SR 524 PD&E Study

Friday Road to Industry Road in Brevard County, FL

Pond Siting Report

FINAL

FDOT Office
District Five

Authors
CONSOR Engineers, LLC.

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Financial Management No. 437983-1-22-01
ETDM No. 14321

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 December 14, 2016 and executed by the Federal Highway Administration and FDOT.

PROFESSIONAL ENGINEER CERTIFICATION

POND SITING REPORT

Project: State Road 524

ETDM Number: 14321

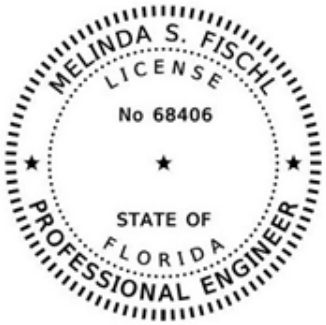
Financial Project ID: 437983-1-22-01

Federal Aid Project Number: TBD

This pond siting report contains engineering information that fulfills the purpose and need for the SR 524 Project Development and Environment Study from Friday Road to Industry Road in Brevard County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with CONSOR Engineers, LLC and that I have prepared or approved the evaluation, findings, opinions, conclusions, or technical advice for this project.

Melinda S. Fischl, Professional Engineer, State of Florida, License No. 68406



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Melinda S. Fischl, P.E. on XX/XX/XXXX.

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EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) is developing a Pond Siting Report (PSR) for the SR 524 Project. The intent of this project is to increase the capacity of SR 524 and respond to future travel demand from the intersections of S. Friday Road to the intersection of Industry Road. The project will also improve safety and provide multi-modal facilities for pedestrian and bicyclists and evaluate improvements to the I-95 interchange.

The primary objective of this Pond Siting Report (PSR) is to address the stormwater management system requirements for the SR 524 improvements. The project will require stormwater management ponds to treat and attenuate the additional runoff resulting from the increased impervious area. The stormwater management system will be designed in accordance with the criteria of the Florida Department of Transportation (FDOT) and the St. Johns River Water Management District (SJRWMD).

Due to the soil characteristics, high ground water tables and the location of wetlands in the vicinity of the project, wet detention ponds were (predominately) used to evaluate the preliminary pond locations and sizing.

This report addresses the pond site alternatives and includes an analysis for selection of a preferred alternatives. This study provided pond locations that are hydraulically functional, environmentally permittable (based on the best available information) and sized to provide treatment and nutrient removal for the existing basin. A total of fourteen pond sites were analyzed for the existing basin. The pond site alternatives are listed in **Table 1** and ranked.

All fourteen pond alternatives provided the minimum necessary treatment volume required to compensate for the SR 524 Widening PD&E project. Twelve pond alternatives have no wetland impacts, are not in a FEMA Flood Zone, and have a low probability of impacting any animal or plant habitats of concern. Ponds 2A and 2B have wetland impacts and have a low probability of impacting any animal or plant habitats of concern.

Table 1 - Alternative Evaluation Matrix

Factors	SR 524 Pond Alternatives													
	Alternative 1A	**Alternative 1B**	**Alternative 1C**	**Alternative 1D**	**Alternative 1E**	**Alternative 2A**	**Alternative 2B**	**Alternative 2C**	**Alternative 2D**	**Alternative 2E**	**Alternative 2F**	**Alternative 3A**	**Alternative 3B**	**Alternative Regional Pond A**
Baseline Location	397+50.00	397+50.00	407+50.00	415+00.00	418+00.00	470+00.00	470+00.00	485+00.00	450+00.00	442+00.00	447+50.00	538+00.00	545+00.00	535+00.00
Side (LT/RT)	LT	LT	LT	LT	LT	RT	RT	RT	LT	RT	RT	LT	LT	LT
Parcel(s) Size (ac)	11.35	11.35	0.58/0.33/0.21	40.94	4.37	129.76	129.76	2.65	52.63	269.45	1.06/1.06/1.62	NA	NA	13.49
Total Parcel(s) Required (Yes/No)	No	No	Yes	No	No	No	No	Yes	No	No	Yes	NA	NA	No
Treatment Volume Required/Provided (ac-ft)	2.84/5.56	2.76/2.86	0.84/0.88	2.76/2.82	0.90/0.90	3.43/12.88	3.17/5.25	1.45/1.31	3.06/3.17	3.06/3.18	3.10/4.11	0.43/0.56	0.31/0.52	2.90/5.47
Easement Required (Yes/No)	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
Possibility of Utility Impacts within Site (Yes/No)	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
FEMA Flood Zone (Yes/No)	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Wetland Impacts (ac)	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes
Habitat Impacts	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Contamination Risk (No/Low/Medium/High)	No	No	No	No	No	No	No	No	No	No	Medium	No	No	Low
Archeological Impacts: Findings of Shovel Test (Positive/Negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	NA	NA	Negative
Historic Site Impacts (Yes/No)	No	No	No	No	No	No	No	No	No	No	No	NA	NA	No
Current Property Use Zoning	Vacant Commercial	Vacant Commercial	Vacant Commercial & Vacant < 5 acres	Vacant Residential (Single Family, Unplatted)	Vacant Institutional	Vacant Municipally Owned (Conservation Land)	Vacant Municipally Owned (Conservation Land)	Vacant Commercial	Vacant Commercial	Commercial (Conservation Land)	Vacant Industrial & Convenience Store w/Gas Pump	FDOT Owned (Swale)	FDOT Owned (Swale)	Vacant Commercial
Recommendations/Ranking	1	2	5	3	4	6	5	4	2	3	1	1	1	NA

Note: The cost evaluation for the stormwater management facility alternatives in this report includes stormwater management facility construction costs, costs associated with wetland impacts, and parcel acquisition costs. The stormwater management facility construction costs include cost of installed drainage structures, drainage pipes and outfalls, clearing and grubbing, earthwork, excavation and grading, berm construction, erosion protection, access accommodations and sodding. The associated parcel acquisition costs for each alternative evaluated include the estimated cost of land and any impacted improvements, administrative costs, and legal fees.

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1.0 GENERAL PROJECT INFORMATION

1.1 INTRODUCTION

Consor Engineers has been contracted by FDOT D5 to prepare a Pond Siting Report for the SR 524 Widening Project PD&E Study (FPN 437983-1-22-01). Refer to **Appendix A**, **Figure 1**, for the *Location Map*.

This report describes alternative locations of potential pond sites and assesses the suitability of each site based on hydraulic, environmental, and economic factors for use as a stormwater management facility for the design phase of the project. Five proposed alternative pond sites are evaluated for Basin 1 and six alternative pond sites are evaluated for Basin 2 and the alternatives have been ranked based on the evaluation of criteria shown on **Table 1**, the *Pond Alternatives Evaluation Matrix*. Basin 3 has only two alternatives, existing swales within the FDOT right of way. A Regional Pond is also evaluated in the report.

This Pond Siting Report (PSR) is used as an engineering tool to identify potential stormwater treatment pond sites for the project. The recommendations are generated using a variety of factors (as summarized in Table **1**). The calculations presented in this report are preliminary and help in estimating the size of the stormwater ponds for each basin. The pond sizes, the limits of basins associated with each pond alternative shown on the figures, tables, and included in the documentation are subject to change throughout the preliminary engineering and project design phases of the project. All referenced elevations correspond to the NAVD 1988 datum unless otherwise noted. Elevations can be converted from NAVD88 to the National Geodetic Vertical Datum of 1929 (NGVD29) by adding a conversion factor of 1.339 feet (NAVD88 + 1.339 feet = NGVD29). The conversion can be found in **Appendix B**.

SR 524 exists as a two-lane urban minor arterial comprised of one 12-foot lane in each direction with 10-foot shoulders (4-foot paved). Intermittent sidewalks are located along the north side of SR 524 between Cox Road and Industry Road and along the south side from the CVS signalized intersection to Industry Road while the existing paved shoulders serve as undesignated bike lanes. Stormwater sheet flows off the roadway to cross drains via roadside swales along the corridor. The existing right of way through the corridor is 200 feet wide, starts to vary near the London Boulevard intersection and widens to 230 feet to the intersection at Industry Road.

The roadway will be widened to a four-lane divided section and has been divided into four segments along the corridor. Generally, the proposed section includes four 11-foot travel lanes. The roadway has curb and gutter and is divided by a 22-foot median. A 14-foot-wide shared use path on each side of the corridor is also planned. Stormwater will be conveyed to treatment systems through closed storm sewer systems. The four segments will be described in depth in the report.

The project is located within the jurisdiction of the St. Johns River Water Management District (SJRWMD). Stormwater management for water quality (treatment) and water quantity (attenuation) will be provided using a variety of stormwater management approaches best suited to each individual basin. These include dry retention, wet detention, and compensatory treatment. The design of the drainage and stormwater facilities will comply with the standards

set forth by the FDOT and the SJRWMD Environmental Resource Permit (ERP) Applicant's Handbook and Permit Information Manual.

1.2 SITE LOCATION AND DESCRIPTION

The project lies in Sections 13, 22, 23, 24, 26, and 27, Township 24 South, Range 35 East and Section 18, Township 24 South, Range 36 East, in Brevard County. The project includes SR 524 from South Friday Road to Industry Boulevard.

Existing land uses along the corridor are a mixture of commercial, residential, recreational, institutional, undeveloped land, and natural conservation areas. The land uses for the pond alternative sites include Mixed Scrub-Shrub Wetland and Vacant Commercial (Alternative 1A); Shrub and Brushland and Vacant Commercial (Alternative 1B and 1C); Shrub and Brushland and Vacant, Unplatted, Single-Family Home (Alternative 1D); Herbaceous and Vacant Institutional (Alternative 1E); Mixed Wetland Hardwoods, Vacant Municipally Owned and Conservation Land (Alternative 2A); Shrub and Brushland, Vacant Municipally Owned and Conservation Land (Alternative 2B); Shrub and Brushland and Vacant Commercial (Alternative 2C and 2D); Shrub and Brushland, Commercial, and Conservation Land (Alternative 2E); Mixed Wetland Hardwoods and Commercial and Services (Alternative 2F); Commercial and Services and Roads and Highways (Alternative 3A and 3B); and Commercial and Services, Reservoirs, and Freshwater Marshes and Vacant Commercial (Alternative Regional Pond A).

Refer to **Figure 2** for a *Topo Map* of the project and alternative pond sites in **Appendix A**.

1.3 SOIL CHARACTERISTICS

The *Soil Survey of Brevard County, Florida* published by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS) classifies the existing soils within the project limits and pond site alternatives as well-drained to moderately drained sandy soils. This information indicates there are approximately fifteen to seventeen soil groups within the vicinity of the proposed project. Due to the high groundwater in the project area of the A/D soils, soil type D was selected for the pond design curve numbers. The soil types found within the pond alternatives are described in **Table 2**. Refer to **Appendix A, Figures 3A** through **3N** for a depiction of the soils.

Table 2 – Pond Alternative Soil Types

Map Unit Symbol	Soil Type	Hydrologic Soil Group Rating
2	Anclote sand, frequently ponded, 0 to 1 percent slopes	A/D
7	Basinger sand, 0 to 2 percent slopes	A/D
28	Immokalee sand, 0 to 2 percent slopes	B/D
36	Myakka sand, 0 to 2 percent slopes	A/D
38	Myakka sand, depressional	B/D
49	Pomello sand, 0 to 5 percent slopes	A
51	Pompano sand, 0 to 2 percent slopes	A/D
54	St. Johns sand, 0 to 2 percent slopes	B/D
55	St. Johns sand, depressional	B/D
56	St. Lucie fine sand, 0 to 5 percent slopes	A
57	St. Lucie fine sand, 5 to 12 percent slopes	A
67	Tomoka muck, frequently flooded	A/D

PSI, an Intertek, Inc company, conducted a limited subsurface exploration to provide a preliminary evaluation for the soil conditions at each of the preferred alternative pond sites. Estimated seasonal high-water table (SHWT) is defined as groundwater level that is anticipated at the end of the wet season of a normal rainfall year under current site conditions. The SHWT was estimated at the boring locations where groundwater was encountered for the pond alternatives. The geotechnical information provided by Intertek, Inc. for this study is included in **Appendix D**. **Table 3** depicts the estimated depth to the SHWT and average depth to the encountered groundwater for each pond alternative. E-Sciences found evidence of seasonally inundation (water staining on trees) at Pond Alternative 1D.

Table 3 - Estimated Groundwater and SHWT Elevations

Pond Alternative	Boring Name	Existing Ground Elevation (ft)	Encountered Groundwater Depth (ft)	Encountered Groundwater Elevation (ft)	Estimated Normal Seasonal High Ground Water Elevation (ft)
1A	PB-1*	21.00	0.80	20.20	21.00
1B	PB-2	22.40	2.20	20.20	22.00
1C	PB-3	25.00	2.10	22.90	23.50
1D	PB-4	23.90	2.80	21.10	23.50
1E	PB-5	23.50	2.80	20.70	23.00
2A	PB-10*	17.60	2.90	14.70	Above Ground Surface
2B	PB-6*	26.40	3.10	23.30	24.00
2C	PB-7	24.00	3.20	22.80	22.50
3A	PB-8	30.10	3.30	26.80	26.00
3B	PB-9	30.30	2.70	27.60	26.50

*Geotech recommends biological indicators be identified at these locations.

1.4 FEMA FLOODPLAIN INFORMATION

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) identifies the following floodplain zone present within the project study area.

- Zone A, a 100-year floodplain with no base flood elevation and flood hazard determined.
- Zone AE, a 100-year floodplain with base flood elevations determined.
- The remainder of the project are in designated Zone X, areas of 100-year flood with average depths of less than one foot or with drainage areas less than one square mile; or Zone X which is determined to be outside the 500-year floodplain.

The proposed pond alternative sites are not within any floodplains as shown on the FEMA map panels 12009C0425G, dated March 17, 2014, and 12009C0320H, dated January 29, 2021. A letter of map revision (LOMR) determination updated both FEMA FIRM panels, 12009C0425G and 12009C0320H, in the area of the Walmart Distribution Center near the I-95/SR 524 Interchange. The effective date for LOMR determination was July 13, 2021. **Figures 4A, 4B, 4C, and 4D** in **Appendix A** depict the FEMA maps with the pond alternative sites located.

2.0 DRAINAGE REFERENCE AND RESOURCE INFORMATION

2.1 COORDINATION

Individual meetings were conducted with the stakeholders involved along the corridor, including FDOT, Space Coast Transportation Planning Organization (SCTPO), Brevard County, and the City of Cocoa. Multiple meetings were held with each stakeholder to identify their specific concerns regarding potential alternative improvements, including pond site alternative locations, associated with the SR 524 study corridor. Four design meetings were held with FDOT to analyze corridor typical sections, alignments, intersection improvements, and pond site alternative locations. Input gained from public meetings and stakeholder meetings was used to define the decision-making process, develop alternative locations, and reach final recommendations. Meeting minutes for the pond site alternative meeting are located in **Appendix C**.

2.2 PREVIOUS DRAINAGE STUDIES

There are no previous drainage studies conducted by the FDOT within the project limits.

The Brevard County Natural Resources Management Department and Pegasus Engineering, LLC., produced the *West Cocoa Watershed Evaluation* in April 2014. The *West Cocoa Watershed Evaluation* study includes five subbasins which overlap the two basins, Mud Lake Drainage Basin and the St. Johns River above Puzzle Lake Drainage Basin, defined by the FDEP. The SR 524 PD&E project corridor lies within the study's boundaries.

2.3 EXISTING STORMWATER PERMITS

There are several SJRWMD permits for projects along SR 524. There is a historic Environmental Resource Permit from the FDEP for SR 524 for the City of Cocoa, dated January 1991, but the

documents are unavailable on the FDEP Oculus website. **Table 4** is a list of issued and pending permits along the SR 524 project corridor.

Table 4 - Issued and Pending SJRWMD Permits

Application Number	Permit Name	Date Issued	Discharge to FDOT R/W
15695-1	Cocoa North Units 5 & 6	04/1981	Yes
15771-1	Cocoa North Units 7 & 8	02/1983	No (ditch to CD-6)
15945-3	Cocoa Conservation Area Phase I	04/2009	No
16068-1,2	Coventry of Cocoa	01/1985, 12/1990	Yes
16110-1	SR 528/Clear Lake Road (Industry Road) Ramps	08/1985	Yes
16429-4	Northwest Lakes Mobile Home Park-Phases 5 & 6	10/2004	No
16680-1,2	Shoppes of Cocoa North	06/1993, 05/2006	Yes
16680-3	Shoppes of Cocoa North Outparcel	06/2007	Yes
16680-5	Home Depot FL #640 (Transfer)	05/2009	Yes
16680-6	Cirrus (apartments)	03/2021	Yes
23963-1,2	Shoppes of Cocoa North	07/1993, 05/2006	Yes
24181-1	McDonald's Restaurant Cocoa	08/1995	Yes
24262-1	State Road 524 Sidewalk	09/1996	Yes
34138-1,2	Northwest Baptist Church of Cocoa	12/1993, 06/2003	No
34876-1	Junny Rio Martinez Park	09/1997	No (ditch to CD-6)
63569-1,2	Millennium Oil Company	01/2000, 10/2006	No (to Cox Road ditch)
63830-1,2,4	Cocoa Commons/Publix	09/2000, 04/2001, 11/2002	No
63830-3	Harbor Federal Savings Bank @ Cocoa Commons	06/2001	No
64579-1,2,3,4	Brevard Crossings	02/2003, 02/2002, 01/2006	No
64579-5,6,7,9	Citizen Kane-DC (Walmart Distribution Center)	05/2015, 07/2015, 03/2016, 06/2017	No (to Cox Road ditch)
91298-1,2	Clearlake Cove, London Cove	05/2004, 09/2011	No
91298-3,4	London Cove, Retreat at Cocoa Commons	Both Pending	No
92249-1,2,4	Treetops Commercial Project	04/2007, 08/2007, 07/2012	No
92249-5,7	The Preserve at Cocoa, Integra Trails	08/2014, 09/2020	No
95062-1	Bagell Dentist Office, DMD	05/2005	No (canal to CD-5)
96962-1	SR 524 at I-95 Intersection Improvements	02/2005	Yes
98863-2	I-95 Widening from South of Fiske Blvd to South of SR 528	07/2007	Yes (to L/A R/W)
106956-1	Loch Lomand Cul-de-Sac	12/2007	No (to Cox Road ditch)
114022-1,2	Cocoa Landing	01/2010, 06/2020	No
117917-1,2,3	Flying J – Cocoa, Fountain SR 524	07/2011, 12/2016, 07/2016	Yes (to L/A R/W)
145521-1	SR 501 Michigan Ave to Industry Rd (Geotech Borings)	03/2016	No
146952-1	Cocoa Fire Station #3 SR 524	12/2016	No

3.0 EXISTING DRAINAGE CHARACTERISTICS

3.1 WATERSHED DESCRIPTIONS

The existing drainage patterns were determined using United States Geological Survey (USGS) quadrangle maps, existing permits (where available), one-foot contours (2007) provided by the County, and aerial maps. SR 524 lies within mostly flat terrain with ground elevations from +25 to +30 feet NGVD in the project corridor.

There are seven cross drains and two median drains located within the project area. All drainage basins are "open" with flow generally from north to south and ultimately outfall to the St. Johns River. Refer to **Table 5** for a description of each existing cross drain. The location of each cross drain and drainage patterns are shown on the Drainage Maps in **Appendix A, Figures 5A and 5B** for the Straight-Line Diagram. The project was divided into three basins for stormwater pond analysis. Refer to the *SR 524 PD&E Location Hydraulics Report* for more information on the cross drains.

Table 5 - Summary of Existing Cross Drains

Structure No.	Station	# of Barrels	Size	Type	Length (ft)
CD-1	407+00	2	24"	RCP	87
CD-2	431+00	1	24"	RCP	113
CD-3	447+00	1	30"	RCP	94
CD-4	453+99	1	30"	RCP	191
CD-5	460+44	2	36"	RCP	112
CD-6	488+65	3	42"	RCP	114
CD-7	527+03	1	24"	RCP	120

4.0 PROPOSED DRAINAGE DESIGN

4.1 STORMWATER MANAGEMENT DESIGN APPROACH

A total of fourteen pond sites were analyzed using aerial photographs, field verification, information from the Brevard County Property Appraiser, and available research data for the project. Pond site locations are depicted in the *Proposed Drainage Maps* in **Appendix A**, **Figures 6A to 6D**. The following factors were considered in the selection of potential pond sites:

- Present use of the land (vacant, proposed, developed)
- Parcel Size
- Proximity of the sites to SR 524
- Proximity of the sites to an outfall
- Location of any nearby wells
- Which portions of roadway can be drained to the potential pond sites
- Site accessibility for construction and future maintenance of the ponds
- Jurisdictional Wetland Issues
- Threatened/ Endangered Species
- Soil type and seasonal high groundwater table
- Hazardous Materials Contamination
- Archeological/ Historical Resources
- Construction cost
- R/W Cost

4.2 DESIGN CRITERIA

Water quality and quantity requirements will comply with the guidelines as defined in Chapter 62-330 of the Florida Administrative Code (F.A.C.), the statewide Environmental Resource Permitting (ERP) Applicant's Handbook, Volume 1 (June 1, 2018), and the SJRWMD ERP Applicant's Handbook, Volume II (June 1, 2018).

