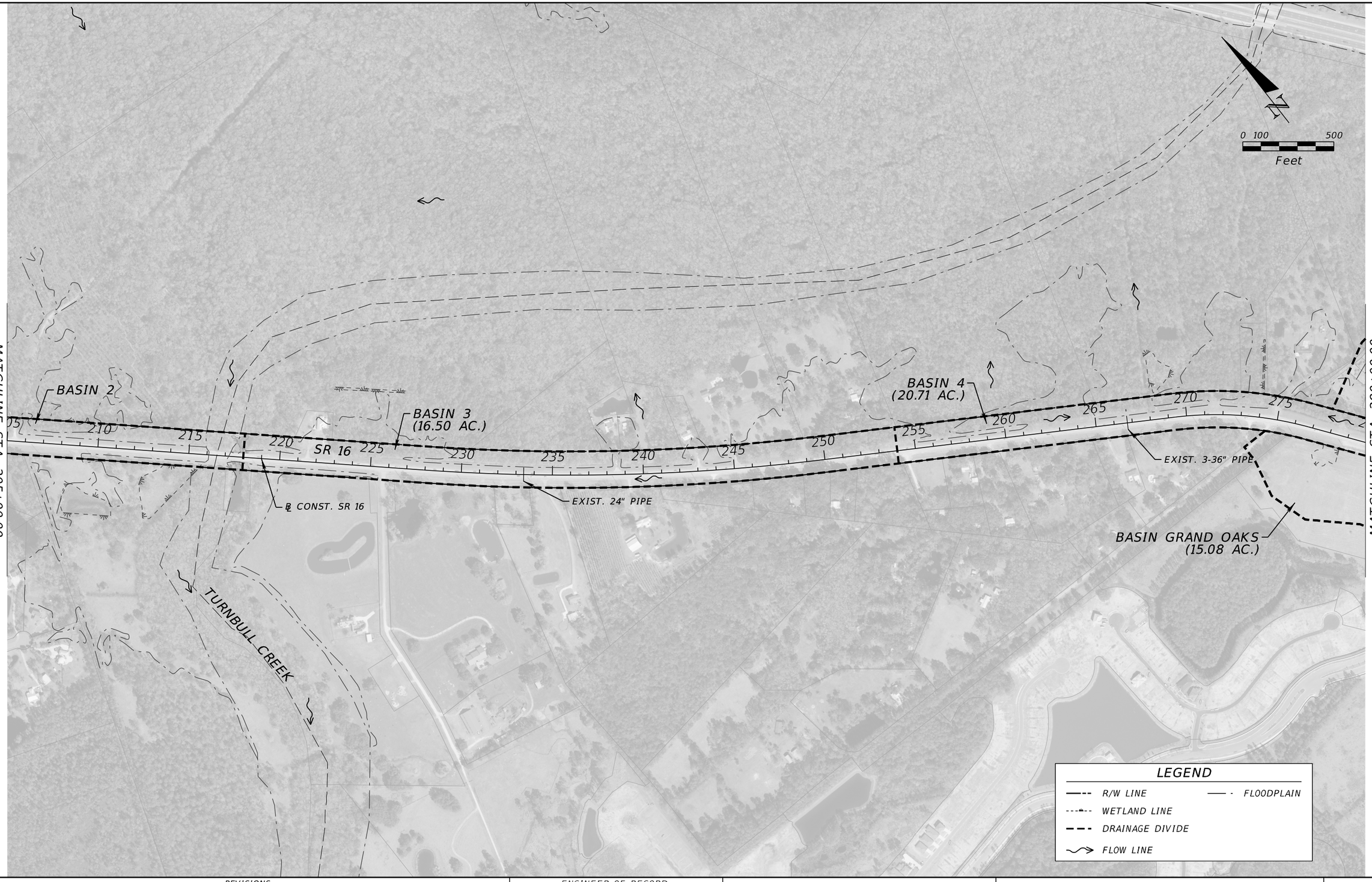


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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PRE-DEVELOPMENT DRAINAGE MAP (1)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC. 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION				SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC. 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID	PRE-DEVELOPMENT DRAINAGE MAP (2)	
					SR 16	ST. JOHNS	21044753201		

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MATCHLINE STA. 280+00.00

MATCHLINE STA. 355+00.00

BASIN TOMOKA PINES
(82.34 AC.)

BASIN TURNING POINT
(37.85 AC.)

BASIN SOUTH OF PARK PLACE
(124.83 AC.)

BASIN 4

BASIN 5
(17.86 AC.)

BASIN 6
(14.74 AC.)

BASIN GRAND OAKS

SOLUNA APARTMENTS
(108.20 AC.)

ORIENT DR

DOWNS CORNER RD

TURNBULL CREEK RD

WINDWARD RANCH BLVD

WHISPER RIDGE DR

SR 16

℄ CONST. SR 16

280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355

0 100 500
Feet

N

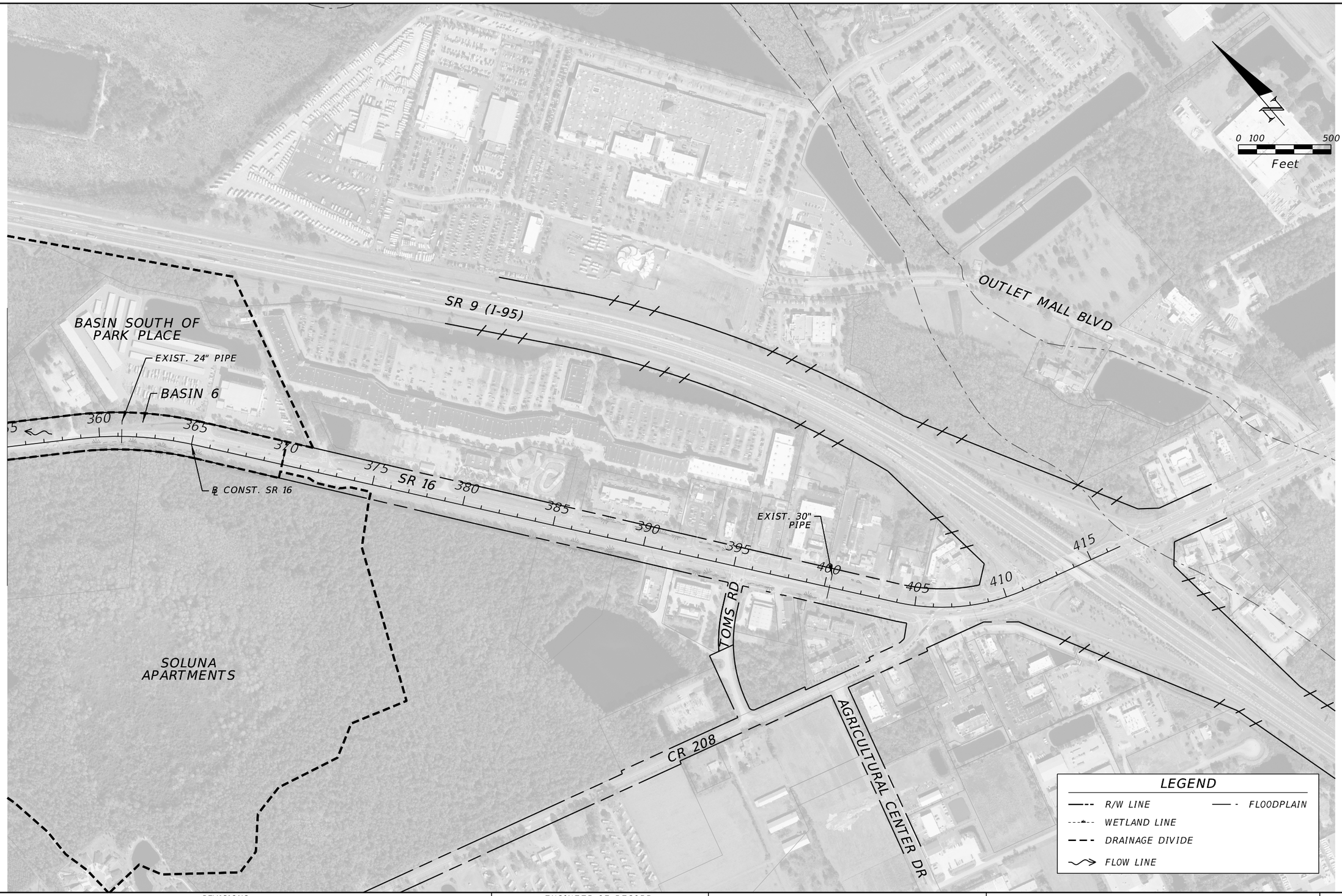
LEGEND

- R/W LINE
- WETLAND LINE
- DRAINAGE DIVIDE
- FLOW LINE
- FLOODPLAIN

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PRE-DEVELOPMENT DRAINAGE MAP (3)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC. 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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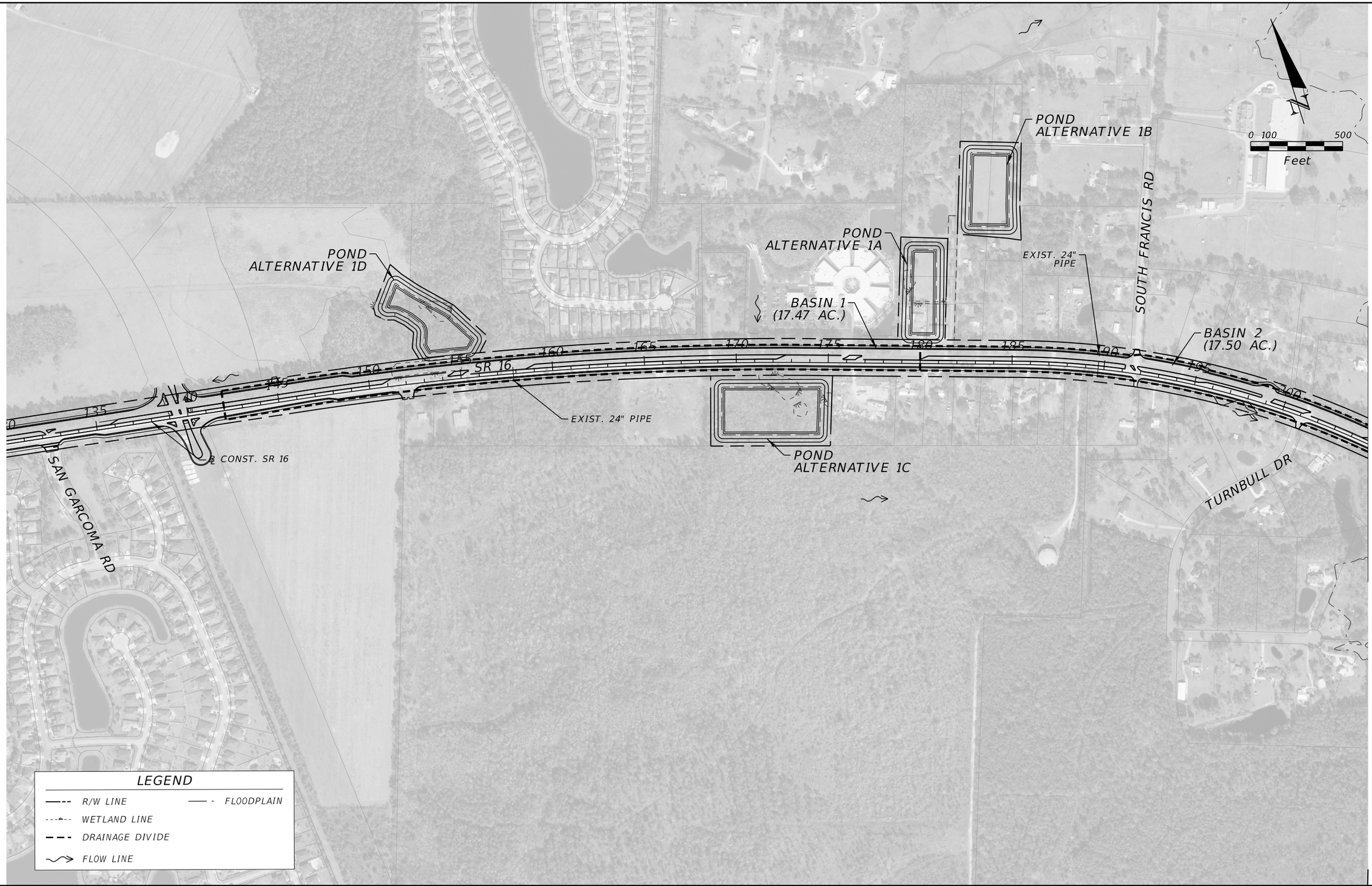


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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PRE-DEVELOPMENT DRAINAGE MAP (4)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC. 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

$DATES $TIMES $USERS
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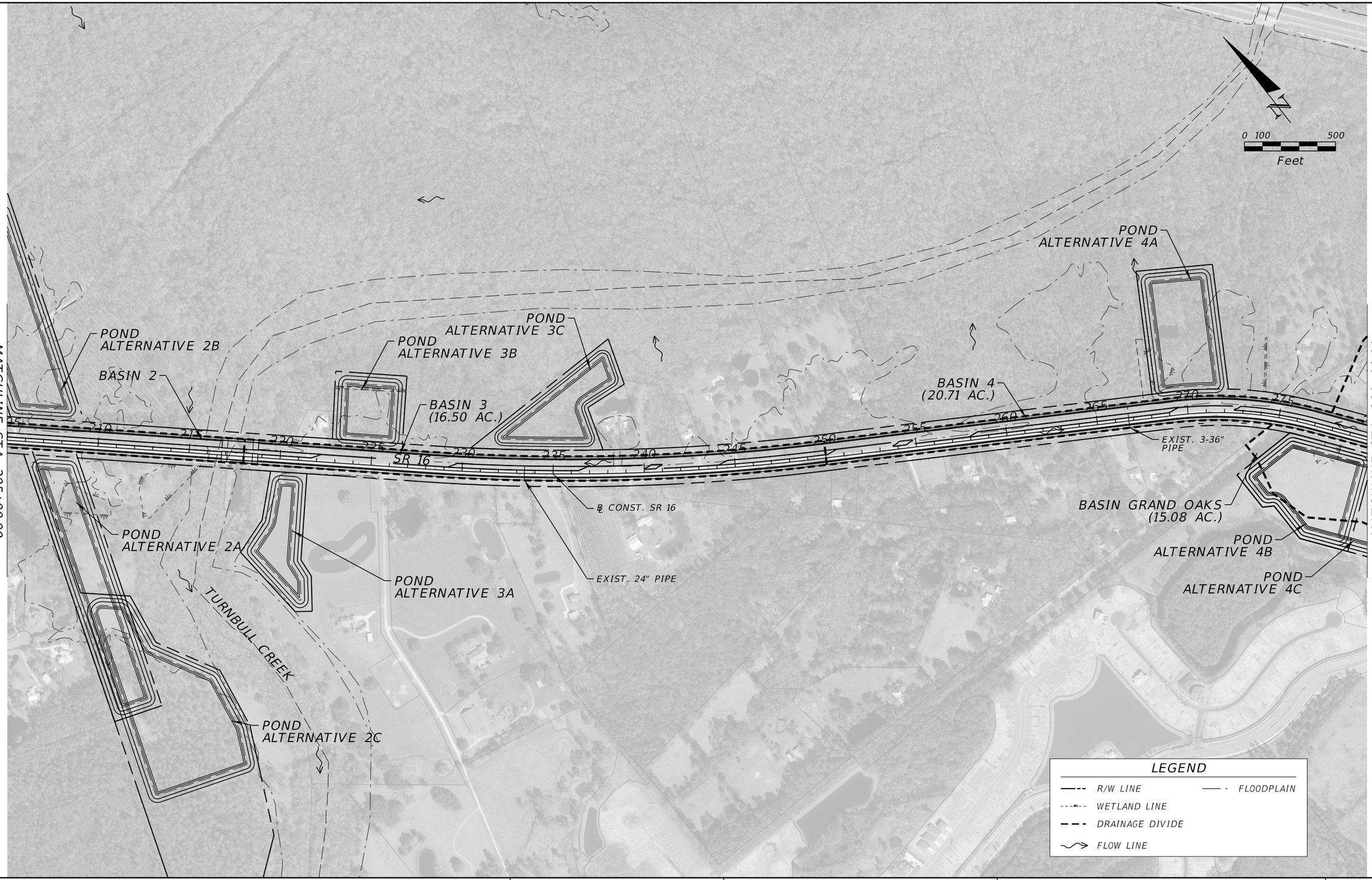


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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POST-DEVELOPMENT DRAINAGE MAP (1)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