4.2.1 WATER QUALITY CRITERIA

The majority method of stormwater treatment for this project will be wet detention due to the high groundwater elevation. Wet detention ponds are permanently wet ponds designed to slowly release collected stormwater runoff through an outlet structure and provide a 21-day residence time (with no littoral zone). The runoff volume equals the greater of one inch of runoff over the drainage area or 2.5 inches times the impervious area (excluding water bodies).

Pond 3A and 3B will be dry retention due to the low groundwater elevation and high permeability of the Type A soils. Dry retention involves storing the first flush of stormwater in a pond and allowing the runoff to percolate into the ground as the means of treatment. The runoff volume equal to the greater of 1.25 inches over the impervious area or 0.5 inch over the entire basin must be retained.

Table 6 demonstrates the treatment volume requirements for each pond alternative and the total volume available in the pond from the control elevation to one foot below the inside berm elevation for the wet ponds. The dry ponds/swales, 3A and 3B, total volume available is measured to one-half foot below the top of berm.

Table 6 - Treatment Volume Requirements

Pond Alternative	Treatment Volume Required (ac-ft)	Total Volume Available (ac-ft)
Pond 1A	2.84	5.56
Pond 1B	2.76	2.86
Pond 1C	0.84	0.88
Pond 1D	2.76	2.82
Pond 1E	0.90	0.90
Pond 2A	3.43	12.88
Pond 2B	3.17	5.25
Pond 2C	1.45	1.31
Pond 2D	3.06	3.17
Pond 2E	3.06	3.18
Pond 2F	3.10	4.11
Pond 3A	0.43	0.77
Pond 3B	0.31	1.04
Regional Pond A	2.90	5.47

As shown in **Table 6**, excess volume can be provided in some the pond alternatives.

4.2.2 WATER QUANTITY CRITERIA

The post development peak discharge will be less than or equal to the pre-development peak discharge for the 25-year/24-hour storm event for open basins.

4.2.3 RECOVERY CRITERIA

The wet ponds will have an outfall structure designed to drawdown one-half the required treatment volume within 24 and 30 hours following a storm event, but no more than one-half of this volume will be discharged within the first 24 hours.

The dry retention ponds must recover the treatment volume within 72 hours by natural soil infiltration and disposition into the ground water table, evapotranspiration, or evaporation.

4.3 OFW AND IMPAIRED WATER BODY TREATMENT

The St. Johns River Above Puzzle Lake (South Segment), WBID #28935, and Mud Lake Outlet, WBID #3056, are not considered OFWs, not part of a Basin Management Action Plan (BMAP) and are not part of a Restoration Plan per the FDEP. WBID #28935 is listed as being impaired for fecal coliform, silver, and total nitrogen. There are currently no adopted Total Maximum Daily Load

levels (TMDLs) for WBID #28935, but one is under development by the FDEP. Since the Mud Lake Outlet flows to the St. Johns River Above Puzzle Lake (South Segment) the ponds will require nutrient loading calculations to show a net improvement for nutrients.

4.4 POND SITE CONFIGURATION

The following pond geometry criterion were utilized for conservatively sizing the wet pond alternatives:

- 15' maintenance berms with 1:15 (V:H) side slopes.
- Maximum 1:4 side slopes between the inside of the top of the maintenance berm to the pond bottom.
- Minimum 30' radii for the inside corners of the maintenance berms.
- At least one foot of freeboard is provided between the peak stage and the inside of the maintenance berm.
- Maximum pond depth of 12 feet (wet detention ponds).
- Mean depth (pond volume divided by the pond area at the control elevation) between 2 and 8 feet (wet detention ponds).

The dry ponds (swales) must have a top width to depth ration of the cross section equal to or greater than 6:1 or side slope equal to or greater than 3:1 (horizontal to vertical). A factor of safety of two (2) shall be applied to the hydraulic conductivity.

A pond typical section can be found in **Appendix A**, **Figure 7**. **Table 7** summarizes the pond sizes provided for each alternative.

Table 7 - Pond Alternative Sizes

Pond Alternative	Parcel(s) Size (ac.)	Pond Size @ Outside Berm (ac.)	Inside Berm Elevation (ft.)	Stage of Treatment Volume (ft.)
1A	11.35	3.57	24.00	22.04
1B	11.35	2.07	25.00	23.94
1C	0.58/0.33/0.21	0.84	26.50	25.68
1D	40.94	1.95	26.50	25.46
1E	4.37	0.69	26.50	25.73
2A	129.76	6.46	21.00	18.26
2B	129.76	3.33	27.00	25.24
2C	2.65	1.81	24.00	23.60
2D	52.63	1.77	27.20	26.11
2E	269.45	2.24	25.60	24.53
2F	1.06/1.06/1.62	2.75	25.60	24.12
3A	NA – FDOT Owned	0.48	30.00	29.27
3B	NA – FDOT Owned	1.16	30.00	29.36
Reg. Pond A	13.49	6.40	30.10	28.63

5.0 ALTERNATIVE POND SITE INFORMATION

5.1 BASIN 1

Basin 1 begins at the project beginning, station 380+60.00, and extends to approximately 800 feet west of Cox Road, station 447+00.00. Basin 1 includes Segment 1 and a portion of Segment 2 as the preferred roadway alternatives. Segment 1 will be a four-lane divided section that runs between South and North Friday Roads with a Diverging Diamond Interchange (DDI) at I-95. The typical section outside the DDI has 12-foot travel, Type F outside curb and gutter, Type E inside curb and gutter, 14-foot shared-use paths on either side of the corridor four feet from the right of way, and a varying median (48 feet south, 53 feet north). The travel lanes widen to 14 feet within the DDI limits and includes an additional 14-foot left-turn lane. Segment 2 will be a four-lane divided section that runs from Friday Road (North) to Cox Road. This section has type F outside curb and gutter, 12-foot outside lanes, 11-foot inside lanes, type E inside curb and gutter, and a 22-foot median (17.5-feet sodded), 14-foot shared-use paths are on each side of the corridor four feet from the existing right of way. Wide drainage swales with 1:4 front and back slopes will be placed between the shared-use path and the outside curb and gutter to capture offsite runoff and convey to the cross drains. Roadway runoff will be collected via a closed system, predominately consisting of curb inlets.

Basin 1 is part of the larger Upper St. John's River Basin. The ultimate discharge location for this basin is the St. John's River Above Puzzle Lake, and the Water Body Identification (WBID) number is 28935. This basin is not an OFW but is impaired for total nitrogen. Land use adjacent to the corridor is a mixture of commercial, residential, institutional, and undeveloped land.

5.1.1 POND ALTERNATIVE 1A

Pond alternative 1A is located at the northwest end of the project corridor, directly east of I-95, and north of SR 524. The property appraiser's website shows Pond Alternative 1A and 1B under the same parcel number. Pond Alternative 1A is considered as the parcel on the south side of Friday Road (South). This parcel is currently listed as an undeveloped commercial site and is 5.40 acres in size. The soil at the site Myakka sand, depressional, with an average ground elevation of 21.0 feet NAVD, based on survey. The manual auger boring within the pond site fount the SHWT was found to be 21.0 feet NAVD. The entire pond site consists of wetlands and is surrounded by wetlands; therefore, an environmental seasonal high survey will need to be completed during design to keep the surrounding wetlands hydrated. There was no evidence of protected species observed during the environmental site visits. There is no contamination risk at the pond site. No floodplain impacts are associated with the pond site.

Runoff from station 380+60 to station 447+00 will be treated in this pond. In order to avoid piping through the I-95/SR 524 Interchange, Friday Road can be treated (compensating treatment) as it is currently not treated. To convey the runoff to this pond, an easement along Friday Road (South) from SR 524 to the pond would need to be acquired from Brevard County. The pond outfall would be placed on the northwest edge of the pond and outfall to the existing ditch running through the parcel.

5.1.2 POND ALTERNATIVE 1B

This pond alternative is located on the northwest side of the project corridor, north of SR 524, east of Friday Road (South) and is directly east of Pond Alternative 1A. This parcel is currently listed as an undeveloped commercial site and is 6.16 acres in size. Since only a portion of the site is needed for the stormwater pond, the location of the pond can be placed within the parcel such that benefits both the FDOT and the remnant parcel owner. The soil at the site is Basinger sand, 0 to 2 percent slopes and Myakka sand, 0 to 2 percent slopes, with an average ground elevation of 24.0 feet NAVD, based on survey. The manual auger boring within the pond site fount the SHWT was found to be 22.0 feet NAVD. There are no wetlands on the site. There was no evidence of protected species observed during the environmental site visits. There is no contamination risk at the pond site. No floodplain impacts are associated with the pond site.

Runoff from station 380+60 to station 447+00 will be treated in this pond. In order to avoid piping through the I-95/SR 524 Interchange, Friday Road can be treated (compensating treatment) as it is currently not treated. To convey the runoff to this pond, an easement along the parcel line from SR 524 to the pond and an easement along the parcel boundary from Friday Road (South) from SR 524 to Friday Road for the outflow. An easement would need to be acquired from Brevard County to convey the outfall discharge to the existing ditch northwest on Friday Road (North).

5.1.3 POND ALTERNATIVE 1C

This pond alternative is located on the northwest side of the project corridor, north of SR 524, and east of Pond Alternative 1B. This site is currently an undeveloped parcel though it has recently been cleared with limited vegetation remaining. Pond Alternative 1C consists of three adjacent parcels is 0.58, 0.33, and 0.21 acres in size. The soils at the site are Myakka sand, 0 to 2 percent slopes, with a ground elevation of 25.0 to 22.9 feet NAVD, based on survey. The SHWT is averaged at 23.5 feet NAVD, based on the soil borings. There were no wetlands on the site prior to the clearing. There was no evidence of protected species observed during the environmental site visits. No floodplain impacts are associated with the pond site.

Runoff from station 390+00 to station 410+00 will be treated in this pond; therefore, an additional pond site will be required to treat all of the basin. Inflow and outflow to the pond alternative can be accomplished from SR 524. The outfall would be directed to the 2-24” RCP cross drain adjacent to the pond.

5.1.4 Pond Alternative 1D

This pond site alternative is located on the northwest side of the project corridor and is east of 1-95, east of Pond Alternative 1C, and north of SR 524. This site is currently an undeveloped parcel. The parcel is 39.23 acres in size. The soils at the site are Myakka sand, 0 to 2 percent slopes and Myakka sand, depressional, with a ground elevation of 23.9 to 21.1 feet NAVD, based on 1-foot GIS contours. The SHWT is averaged at 23.5 feet NAVD,

based on the soil borings. Evidence of seasonal inundation (water staining on trees) was observed on some of the lower portions of the pond site. There are no wetlands on the site. There was no evidence of protected species observed during the environmental site visits.

Runoff from station 380+60 to station 447+00 will be treated in this pond. Inflow and outflow to the pond alternative can be accomplished from SR 524. The outfall would be directed to the 2-24" RCP cross drain southwest of the pond.

5.1.5 Pond Alternative 1E

Pond Alternative 1E is located on the northwest side of the project corridor and is adjacent to the south side of Thien Thai Lane and north of SR 524. This site is currently an undeveloped parcel and consists of pasture grasses that are maintained with periodic mowing and scattered pines. The parcel is 4.37 acres in size. The soils at the site are Myakka sand, 0 to 2 percent slopes and Myakka sand, depressional, with a ground elevation of 23.5 to 20.7 feet NAVD, based on 1-foot GIS contours. The SHWT is averaged at 23.00 feet NAVD, based on the soil borings. There are no wetlands on the site. There was no evidence of protected species observed during the environmental site visits.

Runoff from station 399+50 to station 421+20 will be treated in this pond; therefore, either an additional pond site will be required to treat the remaining basin limits, or the pond can be made larger within the parcel but will impact the frontage signing for the church. Inflow and outflow to the pond alternative can be accomplished from SR 524. The outfall would be directed to the 1-24" RCP cross drain northeast of the pond.

5.1.6 Joint-Use Pond Alternative 1F

Joint-Use Pond Alternative 1F is the large existing pond adjacent to SR 524 within the Walmart Distribution Center property, Wet Pond – B in permit #64579-9. The top of bank of the pond is a flat berm with an elevation of 26.60 feet. The 10-year/24-hour storm elevation is 24.36 feet in the calculations (25.02 feet in the plans), the mean annual storm event elevation is 25.78 feet in the calculations (not shown in the plans), the 25-year/24-hour storm event elevation is 24.91 feet in the calculations (not shown in the plans), and the 100-year/24-hour storm elevation is 25.78 feet in the calculations (26.47 feet in the plans). There may be some available capacity for treating part of SR 524, but there is not enough available capacity to eliminate the need for an additional pond within this basin.

5.2 BASIN 2

Basin 2 begins approximately 800 feet west of Cox Road, station 447+00.00, and extends to approximately 275 feet west of London Boulevard, station 522+00.00. Basin 2 includes a portion of Segment 2 and Segment 3 as the preferred roadway alternatives. Segment 2 will be a four-lane divided section that runs from Friday Road (North) to Cox Road. This section has type F outside curb and gutter, 12-foot outside lanes, 11-foot inside lanes, type E inside curb and gutter, and a 22-

foot median (17.5-feet sodded), 14-foot shared-use paths are on each side of the corridor four feet from the existing right of way. Wide drainage swales with 1:4 front and back slopes will be placed between the shared-use path and the outside curb and gutter to capture offsite runoff and convey to the cross drains. Segment 3 will be a four-lane divided section that runs from Cox Road to London Boulevard. This section has type F outside curb and gutter, 11-foot travel lanes, type E inside curb and gutter, and a 22-foot median (17.5-foot sodded), 14-foot shared-use paths are on each side of the corridor 4 feet from the existing right of way. Drainage swales with 1:4 front and back slopes will be placed between the shared-use path and the outside curb and gutter to capture offsite runoff and convey to the cross drains. Roadway runoff will be collected via a closed system, predominately consisting of curb inlets.

Basin 2 is part of the larger Upper St. John's River Basin. Runoff will discharge location from this basin to the Mud Lake Outlet, WBID number 3056, and ultimately to the St. Johns River. This basin is not an OFW and is not impaired for nutrients, though runoff will eventually run through the St. Johns River Above Puzzle Lake basin and it is impaired for total nitrogen. Land use adjacent to the corridor is a mixture of commercial, residential, institutional, and undeveloped land.

5.2.1 Pond Alternative 2A

This pond site is southwest of Mud Lake. This site is currently an undeveloped parcel within conservation lands. The parcel is 129.76 acres in size. The soils at the site are Pomello sand, 0 to 5 percent slopes; St. Lucie fine sand, 0 to 5 percent slopes; and Tomoka muck, frequently ponded, 0 to 1 percent slopes, with a ground elevation of 17.6 to 14.7 feet NAVD, based on surveyed information. The SHWT is averaged at 14.7 feet NAVD, based on the soil borings. The majority of this site consists of wetlands and no evidence of protected species was observed during site visits. The pond is outside the surrounding floodplain shape. There is no contamination risk at the pond site.

Runoff from station 447+00 to station 522+50 will be treated in this pond. To convey the runoff to this pond, an easement from SR 524 through the conservation area to the pond would be needed. The pond outfall would be to the wetlands at the southwest side of the pond.

5.2.2 Pond Alternative 2B

This pond site is west of the Mud Lake. This site is currently an undeveloped parcel within conservation lands. The parcel is 129.76 acres in size. The soils at the site are Immokalee sand, 0 to 2 percent slopes and Pomello sand, 0 to 5 percent slopes, with a ground elevation of 26.4 to 23.3 feet NAVD, based on surveyed information. The SHWT is averaged at 24.0 feet NAVD, based on the soil borings. The pond is outside the surrounding floodplain shape. There are no wetlands on the site and the potential for listed species habitat is low because no nesting, roosting, or foraging habitat was found at the site. There is no contamination risk at the pond site.

Runoff from station 447+00 to station 522+50 will be treated in this pond. To convey the runoff to this pond, an easement from SR 524 through the conservation area to the pond

would be needed. The pond outfall would be to the wetlands at the southwest side of the pond.

5.2.3 Pond Alternative 2C

This pond site is south of Westminster Drive. This site was an undeveloped parcel at the beginning of the study. The parcel is 2.65 acres in size. The soils at the site are Immokalee sand, 0 to 2 percent slopes and Pomello sand, 0 to 5 percent slopes, with a ground elevation of 24.0 to 20.8 feet NAVD, based on surveyed information. The SHWT is averaged at 22.5 feet NAVD, based on the soil borings. There are forested wetlands to the south of the site and the potential for listed species habitat is low because no nesting, roosting, or foraging habitat was found at the site. The site is outside the floodplain shape. There is no contamination risk at the pond site.

Runoff from station 455+00 to station 489+00 will be treated in this pond; therefore, an additional pond site will be required to treat the remainder of the basin.

This pond alternative site has been developed into a commercial site (Dollar General) since the beginning of the study.

5.2.4 Pond Alternative 2D

This pond site is west of Cox Road and north of SR 524. This site is currently an undeveloped parcel. The parcel is 52.63 acres in size. The soils at the site are Myakka sand, 0 to 2 percent, with a ground elevation of averaging 24.5 feet NAVD, based on the adjacent permit information (NW Baptist Mission Site Plan, permit #34138-1). The SHWT is averaged at 23.2 feet NAVD, based on the adjacent permit (NW Baptist Mission Site Plan, permit #34138-1). There are no wetlands on the site and the potential for listed species habitat is low because no nesting, roosting, or foraging habitat was found at the site. The site is not located within or near the floodplain. There is no contamination risk at the pond site.

Runoff from station 447+00 to station 522+00 will be treated in this pond. To convey the runoff to this pond, and easement from Cox Road to the pond site would be needed. The pond would outfall to the Cox Road ditch via the maintenance easement to the pond, adjacent to the northern parcel line. Refer to the Pond (Alternative 2D) Exhibit in **Appendix A, Figure 8-5** for a depiction of the site.

5.2.5 Pond Alternative 2E

This pond site is west of Cox Road and south of SR 524. This site is currently an undeveloped parcel within the Walmart Distribution Center property. The parcel is 269.45 acres in size. The soils at the site are Myakka sand, 0 to 2 percent slopes and Pompano sand, 0 to 2 percent slopes, with a ground elevation of 11.0 to 33.0 feet NAVD, based on existing Walmart Distribution Center permit (#64579-9). The SHWT (and adjacent wetland elevation) is averaged at 22.6 feet NAVD, based on existing Walmart Distribution Center permit (#64579-9). The majority of this pond site consists of uplands but there are some very small depressional areas along the eastern end of the site that could be classified as

wetlands. No evidence of protected species was observed during the site visits. The site is not located within or near the floodplain. There is no contamination risk at the pond site.

Runoff from station 447+00 to station 522+00 will be treated in this pond. Inflow to the pond alternative can be accomplished from SR 524. The pond would outfall to the Cox Road ditch to the east via the existing wetland and drainage patterns.

5.2.6 Pond Alternative 2F

This pond site is west of Cox Road, south of SR 524, and includes three adjacent properties. Two of these sites are currently undeveloped parcels, each measuring 1.06 acres in size. The third site is a closed gas station, measuring 1.62 acres. This site was chosen after the Pond Site Alternative meeting held with the FDOT. The reasoning for this site is besides being closed, the roadway improvements would clip part of the site anyway and using this site would eliminate the left turn access needed so close to the proposed roundabout. The soils at the site are Anclote sand, frequently ponded, 0 to 1 percent slopes and Myakka sand, 0 to 2 percent slopes, with a ground elevation averaging 22.6 feet NAVD, based on the adjacent existing Walmart Distribution Center permit (#64579-9). The SHWT (and adjacent wetland elevation) is averaged at 22.6 feet NAVD, based on the adjacent existing Walmart Distribution Center permit (#64579-9). The two vacant sites consist of wetlands. The potential for listed species habitat is low because no nesting, roosting, or foraging habitat was found at the site. The site is not located within or near the floodplain. The vacant sites were not checked for contamination risk as it was added later in the study. The closed gas station was found to be a medium risk site and recommended for further assessment.

Runoff from station 447+00 to station 522+00 will be treated in this pond. Inflow to the pond alternative can be accomplished from SR 524 with an easement from either adjacent property or can be pipes along Cox Road to the pond alternative. The pond outfall would be placed southeast edge of the pond directly to the Cox Road ditch.

5.3 BASIN 3

Basin 3 begins at approximately 275 feet west of London Boulevard, station 522+00.00, and extends to the end of the project corridor at Industry Road, station 546+00.00. Basin 3 Segment 4 as the preferred roadway alternatives. Segment 4 will be a four-lane divided section that runs from London Boulevard to Industry Road. This section has type F outside curb and gutter, 11-foot travel lanes, type E inside curb and gutter, and a 22-foot median (17.5-foot sodded). Fourteen foot shared-use paths are on each side of the corridor. The existing right of way widens on the north side, but the horizontal alignment will be at the same offset from the centerline as in segments 2 and 3 (50-feet). Wide drainage swales with 1:4 front and back slopes will be placed between the shared-use path and the outside curb and gutter except where the shared-use path comes in closer to the road to tie back into the existing curb ramp configuration at Industry Road. Roadway runoff will be collected using a closed system, using curb inlets and closed flume inlets.

Basin 3 is part of the larger Upper St. John's River Basin. The discharge location for this basin is the Mud Lake Outlet, WBID number 3056, and ultimately to the St. John's River. This basin is not an OFW and is not impaired for nutrients, though runoff will eventually run through the St. Johns River Above Puzzle Lake basin and it is impaired for total nitrogen. Land use adjacent to the corridor is a mixture of commercial, residential, institutional, and undeveloped land.

5.3.1 Pond Alternative 3A

This pond site is west of Industry Road and north of SR 524. This site is within the FDOT right of way. The soils at the site are Immokalee sand, 0 to 2 percent slopes and St. Lucie fine sand, 0 to 5 percent slopes, with a ground elevation of approximately 26.8 to 30.1 feet NAVD, based on project survey data. The SHWT is averaged at 26.0 feet NAVD, based on the soil borings. There are no wetlands on the site and no evidence of protected species was observed during the site visits. The site is not located within or near the floodplain. There is no contamination risk at the pond site.

Runoff from station 522+00 to station 539+00 will be treated in this pond. Inflow to the pond alternative can be accomplished from SR 524. The pond outfall would be placed on the northwest edge of the pond.

5.3.2 Pond Alternative 3B

This pond site is west of Industry Road and north of SR 524. This site is within the FDOT right of way. The soils at the site are St. Johns sand, 0 to 2 percent slopes, St. Lucie fine sand, 0 to 5 percent slopes and St. Lucie fine sand, 5 to 12 percent slopes, with a ground elevation of approximately 27.8 to 31.1 feet NAVD, based on project survey data. The SHWT is averaged at 26.50 feet NAVD, based on the soil borings. There are no wetlands on the site and no evidence of protected species was observed during the site visits. The site is not located within or near the floodplain. There is no contamination risk at the pond site.

Runoff from station 539+00 to station 546+00 will be treated in this pond. Inflow to the pond alternative can be accomplished from SR 524. The pond outfall would be placed on the northwest edge of the pond.

5.4 POND ALTERNATIVE REGIONAL POND A

This pond site is west of Industry Road, north of SR 524, south of SR 528, and west of SR 501/Clearlake Road. This site was a vacant developed commercial parcel at the beginning of the study. The parcel is 15.74 acres in size. The soils at the site are Immokalee sand, 0 to 2 percent slopes, St. Johns sand, 0 to 2 percent slopes, St. Johns sand, depressional, and St. Lucie fine sand, 5 to 12 percent, with a ground elevation of 16.5 to 33 feet NAVD, based on the existing Home Depot permit (#16680-1). The SHWT is 28.1 feet NAVD, based on the existing Home Depot permit (#16680-1). A separate surface water/wetland is located in the northwest corner of the site that appears to be a relict stormwater feature. No evidence of protected species was observed during the site visits. This site is located outside any floodplain boundaries. There is no contamination risk at the pond site.

Runoff from station 488+50 to station 546+00 will be treated in this pond. This pond alternative would reduce the treatment volume needed in the adjoining basin.

Recently this site was purchased by a developer and a permit to construct apartment buildings and a SJRWMD permit was issued in March 2021. As of this report, construction has begun.

6.0 EVALUATION ALTERNATIVES

Pond site alternatives were identified using recent aerials, field reviews, and Brevard County Property Appraiser maps for land use zoning. Factors considered in evaluating alternative pond sites included hydraulics, land costs for pond right-of-way and any required inflow or outflow easements, costs of inflow and outflow structures, potential wetland impacts, potential for presence of protected species, hazardous material contamination potential, and the potential for presence of cultural and/or historical resources. The above factors were used to determine the preferred alternative pond sites. All pond options are hydraulically feasible and avoid or have mitigation strategies indicated for impacts to quality wetlands, or involvement with contamination sites. Factors such as wetland impacts were assigned costs that are included in the estimated total pond cost. Ranking the ponds based upon this cost provides the preferred alternative for each basin. **Table 1** is a matrix showing all the criteria for the alternative pond sites (Executive Summary).

6.1 POND RIGHT-OF-WAY COST ESTIMATES

Right-of-Way cost estimates for the alternative pond sites evaluated in this report will be determined by FDOT. These costs will be combined with construction and mitigation costs and will be included on the matrix within the total estimated cost for each pond site.

6.2 ENVIRONMENTAL EVALUATION

Environmental factors that were investigated include wetland impacts, potential for the presence of protected species, hazardous material contamination potential, and the potential presence of cultural and/or historic resources.

6.2.1 JURISDICTIONAL WETLAND INVOLVEMENT

A Natural Resources Evaluation (NRE) Report has been provided by E-Sciences. Wetland and surface water impacts are associated with some of the pond alternatives. A summary of the preliminary findings is provided in the NRE included in **Appendix E**.

6.2.2 THREATENED AND ENDANGERED SPECIES

A NRE Report provided by E-Sciences also included field reconnaissance to assess the potential occurrence of protected species within the study corridor. This report describes the habitat found at each pond site alternative, including no identified gopher tortoises or their burrows within the project corridor at the time of the NRE Report. A copy of the report is included in **Appendix E.**

6.2.3 HAZARDOUS MATERIALS CONTAMINATION

PSI, an Intertek company, performed a Level 1 Contamination Screening Evaluation Report (CSER) in March 2020. The potential pond sites were found to have a low risk for contamination. A copy of the report is included in **Appendix F.**

6.2.4 HISTORICAL / ARCHEOLOGICAL RESOURCES

A Phase I Cultural Resource Assessment Survey (CRAS) was conducted by SEARCH in February 2020. The shovel tests performed in the potential pond sites did not result in any findings, although three shovel tests performed within the proposed easement

access road for Pond 2A did result in positive shovel tests. A copy of the report is included in **Appendix G.**

7.0 CONCLUSIONS

The information provided in this report was based on pond sizes and locations determined from preliminary data and calculations, utilizing reasonable engineering judgement and assumptions. Pond sizes and configurations may change during final design as more detailed information on seasonal high ground water elevations, property boundaries, right-of-way, etc. becomes available. The pond sites evaluation matrix is listed in **Table 1** in the Executive Summary.

All fourteen pond alternatives provided the minimum necessary treatment volume required for the SR 524 Widening Project. Pond Alternative 2C has been developed into a commercial property. Pond Alternative Regional Pond A has recently been sold and repermitted as apartments. Pond Alternatives 1A and 2F have wetland impacts. Pond Alternative 1C has been rezoned as commercial land and cleared of trees and vegetation. No remaining Pond Alternative is in a FEMA Flood Zone or considered a historic site. All remaining Pond Alternatives have a low probability of impacting any animal or plant habitats of concern and had negative shovel tests for archeological impacts. Only Pond Alternatives 2F was found to be a medium risk for ground contamination. Pond Alternatives 1A, 1B, 2A, 2B, 2D, 2E, and 2F will need drainage easements for inflow and/or outflow pipes. Pond Alternatives 3A and 3B are the only alternatives where utility impacts may occur as they are within the FDOT right of way. Based on the findings of this study and the reasons provided in this study, Pond Alternatives 1A, 2F, 3A, and 3B have been ranked first within their respective basins.

Users of this report are cautioned that the information herein was based on pond sizes and locations determined from preliminary data and calculations, utilizing reasonable engineering judgment and assumptions, including minimizing wetland and floodplain impacts. Pond sizes and configurations may change during final design as more detailed information on seasonal high-water elevations, property boundaries, right-of-way costs, etc. becomes available. **Table 1** provides the pond alternative rankings.

APPENDIX A

FIGURES

SR 524 LOCATION MAP

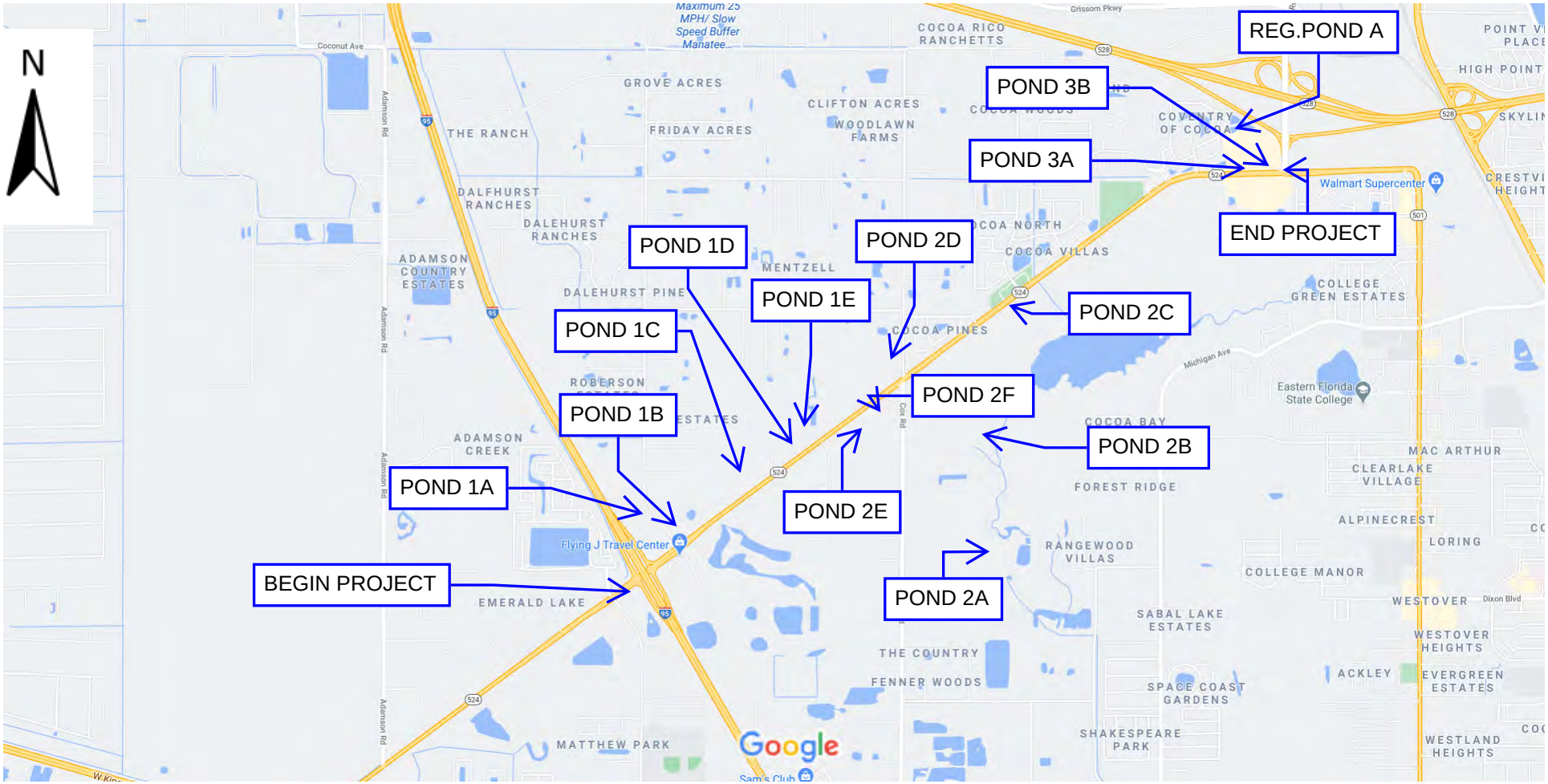
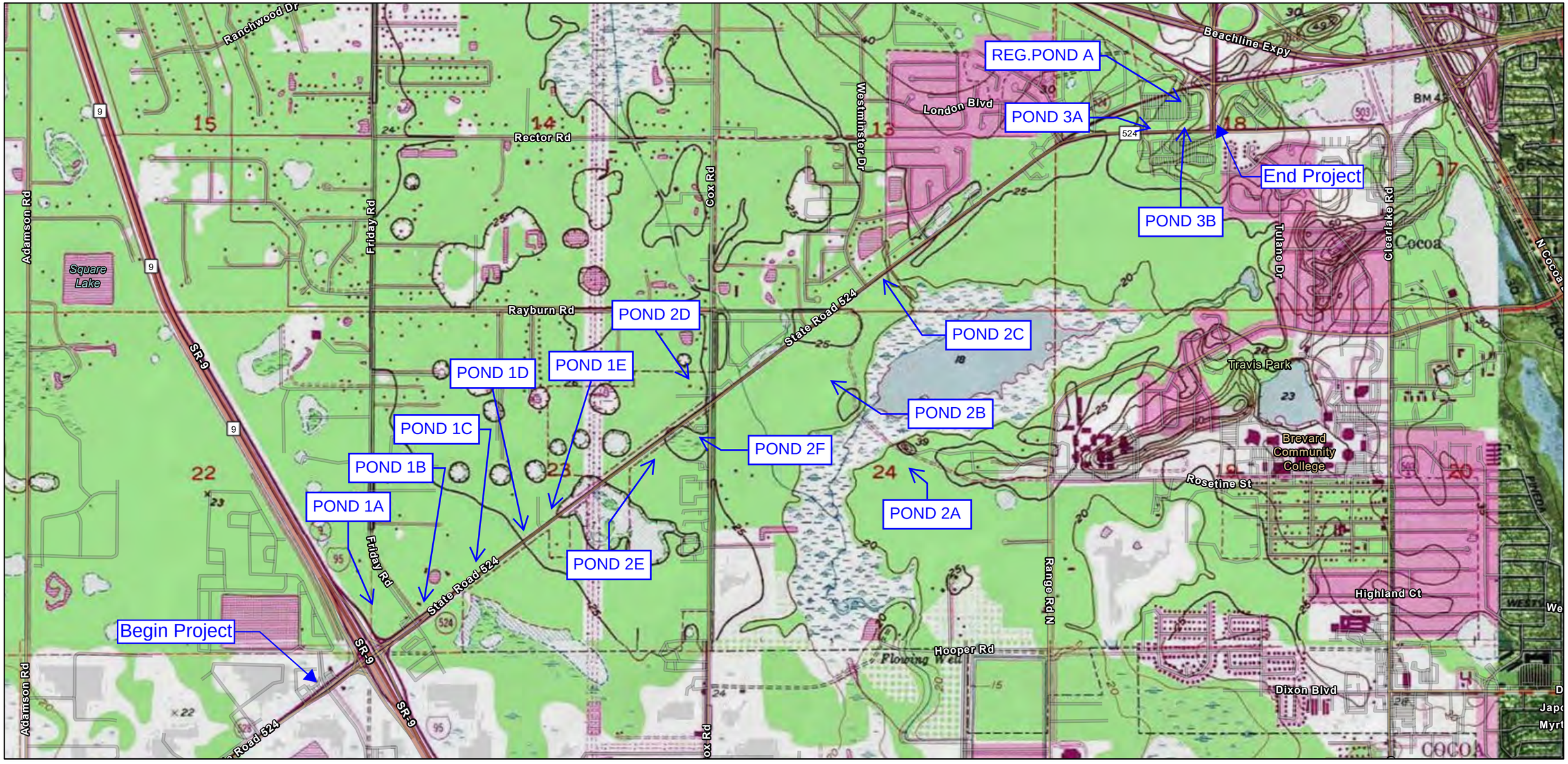


FIGURE 1

SR 524 PD&E Topo Map



8/9/2022

USA Topo Maps	High Resolution 60cm Imagery	4.8m Resolution Metadata
World Imagery	High Resolution 30cm Imagery	DATUM: NAD27
Low Resolution 15m Imagery	Citations	

1:20,634

0 0.2 0.4 0.8 mi

0 0.33 0.65 1.3 km

FIGURE 2

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Brevard County, Florida

SR 524 Widening PD&E

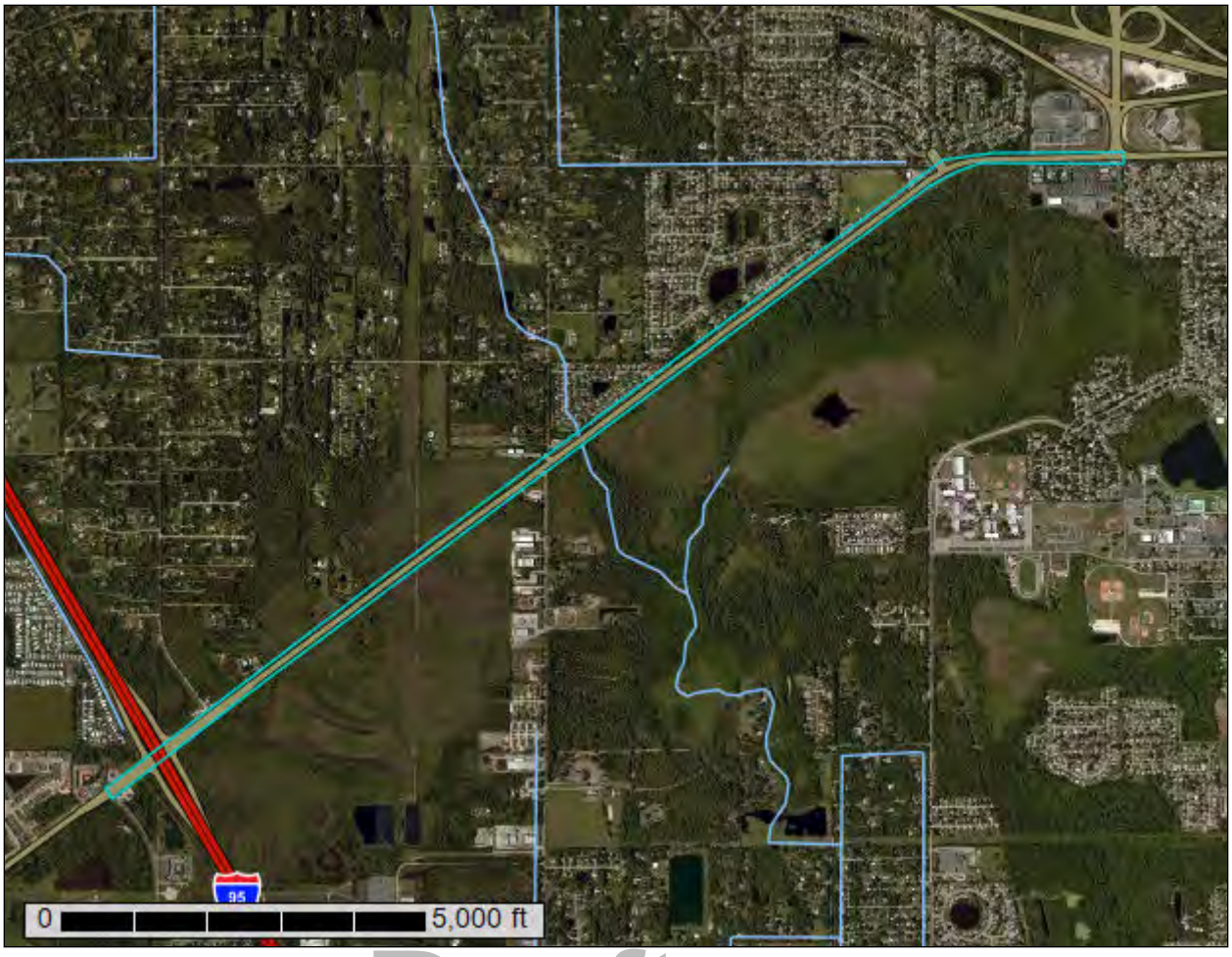


FIGURE 3

September 1, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

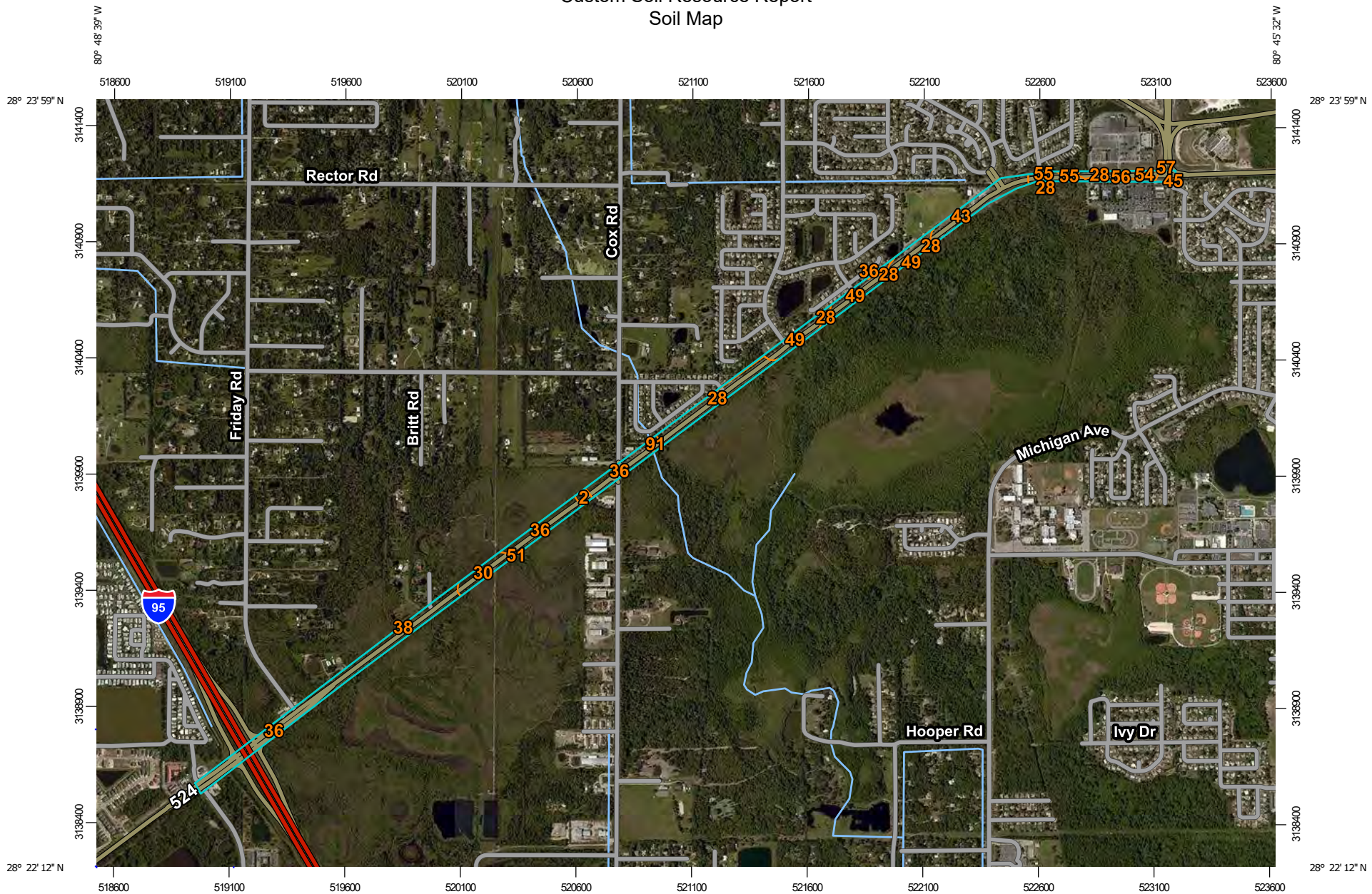
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:23,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 300 600 1200 1800