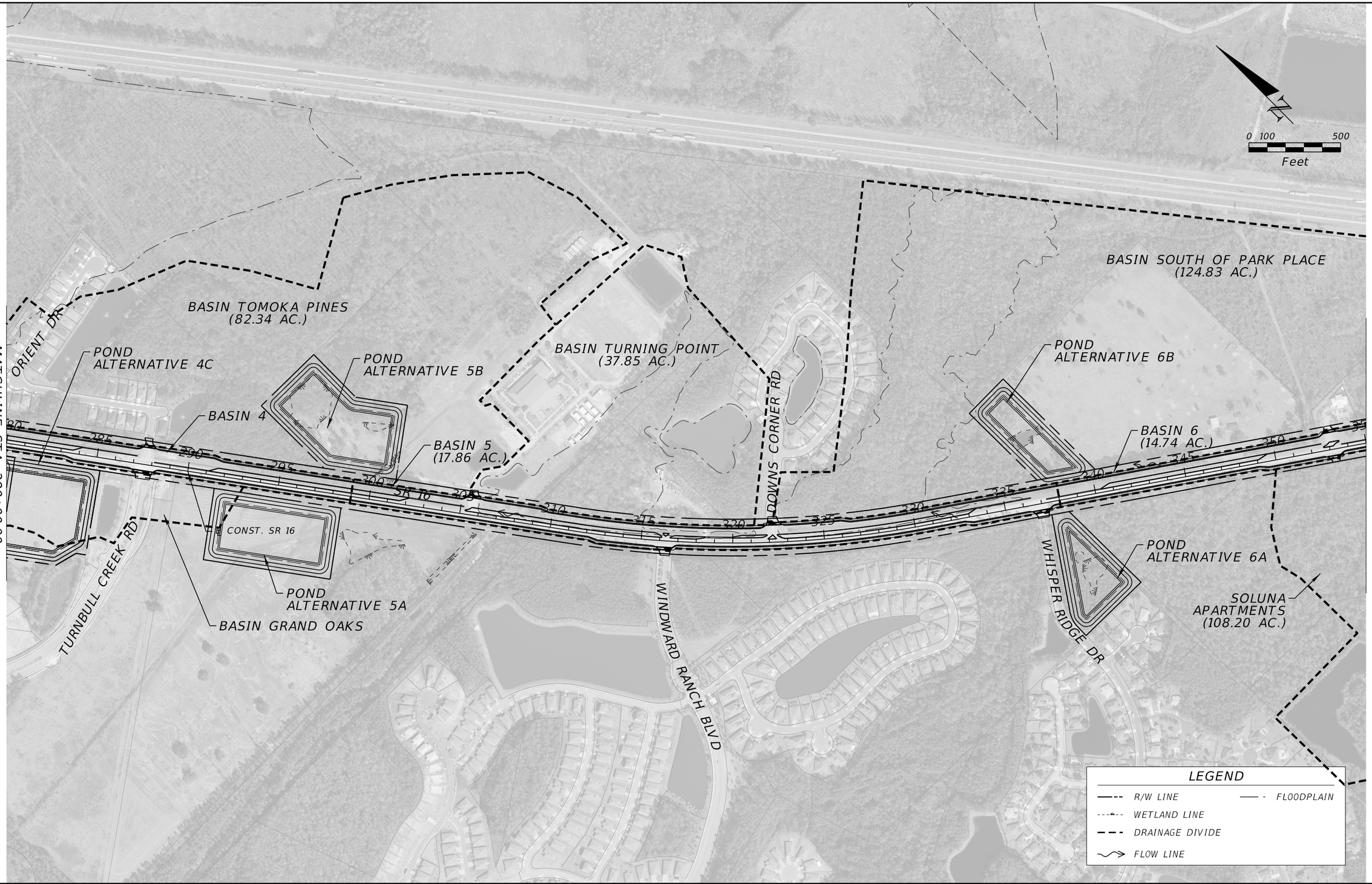
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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POST-DEVELOPMENT DRAINAGE MAP (2)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

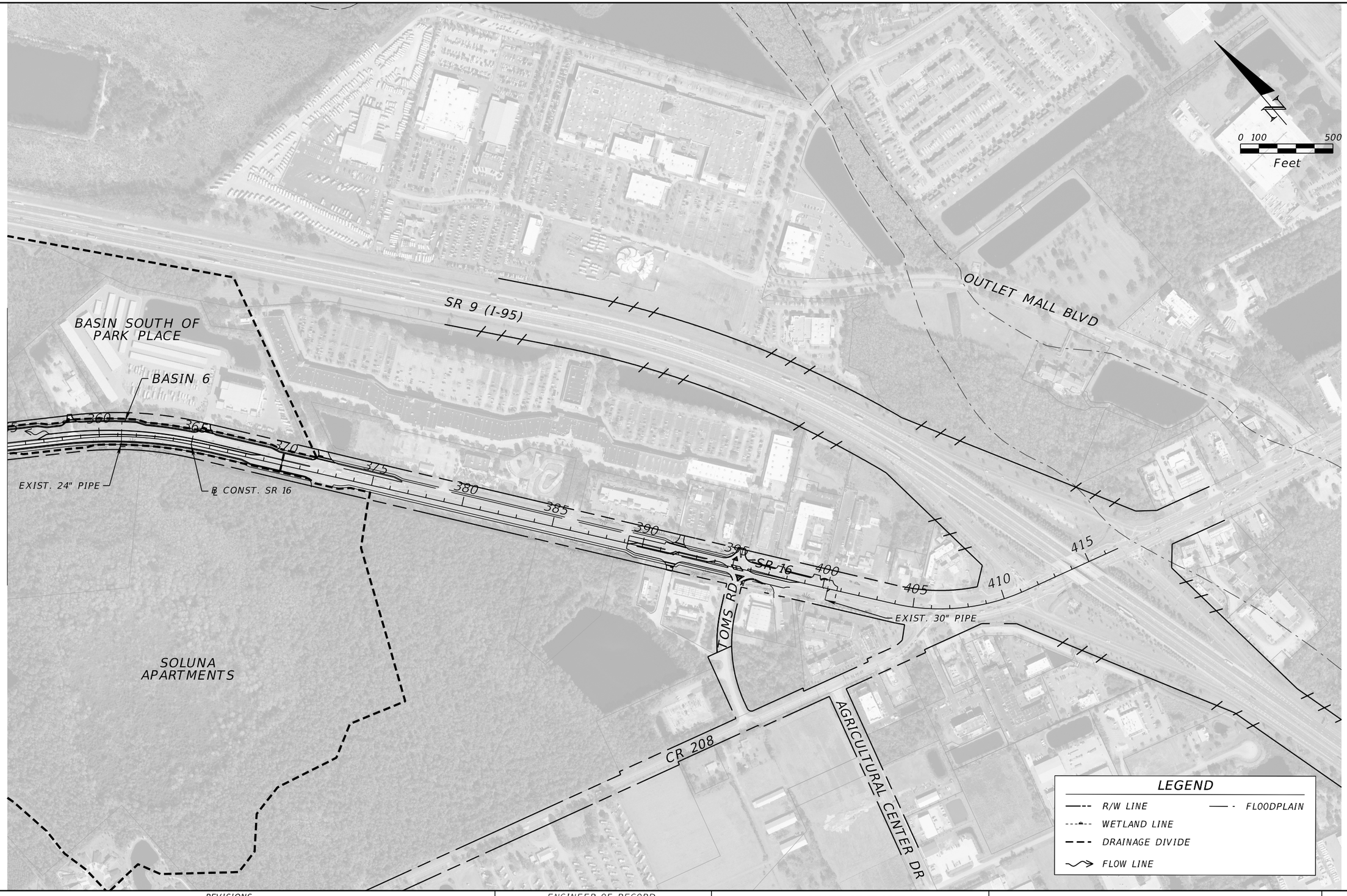
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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POST-DEVELOPMENT DRAINAGE MAP (3)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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$DATES STIMES SUSERS
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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POST-DEVELOPMENT DRAINAGE MAP (4)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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Appendix D – Pond Sizing Calculations

Time of Concentration Calculations

Treatment Calculations

Routing Calculations

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Pre-Basin 1 & 2
Condition: Pre-Development

Sheet Flow [TR-55 equation 3-3]

	AB		BC							
Surface Description	Smooth surfaces		Bermuda grass							
Manning's Roughness coeff., n	0.011		0.41							
Flow Length, L (should be <= 100 ft)	21	ft	28	ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in	4.52	in		in		in		
Elevation 1, E_1	28.00	ft	27.00	ft		ft		ft		
Elevation 2, E_2	27.00	ft	25.00	ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.05	ft/ft	0.07	ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	0.00	hr	0.07	hr		hr		hr		
	0.2	+	4.0	+		+		=	4.2	min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, s = (E_1 - E_2) / L		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		CD								
		Channel								
Open Channel	Front Slope, s_1	6.00	:1		:1		:1		:1	
	Bottom width, B	5.00	ft		ft		ft		ft	
	Back Slope, s_2	4.00	:1		:1		:1		:1	
	Depth, H	0.74	ft		ft		ft		ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		6.44	sq ft		sq ft		sq ft		sq ft	
Wetted Perimeter, P_w		12.55	ft		ft		ft		ft	
Hydraulic radius, r = a / P_w		0.51	ft		ft		ft		ft	
Flow Length, L		7300	ft		ft		ft		ft	
Elevation 1, E_1		25.00	ft		ft		ft		ft	
Elevation 2, E_2		18.50	ft		ft		ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0009	ft/ft		ft/ft		ft/ft		ft/ft	
Manning's Roughness coeff., n		0.042								
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.68	ft/s		ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		2.99	ft/s		ft/s		ft/s		ft/s	
		179.4	+		+		+		=	179.4 min

Total Time of Concentration

Watershed Tc = 184 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Post-Basin 1 & 2
Condition: Post-Development

Sheet Flow [TR-55 equation 3-3]

Surface Description									
Manning's Roughness coeff., n									
Flow Length, L (should be <= 100 ft)		ft		ft		ft		ft	
Two-yr, 24-hr rainfall, P_2		in		in		in		in	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Land Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
$Tt = 0.007 * (n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
$T_t = L / (3600 * V)$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		AB		BC		CD			
		Pipe		Pipe		Pipe			
Open Channel	Front Slope, s_1		:1		:1		:1		:1
	Bottom width, B		ft		ft		ft		ft
	Back Slope, s_2		:1		:1		:1		:1
	Depth, H		ft		ft		ft		ft
Pipe	Diameter, D	36.0	in	42.0	in	48.0	in		in
Cross Sectional Flow Area, a		7.07	sq ft	9.62	sq ft	12.57	sq ft		sq ft
Wetted Perimeter, P_w		9.42	ft	11.00	ft	12.57	ft		ft
Hydraulic radius, $r = a / P_w$		0.75	ft	0.88	ft	1.00	ft		ft
Flow Length, L		1800	ft	2400	ft	2700	ft		ft
Elevation 1, E_1		23.50	ft	22.00	ft	19.10	ft		ft
Elevation 2, E_2		22.00	ft	19.10	ft	16.80	ft		ft
Channel Slope, $s = (E_1 - E_2) / L$		0.0008	ft/ft	0.0012	ft/ft	0.0009	ft/ft		ft/ft
Manning's Roughness coeff., n		0.012		0.012		0.012			
Average Velocity, $V = 1.49 * r^{2/3} * s^{1/2} /$		2.96	ft/s	3.95	ft/s	3.62	ft/s		ft/s
$T_t = L / (3600 * V)$		0.17	ft/s	0.17	ft/s	0.21	ft/s		ft/s
		10.1	+	10.1	+	12.4	+	=	32.7 min

Total Time of Concentration

30 min ɔd Tc = 33 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Pre-Basin 3
Condition: Pre-Development

Sheet Flow [TR-55 equation 3-3]

	AB		BC							
Surface Description	Smooth surfaces		Bermuda grass							
Manning's Roughness coeff., n	0.011		0.41							
Flow Length, L (should be <= 100 ft)	20	ft	35	ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in	4.52	in		in		in		
Elevation 1, E_1	28.50	ft	27.80	ft		ft		ft		
Elevation 2, E_2	27.80	ft	22.00	ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.04	ft/ft	0.17	ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	0.00	hr	0.06	hr		hr		hr		
	0.2	+	3.4	+		+		=	3.6	min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, s = (E_1 - E_2) / L		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		CD								
		Channel								
Open Channel	Front Slope, s_1	6.00	:1		:1		:1		:1	
	Bottom width, B	5.00	ft		ft		ft		ft	
	Back Slope, s_2	4.00	:1		:1		:1		:1	
	Depth, H	0.93	ft		ft		ft		ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		8.97	sq ft		sq ft		sq ft		sq ft	
Wetted Perimeter, P_w		14.49	ft		ft		ft		ft	
Hydraulic radius, r = a / P_w		0.62	ft		ft		ft		ft	
Flow Length, L		3570	ft		ft		ft		ft	
Elevation 1, E_1		22.00	ft		ft		ft		ft	
Elevation 2, E_2		19.00	ft		ft		ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0008	ft/ft		ft/ft		ft/ft		ft/ft	
Manning's Roughness coeff., n		0.042								
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.75	ft/s		ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		1.33	ft/s		ft/s		ft/s		ft/s	
		79.6	+		+		+		=	79.6 min

Total Time of Concentration

Watershed Tc = 83 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Post-Basin 3
Condition: Post-Development

Sheet Flow [TR-55 equation 3-3]

Surface Description									
Manning's Roughness coeff., n									
Flow Length, L (should be <= 100 ft)		ft		ft		ft		ft	
Two-yr, 24-hr rainfall, P_2		in		in		in		in	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Land Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
$Tt = 0.007 * (n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
$T_t = L / (3600 * V)$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		CD							
		Pipe							
Open Channel	Front Slope, s_1		:1		:1		:1		:1
	Bottom width, B		ft		ft		ft		ft
	Back Slope, s_2		:1		:1		:1		:1
	Depth, H		ft		ft		ft		ft
Pipe	Diameter, D	36	in		in		in		in
Cross Sectional Flow Area, a		7.07	sq ft		sq ft		sq ft		sq ft
Wetted Perimeter, P_w		9.42	ft		ft		ft		ft
Hydraulic radius, $r = a / P_w$		0.75	ft		ft		ft		ft
Flow Length, L		3570	ft		ft		ft		ft
Elevation 1, E_1		22.00	ft		ft		ft		ft
Elevation 2, E_2		19.00	ft		ft		ft		ft
Channel Slope, $s = (E_1 - E_2) / L$		0.0008	ft/ft		ft/ft		ft/ft		ft/ft
Manning's Roughness coeff., n		0.012							
Average Velocity, $V = 1.49 * r^{2/3} * s^{1/2} /$		2.97	ft/s		ft/s		ft/s		ft/s
$T_t = L / (3600 * V)$		0.33	ft/s		ft/s		ft/s		ft/s
		20.0	+		+		+	=	20.0 min

Total Time of Concentration

Watershed Tc = 20 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Pre-Basin 4 & 5 & 6
Condition: Pre-Development

Sheet Flow [TR-55 equation 3-3]

	AB		BC							
Surface Description	Smooth surfaces		Bermuda grass							
Manning's Roughness coeff., n	0.011		0.41							
Flow Length, L (should be <= 100 ft)	20	ft	25	ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in	4.52	in		in		in		
Elevation 1, E_1	45.90	ft	45.50	ft		ft		ft		
Elevation 2, E_2	45.50	ft	43.50	ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.02	ft/ft	0.08	ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	0.00	hr	0.06	hr		hr		hr		
	0.3	+	3.5	+		+		=	3.8	min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, s = (E_1 - E_2) / L		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		CD		DE		EF				
		Channel		Channel		Channel				
Open Channel	Front Slope, s_1	6.00	:1	6.00	:1	6.00	:1		:1	
	Bottom width, B	5.00	ft	5.00	ft	5.00	ft		ft	
	Back Slope, s_2	4.00	:1	4.00	:1	4.00	:1		:1	
	Depth, H	0.84	ft	0.80	ft	0.72	ft		ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		7.73	sq ft	7.20	sq ft	6.19	sq ft		sq ft	
Wetted Perimeter, P_w		13.57	ft	13.16	ft	12.35	ft		ft	
Hydraulic radius, r = a / P_w		0.57	ft	0.55	ft	0.50	ft		ft	
Flow Length, L		1500	ft	2000	ft	6500	ft		ft	
Elevation 1, E_1		43.50	ft	43.30	ft	31.00	ft		ft	
Elevation 2, E_2		43.30	ft	31.00	ft	21.00	ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0001	ft/ft	0.0062	ft/ft	0.0015	ft/ft		ft/ft	
Manning's Roughness coeff., n		0.042		0.042		0.042				
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.28	ft/s	1.86	ft/s	0.88	ft/s		ft/s	
T_t = L / (3600 * V)		1.48	ft/s	0.30	ft/s	2.06	ft/s		ft/s	
		88.8	+	17.9	+	123.3	+		=	230.1 min

Total Time of Concentration

Watershed Tc = 234 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Post-Basin 4 & 5 & 6
Condition: Post-Development

Sheet Flow [TR-55 equation 3-3]

Surface Description									
Manning's Roughness coeff., n									
Flow Length, L (should be <= 100 ft)		ft		ft		ft		ft	
Two-yr, 24-hr rainfall, P_2		in		in		in		in	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Land Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
$Tt = 0.007 * (n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Shallow Concentrated Flow [TR-55 figure 3-1]

Surface Description									
Flow Length, L		ft		ft		ft		ft	
Elevation 1, E_1		ft		ft		ft		ft	
Elevation 2, E_2		ft		ft		ft		ft	
Watercourse Slope, $s = (E_1 - E_2) / L$		ft/ft		ft/ft		ft/ft		ft/ft	
Average Velocity, V		ft/s		ft/s		ft/s		ft/s	
$T_t = L / (3600 * V)$		hr		hr		hr		hr	
		+		+		+		=	0.0 min

Open Channel Flow [TR-55 equation 3-4]

		AB		BC		CD			
		Pipe		Pipe		Pipe			
Open Channel	Front Slope, s_1		:1		:1		:1		:1
	Bottom width, B		ft		ft		ft		ft
	Back Slope, s_2		:1		:1		:1		:1
	Depth, H		ft		ft		ft		ft
Pipe	Diameter, D	30	in	48	in	60	in		in
Cross Sectional Flow Area, a		4.91	sq ft	12.57	sq ft	19.63	sq ft		sq ft
Wetted Perimeter, P_w		7.85	ft	12.57	ft	15.71	ft		ft
Hydraulic radius, $r = a / P_w$		0.63	ft	1.00	ft	1.25	ft		ft
Flow Length, L		1500	ft	2000	ft	6500	ft		ft
Elevation 1, E_1		43.50	ft	43.30	ft	31.00	ft		ft
Elevation 2, E_2		43.30	ft	31.00	ft	21.00	ft		ft
Channel Slope, $s = (E_1 - E_2) / L$		0.0001	ft/ft	0.0062	ft/ft	0.0015	ft/ft		ft/ft
Manning's Roughness coeff., n		0.012		0.012		0.012			
Average Velocity, $V = 1.49 * r^{2/3} * s^{1/2} /$		1.05	ft/s	9.74	ft/s	5.65	ft/s		ft/s
$T_t = L / (3600 * V)$		0.40	ft/s	0.06	ft/s	0.32	ft/s		ft/s
		23.9	+	3.4	+	19.2	+	=	46.4 min

Total Time of Concentration

Watershed Tc = 46 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Post Grand Oaks**
Condition: **Post-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	26.82	ft		ft		ft		ft		
Elevation 2, E_2	25.97	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.01	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * $s^{0.4}$)	0.74	hr		hr		hr		hr		
	44.3	+		+		+		=	44.3	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	842	ft		ft		ft		ft		
Elevation 1, E_1	26.82	ft		ft		ft		ft		
Elevation 2, E_2	23.91	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	1.000	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	16.13	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.01	hr		hr		hr		hr		
	0.9	+		+		+		=	0.9	min

Open Channel Flow [TR-55 equation 3-4]

		Pond 4 to outfall									
		Pipe									
Open Channel	Front Slope, s_1		:1		:1		:1		:1		
	Bottom width, B		ft		ft		ft		ft		
	Back Slope, s_2		:1		:1		:1		:1		
	Depth, H		ft		ft		ft		ft		
Pipe	Diameter, D	60	in		in		in		in		
Cross Sectional Flow Area, a		19.63	sq ft		sq ft		sq ft		sq ft		
Wetted Perimeter, P_w		15.71	ft		ft		ft		ft		
Hydraulic radius, r = a / P_w		1.25	ft		1		ft		ft		
Flow Length, L		1189	ft		ft		ft		ft		
Elevation 1, E_1		23.91	ft		ft		ft		ft		
Elevation 2, E_2		22.23	ft		ft		ft		ft		
Channel Slope, s = (E_1 - E_2) / L		0.0014	ft/ft		ft/ft		ft/ft		ft/ft		
Manning's Roughness coeff., n		0.012									
Average Velocity, V = 1.49 * $r^{2/3}$ * $s^{1/2}$ /		5.42	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)		0.06	ft/s		ft/s		ft/s		ft/s		
		3.7	+		+		+		=	3.7	min

Total Time of Concentration

Watershed Tc to Boundry 4 = 49 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Pre Grand Oaks**
Condition: **Pre-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	26.82	ft		ft		ft		ft		
Elevation 2, E_2	25.97	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.01	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	0.74	hr		hr		hr		hr		
	44.3	+		+		+		=	44.3	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	842	ft		ft		ft		ft		
Elevation 1, E_1	26.82	ft		ft		ft		ft		
Elevation 2, E_2	23.91	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	1.000	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	16.13	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.01	hr		hr		hr		hr		
	0.9	+		+		+		=	0.9	min

Open Channel Flow [TR-55 equation 3-4]

		CD									
		Channel									
Open Channel	Front Slope, s_1	6.00	:1		:1		:1		:1		
	Bottom width, B	5.00	ft		ft		ft		ft		
	Back Slope, s_2	4.00	:1		:1		:1		:1		
	Depth, H	1.00	ft		ft		ft		ft		
Pipe	Diameter, D		in		in		in		in		
Cross Sectional Flow Area, a		10.00	sq ft		sq ft		sq ft		sq ft		
Wetted Perimeter, P_w		15.21	ft		ft		ft		ft		
Hydraulic radius, r = a / P_w		0.66	ft		ft		ft		ft		
Flow Length, L		1189	ft		ft		ft		ft		
Elevation 1, E_1		23.91	ft		ft		ft		ft		
Elevation 2, E_2		22.23	ft		ft		ft		ft		
Channel Slope, s = (E_1 - E_2) / L		0.0014	ft/ft		ft/ft		ft/ft		ft/ft		
Manning's Roughness coeff., n		0.042									
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		1.01	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)		0.33	ft/s		ft/s		ft/s		ft/s		
		19.7	+		+		+		=	19.7	min

Total Time of Concentration

Watershed Tc to Boundry 4 = 65 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Post Tomoka Pines**
Condition: **Post-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	28.48	ft		ft		ft		ft		
Elevation 2, E_2	28.30	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * $s^{0.4}$)	1.37	hr		hr		hr		hr		
	82.4	+		+		+		=	82.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	3412	ft		ft		ft		ft		
Elevation 1, E_1	28.30	ft		ft		ft		ft		
Elevation 2, E_2	25.80	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.001	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	0.44	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	2.17	hr		hr		hr		hr		
	130.2	+		+		+		=	130.2	min

Open Channel Flow [TR-55 equation 3-4]

		AB		Pond 4 to outfall						
		Channel		Pipe						
Open Channel	Front Slope, s_1	10.00	:1		:1		:1		:1	
	Bottom width, B	125.00	ft		ft		ft		ft	
	Back Slope, s_2	10.00	:1		:1		:1		:1	
	Depth, H	0.50	ft		ft		ft		ft	
Pipe	Diameter, D		in	60	in		in		in	
Cross Sectional Flow Area, a		65.00	sq ft	19.63	sq ft		sq ft		sq ft	
Wetted Perimeter, P_w		135.05	ft	15.71	ft		ft		ft	
Hydraulic radius, r = a / P_w		0.48	ft	1.25	1		ft		ft	
Flow Length, L		432	ft	1189	ft		ft		ft	
Elevation 1, E_1		25.80	ft	25.22	ft		ft		ft	
Elevation 2, E_2		25.22	ft	22.23	ft		ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0013	ft/ft	0.0025	ft/ft		ft/ft		ft/ft	
Manning's Roughness coeff., n		0.100		0.012						
Average Velocity, V = 1.49 * $r^{2/3}$ * $s^{1/2}$ /		0.34	ft/s	7.23	ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		0.36	ft/s	0.05	ft/s		ft/s		ft/s	
		21.5	+	2.7	+		+	=	24.2	min

Total Time of Concentration

Watershed Tc to Boundry 4 = 237 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Pre Tomoka Pines**
Condition: **Pre-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	28.48	ft		ft		ft		ft		
Elevation 2, E_2	28.30	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	1.37	hr		hr		hr		hr		
	82.4	+		+		+		=	82.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	3412	ft		ft		ft		ft		
Elevation 1, E_1	28.30	ft		ft		ft		ft		
Elevation 2, E_2	25.80	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.001	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	0.44	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	2.17	hr		hr		hr		hr		
	130.2	+		+		+		=	130.2	min

Open Channel Flow [TR-55 equation 3-4]

		CD		DE						
		Channel		Channel						
Open Channel	Front Slope, s_1	10.00	:1	6.00	:1		:1		:1	
	Bottom width, B	125.00	ft	5.00	ft		ft		ft	
	Back Slope, s_2	10.00	:1	4.00	:1		:1		:1	
	Depth, H	0.50	ft	1.00	ft		ft		ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		65.00	sq ft	10.00	sq ft		sq ft		sq ft	
Wetted Perimeter, P_w		135.05	ft	15.21	ft		ft		ft	
Hydraulic radius, r = a / P_w		0.48	ft	0.66	1		ft		ft	
Flow Length, L		432	ft	1189	ft		ft		ft	
Elevation 1, E_1		25.80	ft	25.22	ft		ft		ft	
Elevation 2, E_2		25.22	ft	22.23	ft		ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0013	ft/ft	0.0025	ft/ft		ft/ft		ft/ft	
Manning's Roughness coeff., n		0.100		0.042						
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.34	ft/s	1.35	ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		0.36	ft/s	0.25	ft/s		ft/s		ft/s	
		21.5	+	14.7	+		+	=	36.2	min

Total Time of Concentration

Watershed Tc to Boundry 4 = 249 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Post Turning Point**
Condition: **Post-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	29.41	ft		ft		ft		ft		
Elevation 2, E_2	29.18	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	1.25	hr		hr		hr		hr		
	74.7	+		+		+		=	74.7	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	645	ft		ft		ft		ft		
Elevation 1, E_1	29.18	ft		ft		ft		ft		
Elevation 2, E_2	26.44	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.004	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	1.05	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.17	hr		hr		hr		hr		
	10.2	+		+		+		=	10.2	min

Open Channel Flow [TR-55 equation 3-4]

		CD		Pond 5 to 4						
		Channel		Pipe						
Open Channel	Front Slope, s_1	10.00	:1		:1		:1		:1	
	Bottom width, B	125.00	ft		ft		ft		ft	
	Back Slope, s_2	10.00	:1		:1		:1		:1	
	Depth, H	0.50	ft		ft		ft		ft	
Pipe	Diameter, D		in	60	in		in		in	
Cross Sectional Flow Area, a		65.00	sq ft	19.63	sq ft		sq ft		sq ft	
Wetted Perimeter, P_w		135.05	ft	15.71	ft		ft		ft	
Hydraulic radius, r = a / P_w		0.48	ft	1.25	ft		ft		ft	
Flow Length, L		633	ft	3037	ft		ft		ft	
Elevation 1, E_1		26.44	ft	25.69	ft		ft		ft	
Elevation 2, E_2		25.98	ft	24.03	ft		ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0007	ft/ft	0.0005	ft/ft		ft/ft		ft/ft	
Manning's Roughness coeff., n		0.100		0.012						
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.25	ft/s	3.37	ft/s		ft/s		ft/s	
T_t = L / (3600 * V)		0.71	ft/s	0.25	ft/s		ft/s		ft/s	
		42.8	+	15.0	+		+		=	57.8	min

Total Time of Concentration

Watershed Tc to Pond 4 =	143	min
Watershed Tc to Pond 5 =	128	min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: Pre Turning Point
Condition: Pre-Development

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	29.41	ft		ft		ft		ft		
Elevation 2, E_2	29.18	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	1.25	hr		hr		hr		hr		
	74.7	+		+		+		=	74.7	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC									
Surface Description	Unpaved									
Flow Length, L	645	ft		ft		ft		ft		
Elevation 1, E_1	29.18	ft		ft		ft		ft		
Elevation 2, E_2	26.44	ft		ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.004	ft/ft		ft/ft		ft/ft		ft/ft		
Average Velocity, V	1.05	ft/s		ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.17	hr		hr		hr		hr		
	10.2	+		+		+		=	10.2	min

Open Channel Flow [TR-55 equation 3-4]

		CD		DE		EF				
		Channel		Channel		Channel				
Open Channel	Front Slope, s_1	10.00	:1	6.00	:1	6.00	:1		:1	
	Bottom width, B	125.00	ft	5.00	ft	5.00	ft		ft	
	Back Slope, s_2	10.00	:1	4.00	:1	4.00	:1		:1	
	Depth, H	0.50	ft	1.00	ft	1.00	ft		ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		65.00	sq ft	10.00	sq ft	10.00	sq ft		sq ft	
Wetted Perimeter, P_w		135.05	ft	15.21	ft	15.21	ft		ft	
Hydraulic radius, r = a / P_w		0.48	ft	0.66	ft	0.66	ft		ft	
Flow Length, L		633	ft	3037	ft	1189	ft		ft	
Elevation 1, E_1		26.44	ft	25.69	ft	24.03	ft		ft	
Elevation 2, E_2		25.98	ft	24.03	ft	22.23	ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0007	ft/ft	0.0005	ft/ft	0.0015	ft/ft		ft/ft	
Manning's Roughness coeff., n		0.100		0.042		0.042				
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.25	ft/s	0.63	ft/s	1.04	ft/s		ft/s	
T_t = L / (3600 * V)		0.71	ft/s	1.34	ft/s	0.32	ft/s		ft/s	
		42.8	+	80.7	+	19.0	+		=	142.4 min

Total Time of Concentration

Watershed Tc to Boundry 4 = 227 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Post South of Park Place**
Condition: **Post-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	46.52	ft		ft		ft		ft		
Elevation 2, E_2	46.39	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * $s^{0.4}$)	1.56	hr		hr		hr		hr		
	93.9	+		+		+		=	93.9	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC		CD							
Surface Description	Unpaved		Unpaved							
Flow Length, L	1949	ft	960	ft		ft		ft		
Elevation 1, E_1	46.39	ft	43.46	ft		ft		ft		
Elevation 2, E_2	43.46	ft	31.26	ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.002	ft/ft	0.013	ft/ft		ft/ft		ft/ft		
Average Velocity, V	0.63	ft/s	1.82	ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.87	hr	0.15	hr		hr		hr		
	51.9	+	8.8	+		+		=	60.7	min

Open Channel Flow [TR-55 equation 3-4]

		AB		Pond 6 to 5		Pond 5 to 4				
		Channel		Pipe		Pipe				
Open Channel	Front Slope, s_1	10.00	:1		:1		:1		:1	
	Bottom width, B	125.00	ft		ft		ft		ft	
	Back Slope, s_2	10.00	:1		:1		:1		:1	
	Depth, H	0.50	ft		ft		ft		ft	
Pipe	Diameter, D		in	60	in	60	in		in	
Cross Sectional Flow Area, a		65.00	sq ft	19.63	sq ft	19.63	sq ft		sq ft	
Wetted Perimeter, P_w		135.05	ft	15.71	ft	15.71	ft		ft	
Hydraulic radius, r = a / P_w		0.48	ft	1.25	ft	1.25	ft		ft	
Flow Length, L		2037	ft	1793	ft	3037	ft		ft	
Elevation 1, E_1		31.26	ft	27.31	ft	25.69	ft		ft	
Elevation 2, E_2		28.02	ft	25.69	ft	24.03	ft		ft	
Channel Slope, s = (E_1 - E_2) / L		0.0016	ft/ft	0.0009	ft/ft	0.0005	ft/ft		ft/ft	
Manning's Roughness coeff., n		0.100		0.012		0.012				
Average Velocity, V = 1.49 * $r^{2/3}$ * $s^{1/2}$ /		0.36	ft/s	4.33	ft/s	3.37	ft/s		ft/s	
T_t = L / (3600 * V)		1.55	ft/s	0.12	ft/s	0.25	ft/s		ft/s	
		93.0	+	6.9	+	15.0	+		=	115.0 min

Total Time of Concentration

Watershed Tc to Pond 4 =	270	min
Watershed Tc to Pond 5 =	255	min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Pre South of Park Place**
Condition: **Pre-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	46.52	ft		ft		ft		ft		
Elevation 2, E_2	46.39	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.00	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * s$^{0.4}$)	1.56	hr		hr		hr		hr		
	93.9	+		+		+		=	93.9	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC		CD							
Surface Description	Unpaved		Unpaved							
Flow Length, L	1949	ft	960	ft		ft		ft		
Elevation 1, E_1	46.39	ft	43.46	ft		ft		ft		
Elevation 2, E_2	43.46	ft	31.26	ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.002	ft/ft	0.013	ft/ft		ft/ft		ft/ft		
Average Velocity, V	0.63	ft/s	1.82	ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.87	hr	0.15	hr		hr		hr		
	51.9	+	8.8	+		+		=	60.7	min

Open Channel Flow [TR-55 equation 3-4]

		DE		EF		FG		GH		
		Channel		Channel		Channel		Channel		
Open Channel	Front Slope, s_1	10.00	:1	6.00	:1	6.00	:1	6.00	:1	
	Bottom width, B	125.00	ft	5.00	ft	5.00	ft	5.00	ft	
	Back Slope, s_2	10.00	:1	4.00	:1	4.00	:1	4.00	:1	
	Depth, H	0.50	ft	1.00	ft	1.00	ft	1.00	ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		65.00	sq ft	10.00	sq ft	10.00	sq ft	10.00	sq ft	
Wetted Perimeter, P_w		135.05	ft	15.21	ft	15.21	ft	15.21	ft	
Hydraulic radius, r = a / P_w		0.48	ft	0.66	ft	0.66	ft	0.66	ft	
Flow Length, L		2037	ft	1793	ft	3037	ft	1189	ft	
Elevation 1, E_1		31.26	ft	27.31	ft	25.69	ft	24.03	ft	
Elevation 2, E_2		28.02	ft	25.69	ft	24.03	ft	22.23	ft	
Channel Slope, s = (E_1 - E_2) / L		0.0016	ft/ft	0.0009	ft/ft	0.0005	ft/ft	0.0015	ft/ft	
Manning's Roughness coeff., n		0.100		0.042		0.042		0.042		
Average Velocity, V = 1.49 * r$^{2/3}$ * s$^{1/2}$ /		0.36	ft/s	0.81	ft/s	0.63	ft/s	1.04	ft/s	
T_t = L / (3600 * V)		1.55	ft/s	0.62	ft/s	1.34	ft/s	0.32	ft/s	
		93.0	+	37.1	+	80.7	+	19.0	=	229.8 min

Total Time of Concentration

Watershed Tc to Boundry 4 = 384 min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Post Soluna Apartments**
Condition: **Post-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	47.74	ft		ft		ft		ft		
Elevation 2, E_2	46.44	ft		ft		ft		ft		
Land Slope, $s = (E_1 - E_2) / L$	0.01	ft/ft		ft/ft		ft/ft		ft/ft		
$Tt = 0.007 * (n * L)^{0.8} / (P_2^{0.5} * s^{0.4})$	0.62	hr		hr		hr		hr		
	37.4	+		+		+		=	37.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC		CD							
Surface Description	Unpaved		Unpaved							
Flow Length, L	303	ft	2423	ft		ft		ft		
Elevation 1, E_1	46.44	ft	42.74	ft		ft		ft		
Elevation 2, E_2	42.74	ft	42.32	ft		ft		ft		
Watercourse Slope, $s = (E_1 - E_2) / L$	0.012	ft/ft	0.000	ft/ft		ft/ft		ft/ft		
Average Velocity, V	1.78	ft/s	0.21	ft/s		ft/s		ft/s		
$T_t = L / (3600 * V)$	0.05	hr	3.17	hr		hr		hr		
	2.8	+	190.1	+		+		=	192.9	min

Open Channel Flow [TR-55 equation 3-4]