Feet
0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Brevard County, Florida
Survey Area Data: Version 21, Aug 25, 2021

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

Date(s) aerial images were photographed: Mar 28, 2015—May 18, 2015

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Anclote sand, frequently ponded, 0 to 1 percent slopes	0.8	1.2%
28	Immokalee sand, 0 to 2 percent slopes	10.7	16.5%
30	Malabar sand, 0 to 2 percent slopes	3.4	5.3%
36	Myakka sand, 0 to 2 percent slopes	27.1	41.8%
38	Myakka sand, depressional	0.2	0.2%
43	Paola fine sand, 0 to 8 percent slopes	6.9	10.7%
45	Paola-Urban land complex, 0 to 8 percent slopes	0.1	0.1%
49	Pomello sand, 0 to 5 percent slopes	10.0	15.4%
51	Pompano sand, 0 to 2 percent slopes	0.0	0.0%
54	St. Johns sand, 0 to 2 percent slopes	0.6	1.0%
55	St. Johns sand, depressional	0.8	1.3%
56	St. Lucie fine sand, 0 to 5 percent slopes	2.8	4.4%
57	St. Lucie fine sand, 5 to 12 percent slopes	0.9	1.3%
91	Anclote sand	0.5	0.8%
Totals for Area of Interest		**64.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

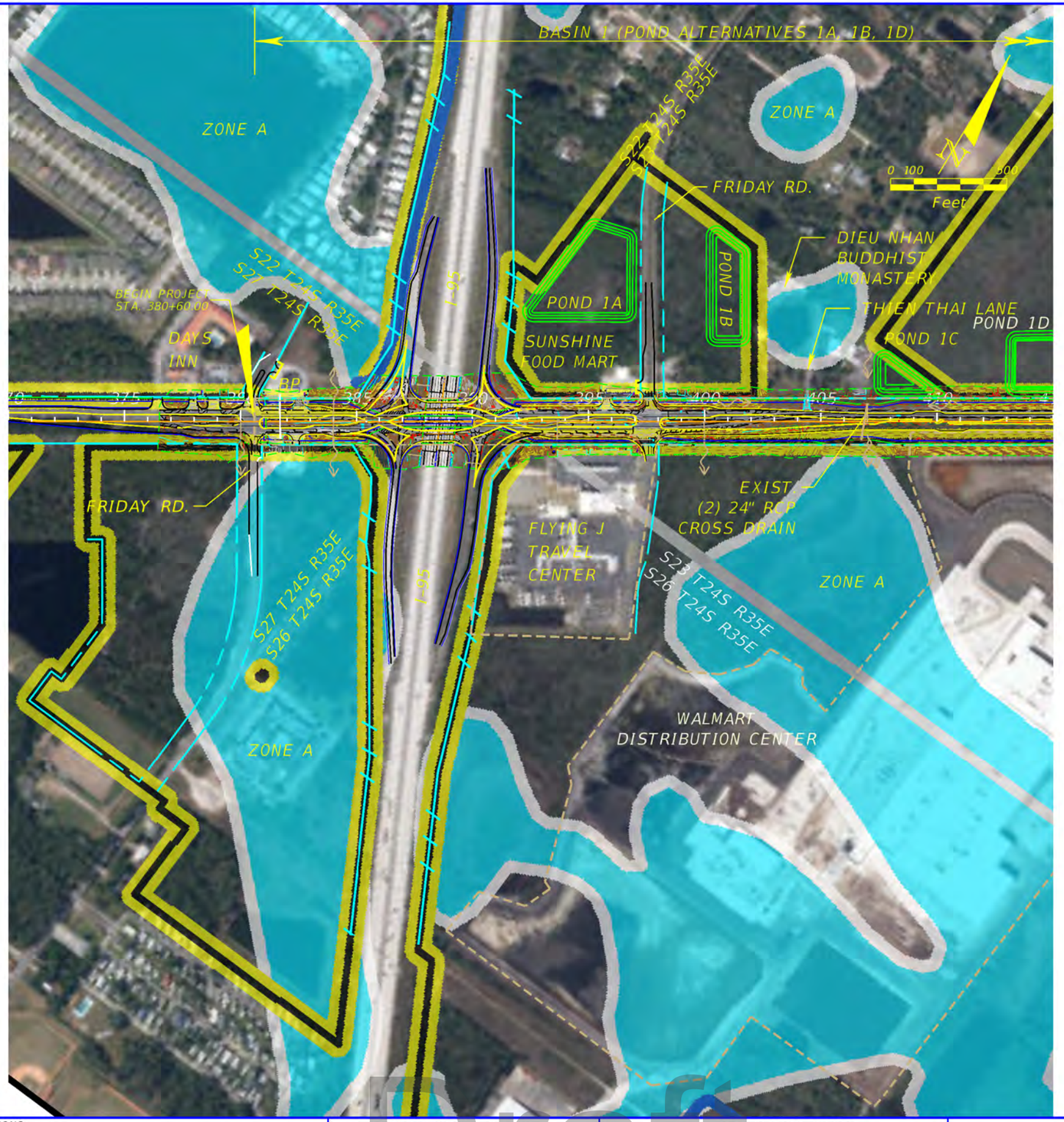
Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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Winter Springs, Florida 3278
Ph: 407.957.1660
Fax: 407.957.8744

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

FLOODPLAIN EXHIBIT

Figure 4A

12/4/2022 9:42:20 PM mfischl
E:\worksets\FDOT\43798312201\drainage\DRMPRD12_Floodplain.dgn

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

FLOODPLAIN EXHIBIT

Figure 4B

12/4/2022 9:43:31 PM mfischl
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

FLOODPLAIN EXHIBIT

Figure 4C

12/4/2022 9:45:25 PM mfischl
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

FLOODPLAIN EXHIBIT

Figure 4D

12/4/2022 9:53:13 PM mfischl
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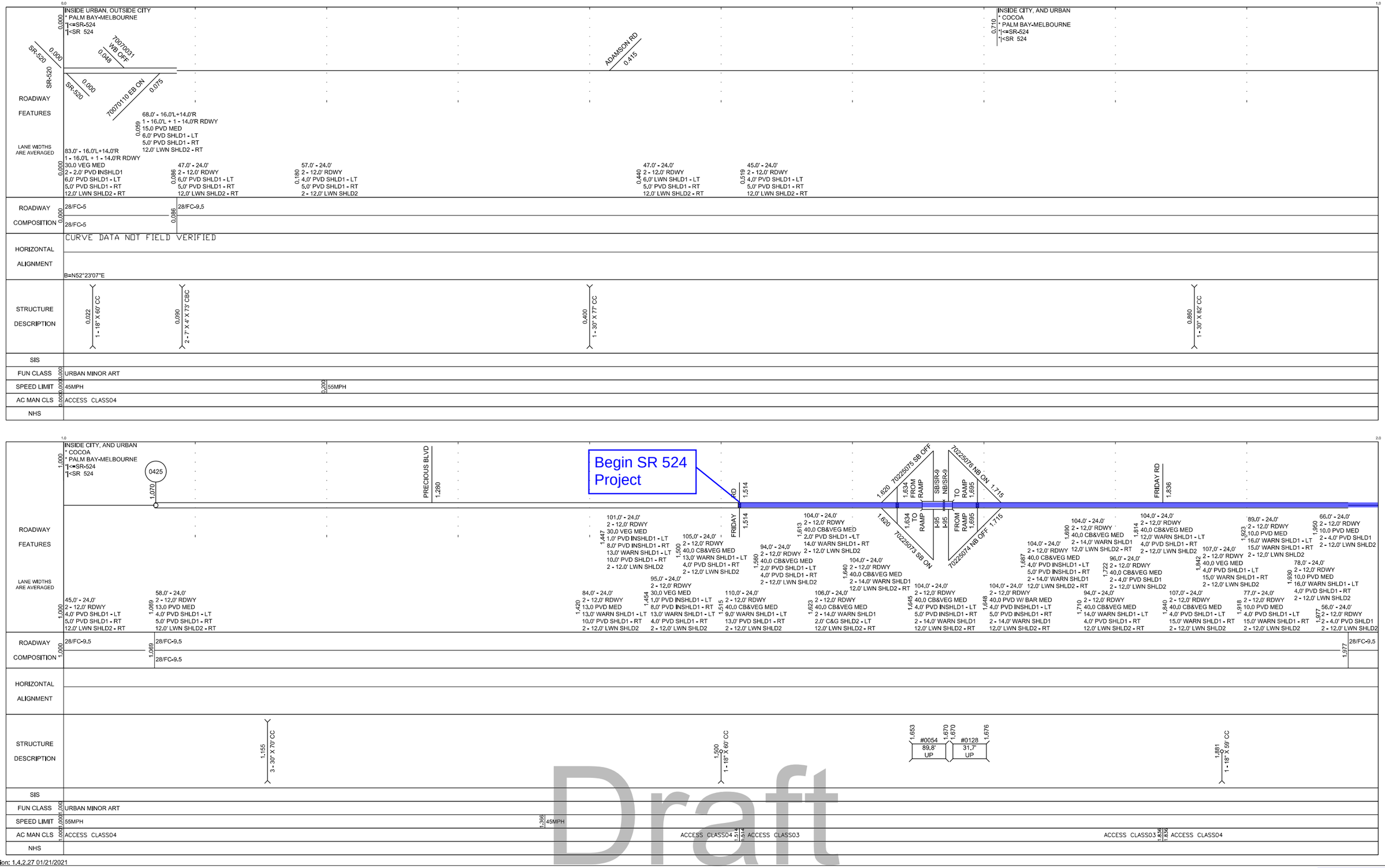
	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	10/29/2020	01/22/2021				
BY	HNTB	HNTB				

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 524/SR 528	BREVARD	05	70070000	1 OF 5



Version: 1.4.2.27 01/21/2021

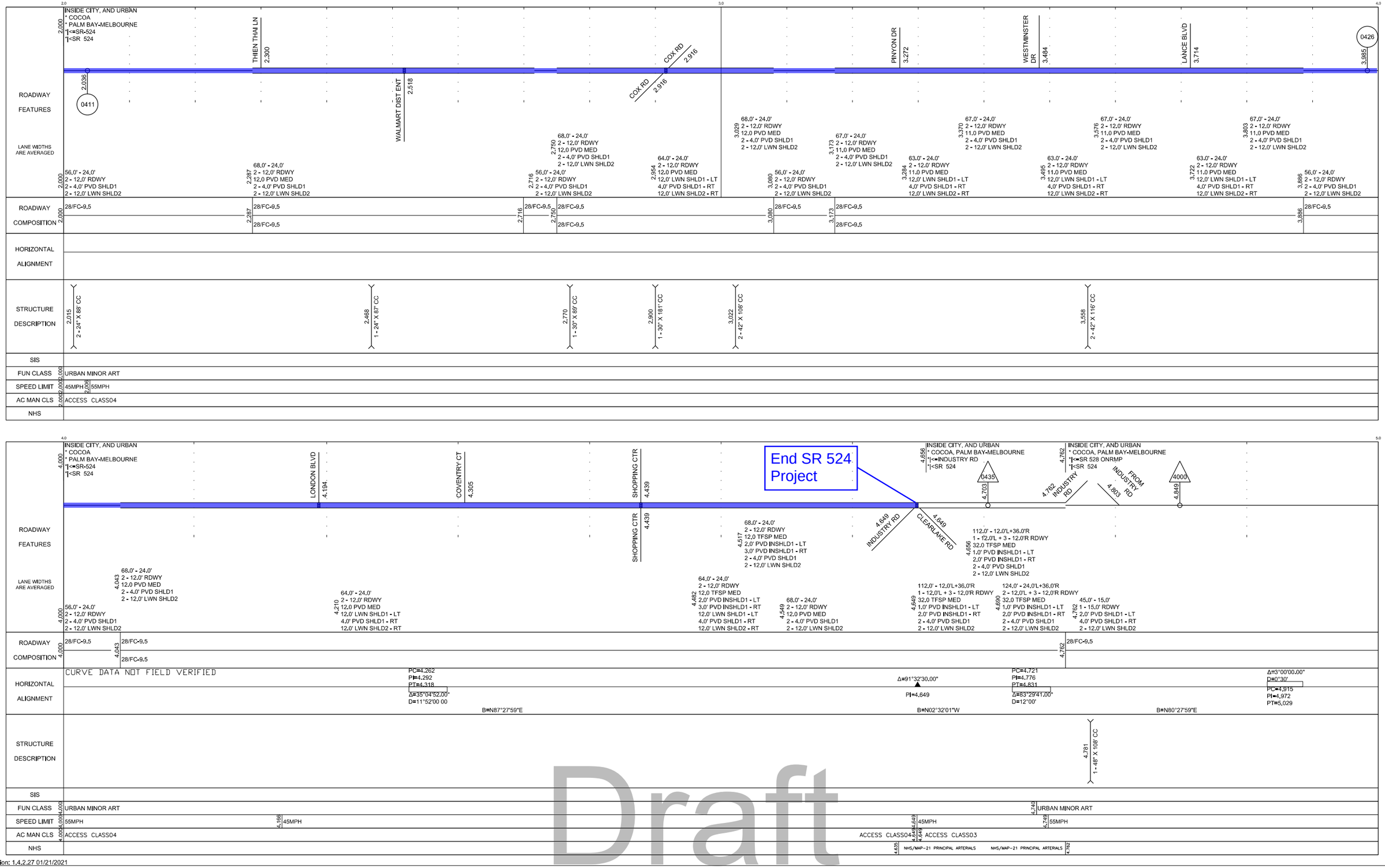
FIGURE 5A

	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV
DATE	10/29/2020	01/22/2021				
BY	HNTB	HNTB				

FLORIDA DEPARTMENT OF TRANSPORTATION

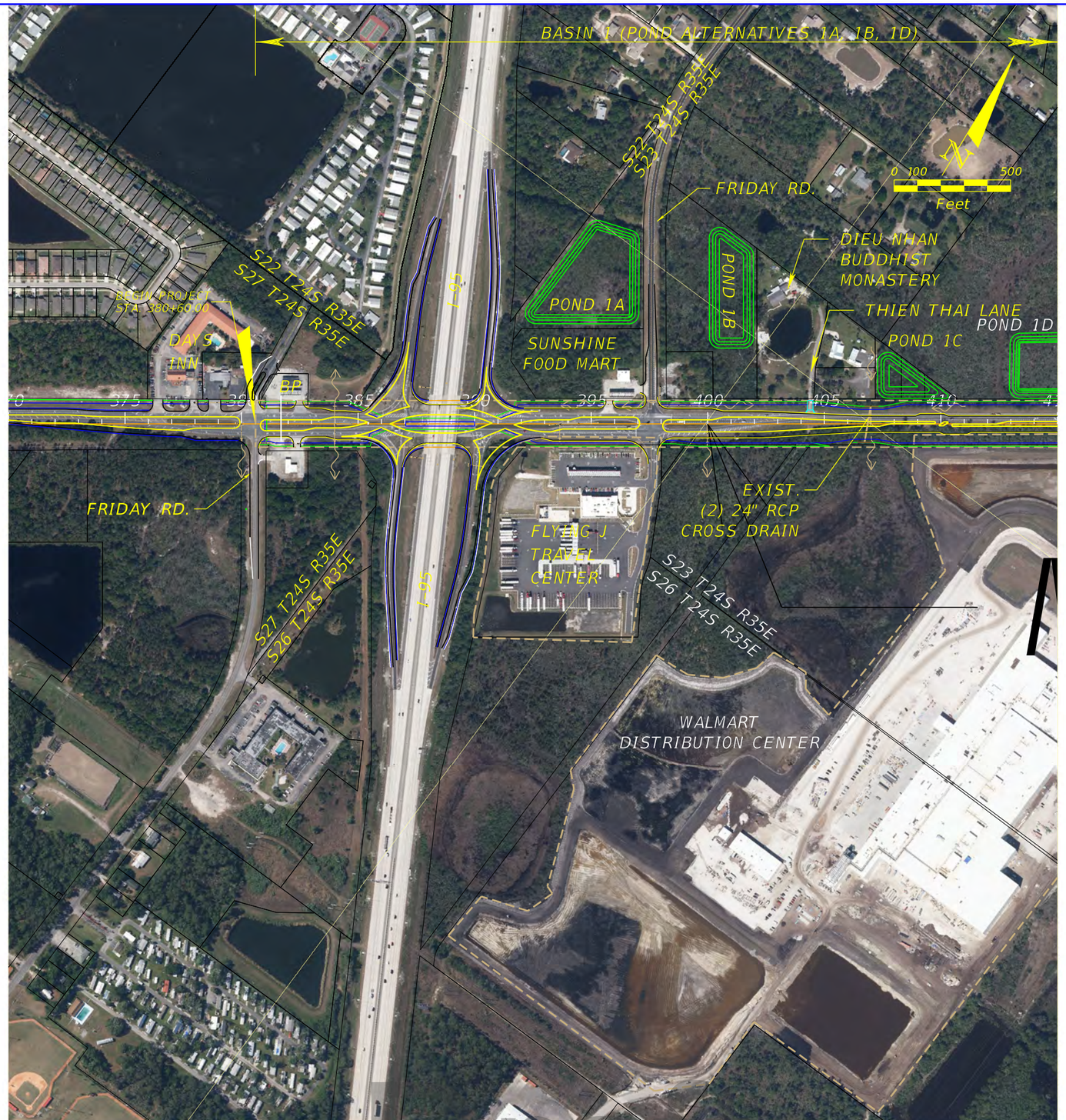
STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02		SR 524/SR 528	BREVARD	05	70070000	2 OF 5



Version: 1.4.2.27 01/21/2021

FIGURE 5B



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Draft

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

PROPOSED DRAINAGE MAP

Figure 6A

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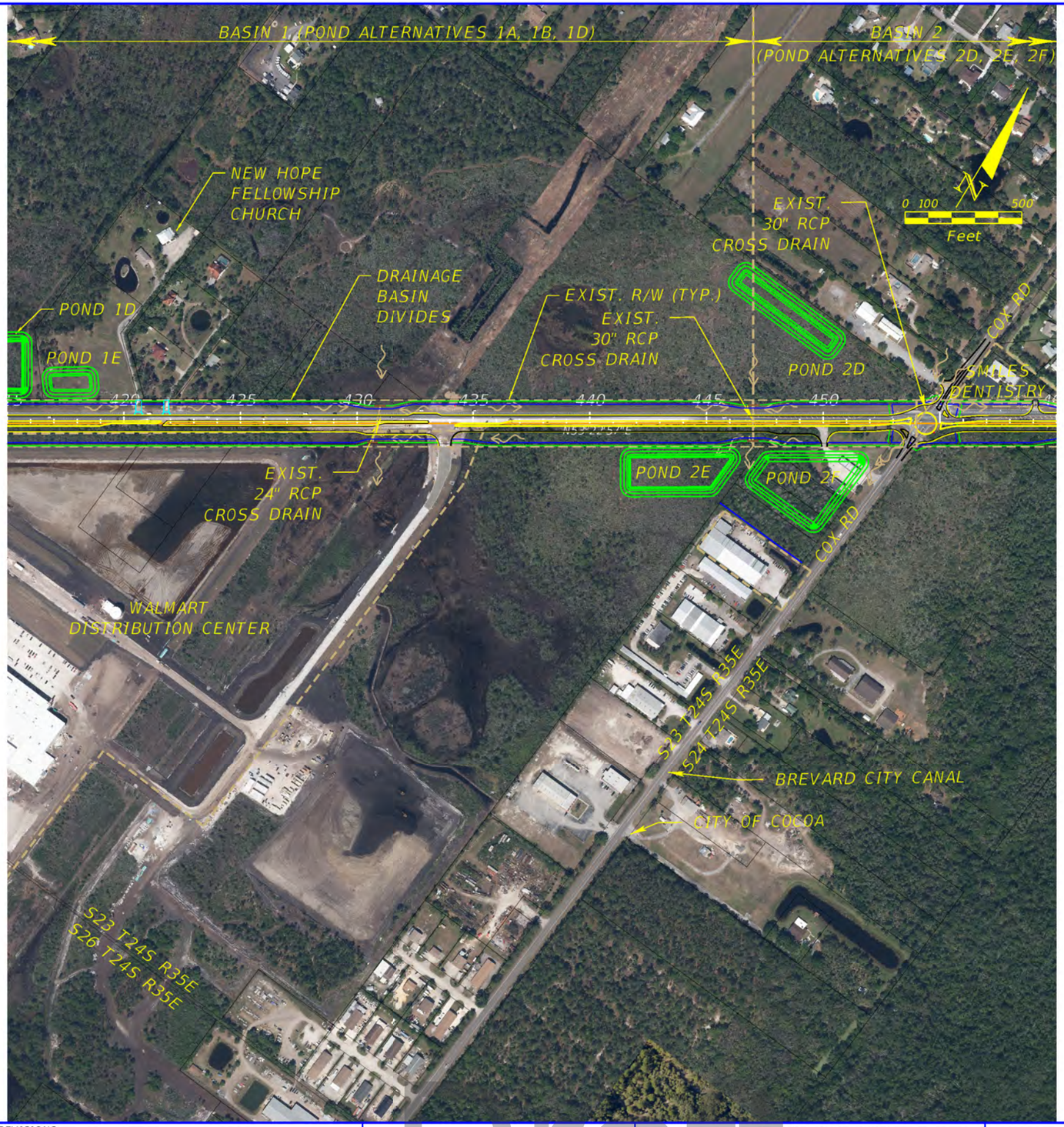