		To Pond 6		Pond 6 to 5		Pond 5 to 4				
		Pipe		Pipe		Pipe				
Open Channel	Front Slope, s_1		:1		:1		:1		:1	
	Bottom width, B		ft		ft		ft		ft	
	Back Slope, s_2		:1		:1		:1		:1	
	Depth, H		ft		ft		ft		ft	
Pipe	Diameter, D	60	in	60	in	60	in		in	
Cross Sectional Flow Area, a		19.63	sq ft	19.63	sq ft	19.63	sq ft		sq ft	
Wetted Perimeter, P_w		15.71	ft	15.71	ft	15.71	ft		ft	
Hydraulic radius, $r = a / P_w$		1.25	ft	1.25	ft	1.25	ft		ft	
Flow Length, L		3457	ft	1793	ft	3037	ft		ft	
Elevation 1, E_1		42.32	ft	27.31	ft	25.69	ft		ft	
Elevation 2, E_2		27.31	ft	25.69	ft	24.03	ft		ft	
Channel Slope, $s = (E_1 - E_2) / L$		0.0043	ft/ft	0.0009	ft/ft	0.0005	ft/ft		ft/ft	
Manning's Roughness coeff., n		0.012		0.012		0.012				
Average Velocity, $V = 1.49 * r^{2/3} * s^{1/2} /$		9.49	ft/s	4.33	ft/s	3.37	ft/s		ft/s	
$T_t = L / (3600 * V)$		0.10	ft/s	0.12	ft/s	0.25	ft/s		ft/s	
		6.1	+	6.9	+	15.0	+		=	28.0 min

Total Time of Concentration

Watershed Tc to Pond 4 =	258	min
Watershed Tc to Pond 6 =	236	min

SR 16

Comp. By:	SS
Date:	4/21/2024
Chk. By:	VV
Job No:	21044753201

Time of Concentration Calculations

Basin No: **Pre Soluna Apartments**
Condition: **Pre-Development**

Sheet Flow [TR-55 equation 3-3]

	AB									
Surface Description	Woods Dense underbrush									
Manning's Roughness coeff., n	0.8									
Flow Length, L (should be <= 100 ft)	100	ft		ft		ft		ft		
Two-yr, 24-hr rainfall, P_2	4.52	in		in		in		in		
Elevation 1, E_1	47.74	ft		ft		ft		ft		
Elevation 2, E_2	46.44	ft		ft		ft		ft		
Land Slope, s = (E_1 - E_2) / L	0.01	ft/ft		ft/ft		ft/ft		ft/ft		
Tt = 0.007 * (n * L)$^{0.8}$ / ($P_2^{0.5}$ * $s^{0.4}$)	0.62	hr		hr		hr		hr		
	37.4	+		+		+		=	37.4	min

Shallow Concentrated Flow [TR-55 figure 3-1]

	BC		CD							
Surface Description	Unpaved		Unpaved							
Flow Length, L	303	ft	2423	ft		ft		ft		
Elevation 1, E_1	46.44	ft	42.74	ft		ft		ft		
Elevation 2, E_2	42.74	ft	42.32	ft		ft		ft		
Watercourse Slope, s = (E_1 - E_2) / L	0.012	ft/ft	0.000	ft/ft		ft/ft		ft/ft		
Average Velocity, V	1.78	ft/s	0.21	ft/s		ft/s		ft/s		
T_t = L / (3600 * V)	0.05	hr	3.17	hr		hr		hr		
	2.8	+	190.1	+		+		=	192.9	min

Open Channel Flow [TR-55 equation 3-4]

		CD								
		Channel		Channel		Channel		Channel		
Open Channel	Front Slope, s_1	6.00	:1	6.00	:1	6.00	:1	6.00	:1	
	Bottom width, B	5.00	ft	5.00	ft	5.00	ft	5.00	ft	
	Back Slope, s_2	4.00	:1	4.00	:1	4.00	:1	4.00	:1	
	Depth, H	1.00	ft	1.00	ft	1.00	ft	1.00	ft	
Pipe	Diameter, D		in		in		in		in	
Cross Sectional Flow Area, a		10.00	sq ft	10.00	sq ft	10.00	sq ft	10.00	sq ft	
Wetted Perimeter, P_w		15.21	ft	15.21	ft	15.21	ft	15.21	ft	
Hydraulic radius, r = a / P_w		0.66	ft	0.66	ft	0.66	ft	0.66	ft	
Flow Length, L		3457	ft	1793	ft	3037	ft	1189	ft	
Elevation 1, E_1		42.32	ft	27.31	ft	25.69	ft	24.03	ft	
Elevation 2, E_2		27.31	ft	25.69	ft	24.03	ft	22.23	ft	
Channel Slope, s = (E_1 - E_2) / L		0.0043	ft/ft	0.0009	ft/ft	0.0005	ft/ft	0.0015	ft/ft	
Manning's Roughness coeff., n		0.042		0.042		0.042		0.042		
Average Velocity, V = 1.49 * $r^{2/3}$ * $s^{1/2}$ /		1.77	ft/s	0.81	ft/s	0.63	ft/s	1.04	ft/s	
T_t = L / (3600 * V)		0.54	ft/s	0.62	ft/s	1.34	ft/s	0.32	ft/s	
		32.6	+	37.1	+	80.7	+	19.0	=	169.3 min

Total Time of Concentration

Watershed Tc to Boundry 4 = 400 min

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 2A & 2B
OFW: FALSE
ICPR Scenario: POST

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	41.21	3.43	0.00	3.43	
(Criteria B) 2.5" over Impervious Area	19.37	4.04	0.00	4.04	
Required Treatment Volume [max(A, B)]				**4.04**	**ac-ft**

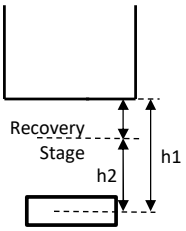
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft) Total	Volume (ac-ft) Treatment
Berm Front		28.00	6.24	52.64	27.63
Treatment Weir	**Provided**	**24.00**	5.10	29.96	**4.95**
	Required	23.82	5.04	29.05	**4.04**
Orifice Invert / NWL		23.00	4.81	25.01	0.00
Break		21.00	4.26	15.94	-
Bottom		17.00	3.71	0.00	-
Sump Top		17.00	3.71	0.00	-
Sump Bottom		17.00	3.71	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.88	ft
Recovery	Elevation	23.60	ft
	Required Vol.	**2.02**	**ac-ft**
	Design Vol.	**2.02**	**ac-ft**
	Head, h_2	0.47	ft
Mean Value	Head, h_m	0.67	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	12.00	**in**
	Area, A	0.25	ft^2
	Centerline Elev.	23.13	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.99	cfs
Time to Recover Volume		**24.69**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	4.81	4.81	
Impervious		0.95	19.37	18.40	
Pervious Open Space		0.20	17.03	3.41	
Total			41.21	26.62	
Weighted Runoff Coefficient, c				0.65	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**8.83**	**ac-ft**
	Provided			**25.01**	**ac-ft**
Mean Depth				**5.20**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 3A, 3B, 3C
OFW: FALSE
ICPR Scenario: POST

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	18.97	1.58	0.00	1.58	
(Criteria B) 2.5" over Impervious Area	9.13	1.90	0.00	1.90	
Required Treatment Volume [max(A, B)]				**1.90**	**ac-ft**

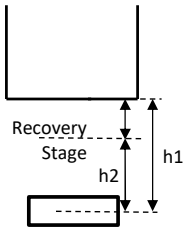
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft) Total	Volume (ac-ft) Treatment
Berm Front		29.00	2.47	20.66	10.88
Treatment Weir	**Provided**	**25.00**	2.00	11.72	**1.94**
	Required	24.98	2.00	11.68	**1.90**
Orifice Invert / NWL		24.00	1.88	9.78	0.00
Break		22.00	1.66	6.24	-
Bottom		18.00	1.46	0.00	-
Sump Top		18.00	1.46	0.00	-
Sump Bottom		18.00	1.46	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.88	ft
Recovery	Elevation	24.52	ft
	Required Vol.	**0.95**	**ac-ft**
	Design Vol.	**0.95**	**ac-ft**
	Head, h_2	0.39	ft
Mean Value	Head, h_m	0.63	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	6.00	**in**
	Area, A	0.13	ft^2
	Centerline Elev.	24.13	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.48	cfs
Time to Recover Volume		**24.02**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	1.88	1.88	
Impervious		0.95	9.13	8.67	
Pervious Open Space		0.20	7.96	1.59	
Total			18.97	12.15	
Weighted Runoff Coefficient, c				0.64	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**4.03**	**ac-ft**
	Provided			**9.78**	**ac-ft**
Mean Depth				**5.20**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 4A & 4B
OFW: FALSE
ICPR Scenario: POST

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	25.57	2.13	0.00	2.13	
(Criteria B) 2.5" over Impervious Area	11.39	2.37	0.00	2.37	
Required Treatment Volume [max(A, B)]				**2.37**	**ac-ft**

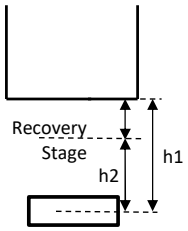
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft)	
				Total	Treatment
Berm Front		29.50	4.86	41.48	21.60
Treatment Weir	**Provided**	**25.25**	3.94	22.77	**2.90**
	Required	25.12	3.91	22.25	**2.37**
Orifice Invert / NWL		24.50	3.78	19.88	0.00
Break		22.50	3.38	12.72	-
Bottom		18.50	2.99	0.00	-
Sump Top		18.50	2.99	0.00	-
Sump Bottom		18.50	2.99	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.63	ft
Recovery	Elevation	24.95	ft
	Required Vol.	**1.19**	**ac-ft**
	Design Vol.	**1.19**	**ac-ft**
	Head, h_2	0.32	ft
Mean Value	Head, h_m	0.47	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	8.00	**in**
	Area, A	0.17	ft^2
	Centerline Elev.	24.63	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.55	cfs
Time to Recover Volume		**26.00**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	3.78	3.78	
Impervious		0.95	11.39	10.82	
Pervious Open Space		0.20	10.40	2.08	
Total			25.57	16.68	
Weighted Runoff Coefficient, c				0.65	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**5.53**	**ac-ft**
	Provided			**19.88**	**ac-ft**
Mean Depth				**5.26**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 5A & 5B
OFW: FALSE
ICPR Scenario: POST

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	22.08	1.84	0.00	1.84	
(Criteria B) 2.5" over Impervious Area	10.17	2.12	0.00	2.12	
Required Treatment Volume [max(A, B)]				**2.12**	**ac-ft**

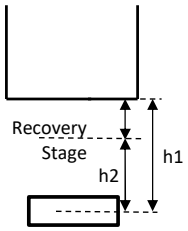
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft)	
				Total	Treatment
Berm Front		30.00	4.22	29.66	17.63
Treatment Weir	**Provided**	**25.75**	3.04	14.23	**2.20**
	Required	25.72	3.03	14.15	**2.12**
Orifice Invert / NWL		25.00	2.84	12.03	0.00
Break		23.00	2.30	6.90	-
Bottom		19.00	1.16	0.00	-
Sump Top		19.00	1.16	0.00	-
Sump Bottom		19.00	1.16	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.63	ft
Recovery	Elevation	25.40	ft
	Required Vol.	**1.06**	**ac-ft**
	Design Vol.	**1.06**	**ac-ft**
	Head, h_2	0.27	ft
Mean Value	Head, h_m	0.45	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	7.00	**in**
	Area, A	0.15	ft^2
	Centerline Elev.	25.13	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.47	cfs
Time to Recover Volume		**27.27**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	2.84	2.84	
Impervious		0.95	10.17	9.66	
Pervious Open Space		0.20	9.07	1.81	
Total			22.08	14.31	
Weighted Runoff Coefficient, c				0.65	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**4.75**	**ac-ft**
	Provided			**12.03**	**ac-ft**
Mean Depth				**4.24**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 6A & 6B
OFW: FALSE
ICPR Scenario: POST

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	17.04	1.42	0.00	1.42	
(Criteria B) 2.5" over Impervious Area	8.58	1.79	0.00	1.79	
Required Treatment Volume [max(A, B)]				**1.79**	**ac-ft**

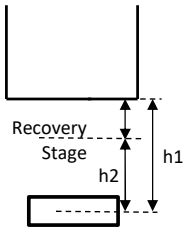
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft)	
				Total	Treatment
Berm Front		39.00	2.30	18.58	9.98
Treatment Weir	**Provided**	**35.10**	1.82	10.53	**1.93**
	Required	35.02	1.81	10.39	**1.79**
Orifice Invert / NWL		34.00	1.69	8.60	0.00
Break		32.00	1.47	5.44	-
Bottom		28.00	1.25	0.00	-
Sump Top		28.00	1.25	0.00	-
Sump Bottom		28.00	1.25	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.98	ft
Recovery	Elevation	34.60	ft
	Required Vol.	**0.89**	**ac-ft**
	Design Vol.	**0.89**	**ac-ft**
	Head, h_2	0.48	ft
Mean Value	Head, h_m	0.73	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	4.00	**in**
	Area, A	0.08	ft^2
	Centerline Elev.	34.13	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.34	cfs
Time to Recover Volume		**31.63**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	1.69	1.69	
Impervious		0.95	8.58	8.15	
Pervious Open Space		0.20	6.77	1.35	
Total			17.04	11.20	
Weighted Runoff Coefficient, c				0.66	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**3.71**	**ac-ft**
	Provided			**8.60**	**ac-ft**
Mean Depth				**5.09**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 2C
OFW: FALSE
ICPR Scenario: POST 2

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	45.15	3.76	0.00	3.76	
(Criteria B) 2.5" over Impervious Area	19.37	4.04	0.00	4.04	
Required Treatment Volume [max(A, B)]				**4.04**	**ac-ft**

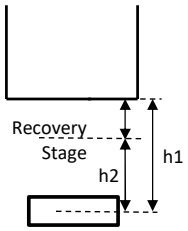
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft) Total	Volume (ac-ft) Treatment
Berm Front		25.50	10.18	68.97	38.53
Treatment Weir	**Provided**	**22.00**	9.23	35.02	**4.58**
	Required	21.94	9.21	34.47	**4.04**
Orifice Invert / NWL		21.50	9.09	30.44	0.00
Break		19.50	8.67	12.68	-
Bottom		18.00	8.25	0.00	-
Sump Top		18.00	8.25	0.00	-
Sump Bottom		18.00	8.25	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.38	ft
Recovery	Elevation	21.78	ft
	Required Vol.	**2.02**	**ac-ft**
	Design Vol.	**2.02**	**ac-ft**
	Head, h_2	0.16	ft
Mean Value	Head, h_m	0.27	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	18.00	**in**
	Area, A	0.38	ft^2
	Centerline Elev.	21.63	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	0.93	cfs
Time to Recover Volume		**26.25**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	9.09	9.09	
Impervious		0.95	19.37	18.40	
Pervious Open Space		0.20	16.69	3.34	
Total			45.15	30.83	
Weighted Runoff Coefficient, c				0.68	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**10.23**	**ac-ft**
	Provided			**30.44**	**ac-ft**
Mean Depth				**3.35**	**ft**

SR 16	Comp. By:	SS
	Date:	6/27/2024
	Chk. By:	VV
	Job No:	21044753201

Wet Detention Design Calculations (SJRWMD)

Pond Name: POND 4C
OFW: FALSE
ICPR Scenario: POST 2

Required Treatment Volume

	Area (ac)	Runoff (ac-ft)	OFW Req. (ac-ft)	Total Runoff (ac-ft)	
(Criteria A) 1" over Total Area*	63.06	5.26	0.00	5.26	
(Criteria B) 2.5" over Impervious Area	30.09	6.27	0.00	6.27	
Required Treatment Volume [max(A, B)]				**6.27**	**ac-ft**

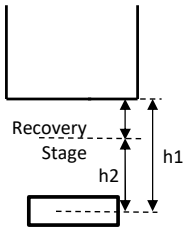
*Total area includes roadway and pond area.

Wet Detention Pond Geometry

		Elevation (ft)	Area (ac)	Volume (ac-ft)	
				Total	Treatment
Berm Front		29.50	9.75	93.63	45.70
Treatment Weir	**Provided**	**25.25**	8.71	54.40	**6.47**
	Required	25.23	8.71	54.20	**6.27**
Orifice Invert / NWL		24.50	8.53	47.93	0.00
Break		22.50	8.06	31.34	-
Bottom		18.50	7.61	0.00	-
Sump Top		18.50	7.61	0.00	-
Sump Bottom		18.50	7.61	0.00	-

Recovery Analysis

Treatment	Head, h_1	0.63	ft
Recovery	Elevation	24.89	ft
	Required Vol.	**3.13**	**ac-ft**
	Design Vol.	**3.13**	**ac-ft**
	Head, h_2	0.26	ft
Mean Value	Head, h_m	0.44	ft
Orifice	**Count, n**	1	
	Height	3.00	**in**
	Width	22.00	**in**
	Area, A	0.46	ft^2
	Centerline Elev.	24.63	ft
	Flow = $(0.6*A*(2*32.2*h_m)^{0.5})*n$	1.47	cfs
Time to Recover Volume		**25.78**	**hr**



Permanent Pool

		C	Area (ac)	C * Area	
Water		1.00	8.53	8.53	
Impervious		0.95	30.09	28.59	
Pervious Open Space		0.20	24.44	4.89	
Total			63.06	42.00	
Weighted Runoff Coefficient, c				0.67	
Residence Time, t				14	days
Wet Season Duration, d				153	days
Wet Season Rainfall, r				29.00	in
Permanent Pool	**Required = (Area*c*r*(t/d))/12*1.5**			**13.93**	**ac-ft**
	Provided			**47.93**	**ac-ft**
Mean Depth				**5.62**	**ft**

Node Max Conditions [Post]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
Boundary 2	25 YR 24 HR	22.92	22.92	0.0000	32.55	0.00	0
Boundary 4	25 YR 24 HR	22.92	22.92	0.0000	211.38	0.00	0
Pond 2A/2B	25 YR 24 HR	27.00	26.13	-0.0010	244.34	24.32	248546
Pond 3A/3B/3C	25 YR 24 HR	28.00	27.72	0.0010	112.36	8.30	100992
Pond 4A/4B	25 YR 24 HR	28.50	28.38	0.0010	221.46	159.80	201151
Pond 5A/5B	25 YR 24 HR	29.00	29.01	0.0010	191.16	159.55	171867
Pond 6A/6B	25 YR 24 HR	38.00	37.86	0.0010	114.05	70.33	94110

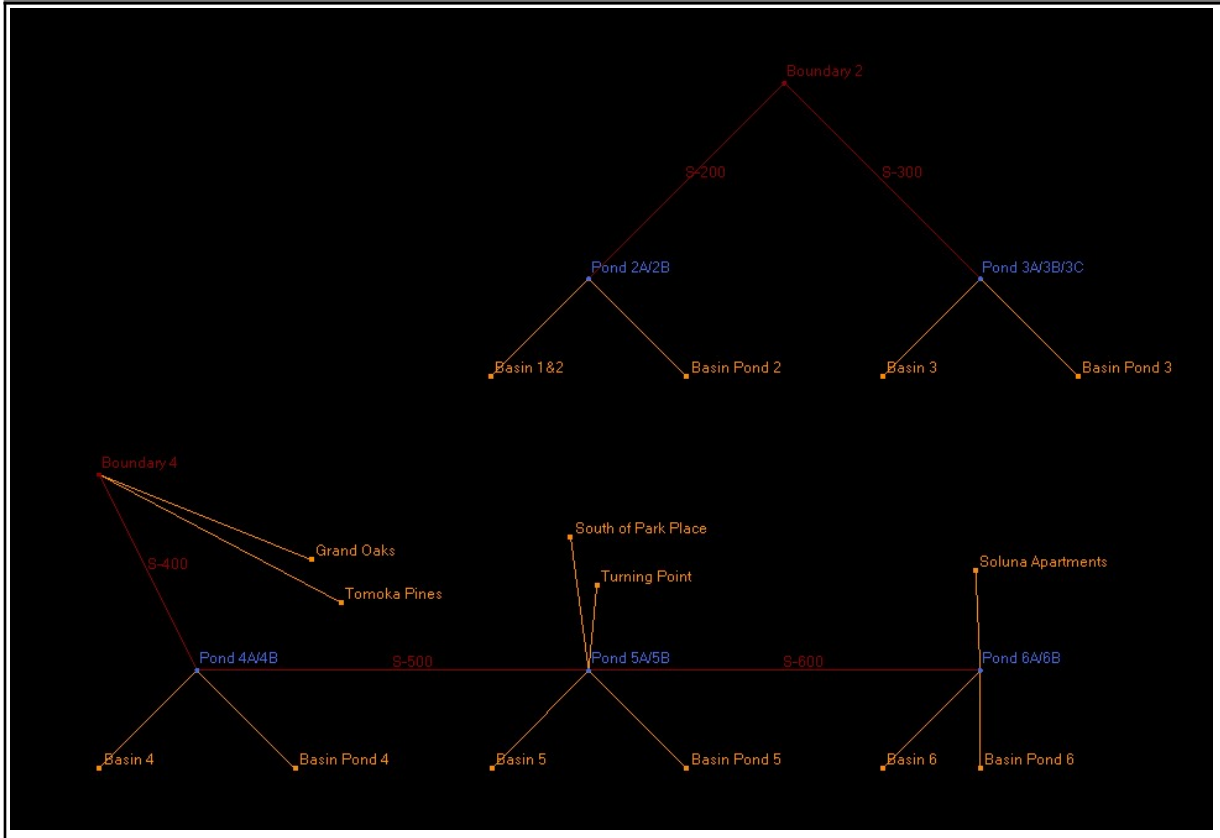
Node Max Conditions [Post 2]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
Boundary 2	25 YR 24 HR	21.40	21.40	0.0000	70.83	0.00	0
Boundary 4	25 YR 24 HR	22.92	22.92	0.0000	206.19	0.00	0
Pond 2C	25 YR 24 HR	24.50	23.81	0.0009	181.83	8.52	423391
Pond 4C	25 YR 24 HR	28.50	28.47	-0.0010	259.47	153.70	413738

Node Max Conditions [Pre]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
Pre-Boundary 2	25 YR4 HR Pre	22.92	22.92	0.0000	71.62	0.00	0
Pre-Boundary 4	25 YR4 HR Pre	22.92	22.92	0.0000	216.55	0.00	0

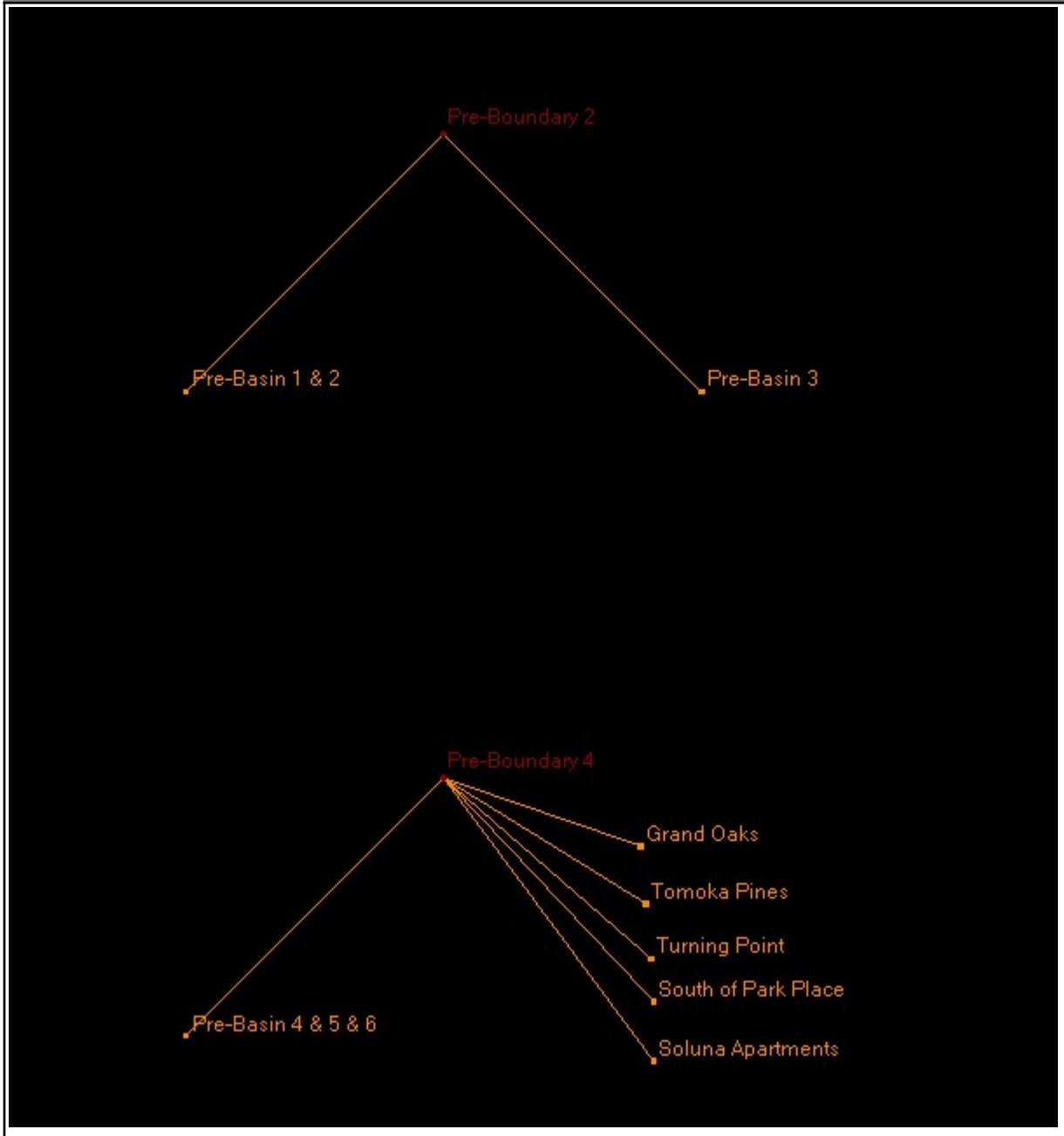
Background Image: Post



Background Image: Post 2



Background Image: Pre



Manual Basin: Basin 1&2

Scenario:	Post
Node:	Pond 2A/2B
Hydrograph Method:	NRCS Unit Hydrograph

Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 34.9700 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
15.6000	Pervious	D			
19.3700	Impervious	-			

Comment:

Manual Basin: Basin 3

Scenario: Post
Node: Pond 3A/3B/3C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 16.5000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
7.3700	Pervious	D			
9.1300	Impervious	-			

Comment:

Manual Basin: Basin 4

Scenario: Post
Node: Pond 4A/4B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 20.7100 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
9.3200	Pervious	D			
11.3900	Impervious	-			

Comment:

Manual Basin: Basin 5

Scenario: Post
Node: Pond 5A/5B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 17.8600 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
7.6900	Pervious	D			
10.1700	Impervious	-			

Comment:

Manual Basin: Basin 6

Scenario: Post
Node: Pond 6A/6B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 14.7400 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
6.1600	Pervious	D			
8.5800	Impervious	-			

Comment:

Manual Basin: Basin Pond 2

Scenario: Post
Node: Pond 2A/2B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 6.2400 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
4.8100	Water	-			
1.4300	Pervious	D			

Comment:

Manual Basin: Basin Pond 3

Scenario: Post
Node: Pond 3A/3B/3C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 2.4700 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.8800	Water	-			
0.5900	Pervious	D			

Comment:

Manual Basin: Basin Pond 4

Scenario: Post
Node: Pond 4A/4B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484

Peaking Factor: 484.0
Area: 4.8600 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
3.7800	Water	-			
1.0800	Pervious	D			

Comment:

Manual Basin: Basin Pond 5

Scenario: Post
Node: Pond 5A/5B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 4.2200 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
2.8400	Water	-			
1.3800	Pervious	D			

Comment:

Manual Basin: Basin Pond 6

Scenario: Post
Node: Pond 6A/6B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 2.3000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
1.6900	Water	-			
0.6100	Pervious	D			

Comment:

Manual Basin: Grand Oaks

Scenario: Post
Node: Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 49.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 15.0800 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0100	URBAN AND BUILT-UP B/D	B/D			
13.8500	AGRICULTURE A/D	A/D			
1.2200	AGRICULTURE B/D	B/D			

Comment:

Manual Basin: Soluna Apartments

Scenario: Post
Node: Pond 6A/6B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 236.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 108.2000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0400	URBAN AND BUILT-UP A/D	A/D			
0.0100	URBAN AND BUILT-UP B/D	B/D			
22.8800	UPLAND FORESTS A/D	A/D			
29.9500	UPLAND FORESTS B/D	B/D			
3.0100	Water	-			
0.3000	Water	-			
42.1600	WETLANDS A/D	A/D			
9.7500	WETLANDS B/D	B/D			
0.0600	TRANSPORTATION, COMMUNICATION	A/D			

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
	AND UTILITIES A/D				
0.0400	TRANSPORTATION, COMMUNICATION AND UTILITIES B/D	B/D			

Comment:

Manual Basin: South of Park Place

Scenario: Post
Node: Pond 5A/5B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 255.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 124.8300 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
9.7500	URBAN AND BUILT-UP A/D	A/D			
1.4200	URBAN AND BUILT-UP B/D	B/D			
22.7200	AGRICULTURE A/D	A/D			
0.0000	AGRICULTURE B/D	B/D			
0.0100	RANGELAND A	A			
2.7100	RANGELAND A/D	A/D			
2.8300	RANGELAND B/D	B/D			
1.5000	UPLAND FORESTS A	A			
31.9400	UPLAND FORESTS A/D	A/D			
24.6500	UPLAND FORESTS B/D	B/D			
2.8600	UPLAND FORESTS C/D	C/D			
7.8400	WETLANDS A	A			
4.8200	WETLANDS A/D	A/D			
5.5900	WETLANDS B/D	B/D			
5.7000	WETLANDS C/D	C/D			
0.3400	TRANSPORTATION, COMMUNICATION AND UTILITIES A/D	A/D			
0.1500	TRANSPORTATION,	B/D			

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
	COMMUNICATION AND UTILITIES B/D				

Comment:

Manual Basin: Tomoka Pines

Scenario: Post
Node: Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 237.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 82.3400 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
17.2700	URBAN AND BUILT-UP A/D	A/D			
38.7700	UPLAND FORESTS A/D	A/D			
2.5100	UPLAND FORESTS B/D	B/D			
23.3200	WETLANDS A/D	A/D			
0.4700	WETLANDS B/D	B/D			

Comment:

Manual Basin: Turning Point

Scenario: Post
Node: Pond 5A/5B
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 128.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 37.8500 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
16.8200	URBAN AND	A/D			

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
	BUILT-UP A/D				
4.6900	UPLAND FORESTS A/D	A/D			
4.7200	UPLAND FORESTS B/D	B/D			
8.1000	WETLANDS A/D	A/D			
3.5200	WETLANDS B/D	B/D			

Comment:

Manual Basin: Basin 1&2

Scenario: Post 2
Node: Pond 2C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 33.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 34.9700 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
15.6000	Pervious	D			
19.3700	Impervious	-			

Comment:

Manual Basin: Basin 3

Scenario: Post 2
Node: Boundary 2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 20.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 16.5000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
7.3700	Pervious	D			
9.1300	Impervious	-			

Comment:

Manual Basin: Basin 4&5&6

Scenario: Post 2
Node: Pond 4C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 46.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 53.3100 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
23.2200	Pervious	D			
30.0900	Impervious	-			

Comment:

Manual Basin: Basin Pond 2

Scenario: Post 2
Node: Pond 2C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 10.1800 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
9.0900	Water	-			
1.0900	Pervious	D			

Comment:

Manual Basin: Basin Pond 4

Scenario: Post 2
Node: Pond 4C

Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 9.7500 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
8.5300	Water	-			
1.2200	Pervious	D			

Comment:

Manual Basin: Grand Oaks

Scenario: Post 2
Node: Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 49.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 15.0800 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0100	URBAN AND BUILT-UP B/D	B/D			
13.8500	AGRICULTURE A/D	A/D			
1.2200	AGRICULTURE B/D	B/D			

Comment:

Manual Basin: Soluna Apartments

Scenario: Post 2
Node: Pond 4C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 258.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area: 108.2000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0400	URBAN AND BUILT-UP A/D	A/D			
0.0100	URBAN AND BUILT-UP B/D	B/D			
22.8800	UPLAND FORESTS A/D	A/D			
29.9500	UPLAND FORESTS B/D	B/D			
3.0100	Water	-			
0.3000	Water	-			
42.1600	WETLANDS A/D	A/D			
9.7500	WETLANDS B/D	B/D			
0.0600	TRANSPORTATION, COMMUNICATION AND UTILITIES A/D	A/D			
0.0400	TRANSPORTATION, COMMUNICATION AND UTILITIES B/D	B/D			

Comment:

Manual Basin: South of Park Place

Scenario: Post 2
Node: Pond 4C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 270.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 124.8300 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
9.7500	URBAN AND BUILT-UP A/D	A/D			
1.4200	URBAN AND BUILT-UP B/D	B/D			
22.7200	AGRICULTURE A/D	A/D			
0.0000	AGRICULTURE B/D	B/D			
0.0100	RANGELAND A	A			
2.7100	RANGELAND A/D	A/D			
2.8300	RANGELAND B/D	B/D			
1.5000	UPLAND FORESTS	A			

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
	A				
31.9400	UPLAND FORESTS A/D	A/D			
24.6500	UPLAND FORESTS B/D	B/D			
2.8600	UPLAND FORESTS C/D	C/D			
7.8400	WETLANDS A	A			
4.8200	WETLANDS A/D	A/D			
5.5900	WETLANDS B/D	B/D			
5.7000	WETLANDS C/D	C/D			
0.3400	TRANSPORTATION, COMMUNICATION AND UTILITIES A/D	A/D			
0.1500	TRANSPORTATION, COMMUNICATION AND UTILITIES B/D	B/D			

Comment:

Manual Basin: Tomoka Pines

Scenario: Post 2
Node: Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 237.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 82.3400 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
17.2700	URBAN AND BUILT-UP A/D	A/D			
38.7700	UPLAND FORESTS A/D	A/D			
2.5100	UPLAND FORESTS B/D	B/D			
23.3200	WETLANDS A/D	A/D			
0.4700	WETLANDS B/D	B/D			

Comment:

Manual Basin: Turning Point

Scenario: Post 2
Node: Pond 4C
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 143.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 37.8500 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
16.8200	URBAN AND BUILT-UP A/D	A/D			
4.6900	UPLAND FORESTS A/D	A/D			
4.7200	UPLAND FORESTS B/D	B/D			
8.1000	WETLANDS A/D	A/D			
3.5200	WETLANDS B/D	B/D			

Comment:

Manual Basin: Grand Oaks

Scenario: Pre
Node: Pre-Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 65.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 15.0800 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0100	URBAN AND BUILT-UP B/D	B/D			
13.8500	AGRICULTURE A/D	A/D			
1.2200	AGRICULTURE B/D	B/D			

Comment:

Manual Basin: Pre-Basin 1 & 2

Scenario: Pre
Node: Pre-Boundary 2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 184.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 34.9700 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
27.1700	Pervious	D			
7.8000	Impervious	-			

Comment:

Manual Basin: Pre-Basin 3

Scenario: Pre
Node: Pre-Boundary 2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 83.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0
Area: 16.5000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
13.2300	Pervious	D			
3.2700	Impervious	-			

Comment:

Manual Basin: Pre-Basin 4 & 5 & 6

Scenario: Pre
Node: Pre-Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 332.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH484
Peaking Factor: 484.0

Area: 53.3200 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
40.5300	Pervious	D			
12.7900	Impervious	-			

Comment:

Manual Basin: Soluna Apartments

Scenario: Pre
Node: Pre-Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 400.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 108.2000 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.0400	URBAN AND BUILT-UP A/D	A/D			
0.0100	URBAN AND BUILT-UP B/D	B/D			
22.8800	UPLAND FORESTS A/D	A/D			
29.9500	UPLAND FORESTS B/D	B/D			
3.0100	Water	-			
0.3000	Water	-			
42.1600	WETLANDS A/D	A/D			
9.7500	WETLANDS B/D	B/D			
0.0600	TRANSPORTATION, COMMUNICATION AND UTILITIES A/D	A/D			
0.0400	TRANSPORTATION, COMMUNICATION AND UTILITIES B/D	B/D			