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DATE	DESCRIPTION	DATE	DESCRIPTION

Draft

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

PROPOSED DRAINAGE MAP

Figure 6B

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DRAFT

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

PROPOSED DRAINAGE MAP

Figure 6C

12/4/2022 7:56:57 PM mfischl
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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	43798312201

PROPOSED DRAINAGE MAP

Figure 6D

12/4/2022 7:59:02 PM mfischl
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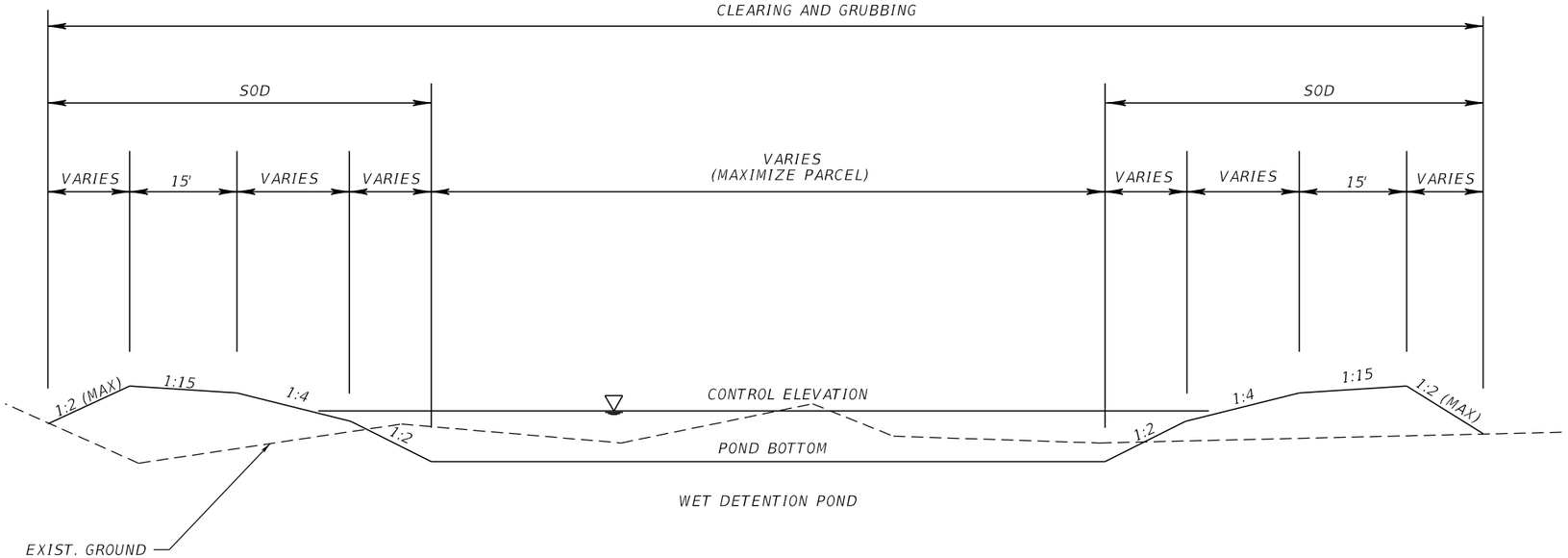


REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

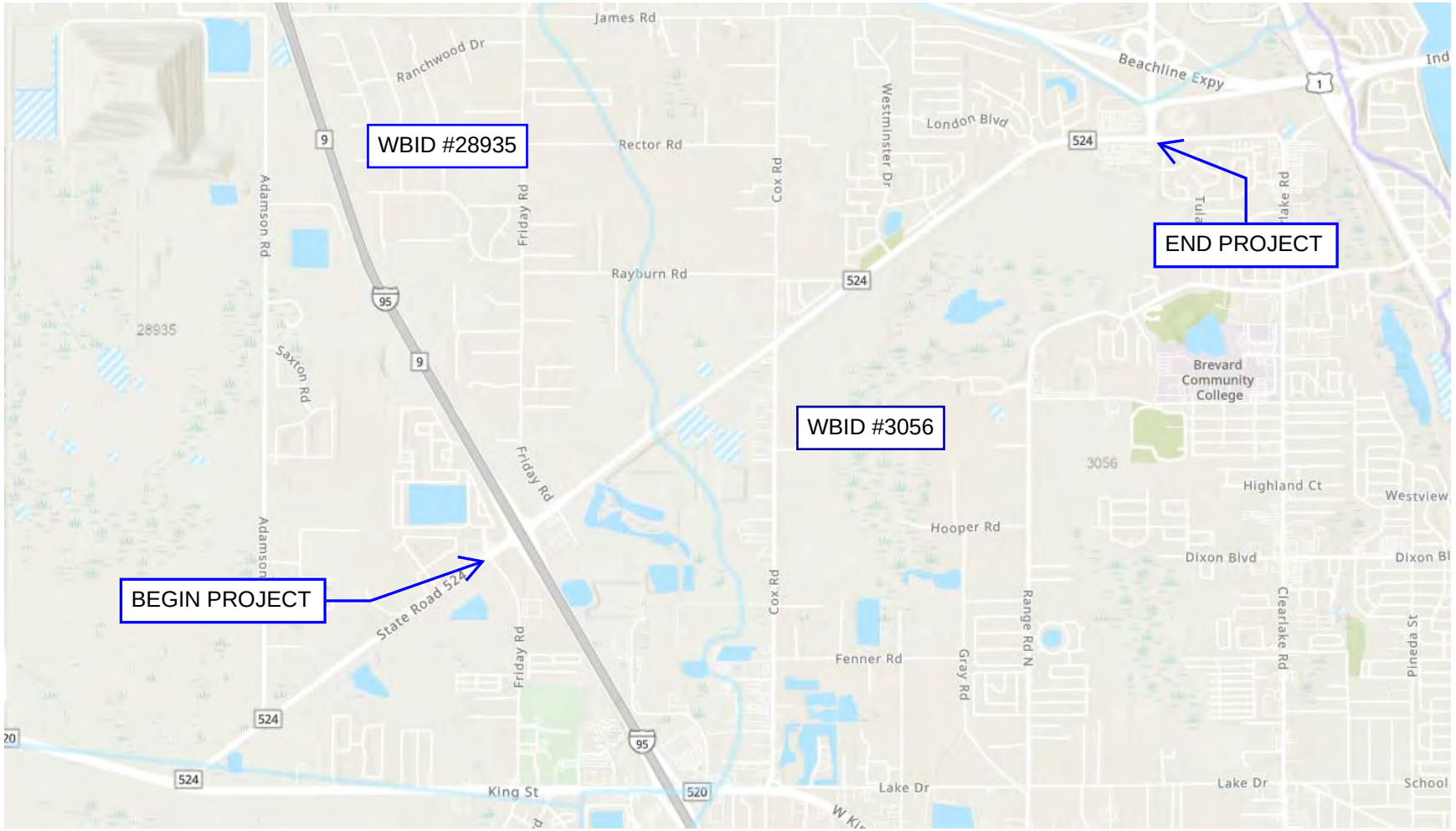
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 524	BREVARD	437983-1-22-01

POND TYPICAL SECTION

Figure 7

SR 524 WBID MAP



N

NTS

Draft

https://ca.dep.state.fl.us/mapdirect/?webmap=4653de46146748018993dd8698e373dd

FIGURE 8

APPENDIX B

CALCULATIONS

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ONLINE VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

Home | About VDatum | Download | Docs & Support | Contact Us

Regional Information

* Region : Contiguous United States

Horizontal Information

	Source	Target
Reference Frame:	NAD 1927	NAD83(2011)
Coor. System:	Projected UTM (Easting, Northing)	Projected UTM (Easting, Northing)
Unit:	foot (U.S. Survey) (US_ft)	foot (U.S. Survey) (US_ft)
Zone:	17 ALE - 0101	17 ALE - 0101

Vertical Information

	Source	Target
Reference Frame:	NGVD 1929	NAVD 88
Unit:	foot (U.S. Survey) (US_ft)	foot (U.S. Survey) (US_ft)
	Height Sounding	Height Sounding
	GEOID model:	GEOID model:

Point Conversion | ASCII File Conversion

	Input		Output
Northing:	3139890 (e.g. 33.7586 or 33 45 30.9600)	Transform	Northing: 10302126.84649
Easting:	0520728 (e.g. -118.7691 or -118 46 8.7600)	Reset	Easting: 1708492.79692
Height:	0 (e.g. 3.037)	DMS	Height: -1.339

to DMS

Vertical Uncertainty (+/-): 0.164 US_ft

Zone: 17 Convergence:0.1006944444 Scale_Factor:0.99960531 Combined_Factor:0.99960537 Vertical_Area: null

Valid Tidal area | Non-Tidal area | Non-Valid area | IGLD85 | SVU area

Alternating Horz. Datum | Ellipsoidal Datum | Orthometric Datum | Tidal Datum

CONSOR ENGINEERS, LLC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1A**

EXISTING CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	380+60.00	-	397+50.00	200	24	0	0.0	0.0	0	0.93	6.83	7.76
CL CONST. (BASED ON TYP.)	397+50.00	-	447+00.00	200	24	0	0.0	8.0	0	3.64	19.09	22.73
RDWY SUBTOTAL:										**4.57**	**25.92**	**30.49**
SIDEWALK	380+60.00	-	447+00.00						0	0.00	0.00	0.00
SDWK SUBTOTAL:										**0.00**	**0.00**	**0.00**
SUBTOTAL:										***4.57***	***25.92***	***30.49***
POND 1A										0.00	3.57	3.57
SUBTOTAL:										***4.57***	***29.49***	***34.06***
TOTAL:										**4.57**	**29.49**	**34.06**

PROPOSED CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524.

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	380+60.00	-	447+00.00	200	46	0	4.5	4	5	8.99	17.23	26.22
RDWY SUBTOTAL:										**8.99**	**17.23**	**26.22**
SIDEWALK	380+60.00	-	447+00.00						28	4.27	0.00	4.27
SDWK SUBTOTAL:										**4.27**	**0.00**	**4.27**
SUBTOTAL:										***13.26***	***17.23***	***30.49***
POND 1A										2.65	0.92	3.57
SUBTOTAL:										***15.91***	***18.15***	***34.06***
TOTAL:										**15.91**	**18.15**	**34.06**

CONSOR ENGINEERS, LLC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1A

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
	Impervious Area (Pavement)	98			4.57	447.86
A/D (ROADWAY)	Open Space / Grass (Good Condition)	84			25.92	2177.28
B/D (POND)	Open Space / Grass (Good Condition)	77			3.57	274.89
				Totals =	34.06	2900.03

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.1**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
	Water Area	100			2.65	265.00
	Impervious Area (Pavement)	98			13.26	1299.48
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			17.23	1378.40
B/D (POND)	Open Space / Grass (Good Condition)	80			0.92	73.60
				Totals =	34.06	3016.48

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **88.6**

CONSOR ENGINEERS, LLC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1A**

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.74 in CN= 85.1

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.69 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.69 in * 34.06 ac = **21.81 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.74 in CN= 85.1

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.57 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.57 in * 34.06 ac = **10.13 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.29 in CN= 88.6

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 8.11 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 8.11 in * 34.06 ac = **23.02 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.29 in CN= 88.6

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.92 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.92 in * 34.06 ac = **11.12 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

V_{at} (25-yr/24-hr) = **1.20 ac-ft (for 25-yr/24-hr storm event)**

V_{at} (2.33-yr/24-hr) = **0.99 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND): ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **2.84** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **2.76** **ac-ft**

CONSOR ENGINEERS, LLC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1A**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water	Estimated Normal Seasonal High Water
PB-1	21.0	0.8	20.20	21.00

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 20.20 ft. 21.00 ft.

AVG. GROUND WATER TABLE ELEVATION: 20.2 Ft. (NAVD)

AVG. SHWT ELEVATION: 21.0 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	**AC.**	**AC.**	**AF**	**AF**
21.00	2.65			0.00
		2.72		
22.00	2.78		2.72	2.72
		2.85		
23.00	2.91		2.85	5.56
		2.98		
24.00	3.05		2.98	8.54
		3.31		
25.00	3.57		3.31	11.85
TOTAL:			**11.85**	

Total Volume to be stored in pond = 2.84 ac-ft

Elevation of Total Volume to be stored in pond = 22.04 ft

Average elevation of pond site = 21.00 ft

Lowest roadway elevation in basin = 26.62 ft

DHW = Low road el - 1' = 25.62 ft

Wetland Elevation = ft Unknown

CONSOR ENGINEERS, LLC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1A**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:				
DA = DRAINAGE AREA TO POND (AC) =	34.06	AC	inc. pond
ROAD IMPERVIOUS AREA =	13.26	AC	
POND IMPERVIOUS AREA =	2.65	AC	
PERVIOUS AREA =	18.15	AC	
C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA			
C = RUNOFF COEFFICIENT =	0.554		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF = 6.69 AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
17.0	2.27		0.00	0.00
		2.34		
19.0	2.40		4.67	4.67
		2.46		
20.0	2.52		2.46	7.13
		2.59		
21.0	2.65		2.59	9.72

CHECK PPV DEPTH: 4.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

9.72 / 2.65 = 3.67 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1B

EXISTING CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	380+60.00	-	397+50.00	200	24	0	0.0	0.0	0	0.93	6.83	7.76
CL CONST. (BASED ON TYP.)	397+50.00	-	447+00.00	200	24	0	0.0	8.0	0	3.64	19.09	22.73
RDWY SUBTOTAL:										**4.57**	**25.92**	**30.49**
SIDEWALK	380+60.00	-	447+00.00						0	0.00	0.00	0.00
SDWK SUBTOTAL:										**0.00**	**0.00**	**0.00**
SUBTOTAL:										***4.57***	***25.92***	***30.49***
POND 1B										0.00	1.70	1.70
TOTAL:										**4.57**	**27.62**	**32.19**

PROPOSED CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	380+60.00	-	447+00.00	200	46	0	4.5	4	5	8.99	17.23	26.22
RDWY SUBTOTAL:										**8.99**	**17.23**	**26.22**
SIDEWALK	380+60.00	-	447+00.00						28	4.27	0.00	4.27
SDWK SUBTOTAL:										**4.27**	**0.00**	**4.27**
SUBTOTAL:										***13.26***	***17.23***	***30.49***
POND 1B										1.52	0.18	1.70
TOTAL:										**14.78**	**17.41**	**32.19**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1B

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
	Impervious Area (Pavement)	98			4.57	447.86
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			25.92	2177.28
A/D (POND)	Wood/Forest Land (Good Condition)	77			1.70	130.90
				Totals =	32.19	2756.04

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.6**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
	Water Area	100			1.52	152.00
	Impervious Area (Pavement)	98			13.26	1299.48
A/D (ROADWAY)	Open Space / Grass (Good Condition)	84			17.23	1447.32
A/D (POND)	Open Space / Grass (Good Condition)	80			0.18	14.40
				Totals =	32.19	2913.20

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **90.5**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1B**

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.68 in CN= 85.6

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.74 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.74 in * 32.19 ac = **20.77 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.68 in CN= 85.6

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.62 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.62 in * 32.19 ac = **9.70 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.05 in CN= 90.5

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 8.35 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 8.35 in * 32.19 ac = **22.39 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.05 in CN= 90.5

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 4.12 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 4.12 in * 32.19 ac = **11.06 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.62 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **1.36 ac-ft (for 25-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **2.68** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **2.76** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1B**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal Seasonal High Water Elevation
PB-2	22.4	2.0	20.42	22.00

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 20.42 ft. 22.00 ft.

AVG. GROUND WATER TABLE ELEVATION: 20.4 Ft. (NAVD)

AVG. SHWT ELEVATION: 22.0 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
22.00	1.33			0.00
		1.38		
23.00	1.43		1.38	1.38
		1.48		
24.00	1.53		1.48	2.86
		1.59		
25.00	1.64		1.59	4.45
		1.86		
26.00	2.07		1.86	6.30
TOTAL:			**6.30**	

Total Volume to be stored in pond = **2.76** **ac-ft**

Elevation of Total Volume to be stored in pond = **23.94** **ft**

Average elevation of pond site = 24.00 ft

Lowest roadway elevation in basin = 26.09 ft

DHW = Low road el - 1' = 25.09 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1B**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:

DA = DRAINAGE AREA TO POND (AC) =	32.19	AC	inc. pond
ROAD IMPERVIOUS AREA =	13.26	AC	
POND IMPERVIOUS AREA =	1.52	AC	
PERVIOUS AREA =	17.41	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.547		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF = **6.24** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL	
Ft. (NAVD)	AC.	AC.	AF	AF	
16.0	0.93		0.00	0.00	
		1.03			
20.0	1.12		4.10	4.10	
		1.17			
21.0	1.22		1.17	5.27	
		1.28			
22.0	1.33		1.28	6.55	increase depth to meet PPV

CHECK PPV DEPTH: 6.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

6.55 / 1.33 = 4.92 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1C

EXISTING CONDITIONS:

BASIN LIMITS: STA. 390+00.00 to STA 410+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	390+00.00	-	397+50.00	200	24	0	0.0	0.0	0	0.41	3.03	3.44
CL CONST. (BASED ON TYP.)	397+50.00	-	410+00.00	200	24	0	0.0	8.0	0	0.92	4.82	5.74
RDWY SUBTOTAL:										**1.33**	**7.85**	**9.18**
SIDEWALK	390+00.00	-	410+00.00						0	0.00	0.00	0.00
SDWK SUBTOTAL:										**0.00**	**0.00**	**0.00**
SUBTOTAL:										***1.33***	***7.85***	***9.18***
POND 1C										0.00	0.84	0.84
SUBTOTAL:										***1.33***	***8.69***	***10.02***
TOTAL:										**1.33**	**8.69**	**10.02**

PROPOSED CONDITIONS:

BASIN LIMITS: STA. 390+00.00 to STA 410+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (BASED ON TYP.)	390+00.00	-	410+00.00	200	46	0	4.5	4	5	2.71	5.18	7.89
RDWY SUBTOTAL:										**2.71**	**5.18**	**7.89**
SIDEWALK	390+00.00	-	410+00.00						28	1.29	0.00	1.29
SDWK SUBTOTAL:										**1.29**	**0.00**	**1.29**
SUBTOTAL:										***4.00***	***5.18***	***9.18***
POND 1C										0.38	0.46	0.84
SUBTOTAL:										***4.38***	***5.64***	***10.02***
TOTAL:										**4.38**	**5.64**	**10.02**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1C

EXISTING CONDITIONS:

Soil Name and Hydrologic group	Cover Description (Cover type, treatment, & hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN			Area (acres)	Product of CN x Area
		Tab. 2-2	Fig. 2-3	Fig. 2-4		
	Impervious Area Pavement	98			1.33	130.34
A/D (ROADWAY)	Open Space / Grass Fair Condition	84			7.85	659.40
A/D (POND)	Wood/Forest Land Good Condition	77			0.84	64.68
				Totals =	10.02	854.42

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.3**

PROPOSED CONDITIONS:

Soil Name and Hydrologic group	Cover Description (Cover type, treatment, & hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN			Area (acres)	Product of CN x Area
		Tab. 2-2	Fig. 2-3	Fig. 2-4		
-	Water Area	100			0.38	38.00
	Impervious Area Pavement	98			4.00	392.00
A/D (ROADWAY)	Open Space / Grass Good Condition	80			5.18	414.40
A/D (POND)	Open Space / Grass Good Condition	80			0.46	36.80
				Totals =	10.02	881.20

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **87.9**

CONSOR ENGINEERS, INC.

	DATE
MADE BY: MSF	21-Jan-22
CHECK BY: DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1C

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.73 in CN= 85.3

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.70 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.70 in * 10.02 ac = **6.43 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.73 in CN= 85.3

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.58 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.58 in * 10.02 ac = **2.99 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.37 in CN= 87.9

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 8.03 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 8.03 in * 10.02 ac = **6.71 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.37 in CN= 87.9

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.85 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.85 in * 10.02 ac = **3.22 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.28 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.23 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **0.84** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **0.83** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1C**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal Seasonal High Water Elevation
PB-3	25.0	2.1	22.90	23.50

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 22.90 ft. 23.50 ft.