Comment:

Manual Basin: South of Park Place

Scenario: Pre
Node: Pre-Boundary 4

Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 384.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 124.8300 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
9.7500	URBAN AND BUILT-UP A/D	A/D			
1.4200	URBAN AND BUILT-UP B/D	B/D			
22.7200	AGRICULTURE A/D	A/D			
0.0000	AGRICULTURE B/D	B/D			
0.0100	RANGELAND A	A			
2.7100	RANGELAND A/D	A/D			
2.8300	RANGELAND B/D	B/D			
1.5000	UPLAND FORESTS A	A			
31.9400	UPLAND FORESTS A/D	A/D			
24.6500	UPLAND FORESTS B/D	B/D			
2.8600	UPLAND FORESTS C/D	C/D			
7.8400	WETLANDS A	A			
4.8200	WETLANDS A/D	A/D			
5.5900	WETLANDS B/D	B/D			
5.7000	WETLANDS C/D	C/D			
0.3400	TRANSPORTATION, COMMUNICATION AND UTILITIES A/D	A/D			
0.1500	TRANSPORTATION, COMMUNICATION AND UTILITIES B/D	B/D			

Comment:

Manual Basin: Tomoka Pines

Scenario: Pre
Node: Pre-Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 249.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 82.3400 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
17.2700	URBAN AND BUILT-UP A/D	A/D			
38.7700	UPLAND FORESTS A/D	A/D			
2.5100	UPLAND FORESTS B/D	B/D			
23.3200	WETLANDS A/D	A/D			
0.4700	WETLANDS B/D	B/D			

Comment:

Manual Basin: Turning Point

Scenario: Pre
Node: Pre-Boundary 4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 227.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0
Area: 37.8500 ac

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
16.8200	URBAN AND BUILT-UP A/D	A/D			
4.6900	UPLAND FORESTS A/D	A/D			
4.7200	UPLAND FORESTS B/D	B/D			
8.1000	WETLANDS A/D	A/D			
3.5200	WETLANDS B/D	B/D			

Comment:

Node: Boundary 2

Scenario: Post
Type: Time/Stage
Base Flow: 0.00 cfs

Initial Stage: 22.92 ft
Warning Stage: 22.92 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	22.92
0	0	0	30.0000	22.92

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Node: Boundary 4

Scenario: Post
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 22.92 ft
Warning Stage: 22.92 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	22.92
0	0	0	30.0000	22.92

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Node: Pond 2A/2B

Scenario: Post
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 23.00 ft
Warning Stage: 27.00 ft

Stage [ft]	Area [ac]	Area [ft2]
28.00	6.2400	271814
23.00	4.8100	209524
21.00	4.2600	185566
17.00	3.7100	161608

Comment:

Node: Pond 3A/3B/3C

Scenario: Post
Type: Stage/Area

Base Flow: 0.00 cfs
Initial Stage: 24.00 ft
Warning Stage: 28.00 ft

Stage [ft]	Area [ac]	Area [ft2]
29.00	2.4700	107593
24.00	1.8800	81893
22.00	1.6600	72310
18.00	1.4600	63598

Comment:

Node: Pond 4A/4B

Scenario: Post
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 24.50 ft
Warning Stage: 28.50 ft

Stage [ft]	Area [ac]	Area [ft2]
29.50	4.8600	211702
24.50	3.7800	164657
22.50	3.3800	147233
18.50	2.9900	130244

Comment:

Node: Pond 5A/5B

Scenario: Post
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 25.00 ft
Warning Stage: 29.00 ft

Stage [ft]	Area [ac]	Area [ft2]
30.00	4.2200	183823
25.00	2.8400	123710
23.00	2.3000	100188
19.00	1.1600	50530

Comment:

Node: Pond 6A/6B

Scenario: Post
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 34.00 ft
Warning Stage: 38.00 ft

Stage [ft]	Area [ac]	Area [ft2]
39.00	2.3000	100188
34.00	1.6900	73616
32.00	1.4700	64033
28.00	1.2500	54450

Comment:

Node: Boundary 2

Scenario: Post 2
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 21.40 ft
Warning Stage: 21.40 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	21.40
0	0	0	30.0000	21.40

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Node: Boundary 4

Scenario: Post 2
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 22.92 ft
Warning Stage: 22.92 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	22.92
0	0	0	30.0000	22.92

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Node: Pond 2C

Scenario: Post 2
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 21.50 ft
Warning Stage: 24.50 ft

Stage [ft]	Area [ac]	Area [ft2]
25.50	10.1800	443441
21.50	9.0900	395960
19.50	8.6700	377665
18.00	8.2500	359370

Comment:

Node: Pond 4C

Scenario: Post 2
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 24.50 ft
Warning Stage: 28.50 ft

Stage [ft]	Area [ac]	Area [ft2]
29.50	9.7500	424710
24.50	8.5300	371567
22.50	8.0600	351094
18.50	7.6100	331492

Comment:

Node: Pre-Boundary 2

Scenario: Pre
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 22.92 ft
Warning Stage: 22.92 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	22.92
0	0	0	30.0000	22.92

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Node: Pre-Boundary 4

Scenario: Pre
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 22.92 ft
Warning Stage: 22.92 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	22.92
0	0	0	30.0000	22.92

Comment: 25-yr Stage Extrapolated from FEMA FIS 12109CV004D 50 and 10yr

Drop Structure Link: S-200

Scenario: Post
From Node: Pond 2A/2B
To Node: Boundary 2
Link Count: 1
Flow Direction: Both
Solution: Combine
Increments: 0
Pipe Count: 1
Damping: 0.0000 ft
Length: 618.00 ft
FHWA Code: 0
Entr Loss Coef: 0.00
Exit Loss Coef: 0.00
Bend Loss Coef: 0.00
Bend Location: 0.00 dec
Energy Switch: Energy

Upstream Pipe

Invert: 20.00 ft
Manning's N: 0.0120

Geometry: Circular

Max Depth: 3.00 ft

Bottom Clip

Default: 0.00 ft
Op Table:
Ref Node:
Manning's N: 0.0000

Top Clip

Default: 0.00 ft
Op Table:
Ref Node:
Manning's N: 0.0000

Downstream Pipe

Invert: 19.00 ft
Manning's N: 0.0120

Geometry: Circular

Max Depth: 3.00 ft

Bottom Clip

Default: 0.00 ft
Op Table:
Ref Node:
Manning's N: 0.0000

Top Clip

Default: 0.00 ft
Op Table:
Ref Node:
Manning's N: 0.0000

Pipe Comment:

Weir Component

Weir: 1
Weir Count: 1
Weir Flow Direction: Both
Damping: 0.0000 ft
Weir Type: Sharp Crested Vertical
Geometry Type: Rectangular
Invert: 23.00 ft
Control Elevation: 23.00 ft
Max Depth: 0.25 ft
Max Width: 1.00 ft
Fillet: 0.00 ft

Bottom Clip

Default: 0.00 ft
Op Table:
Ref Node:

Top Clip

Default: 0.00 ft
Op Table:
Ref Node:

Discharge Coefficients

Weir Default: 3.200
Weir Table:
Orifice Default: 0.600
Orifice Table:

Weir Comment:

Weir Component		Bottom Clip	
Weir:	2	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	24.00 ft	Ref Node:	
Control Elevation:	24.00 ft	**Discharge Coefficients**	
Max Depth:	3.00 ft	Weir Default:	3.200
Max Width:	2.25 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	3	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Horizontal	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	27.00 ft	Ref Node:	
Control Elevation:	27.00 ft	**Discharge Coefficients**	
Max Depth:	3.08 ft	Weir Default:	3.200
Max Width:	4.08 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-300		Upstream Pipe		Downstream Pipe	
Scenario:	Post	Invert:	21.00 ft	Invert:	19.00 ft
From Node:	Pond 3A/3B/3C	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Boundary 2	**Geometry: Circular**		**Geometry: Circular**	
Link Count:	1	Max Depth:	3.00 ft	Max Depth:	3.00 ft
Flow Direction:	Both	**Bottom Clip**			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	516.00 ft	**Top Clip**			

FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000
Bend Location:	0.00 dec				
Energy Switch:	Energy				

Pipe Comment:

Weir Component

Weir:	1
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	24.00 ft
Control Elevation:	24.00 ft
Max Depth:	0.25 ft
Max Width:	0.50 ft
Fillet:	0.00 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	2
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	25.00 ft
Control Elevation:	25.00 ft
Max Depth:	3.00 ft
Max Width:	0.50 ft
Fillet:	0.00 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Horizontal
Geometry Type:	Rectangular
Invert:	28.00 ft
Control Elevation:	28.00 ft
Max Depth:	3.08 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Max Width:	4.08 ft
Fillet:	0.00 ft

Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-400		Upstream Pipe		Downstream Pipe	
Scenario:	Post	Invert:	21.50 ft	Invert:	21.00 ft
From Node:	Pond 4A/4B	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Boundary 4	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	5.00 ft	Max Depth:	5.00 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	327.00 ft	Top Clip			
FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000
Bend Location:	0.00 dec				
Energy Switch:	Energy				

Pipe Comment:

Weir Component	
Weir:	1
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	24.50 ft
Control Elevation:	24.50 ft
Max Depth:	0.25 ft
Max Width:	0.67 ft
Fillet:	0.00 ft

Bottom Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Top Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component	
Weir:	2
Weir Count:	1

Bottom Clip	
Default:	0.00 ft

Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	25.25 ft
Control Elevation:	25.25 ft
Max Depth:	3.25 ft
Max Width:	10.00 ft
Fillet:	0.00 ft

Op Table:	
Ref Node:	
Top Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Horizontal
Geometry Type:	Rectangular
Invert:	28.50 ft
Control Elevation:	28.50 ft
Max Depth:	3.08 ft
Max Width:	4.08 ft
Fillet:	0.00 ft

Bottom Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Top Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-500		Upstream Pipe		Downstream Pipe	
Scenario:	Post	Invert:	22.00 ft	Invert:	20.00 ft
From Node:	Pond 5A/5B	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Pond 4A/4B	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	5.00 ft	Max Depth:	5.00 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	5	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	2839.00 ft	Top Clip			
FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000

Bend Location: 0.00 dec
Energy Switch: Energy

Pipe Comment:

Weir Component		Bottom Clip	
Weir:	1	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	25.00 ft	Ref Node:	
Control Elevation:	25.00 ft	**Discharge Coefficients**	
Max Depth:	0.25 ft	Weir Default:	3.200
Max Width:	0.58 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	2	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	25.75 ft	Ref Node:	
Control Elevation:	25.75 ft	**Discharge Coefficients**	
Max Depth:	3.25 ft	Weir Default:	3.200
Max Width:	20.00 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	3	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Horizontal	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	29.00 ft	Ref Node:	
Control Elevation:	29.00 ft	**Discharge Coefficients**	
Max Depth:	3.08 ft	Weir Default:	3.200
Max Width:	4.08 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-600		Upstream Pipe		Downstream Pipe	
Scenario:	Post	Invert:	31.00 ft	Invert:	22.00 ft
From Node:	Pond 6A/6B	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Pond 5A/5B	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	5.00 ft	Max Depth:	5.00 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	3606.00 ft	Top Clip			
FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000
Bend Location:	0.00 dec				
Energy Switch:	Energy				

Pipe Comment:

Weir Component		Bottom Clip	
Weir:	1	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	34.00 ft	Ref Node:	
Control Elevation:	34.00 ft	Discharge Coefficients	
Max Depth:	0.25 ft	Weir Default:	3.200
Max Width:	0.33 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	2	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	35.10 ft		

Control Elevation:	35.10 ft
Max Depth:	2.90 ft
Max Width:	4.75 ft
Fillet:	0.00 ft

Ref Node:	
Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Horizontal
Geometry Type:	Rectangular
Invert:	38.00 ft
Control Elevation:	38.00 ft
Max Depth:	3.08 ft
Max Width:	4.08 ft
Fillet:	0.00 ft

Bottom Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Top Clip	
Default:	0.00 ft
Op Table:	
Ref Node:	
Discharge Coefficients	
Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-200		Upstream Pipe		Downstream Pipe	
Scenario:	Post 2	Invert:	17.50 ft	Invert:	17.00 ft
From Node:	Pond 2C	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Boundary 2	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	5.00 ft	Max Depth:	5.00 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	196.41 ft	Top Clip			
FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000
Bend Location:	0.00 dec				
Energy Switch:	Energy				

Pipe Comment:

Weir Component

Weir:	1
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	22.00 ft
Control Elevation:	22.00 ft
Max Depth:	2.50 ft
Max Width:	0.75 ft
Fillet:	0.00 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	2
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Horizontal
Geometry Type:	Rectangular
Invert:	24.50 ft
Control Elevation:	24.50 ft
Max Depth:	3.08 ft
Max Width:	4.08 ft
Fillet:	0.00 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Weir Component

Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Rectangular
Invert:	21.50 ft
Control Elevation:	21.50 ft
Max Depth:	0.25 ft
Max Width:	1.50 ft
Fillet:	0.00 ft

Bottom Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Top Clip

Default:	0.00 ft
Op Table:	
Ref Node:	

Discharge Coefficients

Weir Default:	3.200
Weir Table:	
Orifice Default:	0.600
Orifice Table:	

Weir Comment:

Drop Structure Comment:

Drop Structure Link: S-400		Upstream Pipe		Downstream Pipe	
Scenario:	Post 2	Invert:	21.50 ft	Invert:	21.00 ft
From Node:	Pond 4C	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	Boundary 4	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	5.00 ft	Max Depth:	5.00 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	0	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0000	Manning's N:	0.0000
Length:	500.00 ft	Top Clip			
FHWA Code:	0	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	0.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0000	Manning's N:	0.0000
Bend Location:	0.00 dec				
Energy Switch:	Energy				

Pipe Comment:

Weir Component		Bottom Clip	
Weir:	1	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	24.50 ft	Ref Node:	
Control Elevation:	24.50 ft	Discharge Coefficients	
Max Depth:	0.25 ft	Weir Default:	3.200
Max Width:	1.83 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	2	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	Top Clip	
Weir Type:	Sharp Crested Vertical	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	25.25 ft	Ref Node:	
Control Elevation:	25.25 ft	Discharge Coefficients	
Max Depth:	3.25 ft	Weir Default:	3.200
Max Width:	10.00 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Weir Component		Bottom Clip	
Weir:	3	Default:	0.00 ft
Weir Count:	1	Op Table:	
Weir Flow Direction:	Both	Ref Node:	
Damping:	0.0000 ft	**Top Clip**	
Weir Type:	Horizontal	Default:	0.00 ft
Geometry Type:	Rectangular	Op Table:	
Invert:	28.50 ft	Ref Node:	
Control Elevation:	28.50 ft	**Discharge Coefficients**	
Max Depth:	3.08 ft	Weir Default:	3.200
Max Width:	4.08 ft	Weir Table:	
Fillet:	0.00 ft	Orifice Default:	0.600
		Orifice Table:	

Weir Comment:

Drop Structure Comment:

Simulation: 25 YR 24 HR

Scenario: Post
Run Date/Time: 4/21/2024 2:26:15 PM
Program Version: ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		30.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CURVE NUMBER
Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERVIOUS
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft
Edge Length Option: Automatic
Dflt Damping (2D): 0.0050 ft
Min Node Srf Area (2D): 100 ft2
Energy Switch (2D): Energy

IA Recovery Time: 24.0000 hr
ET for Manual Basins: False
Smp/Man Basin Rain Opt: Global
OF Region Rain Opt: Global
Rainfall Name: ~FLMOD
Rainfall Amount: 8.60 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 25 YR 24 HR

Scenario: Post 2

Run Date/Time: 4/21/2024 7:11:29 PM
Program Version: ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		30.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CURVE NUMBER
Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERVIOUS
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~FLMOD
		Rainfall Amount:	8.60 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (2D):	100 ft2	Min Node Srf Area (1D):	100 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Simulation: 25 YR4 HR Pre

Scenario:	Pre
Run Date/Time:	4/21/2024 2:40:56 PM
Program Version:	ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		30.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CURVE NUMBER
Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERVIOUS
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft
Edge Length Option: Automatic
Dflt Damping (2D): 0.0050 ft
Min Node Srf Area (2D): 100 ft2
Energy Switch (2D): Energy

IA Recovery Time: 24.0000 hr
ET for Manual Basins: False
Smp/Man Basin Rain Opt: Global
OF Region Rain Opt: Global
Rainfall Name: ~FLMOD
Rainfall Amount: 8.60 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Appendix E – Pond Site Evaluation Matrix

Alternate Pond Site Evaluation Matrix
Project Description: SR 16 From International Golf Parkway to I-95 PD&E Study
FPID Number: 445737-2-22-01