AVG. GROUND WATER TABLE ELEVATION: 22.9 Ft. (NAVD)

AVG. SHWT ELEVATION: 23.5 Ft. (NAVD)

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	**AC.**	**AC.**	**AF**	**AF**
23.50	0.38			0.00
		0.41		
24.50	0.44		0.41	0.41
		0.47		
25.50	0.50		0.47	0.88
		0.54		
26.50	0.57		0.54	1.42
		0.71		
27.50	0.84		0.71	2.12
TOTAL:			**2.12**	

Total Volume to be stored in pond = **0.84** **ac-ft**

Elevation of Total Volume to be stored in pond = **25.68** **ft**

Average elevation of pond site = 22.32 ft

Lowest roadway elevation in basin = 25.36 ft

DHW = Low road el - 1' = 24.36 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1C**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:

DA = DRAINAGE AREA TO POND (AC) =	10.02	AC	inc. pond
ROAD IMPERVIOUS AREA =	4.00	AC	
POND IMPERVIOUS AREA =	0.38	AC	
PERVIOUS AREA =	5.64	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.530		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF = **1.88** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL	
Ft. (NAVD)	AC.	AC.	AF	AF	
14.5	0.14		0.00	0.00	
		0.19			
18.5	0.21		0.76	0.76	
		0.23			
19.5	0.24		0.95	0.95	
		0.25			
20.5	0.26		0.25	1.20	
		0.27			
21.5	0.28		0.27	1.47	
		0.31			
22.5	0.33		0.31	1.78	
		0.36			
23.5	0.38		0.36	2.13	increase depth to meet PPV

CHECK PPV DEPTH: 9.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

2.13 / 0.38 = 5.61 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1D

EXISTING CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH: TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)	IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
CL CONST. (BASED ON TYP.)	380+60.00	-	397+50.00	200	24	0	0.0	0.0	0	0.93	6.83	7.76
CL CONST. (BASED ON TYP.)	397+50.00	-	447+00.00	200	24	0	0.0	8.0	0	3.64	19.09	22.73
RDWY SUBTOTAL:										**4.57**	**25.92**	**30.49**
SIDEWALK	380+60.00	-	447+00.00						0	0.00	0.00	0.00
SDWK SUBTOTAL:										**0.00**	**0.00**	**0.00**
SUBTOTAL:										***4.57***	***25.92***	***30.49***
POND 1D										0.00	1.60	1.60
SUBTOTAL:										***0.00***	***1.60***	***1.60***
TOTAL:										**4.57**	**27.52**	**32.09**

PROPOSED CONDITIONS:

BASIN LIMITS: STA. 380+60.00 to STA 447+00.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH: TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)	IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
CL CONST. (SEGMENT 2 TYPICAL)	380+60.00	-	447+00.00	200	46	0	4.5	4	5	8.99	17.23	26.22
RDWY SUBTOTAL:										**8.99**	**17.23**	**26.22**
SIDEWALK	380+60.00	-	447+00.00						28	4.27	0.00	4.27
SDWK SUBTOTAL:										**4.27**	**0.00**	**4.27**
SUBTOTAL:										***13.26***	***17.23***	***30.49***
POND 1D										1.32	0.28	1.60
SUBTOTAL:										***1.32***	***0.28***	***1.60***
TOTAL:										**14.58**	**17.51**	**32.09**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1D

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			4.57	447.86
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			25.92	2177.28
A/D (POND)	Wood/Forest Land (Good Condition)	77			1.52	116.79
B/D (POND)	Wood/Forest Land (Good Condition)	77			0.08	6.41
				Totals =	32.09	2748.34
				Use CN =	**85.6**	

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			1.32	132.00
-	Impervious Area (Pavement)	98			13.26	1299.48
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			17.23	1378.40
A/D (POND)	Open Space / Grass (Good Condition)	80			0.27	21.24
B/D (POND)	Open Space / Grass (Good Condition)	80			0.01	1.16
				Totals =	32.09	2832.28
				Use CN =	**88.3**	

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

CONSOR ENGINEERS, INC.

	DATE
MADE BY: MSF	21-Jan-22
CHECK BY: DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1D

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.68 in CN= 85.6

Precipitation (P) = 9.5 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.7 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.75 in * 32.09 ac = **20.7 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.68 in CN= 85.6

Precipitation (P) = 5.2 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.6 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.62 in * 32.09 ac = **9.7 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.33 in CN= 88.3

Precipitation (P) = 9.5 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 8.1 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 8.07 in * 32.09 ac = **21.6 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.33 in CN= 88.3

Precipitation (P) = 5.2 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.9 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.89 in * 32.09 ac = **10.4 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.87 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.72 ac-ft (for 25-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **2.67** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **2.76** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1D**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-4	23.9	2.8	21.10	23.50

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 21.10 ft. 23.50 ft.

AVG. GROUND WATER TABLE ELEVATION: 21.1 Ft. (NAVD)

AVG. SHWT ELEVATION: 23.5 Ft. (NAVD)

PROPOSED STORAGE:

STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL. AF
23.50	1.32		0.00	0.00
		1.37		
24.50	1.41		1.37	1.37
		1.46		
25.50	1.50		1.46	2.82
		1.55		
26.50	1.59		1.55	4.37
		1.77		
27.50	1.95		1.77	6.14
TOTAL:			**6.14**	

Total Volume to be stored in pond = **2.76** **ac-ft**

Elevation of Total Volume to be stored in pond = **25.46** **ft**

Average elevation of pond site = 24.50 ft

Lowest roadway elevation in basin = 25.42 ft

DHW = Low road el - 1' = 24.42 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1D**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:				
DA = DRAINAGE AREA TO POND (AC) =	32.09	AC	inc. pond
ROAD IMPERVIOUS AREA =	13.26	AC	
POND IMPERVIOUS AREA =	1.32	AC	
PERVIOUS AREA =	17.51	AC	
C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA			
C = RUNOFF COEFFICIENT =	0.543		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **6.18** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
18.5	1.04		0.00	0.00
		1.10		
21.5	1.16		3.30	3.30
		1.20		
22.5	1.24		1.20	4.50
		1.28		
23.5	1.32		1.28	5.78

CHECK PPV DEPTH: 5.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{5.78}{1.32}$ = 4.38 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1E

EXISTING CONDITIONS:

BASIN LIMITS: STA. 399+50.00 to STA 421+20.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	399+50.00	-	397+50.00	200	24	0	0.0	0.0	0	-0.11	-0.81	-0.92
CL CONST. (BASED ON TYP.)	397+50.00	-	421+20.00	200	24	0	0.0	8.0	0	1.74	9.14	10.88
RDWY SUBTOTAL:										**1.63**	**8.33**	**9.96**
SIDEWALK	399+50.00	-	421+20.00						0	0.00	0.00	0.00
SDWK SUBTOTAL:										**0.00**	**0.00**	**0.00**
SUBTOTAL:										***1.63***	***8.33***	***9.96***
POND 1E										0.00	0.69	0.69
SUBTOTAL:										***0.00***	***0.69***	***0.69***
TOTAL:										**1.63**	**9.02**	**10.65**

PROPOSED CONDITIONS:

BASIN LIMITS: STA. 399+50.00 to STA 421+20.00, CL CONST. SR 524

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	399+50.00	-	421+20.00	200	46	0	4.5	4	5	2.94	5.63	8.57
RDWY SUBTOTAL:										**2.94**	**5.63**	**8.57**
SIDEWALK	399+50.00	-	421+20.00						28	1.39	0.00	1.39
SDWK SUBTOTAL:										**1.39**	**0.00**	**1.39**
SUBTOTAL:										***4.33***	***5.63***	***9.96***
POND 1E										0.27	0.42	0.69
SUBTOTAL:										***0.27***	***0.42***	***0.69***
TOTAL:										**4.60**	**6.05**	**10.65**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 1, Pond 1E

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			1.63	159.74
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			8.33	699.72
A/D (POND)	Wood/Forest Land (Good Condition)	77			0.13	9.94
B/D (POND)	Wood/Forest Land (Good Condition)	77			0.56	43.19
				Totals =	10.65	912.59

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.7**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			0.27	27.00
-	Impervious Area (Pavement)	98			4.33	424.34
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			5.63	450.40
A/D (POND)	Open Space / Grass (Good Condition)	80			0.08	6.28
B/D (POND)	Open Space / Grass (Good Condition)	80			0.34	27.32
				Totals =	10.65	935.34

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **87.8**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1E**

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 1.67 in CN= 85.7

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 7.75 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.75 in * 10.65 ac = **6.88 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 1.67 in CN= 85.7

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 3.62 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.62 in * 10.65 ac = **3.22 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 1.39 in CN= 87.8

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 8.02 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 8.02 in * 10.65 ac = **7.12 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 1.39 in CN= 87.8

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 3.84 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.84 in * 10.65 ac = **3.41 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.23 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.19 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **0.89** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **0.90** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1E**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-5	23.5	2.8	20.70	23.00

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 20.70 ft. 23.00 ft.

AVG. GROUND WATER TABLE ELEVATION: 20.70 Ft. (NAVD)

AVG. SHWT ELEVATION: 23.00 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
23.00	0.30		0.00	0.00
		0.32		
23.50	0.33		0.16	0.16
		0.35		
24.50	0.37		0.35	0.51
		0.40		
25.50	0.42		0.40	0.90
		0.45		
26.50	0.47		0.45	1.35
		0.58		
27.50	0.69		0.58	1.93
TOTAL:			**1.93**	

Total Volume to be stored in pond = 0.90 ac-ft

Elevation of Total Volume to be stored in pond = 25.73 ft

Average elevation of pond site = 25.08 ft

Lowest roadway elevation in basin = 25.93 ft

DHW = Low road el - 1' = 24.93 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 1, Pond 1E**

PERMANENT POOL VOLUME (PPV) = RT FR

WHERE:
PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:

DA = DRAINAGE AREA TO POND (AC) =	10.65	AC	inc. pond
ROAD IMPERVIOUS AREA =	4.33	AC	
POND IMPERVIOUS AREA =	0.27	AC	
PERVIOUS AREA =	6.05	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.525		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **1.98** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL	
Ft. (NAVD)	AC.	AC.	AF	AF	
17.00	0.15		0.00	0.00	
		0.19			
21.00	0.22		0.74	0.74	
		0.24			
22.00	0.26		0.24	0.98	
		0.28			
23.00	0.30		0.28	1.26	increase depth to meet PPV

CHECK PPV DEPTH: 6.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{1.26}{0.30}$ = 4.20 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2A

BASIN LIMITS: STA. 447+00.00 to STA 522+50.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	447+00.00	-	455+00.00	200	24	0	0.0	0	0	0.44	3.23	3.67
CL CONST. (BASED ON TYP.)	455+00.00	-	522+50.00	200	24	0	0.0	0	8	4.96	26.03	30.99
RDWY SUBTOTAL:										**5.40**	**29.26**	**34.66**
POND 2A										0.00	6.46	6.46
SUBTOTAL:										***0.00***	***6.46***	***6.46***
TOTAL:										**5.40**	**35.72**	**41.12**

BASIN LIMITS: STA. 447+00.00 to STA 522+50.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	447+00.00	-	455+00.00	200	46	28	4.5	4	5	1.61	2.06	3.67
CL CONST. (SEGMENT 3 TYPICAL)	455+00.00	-	522+50.00	200	44	28	4.5	4	5	13.17	17.82	30.99
RDWY SUBTOTAL:										***14.78***	***19.88***	***34.66***
POND 2A										5.16	1.30	6.46
SUBTOTAL:										***5.16***	***1.30***	***6.46***
TOTAL:										**19.94**	**21.18**	**41.12**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2A

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
	Impervious Area (Pavement)	98			5.40	529.20
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			9.77	478.87
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			9.74	818.46
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			9.74	818.46
A/D (POND)	Wood/Forest Land (Good Condition)	77			6.46	497.42
				Totals =	41.12	3142.41

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **76.4**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			5.16	516.00
-	Impervious Area (Pavement)	98			14.78	1448.44
A (ROADWAY)	Open Space / Grass (Good Condition)	39			6.64	258.96
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			6.62	529.60
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			6.62	529.60
A/D (POND)	Open Space / Grass (Good Condition)	80			1.30	104.00
				Totals =	41.12	3386.60

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **82.4**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2A

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 3.09 in CN= 76.4

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 6.59 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 6.59 in * 41.12 ac = **22.59 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 3.09 in CN= 76.4

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 2.74 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 2.74 in * 41.12 ac = **9.39 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.14 in CN= 82.4

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.34 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.34 in * 41.12 ac = **25.15 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.14 in CN= 82.4

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.29 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.29 in * 41.12 ac = **11.28 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **2.56 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **1.90 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **3.43** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **3.08** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2A**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-10	17.6	2.9	14.70	AT GROUND SURFACE

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 14.70 ft.

AVG. GROUND WATER TABLE ELEVATION: 14.70 Ft. (NAVD)

AVG. SHWT ELEVATION: 17.60 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	**AC.**	**AC.**	**AF**	**AF**
17.60	5.16		0.00	0.00
		5.20		
18.00	5.23		2.08	2.08
		5.32		
19.00	5.40		5.32	7.39
		5.49		
20.00	5.58		5.49	12.88
		5.67		
21.00	5.76		5.67	18.55
		6.11		
22.00	6.46		6.11	24.66
TOTAL:			**24.66**	

Total Volume to be stored in pond = 3.43 ac-ft

Elevation of Total Volume to be stored in pond = 18.26 ft

Average elevation of pond site = 17.60 ft

Lowest roadway elevation in basin = 24.83 ft

DHW = Low road el - 1' = 23.83 ft

Wetland Elevation = 17.60 ft (NOT SURVEYED, ASSUMED SURFACE ELEVATION)

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2A**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE:
PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:

DA = DRAINAGE AREA TO POND (AC) =	41.12	AC	inc. pond
ROAD IMPERVIOUS AREA =	14.78	AC	
POND IMPERVIOUS AREA =	5.16	AC	
PERVIOUS AREA =	21.18	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.570		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF =	**8.31**	AF	
ADD 50% ADDITIONAL VOLUME FOR DISCHARGE TO WETANDS IN CONSERVATION AREA =	**12.47**	AF	(PER OTHER PERMITS IN CORRIDOR)

STAGE Ft. (NAVD)	AREA AC.	AVERAGE AREA AC.	INCREMENTAL VOL. AF	CUMULATIVE VOL AF
12.60	4.48		0.00	0.00
		4.65		
15.60	4.81		13.94	13.94
		4.90		
16.60	4.98		4.90	18.83
		5.07		
17.60	5.16		5.07	23.90

CHECK PPV DEPTH: 5.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{23.90}{5.16}$ = 4.63 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2B**

BASIN LIMITS: STA. 447+00.00 to STA 522+50.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	447+00.00	-	455+00.00	200	24	0	0.0	0	0	0.44	3.23	3.67
CL CONST. (BASED ON TYP.)	455+00.00	-	522+50.00	200	24	0	0.0	0	8	4.96	26.03	30.99
RDWY SUBTOTAL:										***5.40***	***29.26***	***34.66***
POND 2B										0.00	3.33	3.33
SUBTOTAL:										**0.00**	**3.33**	**3.33**
TOTAL:										**5.40**	**32.59**	**37.99**

BASIN LIMITS: STA. 447+00.00 to STA 522+50.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	447+00.00	-	455+00.00	200	46	28	4.5	4	5	1.61	2.06	3.67
CL CONST. (SEGMENT 3 TYPICAL)	455+00.00	-	522+50.00	200	44	28	4.5	4	5	13.17	17.82	30.99
RDWY SUBTOTAL:										***14.78***	***19.88***	***34.66***
POND 2B										0.00	3.33	3.33
SUBTOTAL:										***0.00***	***3.33***	***3.33***
TOTAL:										**14.78**	**23.21**	**37.99**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2B

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			5.40	529.20
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			9.77	478.87
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			9.74	818.46
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			9.74	818.46
A (POND)	Open Space / Grass (Good Condition)	25			0.61	15.32
B/D (POND)	Wood/Forest Land (Good Condition)	77			2.72	209.23
				Totals =	37.99	2869.54

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **75.5**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			0.00	0.00
-	Impervious Area (Pavement)	98			14.78	1448.44
A (ROADWAY)	Open Space / Grass (Good Condition)	39			6.64	258.96
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			6.62	529.60
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			6.62	529.60
A (POND)	Open Space / Grass (Good Condition)	39			0.61	23.90
B/D (POND)	Open Space / Grass (Good Condition)	80			2.72	217.38
				Totals =	37.99	3007.88

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **79.2**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2B**

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 3.24 in CN= 75.5

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 6.48 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 6.48 in * 37.99 ac = **20.52 in (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 3.24 in CN= 75.5

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 2.66 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 2.66 in * 37.99 ac = **8.42 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.63 in CN= 79.2

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 6.94 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 6.94 in * 37.99 ac = **21.97 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.63 in CN= 79.2

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 2.99 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 2.99 in * 37.99 ac = **9.47 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.45 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **1.05 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **3.17** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **3.08** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2B**

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-6	26.4	3.1	23.30	24.00

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 23.30 ft. 24.00 ft.

AVG. GROUND WATER TABLE ELEVATION: 23.3 Ft. (NAVD)

AVG. SHWT ELEVATION: 24.0 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	**AC.**	**AC.**	**AF**	**AF**
24.00	2.44		0.00	0.00
		2.50		
25.00	2.56		2.50	2.50
		2.63		
26.00	2.69		5.25	5.25
		2.76		
27.00	2.82		2.76	8.01
		3.08		
28.00	3.33		3.08	11.08
TOTAL:			**13.58**	

Total Volume to be stored in pond = 3.17 ac-ft

Elevation of Total Volume to be stored in pond = 25.24 ft

Average elevation of pond site = 26.40 ft

Lowest roadway elevation in basin = 24.83 ft

DHW = Low road el - 1' = 23.83 ft

Wetland Elevation = 24.00 ft (NOT SURVEYED, ASSUMED CONTROL ELEVATION)

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2B**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:	DA = DRAINAGE AREA TO POND (AC) =	37.99	AC	inc. pond
	ROAD IMPERVIOUS AREA =	14.78	AC	
	POND IMPERVIOUS AREA =	0.00	AC	
	PERVIOUS AREA =	23.21	AC	
	C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA			
	C = RUNOFF COEFFICIENT =	0.492		
	R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
	WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
	CF = CONVERSION FACTOR =	12	IN/FT	
	RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF = **6.62** AF

ADD 50% ADDITIONAL VOLUME FOR DISCHARGE TO WETANDS IN CONSERVATION AREA = **9.94** AF (PER OTHER PERMITS IN CORRIDOR)

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
16.00	1.89		0.00	0.00
		2.04		
22.00	2.19		12.24	12.24
		2.25		
23.00	2.31		2.25	14.49
		2.38		
24.00	2.44		2.38	16.87

CHECK PPV DEPTH: 8.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{16.87}{2.44}$ = 6.91 < 8.00 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2C

BASIN LIMITS: STA. 455+00.00 to STA 489+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	455+00.00	-	489+00.00	200	24	0	0.0	0	8	2.50	13.11	15.61
RDWY SUBTOTAL:										**2.50**	**13.11**	**15.61**
POND 2C										0.00	1.81	1.81
SUBTOTAL:										***0.00***	***1.81***	***1.81***
TOTAL:										**2.50**	**14.92**	**17.42**

BASIN LIMITS: STA. 455+00.00 to STA 489+00.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 3 & 4 TYPICAL)	455+00.00	-	489+00.00	200	44	28	4.5	4	5	6.63	8.98	15.61
RDWY SUBTOTAL:										**6.63**	**8.98**	**15.61**
POND 2C										1.23	0.58	1.81
SUBTOTAL:										***1.23***	***0.58***	***1.81***
TOTAL:										**7.86**	**9.56**	**17.42**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2C

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			2.50	245.00
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			10.49	513.91
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			1.31	110.12
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			1.31	110.12
A (POND)	Wood/Forest Land (Good Condition)	25			0.21	5.20
B/D (POND)	Wood/Forest Land (Good Condition)	77			1.60	123.34
				Totals =	17.42	1107.71

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **63.6**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			1.23	123.00
-	Impervious Area (Pavement)	98			6.63	649.74
A (ROADWAY)	Open Space / Grass (Good Condition)	39			7.18	280.18
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			0.90	71.84
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			0.90	71.84
A (POND)	Open Space / Grass (Good Condition)	39			0.07	2.60
B/D (POND)	Open Space / Grass (Good Condition)	80			0.51	41.06
				Totals =	17.42	1240.26

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **71.2**

CONSOR ENGINEERS, INC.

	DATE
MADE BY: MSF	21-Jan-22
CHECK BY: DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2C

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 5.73 in CN= 63.6

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 4.96 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 4.96 in * 17.42 ac = **7.20 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 5.73 in CN= 63.6

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 1.68 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.68 in * 17.42 ac = **2.44 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 4.05 in CN= 71.2

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 5.93 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 5.93 in * 17.42 ac = **8.61 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 4.05 in CN= 71.2

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2 / (P + 0.8S)$ = 2.29 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 2.29 in * 17.42 ac = **3.32 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.41 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.88 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **1.45** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **1.38** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2C

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-7	24.0	3.2	20.80	22.50

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 20.80 ft. 22.50 ft.

AVG. GROUND WATER TABLE ELEVATION: 20.80 Ft. (NAVD)

AVG. SHWT ELEVATION: 22.50 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
22.50	1.23		0.00	0.00
		1.28		
23.00	1.32		0.64	0.64
		1.35		
23.50	1.37		0.67	1.31
		1.40		
24.00	1.42		0.70	2.01
		1.62		
25.00	1.81		1.62	3.62
TOTAL:			**3.62**	

Total Volume to be stored in pond = 1.45 ac-ft

Elevation of Total Volume to be stored in pond = 23.60 ft

Average elevation of pond site = 23.00 ft

Lowest roadway elevation in basin = 25.73 ft

DHW = Low road el - 1' = 24.73 ft

Wetland Elevation = 22.90 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 2, Pond 2C

PERMANENT POOL VOLUME (PPV) = RT FR *(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)*

WHERE:
PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS
WHERE:

DA = DRAINAGE AREA TO POND (AC) =	17.42	AC	inc. pond
ROAD IMPERVIOUS AREA =	6.63	AC	
POND IMPERVIOUS AREA =	1.23	AC	
PERVIOUS AREA =	9.56	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.542		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **3.35** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
16.50	0.87		0.00	0.00
		0.96		
20.50	1.05		3.84	3.84
		1.10		
21.50	1.14		1.10	4.94
		1.19		
22.50	1.23		1.19	6.12

CHECK PPV DEPTH: 6.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{6.12}{1.23}$ = 4.98 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2D

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH: TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)	IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
CL CONST. (BASED ON TYP.)	447+00.00	-	522+00.00	200	24	0	0.0	8	0	5.51	27.70	33.21
RDWY SUBTOTAL:										**5.51**	**27.70**	**33.21**
SIDEWALK	455+00.00	-	522+00.00						8	1.23	0.00	1.23
SDWK SUBTOTAL:										**1.23**	**0.00**	**1.23**
SUBTOTAL:										***6.74***	***27.70***	***34.44***
POND 2D										0.00	2.29	2.29
SUBTOTAL:										***0.00***	***2.29***	***2.29***
TOTAL:										**6.74**	**29.99**	**36.73**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH: TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)	IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
CL CONST. (SEGMENT 2 TYPICAL)	447+00.00	-	455+00.00	200	46	28	4.5	4	5	1.61	2.06	3.67
CL CONST. (SEGMENT 3 TYPICAL)	455+00.00	-	522+00.00	200	44	28	4.5	4	5	13.07	17.69	30.76
RDWY SUBTOTAL:										**14.68**	**19.75**	**34.43**
POND 2D										1.50	0.79	2.29
SUBTOTAL:										***1.50***	***0.79***	***2.29***
TOTAL:										**16.18**	**20.54**	**36.72**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2D

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			6.74	660.52
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			2.77	135.73
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			12.47	1047.06
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			12.47	1047.06
A/D (POND)	Wood/Forest Land (Good Condition)	77			2.29	176.33
				Totals =	36.73	3066.70

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **83.5**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			1.50	150.00
-	Impervious Area (Pavement)	98			14.68	1438.64
A (ROADWAY)	Open Space / Grass (Good Condition)	39			1.98	77.03
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
A/D (POND)	Open Space / Grass (Good Condition)	80			0.79	63.20
				Totals =	36.72	3150.87

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.8**

CONSOR ENGINEERS, INC.

	DATE
MADE BY: MSF	21-Jan-22
CHECK BY: DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2D

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

ATTENUATION VOLUME (OPEN BASIN)
EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.98 in CN= 83.5
Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.48 in (for 25-yr/24-hr storm event)
Total Runoff for the Project Area = 7.48 in * 36.73 ac = **22.90 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.98 in CN= 83.5
Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.40 in (for 2.33-yr/24-hr storm event)
Total Runoff for the Project Area = 3.40 in * 36.73 ac = **10.42 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.65 in CN= 85.8
Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.77 in (for 25-yr/24-hr storm event)
Total Runoff for the Project Area = 7.77 in * 36.72 ac = **23.77 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.65 in CN= 85.8
Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.63 in (for 2.33-yr/24-hr storm event)
Total Runoff for the Project Area = 3.63 in * 36.72 ac = **11.12 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.87 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.70 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **3.06** **ac-ft**
OR
2.5" over the impervious area (excludes water bodies) = **3.06** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2D

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal Seasonal High Water
PB-11	not surveyed	0.5		at ground surface

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVG. SHWT ELEVATION: 24.5 Ft. (NGVD) = 23.2 Ft. (NAVD)

Control elevation of 23.2 ft NAVD per adjacent permit #34138-1, NW Baptist Mission Site Plan. Discharge to canal along Cox Road and ultimate discharge to St. Johns River above Lake Poinsett per TSR.

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
23.20	0.90			0.00
		0.95		
24.20	1.00		0.95	0.95
		1.06		
25.20	1.11		1.06	2.01
		1.17		
26.20	1.22		1.17	3.17
		1.28		
27.20	1.33		1.28	4.45
		1.55		
28.20	1.77		1.55	6.00
TOTAL:			**6.00**	

Total Volume to be stored in pond = 3.06 ac-ft

Elevation of Total Volume to be stored in pond = 26.11 ft

Average elevation of pond site = 24.5 ft

Lowest roadway elevation in basin = 26.6 ft

DHW = Low road el - 1' = 25.6 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**
LOCATION: **Basin 2, Pond 2D**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE:
PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS
WHERE:

DA = DRAINAGE AREA TO POND (AC) =	36.72	AC	inc. pond
ROAD IMPERVIOUS AREA =	14.68	AC	
POND IMPERVIOUS AREA =	1.50	AC	
PERVIOUS AREA =	20.54	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.533		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **6.93** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
16.2	0.45		0.00	0.00
		0.57		
21.2	0.69		2.85	2.85
		0.74		
22.2	0.79		0.74	3.59
		0.85		
23.2	0.90		0.85	4.44

CHECK PPV DEPTH: 7.0 FT. ≤ 12 FT. OK.
CHECK MEAN DEPTH:
4.44 / 0.90 = 4.93 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2E**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	447+00.00	-	455+00.00	200	24	0	0.0	0	0	0.44	3.23	3.67
CL CONST. (BASED ON TYP.)	455+00.00	-	522+00.00	200	24	0	0.0	0	8	4.92	25.84	30.76
RDWY SUBTOTAL:										**5.36**	**29.07**	**34.43**
POND 2E										0.00	2.24	2.24
SUBTOTAL:										***0.00***	***2.24***	***2.24***
TOTAL:										**5.36**	**31.31**	**36.67**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	447+00.00	-	454+50.00	200	46	28	4.5	4	5	1.51	1.93	3.44
CL CONST. (SEGMENT 3 TYPICAL)	454+50.00	-	522+00.00	200	44	28	4.5	4	5	13.17	17.82	30.99
RDWY SUBTOTAL:										**14.68**	**19.75**	**34.43**
POND 2E										1.68	0.56	2.24
SUBTOTAL:										***1.68***	***0.56***	***2.24***
TOTAL:										**16.36**	**20.31**	**36.67**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2E**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			5.36	525.28
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			2.91	142.44
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			13.08	1098.85
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			13.08	1098.85
A/D (POND)	Wood/Forest Land (Good Condition)	77			2.24	172.48
				Totals =	36.67	3037.90

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **82.8**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			1.68	168.00
-	Impervious Area (Pavement)	98			14.68	1438.64
A (ROADWAY)	Open Space / Grass (Good Condition)	39			1.98	77.03
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
A/D (POND)	Open Space / Grass (Good Condition)	80			0.56	44.80
				Totals =	36.67	3150.47

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **85.9**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2E**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.07 in CN= 82.8

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.40 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.40 in * 36.67 ac = **22.61 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.07 in CN= 82.8

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.34 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.34 in * 36.67 ac = **10.21 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.64 in CN= 85.9

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.78 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 7.78 in * 36.67 ac = **23.78 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.64 in CN= 85.9

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.65 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 3.65 in * 36.67 ac = **11.14 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.17 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.93 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **3.06** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **3.06** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2E**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal Seasonal High Water
PB-13	not surveyed	0.5		AT GROUND SURFACE

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVG. SHWT ELEVATION: 22.6 Ft. (NAVD)

Control elevation of 22.6 ft NAVD per the permit # 64579-9, Walmart Distribution Center. Discharge to canal along Cox Road and ultimate discharge to St. Johns River above Lake Poinsett per TSR.

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
22.60	1.48		0.00	0.00
		1.54		
23.60	1.59		1.54	1.54
		1.64		
24.60	1.69		1.64	3.18
		1.75		
25.60	1.80		1.75	4.92
		2.02		
26.60	2.24		2.02	6.94
TOTAL:			**6.94**	

Total Volume to be stored in pond = 3.06 ac-ft

Elevation of Total Volume to be stored in pond = 24.53 ft

Average elevation of pond site = 22.60 ft

Lowest roadway elevation in basin = 25.41 ft

DHW = Low road el - 1' = 24.41 ft

Wetland Elevation = 22.60 ft (surrounding wetland conservation area)

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 2, Pond 2E**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS
WHERE:

DA = DRAINAGE AREA TO POND (AC) =	36.67	AC	inc. pond
ROAD IMPERVIOUS AREA =	14.68	AC	
POND IMPERVIOUS AREA =	1.68	AC	
PERVIOUS AREA =	20.31	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.537		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **6.98** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
17.6	1.13		0.00	0.00
		1.21		
20.6	1.28		3.62	3.62
		1.33		
21.6	1.38		1.33	4.95
		1.43		
22.6	1.48		1.43	6.38

CHECK PPV DEPTH: 5.0 FT. ≤ 12 FT. OK.
CHECK MEAN DEPTH:
6.38 / 1.48 = 4.31 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2F

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	447+00.00	-	455+00.00	200	24	0	0.0	0	0	0.44	3.23	3.67
CL CONST. (BASED ON TYP.)	455+00.00	-	522+00.00	200	24	0	0.0	0	8	4.92	25.84	30.76
RDWY SUBTOTAL:										**5.36**	**29.07**	**34.43**
POND 2F										0.62	2.13	2.75
SUBTOTAL:										***0.62***	***2.13***	***2.75***
TOTAL:										**5.98**	**31.20**	**37.18**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	447+00.00	-	454+50.00	200	46	28	4.5	4	5	1.51	1.93	3.44
CL CONST. (SEGMENT 3 TYPICAL)	454+50.00	-	522+00.00	200	44	28	4.5	4	5	13.17	17.82	30.99
RDWY SUBTOTAL:										**14.68**	**19.75**	**34.43**
POND 2F										2.11	0.64	2.75
SUBTOTAL:										***2.11***	***0.64***	***2.75***
TOTAL:										**16.79**	**20.39**	**37.18**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2F

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			5.98	586.04
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			2.91	142.44
A/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			13.08	1098.85
B/D (ROADWAY)	Open Space / Grass (Fair Condition)	84			13.08	1098.85
A/D (POND)	Open Space / Grass (Fair Condition)	84			0.36	30.24
A/D (POND)	Wood/Forest Land (Good Condition)	77			1.77	136.29
				Totals =	37.18	3092.71

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **83.2**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			2.11	211.00
-	Impervious Area (Pavement)	98			14.68	1438.64
A (ROADWAY)	Open Space / Grass (Good Condition)	39			1.98	77.03
A/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
B/D (ROADWAY)	Open Space / Grass (Good Condition)	80			8.89	711.00
A/D (POND)	Open Space / Grass (Good Condition)	80			0.52	41.63
B/D (POND)	Open Space / Grass (Good Condition)	80			0.12	9.57
				Totals =	37.18	3199.87

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **86.1**

CONSOR ENGINEERS, INC.

	DATE
MADE BY: MSF	21-Jan-22
CHECK BY: DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E
LOCATION: Basin 2, Pond 2F

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

ATTENUATION VOLUME (OPEN BASIN)
EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.02 in CN= 83.2
Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.44 in (for 25-yr/24-hr storm event)
Total Runoff for the Project Area = 7.44 in * 37.18 ac = **23.06 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 2.02 in CN= 83.2
Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.37 in (for 2.33-yr/24-hr storm event)
Total Runoff for the Project Area = 3.37 in * 37.18 ac = **10.45 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.62 in CN= 86.1
Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 7.80 in (for 25-yr/24-hr storm event)
Total Runoff for the Project Area = 7.80 in * 37.18 ac = **24.17 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 1.62 in CN= 86.1
Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)
Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 3.66 in (for 2.33-yr/24-hr storm event)
Total Runoff for the Project Area = 3.66 in * 37.18 ac = **11.34 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.11 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.89 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **3.10** **ac-ft**
OR
2.5" over the impervious area (excludes water bodies) = **3.06** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**
LOCATION: **Basin 2, Pond 2F**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal Seasonal High Water
PB-12	not surveyed	1.0		at ground surface

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVG. SHWT ELEVATION: 22.6 Ft. (NAVD)

Control elevation of 22.6 ft NAVD per adjacent permit # 64579-9, Walmart Distribution Center. Discharge to canal along Cox Road and ultimate discharge to St. Johns River above Lake Poinsett per TSR.

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
22.60	1.94			0.00
		2.00		
23.60	2.05		2.00	2.00
		2.11		
24.60	2.17		2.11	4.11
		2.23		
25.60	2.29		2.23	6.34
		2.52		
26.60	2.75		2.52	8.86
TOTAL:			**8.86**	

Total Volume to be stored in pond = 3.10 ac-ft

Elevation of Total Volume to be stored in pond = 24.12 ft

Average elevation of pond site = 22.60 ft

Lowest roadway elevation in basin = 26.30 ft

DHW = Low road el - 1' = 25.30 ft

Wetland Elevation = 22.60 ft (adjacent wetland conservation area to the west)

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**
LOCATION: **Basin 2, Pond 2F**

BASIN LIMITS: STA. 447+00.00 to STA 522+00.00, CL CONST. SR 524

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:

DA = DRAINAGE AREA TO POND (AC) =	37.18	AC	inc. pond
ROAD IMPERVIOUS AREA =	14.68	AC	
POND IMPERVIOUS AREA =	2.11	AC	
PERVIOUS AREA =	20.39	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.542		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:
PPV = DA C R RT / WS CF = **7.14** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
17.6	1.51		0.00	0.00
		1.62		
20.6	1.72		4.85	4.85
		1.78		
21.6	1.83		1.78	6.62
		1.89		
22.6	1.94		1.89	8.51

CHECK PPV DEPTH: 5.0 FT. ≤ 12 FT. OK.
CHECK MEAN DEPTH:
8.51 / 1.94 = 4.38 between 2 and 8 FT. O.K.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Pond 3A

BASIN LIMITS: STA. 522+00.00 to STA 539+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	522+00.00	-	539+00.00	250	36	0	0	8	8	2.03	7.73	9.76
RDWY SUBTOTAL:										**2.03**	**7.73**	**9.76**
POND 3A										***0.00***	***0.47***	***0.47***
TOTAL:										**2.03**	**8.20**	**10.23**

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (BASED ON TYP.)	522+00.00	-	539+00.00	250	44	28	4.5	4	5	3.32	6.44	9.76
RDWY SUBTOTAL:										**3.32**	**6.44**	**9.76**
POND 3A										***0.40***	***0.07***	***0.47***
TOTAL:										**3.72**	**6.51**	**10.23**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Pond 3A

BASIN LIMITS: STA. 522+00.00 to STA 539+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			2.03	198.94
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			7.73	378.77
A (POND)	Open Space / Grass (Fair Condition)	49			0.37	18.06
B/D (POND)	Open Space / Grass (Fair Condition)	84			0.10	8.53
				Totals =	10.23	604.29

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service

Use CN = **59.1**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			0.40	40.00
-	Impervious Area (Pavement)	98			3.32	325.36
A (ROADWAY)	Open Space / Grass (Good Condition)	39			6.44	251.16
A (POND)	Open Space / Grass (Good Condition)	39			0.05	2.14
B/D (POND)	Open Space / Grass (Good Condition)	80			0.02	1.21
				Totals =	10.23	619.87

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **60.6**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3A**

BASIN LIMITS: STA. 522+00.00 to STA 539+00.00, CL CONST. SR 524

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.93 in CN= 59.1

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 4.38 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 4.38 in * 10.23 ac = **3.73 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.93 in CN= 59.1

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 1.35 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.35 in * 10.23 ac = **1.15 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.50 in CN= 60.6

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 4.57 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 4.57 in * 10.23 ac = **3.90 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.50 in CN= 60.6

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 1.46 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.46 in * 10.23 ac = **1.25 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.17 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.09 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (DRY POND) **ONLINE** ***(Section 5.2.1 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

0.5" over the entire basin = **0.43** **ac-ft**

OR

1.25" over the impervious area (excludes water bodies) = **0.35** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3A**

BASIN LIMITS: STA. 522+00.00 to STA 539+00.00, CL CONST. SR 524

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-8	30.1	3.3	26.80	26.00

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 26.80 ft. 26.00 ft.

AVG. GROUND WATER TABLE ELEVATION: 26.8 Ft. (NAVD)

AVG. SHWT ELEVATION: 26.0 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
28.00	0.32		0.00	0.00
		0.35		
29.00	0.38		0.35	0.35
		0.42		
30.00	0.45		0.42	0.77
		0.47		
30.50	0.48		0.23	1.00
TOTAL:			**1.00**	

REQUIRED RUNOFF VOLUME: 0.43 AF

TOP EL. OF RUNOFF VOLUME: 29.27 Ft.

PERCOLATION RATE: Ft./Day

Percolation Rates not performed by geotech. Field visits before and after significant storm events observed dry conditions the next day.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3B**

BASIN LIMITS: STA. 539+00.00 to STA 546+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	539+00.00	-	546+00.00	250	36	0	0	8	8	0.84	3.18	4.02
RDWY SUBTOTAL:										**0.84**	**3.18**	**4.02**
POND 3B										***0.00***	***1.16***	***1.16***
TOTAL:										**0.84**	**4.34**	**5.18**

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (BASED ON TYP.)	539+00.00	-	546+00.00	250	44	28	4.5	4	5	1.37	2.65	4.02
RDWY SUBTOTAL:										**1.37**	**2.65**	**4.02**
POND 3B										***1.02***	***0.14***	***1.16***
TOTAL:										**2.39**	**2.79**	**5.18**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3B**

BASIN LIMITS: STA. 539+00.00 to STA 546+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			0.84	82.32
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			3.18	155.82
A (POND)	Open Space / Grass (Fair Condition)	49			0.47	22.79
B/D (POND)	Open Space / Grass (Fair Condition)	84			0.69	58.37
				Totals =	5.18	319.30

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service

Use CN = **61.6**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			1.02	102.00
-	Impervious Area (Pavement)	98			1.37	134.26
A (ROADWAY)	Open Space / Grass (Good Condition)	39			2.65	103.35
A (POND)	Open Space / Grass (Good Condition)	39			0.06	2.19
B/D (POND)	Open Space / Grass (Good Condition)	80			0.08	6.71
				Totals =	5.18	348.51

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **67.3**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3B**

BASIN LIMITS: STA. 539+00.00 to STA 546+00.00, CL CONST. SR 524

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.22 in CN= 61.6

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 4.71 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 4.71 in * 5.18 ac = **2.03 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 6.22 in CN= 61.6

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 1.54 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.54 in * 5.18 ac = **0.66 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 4.86 in CN= 67.3

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 5.43 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 5.43 in * 5.18 ac = **2.34 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = $\frac{1000}{CN}$ - 10 = 4.86 in CN= 67.3

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $\frac{(P - 0.2S)^2}{(P + 0.8S)}$ = 1.97 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.97 in * 5.18 ac = **0.85 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **0.31 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.19 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (DRY POND) **ONLINE** ***(Section 5.2.1 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

0.5" over the entire basin = **0.22** **ac-ft**

OR

1.25" over the impervious area (excludes water bodies) = **0.14** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Pond 3B**

BASIN LIMITS: STA. 539+00.00 to STA 546+00.00, CL CONST. SR 524

GROUNDWATER DATA:

Boring	Existing Ground Elevation	Depth to Encountered Water Surface	Estimated Encountered Water Elevation	Estimated Normal High Water Elevation
PB-9	30.3	2.7	27.60	26.50

Note: Above information per pond boring profiles: Intertek (PSI), September 2019

AVERAGE ELEVATION (FT) 27.60 ft. 26.50 ft.

AVG. GROUND WATER TABLE ELEVATION: 27.6 Ft. (NAVD)

AVG. SHWT ELEVATION: 26.5 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
29.00	0.98		0.86	0.00
		1.04		
30.00	1.10		1.04	1.04
		1.13		
30.50	1.16		0.57	1.61
TOTAL:			**2.47**	

REQUIRED RUNOFF VOLUME: 0.31 AF

TOP EL. OF RUNOFF VOLUME: 29.36 Ft.

PERCOLATION RATE: Ft./Day

Percolation Rates not performed by geotech. Field visits before and after significant storm events observed dry conditions the next day.