Basin Number	**1**				**1+2**		
Pond Alternative	1A	1B	1C	1D	2A	2B	2C
Additonal Right of Way Needed (acres)	3.26	3.99	5.78	3.59	9.36	10.07	15.67
Required Water Quality Volume (ac-ft)	2.03				2.01		
Required Water Quantity Volume (ac-ft)	9.13				12.79		
Groundwater Condition (ft) (Estimated Depth of SHWT)	1.00	0.00	0.50	0.75	1.00	1.00	1.00
Soil Condition (Hydrologic Soil Group)	A/D	A/D	A/D	A/D & C/D	A/D	A/D	A/D
Potential Hazardous Waste Contaminations	Medium	Medium	Low	Low	No	No	No
Potential Impacts to Endangered Species	Low	Low	Low	Low	Low	Low	Low
Potential Impacts to Cultural Resources	High	Low	Low	Low	Low	Low	Low
Wetland Impacts (acres)	0.12	-	0.57	0.45	1.90	-	
Potential Impacts to Utilities	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Existing Landscapes (Land Use of Parcel with Pond)	Residential, Low Density (Less than two dwelling units per acre)	Cropland and Pastureland	Wetland Hardwood Forests/Upland Hardwood Forests	Upland Hardwood Forests	Vegetated Non-Forested Wetlands/Cropland and Pastureland	Tree Plantations	Vegetated Non-Forested Wetlands/Cropland and Pastureland
Adjoining Land uses (Land Use of Parcels Next to Pond Parcel)	Trans/Utilities/Institutional/Residential, Low Density (Less than two dwelling units per acre)	Cropland and Pastureland/Residential, Low Density (Less than two dwelling units per acre)	Trans/Nurseries and Vineyards/Upland Hardwood Forests/Wetland Hardwood Forests	Trans/Wetland Coniferous Forests/Wetland Forested Mixed/Cropland and Pastureland	Trans/Cropland and Pastureland/Wetland Hardwood Forests	Trans/Wetland Hardwood Forests/Tree Plantations	Trans/Cropland and Pastureland/Wetland Hardwood Forests
Right of Way Costs	$3,127,542	$2,966,938	$2,559,048	$2,278,775	$5,787,027	$2,797,631	$9,688,324
Aesthetic Effects* (Shape of Pond)	-	-	-	-	-	-	-
Construction Costs Including Earthwork*	$4,764,743				$3,557,654		$5,388,672
Preferred Pond Alternative*	No	No	No	No	No	No	Yes

Alternate Pond Site Evaluation Matrix
Project Description: SR 16 From International Golf Parkway to I-95 PD&E Study
FPID Number: 445737-2-22-01

Basin Number	**3**			**4**		**4+5+6**	**5**		**6**	
Pond Alternative	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B
Additonal Right of Way Needed (acres)	4.11	3.31	5.18	6.55	6.75	12.43	6.30	6.78	3.80	3.69
Required Water Quality Volume (ac-ft)	1.90			2.37			2.12		1.79	
Required Water Quantity Volume (ac-ft)	10.88			14.40			11.75		9.98	
Groundwater Condition (ft) (Estimated Depth of SHWT)	1.00	1.00	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00
Soil Condition (Hydrologic Soil Group)	A/D	A/D	A/D	A/D & B/D	A/D & B/D	A/D & B/D	A/D & B/D	A/D	A/D	A/D & B/D
Potential Hazardous Waste Contaminations	No	No	No	No	Medium	Medium	No	Medium	No	No
Potential Impacts to Endangered Species	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Potential Impacts to Cultural Resources	Moderate	Moderate	Moderate	Low	Low	Low	Low	Low	Low	Low
Wetland Impacts (acres)	-	0.10	1.86	1.58	0.28	0.28	-	1.23	0.44	0.25
Potential Impacts to Utilities	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Existing Landscapes (Land Use of Parcel with Pond)	Cropland and Pastureland	Tree Plantations	Wetland Hardwood Forests	Upland Hardwood Forests/Residential, Low Density	Cropland and Pastureland	Cropland and Pastureland	Cropland and Pastureland	Tree Plantations/Wetland Forested Mixed	Tree Plantations/Upland Coniferous Forests/Residential, Medium Density	Upland Coniferous Forests/Cropland and Pastureland
Adjoining Land uses (Land Use of Parcels Next to Pond Parcel)	Trans/Cropland and Pastureland/Reservoirs	Trans/Wetland Hardwood Forests	Trans/Wetland Hardwood Forests	Trans/Upland Hardwood Forests/Tree Plantations/Residential, Low Density	Trans/Cropland and Pastureland	Trans/Cropland and Pastureland	Trans/Cropland and Pastureland	Trans/Tree Plantations/Wetland Forested Mixed	Trans/Residential, Medium Density (Two-Five dwelling units per acre)/Upland Coniferous Forests	Trans/Cropland and Pastureland/Upland Coniferous Forests
Right of Way Costs	$2,775,345	$924,524	$1,446,838	$5,057,969	$5,194,097	$9,564,833	$3,730,530	$4,514,327	$2,669,581	$2,233,367
Aesthetic Effects* (Shape of Pond)	-	-	-	-	-	-	-	-	-	-
Construction Costs Including Earthwork*	$1,483,104			$2,263,434		$5,325,703	$5,083,216		$4,073,229	
Preferred Pond Alternative*	No	No	Yes	No	No	Yes	No	No	No	No

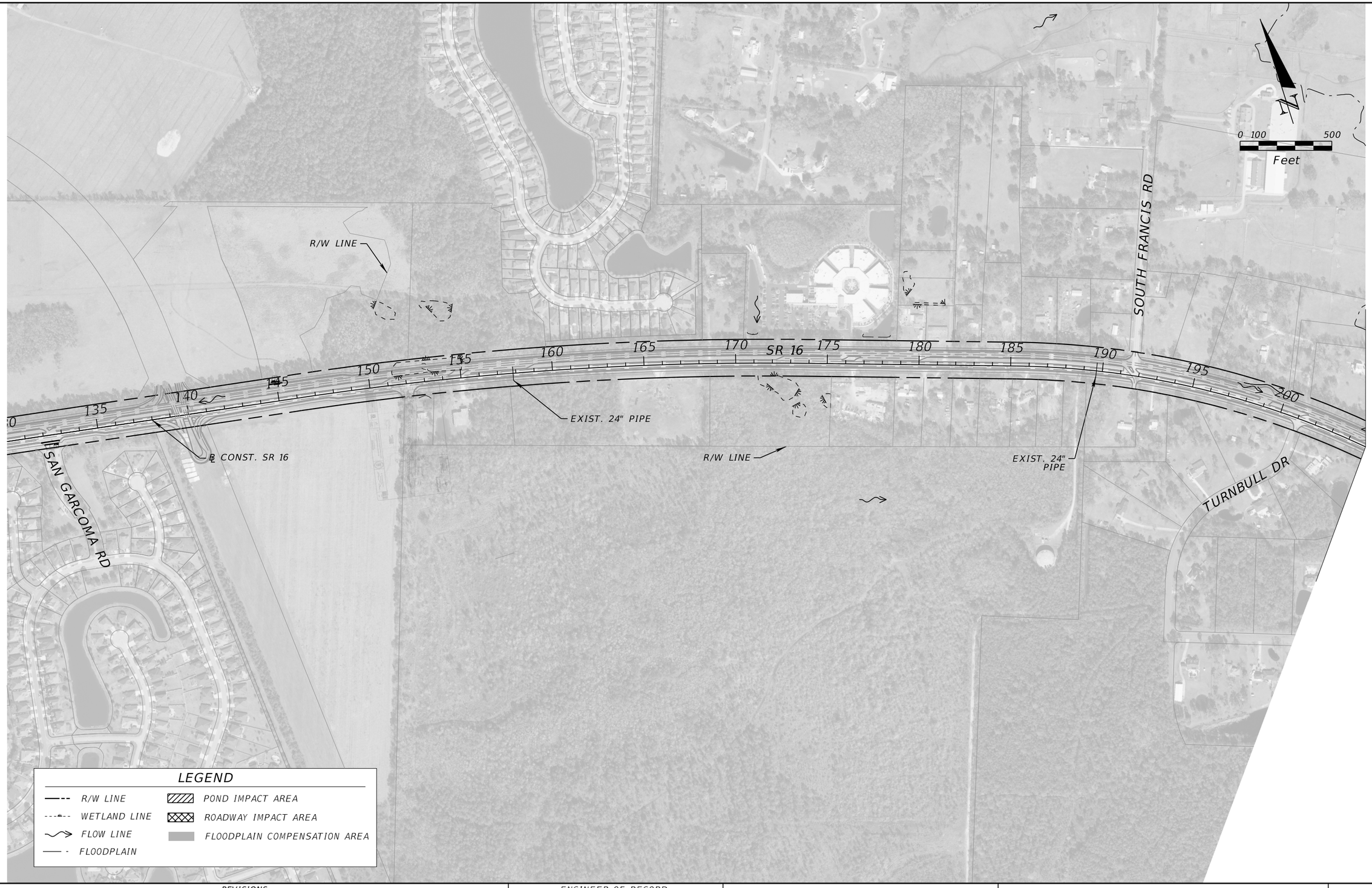
Pond Site	POND 1A,1B,1C,1D	POND 2A & 2B	POND 2C	POND 3A, 3B, 3C	POND 4A & 4B
Total Site Area (ac)	**3.27**	**9.36**	**15.67**	**4.11**	**4.98**
Site Perimeter (ft)	**1622**	**3554**	**5139**	**1993**	**2001**
Area at NWL (ac)	1.53	4.81	9.09	1.88	3.78
Average Exist. Ground Elevation (ft)	**27.53**	**22.82**	**23.50**	**24.29**	**24.98**
Pond Area at Exist Ground (ac)	1.59	4.76	5.04	1.91	3.88
Pipe Length (ft)	**3171.00**	**618.00**	**618.00**	**516.00**	**327.00**

Pay Item	Description	Unit Price	Quantity	Quantity Cost	Quantity	Quantity Cost	Quantity	Quantity Cost	Quantity	Quantity Cost	Quantity	Quantity Cost
104-10-3	SEDIMENT BARRIER (LF)	$2.95	1622	$4,784.90	3554	$10,484.30	5139	$15,160.05	1993	$5,879.35	2001	$5,902.95
110-1-1	CLEARING & GRUBBING (AC)	$92,616.02	3.27	$302,854.39	9.36	$866,885.95	15.67	$1,451,293.03	4.11	$380,651.84	4.98	$461,227.78
120-1	REGULAR EXCAVATION (CY)	$30.73	13717.62	$421,542.47	38937.75	$1,196,557.11	71921.12	$2,210,135.88	16659.21	$511,937.50	35001.70	$1,075,602.14
425-1-549	INLETS, DT BOT, TYPE D, MODIFY (EA)	$10,462.42	**1**	$10,462.42	**1**	$10,462.42	**1**	$10,462.42	**1**	$10,462.42	**1**	$10,462.42
425-2-71	MANHOLES, J-7, <10' (EA)	$10,893.82	**8**	$87,150.56	**2**	$21,787.64	**2**	$21,787.64	**2**	$21,787.64	**1**	$10,893.82
430-175-136	PIPE CULVERT, OPT MATERIAL, ROUND, 36"S/CD (LF)	$313.45	3171	$993,949.95	618	$193,712.10	0	$0.00	516	$161,740.20	0	$0.00
430-175-160	PIPE CULVERT, OPT MATERIAL, ROUND, 60"S/CD (LF)	$641.51	3171	$2,034,228.21	618	$396,453.18	618	$396,453.18	0	$0.00	327	$209,773.77
530-3-4	RIPRAP, RUBBLE, F&I, DITCH LINING (TN)	$253.75	**5.0**	$1,268.75	**5.0**	$1,268.75	**5.0**	$1,268.75	**5.0**	$1,268.75	**5.0**	$1,268.75
550-10-220	FENCING, TYPE B, 5.1-6.0', STANDARD (LF)	$34.70	1622	$56,283.40	3554	$123,323.80	5139	$178,323.30	1993	$69,157.10	2001	$69,434.70
550-60-234	FENCE GATE, TYPE B, SLIDING/CANTILEVER, 18.1-20.0' OPENING (EA) (statewide)	$5,037.99	**1**	$5,037.99	**1**	$5,037.99	**1**	$5,037.99	**1**	$5,037.99	**1**	$5,037.99
570-1-2	PERFORMANCE TURF, SOD (SY)	$6.30	8422	$53,056.08	22022	$138,738.60	31847	$200,637.36	10793	$67,997.16	5808	$36,590.40
Subtotal				$3,970,619.11		$2,964,711.84		$4,490,559.60		$1,235,919.96		$1,886,194.72
Contingency 20%				$794,123.82		$592,942.37		$898,111.92		$247,183.99		$377,238.94
Total				$4,764,742.93		$3,557,654.20		$5,388,671.52		$1,483,103.95		$2,263,433.67

Pond Site	POND 4C	POND 5A & 5B	POND 6A & 6B
Total Site Area (ac)	**12.43**	**4.98**	**3.69**
Site Perimeter (ft)	**3064**	**2526**	**1806**
Area at NWL (ac)	8.53	2.84	1.69
Average Exist. Ground Elevation (ft)	**25.52**	**26.35**	**34.68**
Pond Area at Exist Ground (ac)	8.78	3.21	1.77
Pipe Length (ft)	**327.00**	**2839.00**	**3606.00**

Pay Item	Description	Unit Price	Quantity	Quantity Cost	Quantity	Quantity Cost	Quantity	Quantity Cost
104-10-3	SEDIMENT BARRIER (LF)	$2.95	3064	$9,038.80	2526	$7,451.70	1806	$5,327.70
110-1-1	CLEARING & GRUBBING (AC)	$92,616.02	12.43	$1,151,217.13	4.98	$461,227.78	3.69	$341,753.11
120-1	REGULAR EXCAVATION (CY)	$30.73	91609.28	$2,815,153.33	26007.98	$799,225.16	15770.64	$484,631.66
425-1-549	INLETS, DT BOT, TYPE D, MODIFY (EA)	$10,462.42	**1**	$10,462.42	**1**	$10,462.42	**1**	$10,462.42
425-2-71	MANHOLES, J-7, <10' (EA)	$10,893.82	**1**	$10,893.82	**8**	$87,150.56	**10**	$108,938.20
430-175-136	PIPE CULVERT, OPT MATERIAL, ROUND, 36"S/CD (LF)	$313.45	0	$0.00	2839	$889,884.55	0	$0.00
430-175-160	PIPE CULVERT, OPT MATERIAL, ROUND, 60"S/CD (LF)	$641.51	327	$209,773.77	2839	$1,821,246.89	3606	$2,313,285.06
530-3-4	RIPRAP, RUBBLE, F&I, DITCH LINING (TN)	$253.75	**5.0**	$1,268.75	**5.0**	$1,268.75	**5.0**	$1,268.75
550-10-220	FENCING, TYPE B, 5.1-6.0', STANDARD (LF)	$34.70	3064	$106,320.80	2526	$87,652.20	1806	$62,668.20
550-60-234	FENCE GATE, TYPE B, SLIDING/CANTILEVER, 18.1-20.0' OPENING (EA) (statewide)	$5,037.99	**1**	$5,037.99	**1**	$5,037.99	**1**	$5,037.99
570-1-2	PERFORMANCE TURF, SOD (SY)	$6.30	18876	$118,918.80	10382	$65,405.34	9680	$60,984.00
Subtotal				$4,438,085.60		$4,236,013.34		$3,394,357.09
Contingency 20%				$887,617.12		$847,202.67		$678,871.42
Total				$5,325,702.72		$5,083,216.00		$4,073,228.51

Appendix F – Impact and Compensation Maps



REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			IMPACT AND COMPENSATION MAP (1)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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MATCHLINE STA. 205+00.00

POND 2B IMPACT AREA
FPC 1B
POND 3B IMPACT AREA
POND 3C IMPACT AREA
ROADWAY IMPACT AREA
POND 4 IMPACT AREA
0 100 500
Feet
SR 16
EXIST. 24" PIPE
℄ CONST. SR 16
R/W LINE
EXIST. 3-36" PIPE
FPC 1A
POND 3B IMPACT AREA
FPC 1C
POND 2A IMPACT AREA
TURNBULL CREEK
POND 2C IMPACT AREA
FPC 1A

LEGEND

R/W LINE	POND IMPACT AREA
WETLAND LINE	ROADWAY IMPACT AREA
FLOW LINE	FLOODPLAIN COMPENSATION AI
FLOODPLAIN	

MATCHLINE STA. 280+00.00

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

SANOJ SHRESTHA, P.E.
LICENSE NUMBER: 85715
RS&H, INC
10748 DEERWOOD PARK BLVD. SOUTH
JACKSONVILLE, FL 32256

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 16	ST. JOHNS	21044753201

IMPACT AND COMPENSATION MAP (2)

SHEET NO.