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Regional Pond A

BASIN LIMITS: STA. 488+50.00 to STA 546+00.00, CL CONST. SR 524

EXISTING CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	BIKE LANE (Ft.)	INSIDE SHOULDER (Ft.)	OUTSIDE SHOULDER (Ft.)	SIDE-WALKS (Ft.)			
CL CONST. (BASED ON TYP.)	488+50.00	-	522+50.00	200	24	0	0	8	8	3.12	12.49	15.61
CL CONST. (BASED ON TYP.)	522+50.00	-	535+00.00	225	24	0	0	8	8	1.15	5.31	6.46
CL CONST. (BASED ON TYP.)	535+00.00	-	546+00.00	250	36	0	0	8	8	1.31	5.00	6.31
RDWY SUBTOTAL:										**5.58**	**22.80**	**28.38**
REGIONAL POND A										0.00	6.40	6.40
SUBTOTAL:										***0.00***	***6.40***	***6.40***
TOTAL:										**5.58**	**29.20**	**34.78**

BASIN LIMITS: STA. 488+50.00 to STA 546+00.00, CL CONST. SR 524

PROPOSED CONDITIONS:

LOCATION	STATION	To	STATION	BASIN WIDTH (Ft.)	IMPERVIOUS WIDTH					IMP. AREA (Acres)	PERV. AREA (Acres)	TOTAL AREA (Acres)
					TRAVEL LANES (Ft.)	SIDE-WALKS (Ft.)	TYPE 'E' C&G (Ft.)	TYPE 'F' C&G (Ft.)	MEDIAN PAVED (Ft.)			
CL CONST. (SEGMENT 2 TYPICAL)	488+50.00	-	522+50.00	200	46	28	4.5	4	5	6.83	8.78	15.61
CL CONST. (SEGMENT 3 TYPICAL)	522+50.00	-	535+00.00	225	44	28	4.5	4	5	2.44	4.02	6.46
CL CONST. (SEGMENT 4 TYPICAL)	535+00.00	-	546+00.00	250	44	28	4.5	4	5	2.15	4.16	6.31
RDWY SUBTOTAL:										**11.42**	**16.96**	**28.38**
REGIONAL POND A										5.37	1.03	6.40
SUBTOTAL:										***5.37***	***1.03***	***6.40***
TOTAL:										**16.79**	**17.99**	**34.78**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Regional Pond A

EXISTING CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Impervious Area (Pavement)	98			5.58	546.84
A (ROADWAY)	Open Space / Grass (Fair Condition)	49			22.80	1117.20
B/D (POND)	Commercial/Business Area (85% Impervious)	93			4.95	460.09
A (POND)	Commercial/Business Area (85% Impervious)	81			1.45	117.68
				Totals =	34.78	2241.81

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **64.5**

PROPOSED CONDITIONS:

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, & hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area (acres)	Product of CN x Area
-	Water Area	100			5.37	537.00
-	Impervious Area (Pavement)	98			11.42	1119.16
A (ROADWAY)	Open Space / Grass (Good Condition)	39			16.96	661.44
B/D (POND)	Open Space / Grass (Good Condition)	80			0.80	63.70
A (POND)	Open Space / Grass (Good Condition)	39			0.23	9.12
				Totals =	34.78	2390.41

REFERENCE:
Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use CN = **68.7**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Regional Pond A

ATTENUATION VOLUME (OPEN BASIN)

EXISTING CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 5.51 in CN= 64.5

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2/(P + 0.8S)$ = 5.07 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 5.07 in * 34.78 ac = **14.69 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 5.51 in CN= 64.5

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2/(P + 0.8S)$ = 1.75 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 1.75 in * 34.78 ac = **5.06 ac-ft (for 2.33-yr/24-hr storm event)**

PROPOSED CONDITIONS:

Soil Capacity (S) = 1000/CN - 10 = 4.55 in CN= 68.7

Precipitation (P) = 9.50 in (for 25-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2/(P + 0.8S)$ = 5.62 in (for 25-yr/24-hr storm event)

Total Runoff for the Project Area = 5.62 in * 34.78 ac = **16.28 ac-ft (for 25-yr/24-hr storm event)**

Soil Capacity (S) = 1000/CN - 10 = 4.55 in CN= 68.7

Precipitation (P) = 5.20 in (for 2.33-yr/24-hr storm event)

Runoff (Q) = $(P - 0.2S)^2/(P + 0.8S)$ = 2.08 in (for 2.33-yr/24-hr storm event)

Total Runoff for the Project Area = 2.08 in * 34.78 ac = **6.03 ac-ft (for 2.33-yr/24-hr storm event)**

REQUIRED ATTENUATION VOLUME (POST - EXISTING):

Vat (25-yr/24-hr) = **1.59 ac-ft (for 25-yr/24-hr storm event)**

Vat (2.33-yr/24-hr) = **0.97 ac-ft (for 2.33-yr/24-hr storm event)**

TREATMENT VOLUME (WET POND) **ONLINE** ***(Section 8.2 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

1.0" over the entire basin = **2.90** **ac-ft**

OR

2.5" over the impervious area (excludes water bodies) = **2.38** **ac-ft**

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: SR 524 Widening PD&E

LOCATION: Basin 3, Regional Pond A

GROUNDWATER DATA:

AVG. SHWT ELEVATION: 28.5 Ft. (NGVD) (from existing Home Depot permit 16680-1)
27.2 Ft. (NAVD)

PROPOSED STORAGE:

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL.
Ft. (NAVD)	AC.	AC.	AF	AF
27.20	5.37		0.00	0.00
		5.47		
28.20	5.57		5.47	5.47
		5.67		
29.20	5.77		5.67	11.14
		6.09		
30.20	6.40		6.09	17.23
TOTAL:			**17.23**	

Total Volume to be stored in pond = 2.90 ac-ft

Elevation of Total Volume to be stored in pond = 27.73 ft

Lowest roadway elevation in basin = 29.60 ft

DHW = Low road el - 1' = 28.60 ft

CONSOR ENGINEERS, INC.

		DATE
MADE BY:	MSF	21-Jan-22
CHECK BY:	DAB	21-Apr-22

PROJECT: **SR 524 Widening PD&E**

LOCATION: **Basin 3, Regional Pond A**

PERMANENT POOL VOLUME (PPV) = RT FR ***(Section 8.8 of SJRWMD ERP Applicant's Handbook, Permit Information Manual, Volume II)***

WHERE: PPV = PERMANENT POOL VOLUME (AF)
RT = RESIDENCE TIME (DAYS)
FR = AVERAGE FLOW RATE (AF/DAY)

FR = DA C R / WS

WHERE:				
DA = DRAINAGE AREA TO POND (AC) =	34.78	AC	inc. pond
ROAD IMPERVIOUS AREA =	11.42	AC	
POND IMPERVIOUS AREA =	5.37	AC	
PERVIOUS AREA =	17.99	AC	

C = (RD IMP AREA (0.95) + POND IMP (1) +PERV (0.2))/TOTAL AREA

C = RUNOFF COEFFICIENT =	0.570		
R = WET SEASON RAINFALL DEPTH (IN) =	31	IN	
WS = LENGTH OF WET SEASON (DAYS) =	153	DAYS	
CF = CONVERSION FACTOR =	12	IN/FT	
RT = RESIDENCE TIME (ASSUME NO LITTORAL ZONE) =	21	DAYS	(no littoral zone)

THEREFORE:

PPV = DA C R RT / WS CF = **7.03** AF

STAGE	AREA	AVERAGE AREA	INCREMENTAL VOL.	CUMULATIVE VOL
Ft. (NAVD)	AC.	AC.	AF	AF
22.20	4.49		0.00	0.00
		4.73		
25.20	4.97		14.19	14.19
		5.07		
26.20	5.17		5.07	19.26
		5.27		
27.20	5.37		5.27	24.53

CHECK PPV DEPTH: 5.0 FT. ≤ 12 FT. OK.

CHECK MEAN DEPTH:

$\frac{24.53}{5.37}$ = 4.57 < 8.00 FT. O.K.

Complete Report (not including cost) Ver 4.3.5

Project: SR 524 Widening PD_E Study
Date: 3/10/2023 4:12:18 PM

Site and Catchment Information

Analysis: Net Improvement

Catchment Name	Pond Alternative 1A	Pond Alternative 2F	Pond Alternative 3A _ 3B
Rainfall Zone	Florida Zone 2	Florida Zone 2	Florida Zone 2
Annual Mean Rainfall	52.00	52.00	52.00

Pre-Condition Landuse Information

Landuse	User Defined Values	User Defined Values	Highway: TN=1.520 TP=0.200
Area (acres)	0.00	0.00	0.00
Rational Coefficient (0-1)	0.00	0.00	0.00
Non DCIA Curve Number	87.67	87.95	81.86
DCIA Percent (0-100)	13.40	16.10	18.60
Nitrogen EMC (mg/l)	1.499	1.511	1.520
Phosphorus EMC (mg/l)	0.188	0.195	0.200
Runoff Volume (ac-ft/yr)	0.000	0.000	0.000
Groundwater N (kg/yr)	0.000	0.000	0.000
Groundwater P (kg/yr)	0.000	0.000	0.000
Nitrogen Loading (kg/yr)	0.000	0.000	0.000
Phosphorus Loading (kg/yr)	0.000	0.000	0.000

Post-Condition Landuse Information

Landuse	Highway: TN=1.520 TP=0.200	Highway: TN=1.520 TP=0.200	Highway: TN=1.520 TP=0.200
Area (acres)	3.57	2.75	1.63
Rational Coefficient (0-1)	0.54	0.53	0.43
Non DCIA Curve Number	93.70	93.09	90.86
DCIA Percent (0-100)	38.90	39.50	30.40
Wet Pond Area (ac)	2.65	2.11	0.00
Nitrogen EMC (mg/l)	1.520	1.520	1.520
Phosphorus EMC (mg/l)	0.200	0.200	0.200
Runoff Volume (ac-ft/yr)	2.136	1.460	3.063
Groundwater N (kg/yr)	0.000	0.000	0.000
Groundwater P (kg/yr)	0.000	0.000	0.000
Nitrogen Loading (kg/yr)	4.004	2.737	5.740
Phosphorus Loading (kg/yr)	0.527	0.360	0.755

Catchment Number: 1 Name: Pond Alternative 1A

Project: SR 524 Widening PD_E Study
Date: 3/10/2023

Wet Detention Design

Permanent Pool Volume (ac-ft)	9.720
Permanent Pool Volume (ac-ft) for 31 days residence	0.181
Annual Residence Time (days)	1661
Littoral Zone Efficiency Credit	
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	3.57
Contributing Area (acres)	0.920
Non-DCIA Curve Number	93.70
DCIA Percent	38.90
Rainfall Zone	Florida Zone 2
Rainfall (in)	52.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	44
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	99

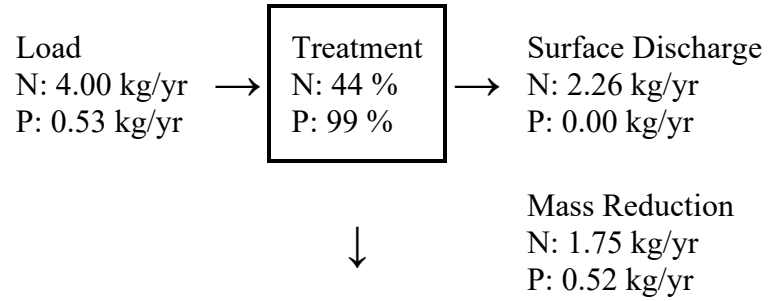
Media Mix Information

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

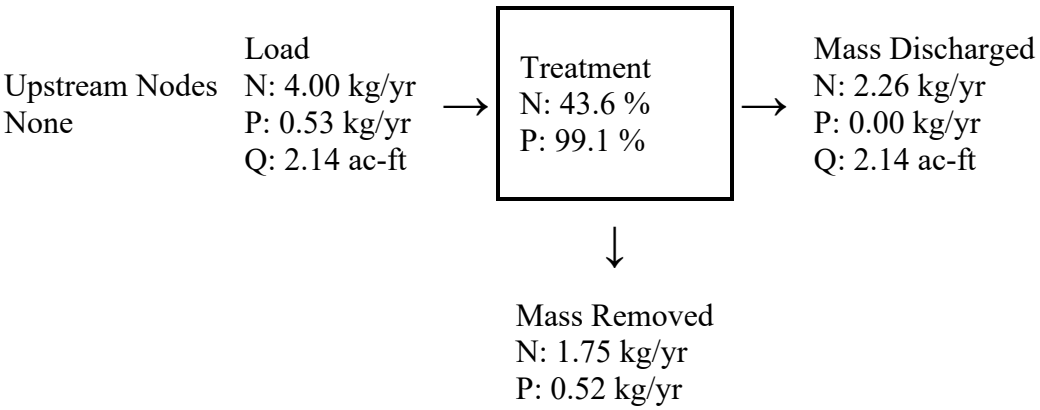
Groundwater Discharge (Stand-Alone)

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)



Load Diagram for Wet Detention (As Used In Routing)



Catchment Number: 2 Name: Pond Alternative 2F

Project: SR 524 Widening PD_E Study
Date: 3/10/2023

Wet Detention Design

Permanent Pool Volume (ac-ft)	8.510
Permanent Pool Volume (ac-ft) for 31 days residence	0.124
Annual Residence Time (days)	2127
Littoral Zone Efficiency Credit	
Wetland Efficiency Credit	

Watershed Characteristics

Catchment Area (acres)	2.75
Contributing Area (acres)	0.640
Non-DCIA Curve Number	93.09
DCIA Percent	39.50
Rainfall Zone	Florida Zone 2
Rainfall (in)	52.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	44
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	99

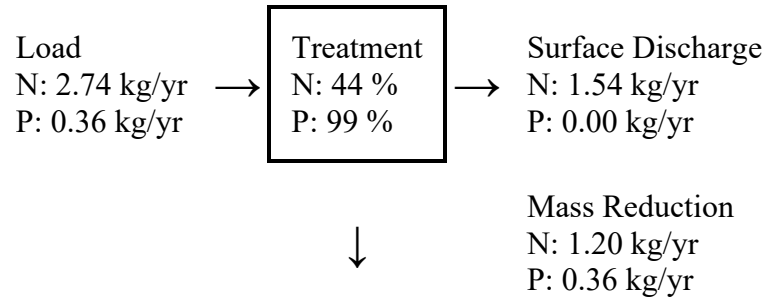
Media Mix Information

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

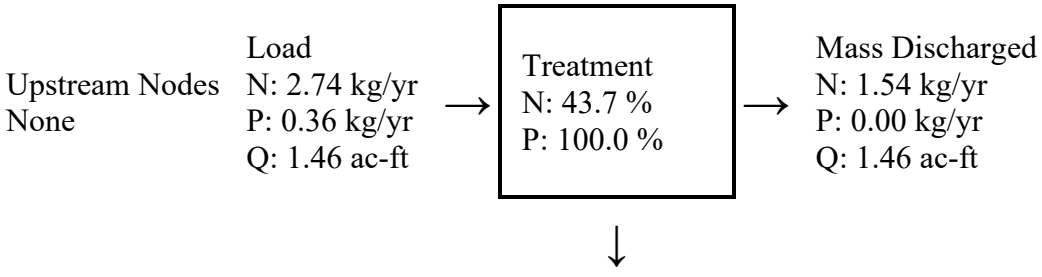
Groundwater Discharge (Stand-Alone)

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)



Load Diagram for Wet Detention (As Used In Routing)



Mass Removed
N: 1.20 kg/yr
P: 0.36 kg/yr

Catchment Number: 3 Name: Pond Alternative 3A _ 3B

Project: SR 524 Widening PD_E Study
Date: 3/10/2023

Retention Design

Retention Depth (in)	5.230
Retention Volume (ac-ft)	0.710

Watershed Characteristics

Catchment Area (acres)	1.63
Contributing Area (acres)	1.630
Non-DCIA Curve Number	90.86
DCIA Percent	30.40
Rainfall Zone	Florida Zone 2
Rainfall (in)	52.00

Surface Water Discharge

Required TN Treatment Efficiency (%)	100
Provided TN Treatment Efficiency (%)	98
Required TP Treatment Efficiency (%)	100
Provided TP Treatment Efficiency (%)	98

Media Mix Information

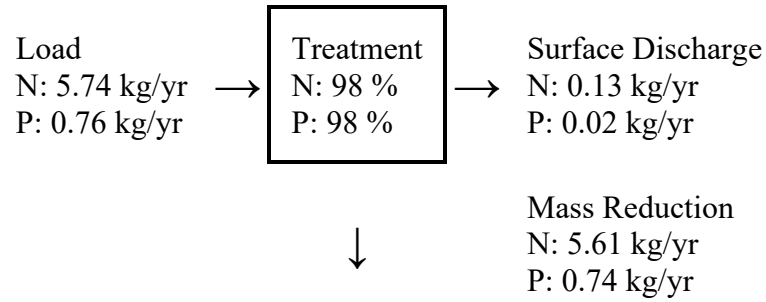
Type of Media Mix	Not Specified
Media N Reduction (%)	
Media P Reduction (%)	

Groundwater Discharge (Stand-Alone)

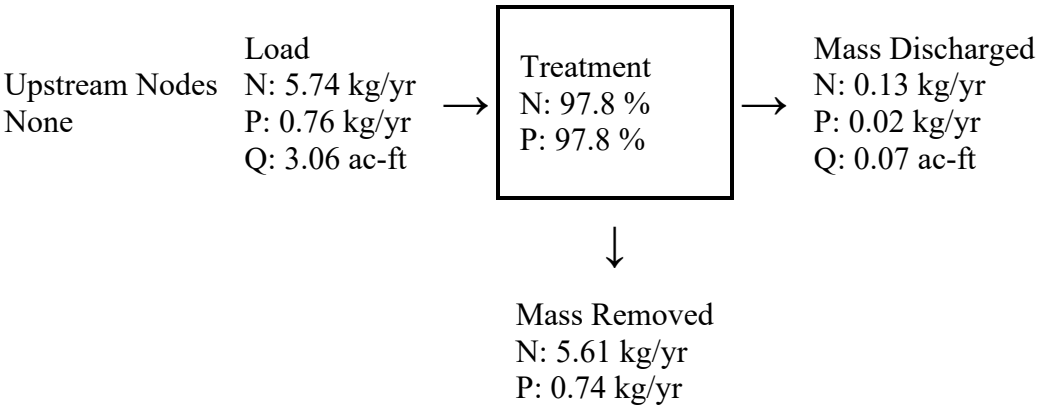
Treatment Rate (MG/yr)	0.000
TN Mass Load (kg/yr)	5.611
TN Concentration (mg/L)	0.000
TP Mass Load (kg/yr)	0.738

TP Concentration (mg/L) 0.000

Load Diagram for Retention (stand-alone)



Load Diagram for Retention (As Used In Routing)



Summary Treatment Report Version: 4.3.5

Project: SR 524 Widening
PD_E Study

Date:3/10/2023

Analysis Type: Net Improvement
BMP Types:
Catchment 1 - (Pond

Routing Summary
Catchment 1 Routed to Outlet
Catchment 2 Routed to Outlet
Catchment 3 Routed to Outlet

Alternative 1A) Wet Detention
Catchment 2 - (Pond
Alternative 2F) Wet Detention
Catchment 3 - (Pond
Alternative 3A _ 3B) Retention
Based on % removal values to
the nearest percent

Total nitrogen target removal met? **No**
Total phosphorus target removal met? **No**

Summary Report

Nitrogen

Surface Water Discharge

Total N pre load	kg/yr	
Total N post load	12.48 kg/yr	
Target N load reduction	100 %	
Target N discharge load	kg/yr	
Percent N load reduction	69 %	
Provided N discharge load	3.93 kg/yr	8.66 lb/yr
Provided N load removed	8.55 kg/yr	18.86 lb/yr

Phosphorus

Surface Water Discharge

Total P pre load	kg/yr	
Total P post load	1.642 kg/yr	
Target P load reduction	100 %	
Target P discharge load	kg/yr	
Percent P load reduction	99 %	
Provided P discharge load	.022 kg/yr	.05 lb/yr
Provided P load removed	1.621 kg/yr	3.573 lb/yr

APPENDIX C

CORRESPONDENCE

SR 524 PD&E Pond Siting Meeting Minutes
437983-1: SR 524 PD&E from Friday Road to Industry Boulevard
August 10, 2022, 11:00 am

Reference: Pond Siting Alternatives Review Meeting

Meeting Location: Teams Virtual Meeting

Attendees:

Ferrell Hickson, PE	FDOT D5, District Drainage Engineer
Casey Lyon	FDOT D5, Environmental Permits Coordinator
Jennifer Ferngren	FDOT D5, Environmental Maintenance Specialist
Philip Escoffier	FDOT D5,
Presley Blackburn, EI	FDOT D5, Drainage Designer
David Graeber, PE	FDOT D5, Consultant Project Manager
Bill Umlauf, PE	CONSOR Engineers, Project Manager
Melinda Fischl, PE	CONSOR Engineers, Drainage Engineer

The purpose of the meeting was to discuss the potential pond sites for the SR 524 PD&E Study. The meeting began with a brief overview of the project and the sites available for Basin 1 and Basin 3. Basin 1 has a willing seller (Pond Alternative 1A) and the site is adequate for the needed treatment volume. Basin 3 will utilize the large swales (Pond Alternatives 3A and 3B) within the FDOT ROW; ditch blocks will be designed to provide the treatment volume.

Pond Alternatives 2A and 2B did not have public approval and are located within Conservation Lands. The Deed further showed it was WMD lands and would be very expensive to use. Pond Alternative 2C was vacant land at the beginning of the study but has now been developed into a Dollar General. Pond Alternatives 2D, 2E, and 2F are vacant lands. Pond Alternative 2D is located on the Walmart Distribution Property and may be part of their conservation land.

Action Items to include in the PSR:

- Check to see if the ponds at the Walmart Distribution Center have available capacity to be a Joint-Use Pond
- Verify Industry Road is part of the FDOT system and not TPK
- Verify Brevard County is agreeable to using Friday Road for compensating treatment
- If the Conservation areas are not WMD Conservation Areas, they may be able to be used for a pond site
    - Check to see how much area (within the Conservation Area) behind the Fire Station can be used for a pond
- Check the closed gas station area at Cox Road to see how much treatment area is available

This is the end of the Meeting Minutes.

APPENDIX D

PRELIMINARY GEOTECHNICAL REPORT

(under separate cover)

APPENDIX E

NATURAL RESOURCES EVALUATION REPORT

(under separate cover)

APPENDIX F

CONTAMINATION SCREENING EVALUATION REPORT

(under separate cover)