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MATCHLINE STA. 280+00.00

MATCHLINE STA. 355+00.00

N

0 100 500

Feet

ORIENT DR

TURNBULL CREEK RD

DOWNS CORNER RD

WINDWARD RANCH BLVD

WHISPER RIDGE DR

SR 16

℄ CONST. SR 16

R/W LINE

FPC 2

FPC 3

ROADWAY IMPACT AREA WEST OF DOWNS CORNER RD

ROADWAY IMPACT AREA EAST OF DOWNS CORNER RD

285 290 295 300 305 310 315 320 325 330 335 340 345 350

LEGEND

- R/W LINE
- WETLAND LINE
- FLOW LINE
- FLOODPLAIN
- POND IMPACT AREA
- ROADWAY IMPACT AREA
- FLOODPLAIN COMPENSATION AREA

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			IMPACT AND COMPENSATION MAP (3)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

MATCHLINE STA. 355+00.00

N

0 100 500
Feet

SR 9 (I-95)

OUTLET MALL BLVD

EXIST. 24" PIPE

℄ CONST. SR 16

SR 16

TOMS RD

EXIST. 30" PIPE

CR 208

AGRICULTURAL CENTER DR

355 360 365 370 375 380 385 390 395 400 405 410 415

LEGEND

- R/W LINE
- WETLAND LINE
- FLOW LINE
- FLOODPLAIN
- POND IMPACT AREA
- ROADWAY IMPACT AREA
- FLOODPLAIN COMPENSATION AREA

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			IMPACT AND COMPENSATION MAP (4)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	SANOJ SHRESTHA, P.E. LICENSE NUMBER: 85715 RS&H, INC 10748 DEERWOOD PARK BLVD. SOUTH JACKSONVILLE, FL 32256	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 16	ST. JOHNS	21044753201		

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Appendix G – Floodplain Compensation Site Evaluation Matrix

Alternate FPC Site Evaluation Matrix
Project Description: SR 16 From International Golf Parkway to I-95 PD&E Study
FPID Number: 210447-5

Impact Location	Turnbull Creek				West of Downs Corner Rd	East of Downs Corner Rd
FPC Alternative	1A	1B	1C	1D	2	3
FPC Additonal Right of Way Needed (acres)	15.79	11.86	9.60	11.43	2.78	1.58
Estimated Right of Way Costs	$9,762,516	$3,294,926	$6,482,559	$7,066,850	$1,779,200	$1,011,200
Hazardous Materials	Low	Low	Low	Low	Low	Low
Utilities Impacts	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Maintenance	Roadside Access	Roadside Access	Roadside Access	Easement Required	Roadside Access	Roadside Access
Cultural Resources Impacts	Moderate	Moderate	Moderate	Moderate	Low	Low
FEMA Flood Zone	AE	AE	AE	AE	AE	AE
FEMA Flood Zone Impacts (acres)	23.2				2.59	2.37
Wetland Impacts (acres)	3.84	5.04	1.04	-	0.54	0.27
Habitat Impacts	Moderate	High	High	Moderate	High	High
Other Environmental Impacts (parks/springs)	Low	Low	Low	Low	Low	Low
Number of Property Owners	1	1	1	1	1	1
Land Use Zoning	Cropland and Pastureland	Tree Plantation	Cropland and Pastureland	Cropland and Pastureland	Wetland Hardwood Forests	Wetland Hardwood Forests/ Tree Plantation
Advantages	Roadside Access, Parcel is for sale	Roadside Access	Roadside Access	Roadside Access, Parcel is for sale.	Roadside Access, Undeveloped Parcel	Roadside Access, Undeveloped Parcel
Disadvantages, etc.	Located in SR-16 Frontage	Located in Conservation Easement, Located in SR-16 Frontage	Residental Parcel	Easement requried for maintenance access	Located in SR-16 Frontage	Located in SR-16 Frontage
Preferred FPC Alternative	No	No	No	Yes	Yes	Yes

Appendix H – Straight Line Diagrams

	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	10/13/2020	10/21/2020	6.312	6.312	01/28/2021 FDOT	02/17/2021 METRIC
BY	PECS	PECS				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02		SR 16	ST. JOHNS	02	78060000	3 OF 6

8.0 | 9.0 | 10.0

ROADWAY FEATURES

8.000 INSIDE URBAN, OUTSIDE CITY
* WORLD GOLF VILLAGE
*|<=SR-16
*|<SR 16

SILVERLEAF PKWY TO 8.013

8.013 FROM SR-16

8.118 90.0' - 48.0'
4 - 12.0' RDWY
30.0 CB&VEG MED
2 - 2.0' C&G INSHLD1
2 - 4.0' PVD SHLD1
2 - 2.0' C&G SHLD2

RUES LANDING RD 8.904

CREEK

MILL

TO INTERTL GOLF 9.525

9.500 INTERNTL GOLF PKWY

9.500 CR-13A/ PACETTI RD 9.970 TO PACETTI RD

13 A

MURABELLA PKWY 9.639

VERONA WAY 9.835

LANE WIDTHS ARE AVERAGED

8.000 90.0' - 12.0'L+36.0'R
1 - 12.0'L + 3 - 12.0'R RDWY
30.0 TFSP MED
2 - 4.0' PVD SHLD1
2 - 2.0' C&G SHLD2

9.500 54.0' - 24.0'
2 - 12.0' RDWY
12.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 4.0' LWN SHLD2

9.835 54.0' - 24.0'
2 - 12.0' RDWY
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

9.967 66.0' - 24.0'
2 - 12.0' RDWY
12.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

ROADWAY COMPOSITION

8.000 28/FC-12.5
28/FC-12.5

9.500 28/FC-12.5
28/FC-12.5

9.835 28/FC-12.5

9.967 28/FC-12.5
28/FC-12.5

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

PC=8.714
PI=8.818
PT=8.920
Δ=21°48'30.00"
D=2°00'

B=S34°04'10"E

Δ=46°50'00.00"
D=13°00'
PC=9.075
PI=9.232
PT=9.371

B=S80°54'10"E

STRUCTURE DESCRIPTION

8.029 2 - 48" X 137' CC

8.400 3 - 42" X 72' CC - LT
3 - 42" X 73' CC - RT

8.824 2 - 36" X 72' CC - LT
2 - 36" X 73' CC - RT

9.108 1 - 18" X 60' CC

9.127 1 - 18" X 60' CC

9.218 1 - 18" X 60' CC

9.233 #0063 31.7' CB 9.239

9.249 3 - 9" X 9" X 140' CBC

9.284 1 - 18" X 55' CC

9.549 2 - 24" X 102' CC

DISTRICT USE

SIS

FUN CLASS

8.000 URBAN PRIN ART OTHER

SPEED LIMIT

8.000 45MPH

9.644 55MPH

9.955 60MPH

AC MAN CLS

8.000 ACCESS CLASS03

ACCESS CLASS03 9.478 9.478 ACCESS CLASS04

10.0 | 11.0 | 12.0

ROADWAY FEATURES

10.000 INSIDE URBAN, OUTSIDE CITY
* WORLD GOLF VILLAGE
*|<=SR-16
*|<SR 16

SAN GIACOMO RD 10.110

S FRANCIS RD 11.231

11.236 OUTSIDE CITY & URBAN
*|<=SR-16
*|<SR 16

TURNBULL DR 11.407

CREEK

TURNBULL

LANE WIDTHS ARE AVERAGED

10.000 66.0' - 24.0'
2 - 12.0' RDWY
12.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

10.318 54.0' - 24.0'
2 - 12.0' RDWY
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

10.758 67.0' - 24.0'
2 - 12.0' RDWY
13.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

11.442 54.0' - 24.0'
2 - 12.0' RDWY
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

ROADWAY COMPOSITION

10.000 28/FC-12.5
28/FC-12.5

10.318 28/FC-12.5

10.758 28/FC-12.5
28/FC-12.5

11.442 28/FC-12.5

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

PC=10.365
PI=10.629
PT=10.891
Δ=9°16'00.00"
D=0°20'

B=S71°38'10"E

PC=11.103
PI=11.285
PT=11.463
Δ=23°44'50.00"
D=1°15'

B=S47°53'20"E

Δ=10°55'30.00"
D=0°30'
PC=11.905
PI=11.121
PT=12.319

STRUCTURE DESCRIPTION

10.596 1 - 24" X 82' CC

10.901 1 - 24" X 86' CC

11.200 2 - 24" X 86' CC

11.720 #0064 110.9' BR 11.741

DISTRICT USE

SIS

FUN CLASS

10.000 URBAN PRIN ART OTHER

11.236 RURAL PRIN ART OTHER

SPEED LIMIT

10.000 60MPH

AC MAN CLS

10.000 ACCESS CLASS04

Version: 1.4.2.27 02/17/2021

	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	10/13/2020	10/21/2020	6.312	6.312	01/28/2021 FDOT	02/17/2021 METRIC
BY	PECS	PECS				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02		SR 16	ST. JOHNS	02	78060000	4 OF 6

12.0 | 13.0 | 14.0

ROADWAY FEATURES

12.000 OUTSIDE CITY & URBAN
*|<=SR-16
*|<SR 16

UNSIGNED 13.045 | SCHOOL ENT 13.390 | DOWNS CORNER 13.701 | WINDWARD BRANCH BLVD 13.593 | WHISPER RIDGE DR 13.986

LANE WIDTHS ARE AVERAGED

12.000 54.0' - 24.0'
2 - 12.0' RDWY
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

13.245 67.0' - 24.0'
2 - 12.0' RDWY
13.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

ROADWAY COMPOSITION

12.000 28/FC-12.5

13.245 28/FC-12.5
28/FC-12.5

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

PC=12.698
PI=12.769
PT=12.838
Δ=22°08'45.00"
D=3°00'

Δ=19°21'15.00"
D=1°00'
PC=13.490
PI=13.675
PT=13.857

B=S58°48'50"E | B=S36°40'05"E | B=S56°01'20"E

STRUCTURE DESCRIPTION

12.030 1 - 24' X 94' CC

12.660 3 - 36' X 86' CC

DISTRICT USE	
SIS	
FUN CLASS	RURAL PRIN ART OTHER
SPEED LIMIT	60MPH
AC MAN CLS	ACCESS CLASS04

14.0 | 15.0 | 16.0

ROADWAY FEATURES

14.000 OUTSIDE CITY & URBAN
*|<=SR-16
*|<SR 16

SHOPPING ENT 14.653 | SHOPPING ENT 14.778 | SHOPPING ENT 14.910 | FACTORY OUTLET'S DR 15.091 | 78080017 SB OFF 15.385 | FROM I-95 SB 15.406 | I-95/SR-9 | I-95/SR-9 | TO I-95 NB 15.507 | 78080018 NB ON 15.524 | BUSINESS ENT 15.610 | OUTLET MALL BLVD 15.724

SHOPPING ENT 15.021 | TOMS RD 15.091 | CR-208 15.295 | TO CR-208 15.280 | 78080015 SB ON 15.385 | TO I-95 SB 15.406 | FROM I-95 NB 15.507 | 15.524 78080016 NB OFF | 15.610 | 15.724 | GREEN ACRES RD 15.896

LANE WIDTHS ARE AVERAGED

14.000 67.0' - 24.0'
2 - 12.0' RDWY
13.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

14.204 54.0' - 24.0'
2 - 12.0' RDWY
2 - 5.0' PVD SHLD1
2 - 10.0' LWN SHLD2

14.402 72.0' - 24.0'
2 - 12.0' RDWY
26.0 PVD MED
2 - 5.0' PVD SHLD1
2 - 6.0' LWN SHLD2

14.516 81.0' - 12.0'L+24.0'R
1 - 12.0'L + 2 - 12.0'R RDWY
23.0 CB&VEG MED
2 - 2.0' C&G INSHLD1
2 - 5.0' PVD SHLD1
2 - 6.0' LWN SHLD2

14.653 93.0' - 48.0'
4 - 12.0' RDWY
23.0 CB&VEG MED
2 - 2.0' C&G INSHLD1
2 - 5.0' PVD SHLD1
2 - 6.0' LWN SHLD2

15.724 108.0' - 48.0'
4 - 12.0' RDWY
40.0 VEG MED
2 - 2.0' PVD INSHLD1
2 - 4.0' PVD SHLD1
2 - 6.0' LWN SHLD2

ROADWAY COMPOSITION

14.000 28/FC-12.5
28/FC-12.5

14.204 28/FC-12.5

14.402 28/FC-12.5
28/FC-12.5

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

PC=14.391
PI=14.454
PT=14.516
Δ=19°46'45.00"
D=3°00'

Δ=37°42'00.00"
D=5°00'
PC=15.253
PI=15.320
PT=15.396

Δ=3°07'00.00"
D=1°00'
PC=15.604
PI=15.634
PT=15.663

B=S36°14'35"E | B=S73°56'00"E | B=S76°59'50"E

STRUCTURE DESCRIPTION

14.450 1 - 24' X 106' CC

15.191 1 - 30' X 121' CC

15.267 1 - 15' X 61' CC

15.336 1 - 15' X 54' CC

15.438 #0057 58.1' UP | 15.449 | 15.456 #0058 58.1' UP | 15.467 | 15.526 1 - 10' X 6' X 117' CBC

15.815 1 - 18' X 73' CC

15.916 1 - 18' X 73' CC

DISTRICT USE	
SIS	
FUN CLASS	RURAL PRIN ART OTHER
SPEED LIMIT	60MPH	14.241 55MPH	14.430 45MPH	15.107 45MPH	15.568 45MPH	15.772 55MPH	15.828 45MPH
AC MAN CLS	ACCESS CLASS04	ACCESS CLASS04 14.426 14.434 ACCESS CLASS03

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	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	10/13/2020	10/21/2020	6.312	6.312	01/28/2021 FDOT	02/17/2021 METRIC
BY	PECS	PECS				

FLORIDA DEPARTMENT OF TRANSPORTATION

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02		SR 16	ST. JOHNS	02	78060000	5 OF 6

16.0 | 17.0 | 18.0

16.000 OUTSIDE CITY & URBAN
*|<=SR-16
*|<SR 16

INMAN RD 16.003 | ZYGMONT CT 16.849 | STRATTON BLVD 16.981

17.797 INSIDE URBAN, OUTSIDE CITY
* ST. AUGUSTINE
*|<=SR-16
*|<SR 16

ROADWAY FEATURES

HARVEST LN 16.003 | OLD TOWN PKWY 16.208 | FORTNER RD 16.410 | RACETRACK RD 16.790 | INDUSTRY CENTER RD 17.145 | UNSIGNED 17.322 | PLEASURE LN 17.392 | UNSIGNED 17.492 | CIRCLE DR E 17.517 | 17.809 FOUR MILE RD | UNSIGNED 17.918

LANE WIDTHS ARE AVERAGED

16.000 108.0' - 48.0'
4 - 12.0' RDWY
40.0 VEG MED
2 - 2.0' PVD INSHLD1
2 - 4.0' PVD SHLD1
2 - 6.0' LWN SHLD2

ROADWAY COMPOSITION

16.000 28/FC-12.5
28/FC-12.5

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

Δ=25°09'00.00" D=2°00' PC=16.537 PI=16.658 PT=16.776 B=N77°51'10"E

PC=16.994 PI=17.052 PT=17.110 Δ=12°16'00.00" D=2°00' B=S89°52'50"E

Δ=18°02'30.00" D=2°00' PC=17.494 PI=17.580 PT=17.665 B=N72°04'40"E

PC=17.819 PI=17.904 PT=17.985 Δ=17°34'00.00" D=2°00' B=N89°41'40"E

STRUCTURE DESCRIPTION

16.029 O 1 - 18" X 72' CC
16.213 O 1 - 18" X 72' CC
16.573 O 1 - 18" X 72' CC
16.658 O 2 - 9' X 3' X 75' CBC - LT, 2 - 9' X 3' X 75' CBC - RT
16.795 O 1 - 18" X 72' CC
16.998 O 1 - 18" X 73' CC
17.362 O 1 - 18" X 72' CC
17.459 O 1 - 18" X 73' CC
17.663 O 1 - 7' X 4' X 75' CBC - LT, 1 - 7' X 4' X 75' CBC - RT
17.738 O 1 - 6' X 3' X 75' CBC - LT, 1 - 6' X 3' X 75' CBC - RT
17.950 O 1 - 18" X 82' CC
17.979 O 1 - 5' X 4' X 180' CBC

DISTRICT USE

SIS

FUN CLASS

16.000 RURAL PRIN ART OTHER
17.797 URBAN PRIN ART OTHER

SPEED LIMIT

16.000 45MPH
16.178 55MPH

AC MAN CLS

16.000 ACCESS CLASS03

18.0 | 19.0 | 20.0

18.000 INSIDE URBAN, OUTSIDE CITY
* ST. AUGUSTINE
*|<=SR-16
*|<SR 16

SELOY DR 18.009 | GLIMPSE OF GLORY RD 18.167 | DAVESTON AVE 18.233 | LONG RD 18.440 | WOODLAWN RD 18.579 | VILLAGE CROSSING CT 18.728 | N TENTH ST 18.817 | N NINTH ST 18.873 | N EIGHTH ST 18.932 | N SEVENTH ST 18.983 | N SIXTH ST 19.034 | N FIFTH ST 19.087 | N FOURTH ST 19.143 | N THIRD ST 19.192 | N SECOND ST 19.249 | N FIRST ST 19.303 | LORD ST 19.372 | COLLINS AVE 19.421 | USINA ST 19.552 | ARTHUR ST 19.635 | HILL ST 19.720 | VARELLA AVE 19.806 | EL REY AVE 19.927

ROADWAY FEATURES

SHOPPING ENT 18.396 | KENTON MORRISON RD 18.579 | COLLEGE DR 18.873 | ROYAL ST AGUSTIA PKW 19.143 | SHOPPING ENT 19.372 | S COLLINS AVE 19.421 | SCHALLER RD 19.488 | DAIRY AVE 19.603 | FORTUNA AVE 19.844

LANE WIDTHS ARE AVERAGED

18.000 108.0' - 48.0'
4 - 12.0' RDWY
40.0 VEG MED
2 - 2.0' PVD INSHLD1
2 - 4.0' PVD SHLD1
2 - 6.0' LWN SHLD2

19.421 64.0' - 48.0'
4 - 12.0' RDWY
12.0 PAVED TURN LANE (TWLTL/TURN) MED
2 - 2.0' C&G SHLD1

ROADWAY COMPOSITION

18.000 28/FC-12.5
28/FC-12.5

19.421 08/FC-0
08/FC-0

HORIZONTAL ALIGNMENT

CURVE DATA NOT FIELD VERIFIED

Δ=0°52'00.00" PI=18.749 B=N88°49'40"E

PC=19.231 PI=19.308 PT=19.384 Δ=8°04'00.00" D=1°00'

Δ=7°22'00.00" D=2°00' PC=19.538 PI=19.573 PT=19.608 B=N89°31'40"E

PC=19.743 PI=19.794 PT=19.844 Δ=15°54'00.00" D=3°00'

STRUCTURE DESCRIPTION

18.176 O 1 - 18" X 72' CC
18.348 O 1 - 18" X 73' CC
18.516 O 1 - 18" X 84' CC
18.652 1 - 6' X 6' X 149' CBC
18.727 O 1 - 18" X 73' CC
18.884 O 1 - 18" X 73' CC
18.935 O 1 - 18" X 73' CC
18.988 O 1 - 18" X 73' CC
19.049 O 1 - 18" X 73' CC
19.097 O 1 - 18" X 73' CC
19.150 O 1 - 18" X 73' CC
19.200 O 1 - 18" X 73' CC
19.250 O 1 - 18" X 73' CC
19.313 1 - 8' X 4' X 130' CBC
19.339 O 1 - 18" X 73' CC

DISTRICT USE

SIS

FUN CLASS

18.000 URBAN PRIN ART OTHER

SPEED LIMIT

18.000 55MPH
18.475 55MPH
19.340 45MPH

AC MAN CLS

18.000 ACCESS CLASS03
19.340 ACCESS CLASS03
19.421 ACCESS CLASS06

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